

USGS-NPS Vegetation Mapping Program Waterton-Glacier International Peace Park

AUGUST 2007

Appendix A

Waterton-Glacier International Peace Park Memorandum of Concurrence



Waterton - Glacier International Peace Park

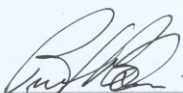
Vegetation classification and mapping of Waterton-Glacier International Peace Park

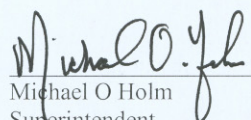
The rugged mountains and tranquil lakes of the Waterton-Glacier International Peace Park are more than just special places and spectacular scenery; they are a shared, precious part of our natural and cultural heritage. Preserving this heritage requires more than passive protection. A sound understanding of park resources, their location and condition, and the actions needed to maintain their health in these dynamic landscapes is necessary. Scientific knowledge, and its application, plays a key role in solving the many, complex issues faced by national parks in both Canada and the United States.

Vegetation, which captures solar energy that powers our natural ecosystems, is a fundamental component of the environment that interacts with geology, soils, climate and wildlife. A seamless vegetation classification and vegetation map developed for the Peace Park will be used by park staff, partners and researchers for a variety of purposes, such as monitoring rare plants, assessing trampling of sensitive alpine vegetation by hikers, tracking the invasion of weeds, planning for prescribed fires, investigating the extent of insect-killed trees, and determining how much habitat is available for grizzly bears and wolverines.

With Glacier and Waterton Lakes national parks long history of cooperative work across an international boundary, it is no surprise that the two parks undertook this ambitious project in 1998. Working together to share resources and expertise means more, and better, science is carried out and applied.

We would like to acknowledge the collective efforts of park staff at many levels and our partners at NatureServe, Montana Natural Heritage Program and the USGS's Upper Midwest Environmental Sciences Center in achieving products that will be used for many years to come. The opportunity to provide the datasets to the public via the internet through the USGS-NPS Vegetation Mapping Program will benefit many people.


Rod Blair
Superintendent
Waterton Lakes National Park


Michael O Holm
Superintendent
Glacier National Park

A Joint Release from Waterton Lakes National Park, Alberta, and Glacier National Park, Montana

USGS-NPS Vegetation Mapping Program Waterton-Glacier International Peace Park

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Appendix B

Preliminary Vegetation Classification of Waterton-Glacier International Peace Park

The development of this preliminary classification of vegetation types is documented in the Vegetation Classification Methods section of this report (Waterton-Glacier International Peace Park Vegetation Mapping Project). It combines several sources into one listing for the project, which was then used to guide both the vegetation sampling effort for classification development and the photointerpretation mapping effort that commenced prior to vegetation classification development.

The following pages are formatted to legal-size page (8.5" x 14") in landscape position.

ZONE				CLASS	Alliance Name	ELCODE	Association Name	EAST WEST	GRADSECT VARIABLES				COMMENTS	1999 PLOTS	GNP PLOTS	WLNP PLOTS	Original Plots Needed
A= ALP- INE	S= SUB- ALPINE	M= MON- TANE	F= FOOT- HILL						SOIL GEOLOGY	DISTUR- BANCE	ELEV- ATION	ASPECT					
		M		FOREST	ABIES GRANDIS FOREST ALLIANCE (Grand Fir)	CEGL000272	Abies grandis / Clintonia uniflora (bride's bonnet) Forest	W					minor				3
		M		FOREST	ABIES GRANDIS SEASONALLY FLOODED FOREST ALLIANCE	CEGL000280	Abies grandis / Senecio triangularis (arrowleaf groundsel) Forest	W	1, 2				minor riparian				3
		M		FOREST	ABIES GRANDIS FOREST ALLIANCE (Grand Fir)	CEGL000293	Abies grandis / Xerophyllum tenax (common beargrass) Forest	W					minor				3
	S			FOREST	ABIES LASIOCARPA - POPULUS TREMULOIDES FOREST ALLIANCE	CEGL000525	Abies lasiocarpa - Populus tremuloides Forest							2			3
	S			FOREST	ABIES LASIOCARPA FOREST ALLIANCE (subalpine fir)	CEGL000295	Abies lasiocarpa / Actaea rubra (red baneberry) Forest		1, 2, 3				minor riparian				3
	S			FOREST	ABIES LASIOCARPA TEMPORARILY FLOODED FOREST ALLIANCE	CEGL000297	Abies lasiocarpa / Alnus viridis ssp. sinuata (sitka alder) Forest				0		minor; alder swales	1			3
	S	M		FOREST	ABIES LASIOCARPA FOREST ALLIANCE (subalpine fir)	CEGL000298	Abies lasiocarpa / Arnica cordifolia Forest		0	0	3, 4	0	40-55% canopy woodland?	3		10	1
	S	M		FOREST	ABIES LASIOCARPA SEASONALLY FLOODED FOREST ALLIANCE	CEGL000300	Abies lasiocarpa / Calamagrostis canadensis (bluejoint) Forest		2, 10	0,2, 3	2 to 4	4	major riparian		1		2
	S			FOREST	ABIES LASIOCARPA FOREST ALLIANCE (subalpine fir)	CEGL000301	Abies lasiocarpa / Calamagrostis rubescens (pine grass) Forest	E									3
	S			FOREST	ABIES LASIOCARPA FOREST ALLIANCE (subalpine fir)	CEGL000304	Abies lasiocarpa / Carex geyeri (elk sedge) Forest		4	0	3	3	minor riparian		1		2
	S			FOREST	ABIES LASIOCARPA FOREST ALLIANCE (subalpine fir)	CEGL000306	Abies lasiocarpa / Clematis columbiana var. columbiana Forest		7, 5, 3	0	3, 5, 4	3, 4			6		0
	S			FOREST	ABIES LASIOCARPA FOREST ALLIANCE (subalpine fir)	CEGL000307	Abies lasiocarpa / Clintonia uniflora (bride's bonnet) Forest		4, 7, 6, 10	1, 3, 2	3, 4	4, 2, 3	major	1	31		0
	S			FOREST	ABIES LASIOCARPA FOREST ALLIANCE (subalpine fir)	CEGL000311	Abies lasiocarpa / Galium triflorum (fragrant bedstraw) Forest						minor				3
	S			FOREST	ABIES LASIOCARPA FOREST ALLIANCE (subalpine fir)	CEGL002611	Abies lasiocarpa / Gymnocarpium dryopteris (western oak fern) Forest						minor				3
	S			FOREST	ABIES LASIOCARPA SEASONALLY FLOODED FOREST ALLIANCE	CEGL000314	Abies lasiocarpa / Ledum glandulosum (western labradortea) Forest	W	5, 3	0, 1	5, 3	2, 3	minor		3		0
	S			FOREST	ABIES LASIOCARPA FOREST ALLIANCE (subalpine fir)	CEGL000315	Abies lasiocarpa / Linnaea borealis (twinflower) Forest		4	1	4	2	major	1	2		1
	S			FOREST	ABIES LASIOCARPA FOREST ALLIANCE (subalpine fir)	CEGL000317	Abies lasiocarpa / Luzula glabrata var. hitchcockii (smooth woodrush) Forest		7, 6, 5, 4, 3, 9, 10	0, 1, 2	5, 4	4, 3, 2	major		50		0
	S	M		FOREST	ABIES LASIOCARPA FOREST ALLIANCE (subalpine fir)	CEGL000319	Abies lasiocarpa / Menziesia ferruginea (rusty menziesia) Forest		7, 10, 4, 3	1, 0, 2	4, 3, 5	3, 4, 2	major, C71, C72, C74; S21?; 40-55% canopy woodland		19	21	0

ZONE				CLASS	Alliance Name	ELCODE	Association Name	EAST WEST	GRADSECT VARIABLES				COMMENTS	1999 PLOTS	GNP PLOTS	WLNP PLOTS	Original Plots Needed
A= ALP-INE	S= SUB-ALPINE	M= MON-TANE	F= FOOT-HILL						SOIL GEOLOGY	DISTUR-BANCE	ELEV-ATION	ASPECT					
	S			FOREST	ABIES LASIOCARPA SEASONALLY FLOODED FOREST ALLIANCE	CEGL000322	Abies lasiocarpa / Oplopanax horridus (devil's club) Forest	W					major riparian	1			3
	S	M		FOREST	ABIES LASIOCARPA SEASONALLY FLOODED FOREST ALLIANCE	CEGL000336	Abies lasiocarpa / Streptopus amplexifolius (claspleaf twistedstalk) Forest		10, 7, 4, 3	0, 1	4, 3, 5	2, 3, 4	major riparian		15		0
		M		FOREST	ABIES LASIOCARPA FOREST ALLIANCE	CEGL000377	Abies lasiocarpa / Symphoricarpus albus Forest		3, 7	1	3	3, 4, 2			3		0
	S			FOREST	ABIES LASIOCARPA FOREST ALLIANCE (subalpine fir)	CEGL000341	Abies lasiocarpa / Vaccinium membranaceum (blue huckleberry) Rocky Mountain Forest						minor	2			3
	S			FOREST	ABIES LASIOCARPA FOREST ALLIANCE (subalpine fir)	CEGL000344	Abies lasiocarpa / Vaccinium scoparium (grouse whorleberry) Forest						major				3
	S			FOREST	ABIES LASIOCARPA FOREST ALLIANCE (subalpine fir)	CEGL000346	Abies lasiocarpa / Xerophyllum tenax (common beargrass) Forest		5, 4, 3, 6, 7	0, 1	4, 3	3, 4	major, C72	1	29		0
	S			FOREST	ABIES LASIOCARPA - LARIX LYALLII FOREST ALLIANCE (subalpine fir -subalpine larch)	CEGL000521	Larix lyallii - Abies lasiocarpa Forest		7	2 to 4	5	4	common; C75		1		2
		M	F	FOREST	LARIX OCCIDENTALIS FOREST ALLIANCE (western larch)	CEGL000624	Larix occidentalis Forest [Provisional]	W					w/ Picea engelmannii				3
	S			FOREST	PICEA ENGELMANNII SEASONALLY FLOODED FOREST ALLIANCE	CEGL000405	Picea (engelmannii x glauca, engelmannii) / Carex disperma (softleaf sedge) Forest		2				minor				3
	S	M	F	FOREST	PICEA ENGELMANNII TEMPORARILY FLOODED FOREST ALLIANCE	CEGL000407	Picea (engelmannii x glauca, engelmannii) / Cornus sericea (redosier dogwood) Forest		1, 2				(Salix drummondiana)				3
	S	M	F	FOREST	PICEA ENGELMANNII TEMPORARILY FLOODED FOREST ALLIANCE	CEGL000409	Picea (engelmannii x glauca, engelmannii) / Galium triflorum (fragrant bedstraw) Forest						minor				3
			F	FOREST	PICEA ENGELMANNII FOREST ALLIANCE (Engelmann Spruce)	CEGL000411	Picea (engelmannii x glauca, engelmannii) / Linnaea borealis (twinflower) Forest										3
			F	FOREST	PICEA ENGELMANNII FOREST ALLIANCE (Engelmann Spruce)	CEGL000415	Picea (engelmannii x glauca, engelmannii) / Maianthemum stellatum (starry false Solomon's seal) Forest	E						1			3
	S			FOREST	PICEA ENGELMANNII FOREST ALLIANCE (Engelmann Spruce)	CEGL000413	Picea (engelmannii x glauca, engelmannii) / Physocarpus malvaceus Forest										3
	S			FOREST	PICEA ENGELMANNII FOREST ALLIANCE (Engelmann Spruce)	CEGL000416	Picea (engelmannii x glauca, engelmannii) / Vaccinium cespitosum (dwarf blueberry) Forest						minor				3

ZONE				CLASS	Alliance Name	ELCODE	Association Name	EAST WEST	GRADSECT VARIABLES				COMMENTS	1999 PLOTS	GNP PLOTS	WLNP PLOTS	Original Plots Needed
A= ALP-INE	S= SUB-ALPINE	M= MON-TANE	F= FOOT-HILL						SOIL GEOLOGY	DISTUR-BANCE	ELEV-ATION	ASPECT					
		M		FOREST	PICEA ENGELMANNII FOREST ALLIANCE (Engelmann Spruce)	CEGL000406	Picea (engelmannii x glauca, engelmannii)/Clintonia uniflora Forest		3, 4	2, 1	3, 4	3, 4, 2	major		4		0
		M		FOREST	PICEA ENGELMANNII SEASONALLY FLOODED FOREST ALLIANCE (Engelmann Spruce)	CEGL000363	Picea engelmannii / Equisetum arvense Forest		1	1	3	3	minor; C78 - 50-60% canopy woodland?	2	1	2	0
	S			FOREST	PINUS ALBICAULIS FOREST ALLIANCE	CEGL000131	Pinus albicaulis / Vaccinium scoparium (grouse whorlberry) Forest			4, 5	4, 5		major: w/ P. flexilis				3
		M	F	FOREST	PINUS CONTORTA FOREST ALLIANCE (Lodgepole Pine)	CEGL000134	Pinus contorta / Arctostaphylos uva-ursi Forest		6	4, 5	1 to 4						3
		M		FOREST	PINUS CONTORTA FOREST ALLIANCE (Lodgepole Pine)	CEGL000135	Pinus contorta / Arnica cordifolia Forest		0	0	3, 4	0	C65 - 25-60% canopy woodland?	3			3
		M	F	FOREST	PINUS CONTORTA FOREST ALLIANCE (Lodgepole Pine)	CEGL000139	Pinus contorta / Calamagrostis rubescens (pine grass) Forest			4, 5	3, 1, 2, 4		C79 - 20-40% canopy woodland?	1		3	1
		M	F	FOREST	PINUS CONTORTA FOREST ALLIANCE (Lodgepole Pine)	CEGL000168	Pinus contorta / Vaccinium cespitosum (dwarf huckleberry) Forest			4, 5			frost pockets, C67?	1			3
	S	M		FOREST	PINUS CONTORTA FOREST ALLIANCE	CEGL000169	Pinus contorta / Vaccinium membranaceum (blue huckleberry) Rocky Mountain Forest		4	1	4	3	minor: post-fire cover type; C66 - 35-45% canopy woodland?	2	1	2	0
	S	M		FOREST	PINUS CONTORTA FOREST ALLIANCE	CEGL000172	Pinus contorta / Vaccinium scoparium (grouse whorlberry) Forest		0	4, 5	1 to 4		C67 - 20-25% canopy woodland?,	2	1	5	0
	S	M	F	FOREST	PINUS CONTORTA FOREST ALLIANCE	CEGL000175	Pinus contorta / Xerophyllum tenax (beargrass) Forest		5	4, 5, 1	3, 4, 2, 1, 5	4, 3	minor: post-fire cover type; C68 - 15-65% canopy woodland?	1	1	6	0
		M	F	FOREST	PINUS CONTORTA TEMPORARILY FLOODED FOREST ALLIANCE	A.175	PINUS CONTORTA TEMPORARILY FLOODED FOREST ALLIANCE							1			
		M	F	FOREST	PINUS CONTORTA TEMPORARILY FLOODED FOREST ALLIANCE	GNP034	Pinus contorta/Calamagrostis canadensis Forest	E	2, 3	4, 5	1 to 4			1			3
		M	F	FOREST	POPULUS BALSAMIFERA SSP. TRICHOCARPA TEMPORARILY FLOODED FOREST ALLIANCE (black cottonwood)	CEGL000667	Populus balsamifera ssp. trichocarpa / Alnus incana (mountain alder) Forest		1, 2, 3								3
		M	F	FOREST	POPULUS BALSAMIFERA SSP. TRICHOCARPA TEMPORARILY FLOODED FOREST ALLIANCE (black cottonwood)	GNP033	Populus balsamifera ssp. trichocarpa / Betula papyrifera (paper birch) Forest		1, 2, 3	4, 5							3
		M	F	FOREST	POPULUS BALSAMIFERA SSP. TRICHOCARPA TEMPORARILY	CEGL000672	Populus balsamifera ssp. trichocarpa / Cornus sericea		1, 2, 3	0	3, 2	3	C76	2		5	1

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A= ALP-INE	S= SUB-ALPINE	M= MON-TANE	F= FOOT-HILL						SOIL GEOLOGY	DISTUR-BANCE	ELEV-ATION	ASPECT					
					FLOODED FOREST ALLIANCE (black cottonwood)		(redosier dogwood) Forest										
		M	F	FOREST	PINUS CONTORTA - POPULUS TREMULOIDES FOREST ALLIANCE	CEGL000536	Populus tremuloides - Pinus contorta / Carex geyeri Forest							2			3
			F	FOREST	POPULUS TREMULOIDES TEMPORARILY FLOODED FOREST ALLIANCE	CEGL000542	Populus tremuloides - Populus balsamifera ssp. trichocarpa / Osmorhiza occidentalis (western sweetroot) Forest		1, 2, 3	4, 5				1			3
		M	F	FOREST	POPULUS TREMULOIDES - PSEUDOTSUGA MENZIESII FOREST ALLIANCE (Quaking aspen-Douglas Fir)	A.426	POPULUS TREMULOIDES - PSEUDOTSUGA MENZIESII FOREST ALLIANCE (Quaking aspen-Douglas Fir)										
		M	F	FOREST	POPULUS TREMULOIDES FOREST ALLIANCE (quaking aspen)	CEGL000564	Populus tremuloides / Amelanchier alnifolia (Saskatoon berry) Forest		3	0	3, 2	4	C60; 45-75% canopy woodland? Heracleum lanatum herbaceous layer mesic-moist to wet. 1999 woodland plots were tallied with forest types.	1	1	10	0
		M	F	FOREST	POPULUS TREMULOIDES SEASONALLY FLOODED FOREST ALLIANCE	CEGL000574	Populus tremuloides / Calamagrostis canadensis (bluejoint) Forest		1, 2, 3, 5	3, 4, 5	3	3	1999 woodland plots were tallied with forest types.	1	1		2
		M	F	FOREST	POPULUS TREMULOIDES FOREST ALLIANCE (quaking aspen)	CEGL000575	Populus tremuloides / Calamagrostis rubescens (pine grass) Forest			4, 5							3
	S			FOREST	POPULUS TREMULOIDES FOREST ALLIANCE (quaking aspen)	CEGL000578	Populus tremuloides / Carex foenea Forest		8	0	5	4			1		2
		M	F	FOREST	POPULUS TREMULOIDES TEMPORARILY FLOODED FOREST ALLIANCE	CEGL000582	Populus tremuloides / Cornus sericea (redosier dogwood) Forest		1, 2, 3	4, 5			major riparian	2			3
		M	F	FOREST	POPULUS TREMULOIDES FOREST ALLIANCE (quaking aspen)	CEGL000595	Populus tremuloides / Osmorhiza occidentalis (western sweetroot) Forest			4, 5			C60? 1999 woodland plots were tallied with forest types.	3			3
		M		FOREST	POPULUS TREMULOIDES FOREST ALLIANCE (quaking aspen)	CEGL000602	Populus tremuloides / Rubus parviflorus Forest		0	0	2, 3	4	C61; 40-60% canopy woodland? 1999 woodland plots were tallied with forest types.	2			3
		M	F	FOREST	POPULUS TREMULOIDES FOREST ALLIANCE (quaking aspen)	CEGL000609	Populus tremuloides / Symphoricarpos albus (common snowberry) Forest		0	4, 5	3	3	C62; Sym. occidentalis shrub layer - dryer. 1999 woodland plots were tallied with forest	2		5	1

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A= ALP-INE	S= SUB-ALPINE	M= MON-TANE	F= FOOT-HILL						SOIL GEOLOGY	DISTUR-BANCE	ELEV-ATION	ASPECT						
		M		FOREST	POPULUS TREMULOIDES FOREST ALLIANCE (quaking aspen)	CEGL000618	Populus tremuloides / Tall Forbs Forest (AS urtdio)			0	0	2	0	C63; 45-75% canopy woodland? Urtica dioica herbaceous layer DISTURBED SITE. 1999 woodland plots were tallied with forest types.	2			3
		M	F	FOREST	POPULUS TREMULOIDES - PSEUDOTSUGA MENZIESII FOREST ALLIANCE (Quaking aspen-Douglas Fir)	GNP032	Pseudotsuga menziesii - Populus tremuloides Forest (Douglas Fir-Quaking aspen)				4				1			3
		M	F	FOREST	PSEUDOTSUGA MENZIESII FOREST ALLIANCE (Douglas Fir)	CEGL000424	Pseudotsuga menziesii / Arctostaphylos uva-ursi Forest		5, 7	0	4, 3	3			3			0
		M	F	FOREST	PSEUDOTSUGA MENZIESII FOREST ALLIANCE (Douglas Fir)	CEGL000427	Pseudotsuga menziesii / Arnica cordifolia Forest		0	0	2, 3	3	C64 - 35-55% canopy woodland?	1		9		1
		M	F	FOREST	PSEUDOTSUGA MENZIESII FOREST ALLIANCE (Douglas Fir)	CEGL000429	Pseudotsuga menziesii / Calamagrostis rubescens (pine grass) Forest						major					3
		M	F	FOREST	PSEUDOTSUGA MENZIESII FOREST ALLIANCE (Douglas Fir)	CEGL000430	Pseudotsuga menziesii / Carex geyeri (elk sedge) Forest						minor	1				3
		M	F	FOREST	PSEUDOTSUGA MENZIESII FOREST ALLIANCE (Douglas Fir)	CEGL000439	Pseudotsuga menziesii / Juniperus communis Forest		4, 5, 7	2, 0	4	2, 3, 4			3			0
		M	F	FOREST	PSEUDOTSUGA MENZIESII FOREST ALLIANCE (Douglas Fir)	CEGL000441	Pseudotsuga menziesii / Linnaea borealis (twinlineflower) Forest						major					3
		M	F	FOREST	PSEUDOTSUGA MENZIESII FOREST ALLIANCE (Douglas Fir)	CEGL000457	Pseudotsuga menziesii / Spiraea betulifolia (white spiraea) Forest		3, 4, 6	1, 2	3	4, 2, 3	minor	1	4			0
			F	FOREST	PSEUDOTSUGA MENZIESII FOREST ALLIANCE (Douglas Fir)	CEGL000458	Pseudotsuga menziesii / Symphoricarpos albus (common snowberry) Forest								2			3
		M		FOREST	PSEUDOTSUGA MENZIESII FOREST ALLIANCE (Douglas Fir)	CEGL000459	Pseudotsuga menziesii / Symphoricarpos albus / Hieracium cynoglossoides Forest	W?	3, 10	1	3	2, 3	major verify WA type		2			3
		M	F	FOREST	PSEUDOTSUGA MENZIESII FOREST ALLIANCE (Douglas Fir)	CEGL000465	Pseudotsuga menziesii / Vaccinium cespitosum (dwarf blueberry) Forest	W?					minor					3
		M	F	FOREST	PSEUDOTSUGA MENZIESII FOREST ALLIANCE (Douglas Fir)	CEGL000466	Pseudotsuga menziesii / Vaccinium membranaceum (blue huckleberry) Forest						minor					3
		M		FOREST	THUJA PLICATA FOREST ALLIANCE (western redcedar)	CEGL000471	Thuja plicata / Aralia nudicaulis (wild sarsparilla) Forest	W	1, 11	2, 3	1 to 4							3

ZONE				CLASS	Alliance Name	ELCODE	Association Name	EAST WEST	GRADSECT VARIABLES				COMMENTS	1999 PLOTS	GNP PLOTS	WLNP PLOTS	Original Plots Needed	
A= ALP-INE	S= SUB-ALPINE	M= MON-TANE	F= FOOT-HILL						SOIL GEOLOGY	DISTUR-BANCE	ELEV-ATION	ASPECT						
		M		FOREST	THUJA PLICATA SEASONALLY FLOODED FOREST ALLIANCE	CEGL000473	Thuja plicata / Athyrium filix-femina (common ladyfern) Forest	W	1, 2, 11	2, 3	1 to 4		minor riparian				3	
		M		FOREST	THUJA PLICATA FOREST ALLIANCE (western redcedar)	CEGL000474	Thuja plicata / Clintonia uniflora (bride's bonnet) Forest	W	1, 11	2, 3	1 to 4						3	
		M		FOREST	THUJA PLICATA FOREST ALLIANCE (western redcedar)	CEGL000476	Thuja plicata / Gymnocarpium dryopteris (western oak fern) Forest	W	1, 11	2, 3	1 to 4						3	
		M		FOREST	THUJA PLICATA SEASONALLY FLOODED FOREST ALLIANCE	CEGL000479	Thuja plicata / Oplopanax horridus (devil's club) Forest	W	1, 2, 11	2, 3	1 to 4		minor riparian				3	
		M		FOREST	TSUGA HETEROPHYLLA FOREST ALLIANCE (western hemlock)	CEGL000488	Tsuga heterophylla / Aralia nudicaulis (wild sarsparilla) Forest	W	1, 2, 7	2, 3	1 to 4		minor				3	
		M		FOREST	TSUGA HETEROPHYLLA FOREST ALLIANCE (western hemlock)	CEGL000493	Tsuga heterophylla / Clintonia uniflora (bride's bonnet) Forest	W	1, 2, 7	2, 3	1 to 4		minor				3	
		M		FOREST	TSUGA HETEROPHYLLA FOREST ALLIANCE (western hemlock)	CEGL000494	Tsuga heterophylla / Gymnocarpium dryopteris (western oak fern) Forest	W	1, 2, 7	2, 3	1 to 4		minor				3	
		M		FOREST	TSUGA HETEROPHYLLA FOREST ALLIANCE (western hemlock)	CEGL000499	Tsuga heterophylla / Xerophyllum tenax (common beargrass) Forest	W	1, 2, 7	2, 3	1 to 4		minor				3	
	S			WOODLAND	ABIES LASIOCARPA - PINUS ALBICAULIS WOODLAND ALLIANCE (subalpine fir - whitebark pine)	CEGL000752	Abies lasiocarpa - Pinus albicaulis / Vaccinium scoparium (grouse whorlberry) Woodland		8, 4, 5, 9	0	5, 4	3, 4	major: 127, 128, 129, 131 perhaps; O28 (Shepardia can.)		10		0	
	S			WOODLAND	ABIES LASIOCARPA WOODLAND ALLIANCE	GNP029	Abies lasiocarpa / _____ sparse woodland over bedrock		5, 6, 9, 10	0	4 to 6				2		3	
		M		WOODLAND	ABIES LASIOCARPA WOODLAND ALLIANCE	CEGL000919	Abies lasiocarpa / Juniperus communis Woodland		5	0	4, 5	3			1	2	1	
	S			WOODLAND	ABIES LASIOCARPA WOODLAND ALLIANCE	GNP021	Abies lasiocarpa / Luzula glabra var. hitchcockii (Xerophyllum tenax) Woodland (subalpine fir)		5, 7, 8	0, 1, 5	4, 5	3, 4	O29		6	4	0	
	S	M		WOODLAND	ABIES LASIOCARPA WOODLAND ALLIANCE	CEGL000338	Abies lasiocarpa / Thalictrum occidentale Forest		0	0	4	2	O32; 15-20% canopy tree savanna?			4	1	
	S			WOODLAND	ABIES LASIOCARPA WOODLAND ALLIANCE	GNP025	Abies lasiocarpa / Xerophyllum tenax - Clintonia borealis Woodland (subalpine fir)				4, 5				1		3	
	S			WOODLAND	ABIES LASIOCARPA WOODLAND ALLIANCE	CEGL000925	Abies lasiocarpa Scree Woodland		5, 9		4, 5				1		3	
	S			WOODLAND	LARIX LYALLII WOODLAND ALLIANCE (subalpine larch)	CEGL000623	Larix lyallii Woodland [Provisional]		7	0	5	2, 3, 4	major: w/ P. flexilis; C75		1	1	12	0
		M	F	WOODLAND	PICEA ENGELMANNII TEMPORARILY FLOODED WOODLAND ALLIANCE (Engelmann Spruce)	A.179	PICEA ENGELMANNII TEMPORARILY FLOODED WOODLAND ALLIANCE (Engelmann Spruce)											

ZONE				CLASS	Alliance Name	ELCODE	Association Name	EAST WEST	GRADSECT VARIABLES				COMMENTS	1999 PLOTS	GNP PLOTS	WLNP PLOTS	Original Plots Needed
A= ALP-INE	S= SUB-ALPINE	M= MON-TANE	F= FOOT-HILL						SOIL GEOLOGY	DISTUR-BANCE	ELEV-ATION	ASPECT					
		M	F	WOODLAND	PICEA ENGELMANNII TEMPORARILY FLOODED WOODLAND ALLIANCE (Engelmann Spruce)	GNP031	Picea englemannii / Salix spp. Woodland										3
	S			WOODLAND	PINUS ALBICAULIS WOODLAND	GNP039a	Pinus albicaulis - (Picea engelmannii) / Dryas octopetala Woodland					O31					3
	S			WOODLAND	PINUS ALBICAULIS WOODLAND	CEGL000128	Pinus albicaulis - Abies lasiocarpa Woodland [Provisional]		0	0	4	4, 3	O28; compare with CEGL000758	1		2	1
	S			WOODLAND	PINUS ALBICAULIS WOODLAND	CEGL000758	Pinus albicaulis / Luzula hitchcockii var. glabrata Woodland		4, 5	0	4, 5	4, 3, 2	O30		3	7	0
	S			WOODLAND	PINUS ALBICAULIS WOODLAND	CEGL000127	Pinus albicaulis Woodland [Provisional]		0	0	5	0	O31; compare with CEGL000758			3	1
		M	F	WOODLAND	PINUS FLEXILIS WOODLAND ALLIANCE (Limber Pine)	CEGL000805	Pinus flexilis / Festuca idahoensis Woodland										3
		M	F	WOODLAND	PINUS FLEXILIS WOODLAND ALLIANCE (Limber Pine)	CEGL000807	Pinus flexilis / Juniperus communis Woodland		0	0	3, 4	4, 3	O27, O25	1		5	1
		M	F	WOODLAND	PINUS PONDEROSA WOODLAND ALLIANCE	CEGL000857	Pinus ponderosa /Festuca idahoensis woodland	W?									3
		M	F	WOODLAND	PSEUDOTSUGA MENZIESII WOODLAND ALLIANCE (Douglas fir)	GNP039	Pseudotsuga menziesii - (P. flexilis, P. contorta) / Juniperus communis Woodland						O25?	3			3
		M	F	WOODLAND	PSEUDOTSUGA MENZIESII WOODLAND ALLIANCE (Douglas fir)	CEGL000901	Pseudotsuga menziesii / Festuca campestris (rough fescue) Woodland		0	0	3	3	minor; O26 (Arctostaphylos uva-ursi)			2	1
		M	F	WOODLAND	PSEUDOTSUGA MENZIESII WOODLAND ALLIANCE (Douglas fir)	WLNP030	Pseudotsuga menziesii / Festuca idahoensis (Idaho fescue) Limestone Woodland		9, 10				minor				3
		M	F	WOODLAND	PSEUDOTSUGA MENZIESII WOODLAND ALLIANCE (Douglas fir)	CEGL000900	Pseudotsuga menziesii / Festuca idahoensis (Idaho fescue) Woodland						minor	2			3
	S			SHRUBLAND	ABIES LASIOCARPA - ACER GLABRUM SHRUBLAND ALLIANCE (subalpine fir - rocky mountain maple)	CEGL000984	Abies lasiocarpa - Acer glabrum (rocky mountain maple) Avalanche Chute Shrubland		4	0	4	0	S21		1	2	0
A	S			SHRUBLAND	ABIES LASIOCARPA KRUMMHOLZ SHRUBLAND ALLIANCE	CEGL000985	Abies lasiocarpa Krummholz Shrubland		7, 5, 8, 6, 4, 10	0	5, 4	4, 3, 2	up to 2 m (S22 Arnica cordifolia?)		10	4	0
		M	F	SHRUBLAND	ACER GLABRUM SHRUBLAND ALLIANCE (rocky mountain maple)	CEGL001061	Acer glabrum Avalanche Chute Shrubland		4, 5, 9								3
	S	M	F	SHRUBLAND	ALNUS INCANA TEMPORARILY FLOODED SHRUBLAND ALLIANCE (mountain alder)	GNP024	Alnus incana - Menziesia ferruginea - Vaccinium membranaceum shrubland		4		2 to 4		Wbark data				3

ZONE				CLASS	Alliance Name	ELCODE	Association Name	EAST WEST	GRADSECT VARIABLES				COMMENTS	1999 PLOTS	GNP PLOTS	WLNP PLOTS	Original Plots Needed
A= ALP-INE	S= SUB-ALPINE	M= MON-TANE	F= FOOT-HILL						SOIL GEOLOGY	DISTUR-BANCE	ELEV-ATION	ASPECT					
		M	F	SHRUBLAND	ALNUS INCANA SEASONALLY FLOODED SHRUBLAND ALLIANCE (mountain alder)	CEGL002628	Alnus incana / Athyrium filix-femina (common ladyfern) Shrubland	W	1, 2				minor				3
		M	F	SHRUBLAND	ALNUS INCANA SEASONALLY FLOODED SHRUBLAND ALLIANCE (mountain alder)	CEGL001146	Alnus incana / Equisetum arvense (field horsetail) Shrubland		1, 2								3
		M	F	SHRUBLAND	ALNUS INCANA TEMPORARILY FLOODED SHRUBLAND ALLIANCE (mountain alder)	CEGL001147	Alnus incana / Mesic Forbs Shrubland		1, 2, 3				clay slopes				3
	S	M	F	SHRUBLAND	ALNUS INCANA TEMPORARILY FLOODED SHRUBLAND ALLIANCE (mountain alder)	CEGL001158	Alnus spp. Avalanche Chute Shrubland		10	3	3, 4	3	S13; inclusions of CEGL001061	1	7		0
		M	F	SHRUBLAND	ALNUS VIRIDIS SSP. SINUATA TEMPORARILY FLOODED SHRUBLAND ALLIANCE (sitka alder)	CEGL001156	Alnus viridis ssp. sinuata / Athyrium filix-femina (common ladyfern) Shrubland		1, 2, 3								3
		M	F	SHRUBLAND	ALNUS VIRIDIS SSP. SINUATA TEMPORARILY FLOODED SHRUBLAND ALLIANCE (sitka alder)	CEGL001154	Alnus viridis ssp. sinuata Shrubland [Provisional]		4, 10	0	4, 3	4, 3, 2		5			0
		M	F	SHRUBLAND	AMELANCHIER ALNIFOLIA SHRUBLAND ALLIANCE	CEGL002183	Amelanchier alnifolia (mixed grass-mixed forb) shrubland						S23 (Prunus virginiana) mixed shrub/grass/forb S23	3			3
			F	SHRUBLAND	AMELANCHIER ALNIFOLIA SHRUBLAND ALLIANCE	CEGL001065	Amelanchier alnifolia / Pseudoroegneria spicata Shrubland		0	0	3, 2	0			2		1
		M	F	SHRUBLAND	BETULA NANA SEASONALLY FLOODED SHRUBLAND ALLIANCE	CEGL001079	Betula nana / Carex rostrata (beaked sedge) Shrubland		1, 2	0	3, 2	1	S24 major riparian		2		1
		M		SHRUBLAND	BETULA OCCIDENTALIS SEASONALLY FLOODED SHRUBLAND ALLIANCE (water birch)	CEGL001080	Betula occidentalis Shrubland		1, 2				minor riparian				3
		M	F	SHRUBLAND	CORNUS SERICEA TEMPORARILY FLOODED SHRUBLAND ALLIANCE (redosier dogwood)	CEGL001165	Cornus sericea Shrubland [Provisional]		1, 2, 3				minor riparian				3
			F	SHRUBLAND	HOLODICUS DISCOLOR SHRUBLAND ALLIANCE	GNP035	Holodiscus discolor -Ceanothus spp. / Festuca idahoensis shubland		4								3
		M	F	SHRUBLAND	ROSA WOODSII TEMPORARILY FLOODED SHRUBLAND ALLIANCE (Wood's rose)	CEGL001126	Rosa woodsii Shrubland		1, 2, 3				minor				3
		M	F	SHRUBLAND	SALIX BEBBIANA TEMPORARILY FLOODED SHRUBLAND ALLIANCE (Bebb willow)	CEGL001173	Salix bebbiana Shrubland		1, 2, 3								3

ZONE				CLASS	Alliance Name	ELCODE	Association Name	EAST WEST	GRADSECT VARIABLES				COMMENTS	1999 PLOTS	GNP PLOTS	WLNP PLOTS	Original Plots Needed
A= ALP-INE	S= SUB-ALPINE	M= MON-TANE	F= FOOT-HILL						SOIL GEOLOGY	DISTUR-BANCE	ELEV-ATION	ASPECT					
			F	SHRUBLAND	SALIX CANDIDA SEASONALLY FLOODED SHRUBLAND ALLIANCE	CEGL001188	Salix candida / Carex rostrata (beaked sedge) shrubland		1, 2								3
		M	F	SHRUBLAND	SALIX DRUMMONDIANA TEMPORARILY FLOODED SHRUBLAND ALLIANCE (Drummond's willow)	CEGL001191	Salix drummondiana / Calamagrostis canadensis (bluejoint) Shrubland		1, 2, 3			major	2				3
		M	F	SHRUBLAND	SALIX DRUMMONDIANA SEASONALLY FLOODED SHRUBLAND ALLIANCE (Drummond's willow)	CEGL002631	Salix drummondiana / Carex utriculata (northwest territory sedge) Shrubland		1, 2				2				3
		M	F	SHRUBLAND	SALIX DRUMMONDIANA TEMPORARILY FLOODED SHRUBLAND ALLIANCE (Drummond's willow)	CEGL001190	Salix drummondiana Shrubland [Provisional]		1, 2, 3			major, steep gradient					3
		M	F	SHRUBLAND	SALIX GEYERIANA SEASONALLY FLOODED SHRUBLAND ALLIANCE (Geyer's willow)	CEGL001205	Salix geeyeriana / Calamagrostis canadensis (bluejoint) Shrubland		1, 2								3
		M	F	SHRUBLAND	SALIX GEYERIANA SEASONALLY FLOODED SHRUBLAND ALLIANCE (Geyer's willow)	CEGL001207	Salix geeyeriana / Carex rostrata (beaked sedge) Shrubland		1, 2			minor: merge with 2631					3
	S	M	F	SHRUBLAND	SALIX GLAUCA TEMPORARILY FLOODED SHRUBLAND ALLIANCE (grayleaf willow)	CEGL001136	Salix Glauca Shrubland		1, 2, 3	6	3, 4	S25, maintained by avalanche and flooding	1		2		1
			F	SHRUBLAND	SALIX WOLFII TEMPORARILY FLOODED SHRUBLAND ALLIANCE	CEGL001238	Salix wolfii / Deschampsia cespitosa Shrubland (wolf's willow)		1, 2, 3								3
		M	F	SHRUBLAND	VACCINIUM MEMBRANACEUM SHRUBLAND ALLIANCE	GNP026	Vaccinium membranaceum - Sorbus americanus - (Festuca spp.) shrubland		8, 3, 4	0, 3	2 to 4	2, 4, 3			3		0
A	S	M		DWARF-SHRUBLAND	ARCTOSTAPHYLOS UVA-URSI DWARF-SHRUBLAND ALLIANCE	CDamm002	Arctostaphylos uva-ursi community Dryas octopetala - heath		6, 7, 5	0	5, 4	4, 3, 2	Damm 1999		13		0
A	S	M		DWARF-SHRUBLAND	ARCTOSTAPHYLOS UVA-URSI DWARF-SHRUBLAND ALLIANCE	CDamm003	Arctostaphylos uva-ursi community Juniperus communis - heath		7, 5, 6	0, 2	4, 5	4, 3, 2	Damm 1999		26		0
A	S	M	F	DWARF-SHRUBLAND	ARCTOSTAPHYLOS UVA-URSI DWARF-SHRUBLAND ALLIANCE	CEGL001392	Arctostaphylos uva-ursi Dwarf-shrubland, WA		7	0	1 to 4	3, 4	Damm 1999, H28?; compare to C EGL000002 and C EGL000003		8	7	0
A	S			DWARF-SHRUBLAND	CASSIOPE MERTENSIANA DWARF-SHRUBLAND ALLIANCE (western moss heather)	CEGL001398	Cassiope mertensiana - Phyllodoce empetriformis (pink mountainheath) Dwarf-shrubland	W			5		Damm 1999, C. tetragona?		W (5)		0
A	S			DWARF-SHRUBLAND	CASSIOPE MERTENSIANA TEMPORARILY FLOODED	CEGL001396	Cassiope mertensiana / Carex paysonis (Payson's sedge) Dwarf-		6, 10, 12	0	5, 6		Damm 1999 C.pay-sax; C. tetragona?		2		1

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A= ALP-INE	S= SUB-ALPINE	M= MON-TANE	F= FOOT-HILL						SOIL GEOLOGY	DISTUR-BANCE	ELEV-ATION	ASPECT					
					DWARF-SHRUBLAND ALLIANCE (western moss heather)		shrubland										
A	S			DWARF-SHRUB HERBACEOUS VEGETATION		WLNP037	Dryas drummondii - Epilobium latifolium Dwarf-shrub Herbaceous Vegetation			0			H08, Waterton				3
A	S			DWARF-SHRUB HERBACEOUS VEGETATION	DRYAS OCTOPETALA DWARF-SHRUB HERBACEOUS ALLIANCE (white dryad)	CEGL001892	Dryas octopetala - Carex rupestris (rock sedge) Dwarf-shrub Herbaceous Vegetation		6, 5, 8	0	5	2, 4, 3	Damm 1999		16		0
A	S			DWARF-SHRUB HERBACEOUS VEGETATION	DRYAS OCTOPETALA DWARF-SHRUB HERBACEOUS ALLIANCE (white dryad)	CEGL001893	Dryas octopetala - Carex spp. Dwarf-shrub Herbaceous Vegetation						may merge with CEGL001892				3
A	S			DWARF-SHRUB HERBACEOUS VEGETATION	DRYAS OCTOPETALA DWARF-SHRUB HERBACEOUS ALLIANCE (white dryad)	CEGL001894	Dryas octopetala - Polygonum viviparum (alpine bistort) Dwarf-shrub Herbaceous Vegetation		6, 5, 7	0, 2	5, 6, 3?	4, 2, 3	Damm 1999		44		0
A	S			DWARF-SHRUBLAND	KALMIA MICROPHYLLA SATURATED DWARF-SHRUBLAND ALLIANCE	CEGL001402	Kalmia microphylla / Aster alpigenus Dwarf-shrubland WA	W	8	0	5	2	Damm 1999 described Phyllodoce glanduliflora-Kalmia microphylla moist heath mostly from the west side. Compare to CEGL001405.		1; W (7)		0
A	S			DWARF-SHRUBLAND	PHYLLODOCE EMPETRIFORMIS DWARF-SHRUBLAND ALLIANCE (pink mountainheath)	CEGL001405	Phyllodoce empetriformis / Antennaria lanata Dwarf-shrubland	W 6	6, 9	0	5	4, 2	Damm 1999, compare to CEGL001402		3		0
A				DWARF-SHRUBLAND	PHYLLODOCE GLANDULIFLORA DWARF-SHRUBLAND ALLIANCE	A.1084	PHYLLODOCE GLANDULIFLORA DWARF-SHRUBLAND ALLIANCE										
A	S			DWARF-SHRUBLAND	SALIX ARCTICA DWARF-SHRUBLAND ALLIANCE (artic willow)	CEGL001431	Salix arctica / Polygonum bistortoides (american bistort) Dwarf-shrubland		6, 4, 7, 8, 9	0	5	4, 2, 3			13		0
A	S			GRASSLAND		CDamm004	Arnica rydbergii-Selaginella scopulorum-Carex phaeocephala-community		5, 6, 7	0	5, 4, 6	4, 3, 2	Damm 1999		24		0
	S	M		GRASSLAND		CDamm014	Artemisia michauxiana-Anemone multifida community Pentstemon ellipticus-Aster sibiricus variant		5, 6, 7	0	4, 5	3, 4, 2	Damm 1999		24		0
			F	GRASSLAND	ARTEMISIA TRIDENTATA SHRUB HERBACEOUS ALLIANCE	CEGL001530	Artemisia tridentata / Festuca idahoensis Shrub Herbaceous Vegetation	W	1, 4		1, 2		minor				3
		M	F	GRASSLAND		GNP038	Bromus spp. - Phleum spp. Grassland						grazed/disturbed lands				3
		M	F	GRASSLAND	CALAMAGROSTIS CANADENSIS SEASONALLY FLOODED HERBACEOUS ALLIANCE	CEGL001559	Calamagrostis canadensis Herbaceous Vegetation		1, 2, 3				major	1			3

ZONE				CLASS	Alliance Name	ELCODE	Association Name	EAST WEST	GRADSECT VARIABLES				COMMENTS	1999 PLOTS	GNP PLOTS	WLNP PLOTS	Original Plots Needed
A= ALP-INE	S= SUB-ALPINE	M= MON-TANE	F= FOOT-HILL						SOIL GEOLOGY	DISTUR-BANCE	ELEV-ATION	ASPECT					
					(bluejoint)												
	S	M	F	GRASSLAND	CAREX AQUATILIS SEASONALLY FLOODED HERBACEOUS ALLIANCE	CEGL001802	Carex aquatilis Herbaceous Vegetation		1, 2	0	3	1	H11 (Cx utriculata), compare with CEGL001803	1		6	1
	S			GRASSLAND		CDamm005	Carex geayeri-ravine-slope community		7, 6, 5	0	4, 5	3, 2	Damm 1999		9		0
		M	F	GRASSLAND	CAREX LASIOCARPA SEASONALLY FLOODED HERBACEOUS ALLIANCE	CEGL001810	Carex lasiocarpa Herbaceous Vegetation		1, 2				major riparian				3
A				GRASSLAND	CAREX NIGRICANS SEASONALLY FLOODED HERBACEOUS ALLIANCE (black alpine sedge)	CEGL001816	Carex nigricans Herbaceous Vegetation		6, 9, 5, 8	0	5	4, 2, 3	Damm 1999		14		0
	S			GRASSLAND	CAREX NIGRICANS SEASONALLY FLOODED HERBACEOUS ALLIANCE (black alpine sedge)	CEGL001816	Carex nigricans Herbaceous Vegetation		6, 9, 5, 8	0	5	4, 2, 3	H02		14	5	0
A	S			GRASSLAND	CAREX SCIRPOIDEA HERBACEOUS ALLIANCE ((northern singlespike sedge)	CEGL001867	Carex scirpoidea - Potentilla diversifolia (varileaf cinquefoil) Herbaceous Vegetation		7, 6, 5	0	4, 5	4, 3	Damm 1999		15		0
		M	F	GRASSLAND	CAREX (ROSTRATA, UTRICULATA) SEASONALLY FLOODED HERBACEOUS ALLIANCE	CEGL001562	Carex utriculata Herbaceous Vegetation (northwest territory sedge)		4, 2	0	5	3	major riparian	1	1		2
		M		GRASSLAND	DANTHONIA CALIFORNICA HERBACEOUS ALLIANCE	CEGL001607	Danthonia californica - Festuca idahoensis Herbaceous Vegetation		0	0	3	4	H25; may include Danthonia parryi			12	1
A	S	M	F	GRASSLAND	DESCHAMPSIA CESPITOSA SEASONALLY FLOODED HERBACEOUS ALLIANCE (tufted hairgrass)	CEGL001599	Deschampsia cespitosa Herbaceous Vegetation		1, 2		1 to 6		major				3
			F	GRASSLAND	EQUISETUM FLUVIATILE SEMIPERMANENTLY FLOODED HERBACEOUS ALLIANCE (water horsetail)	CEGL001960	Equisetum fluviatile Herbaceous Vegetation		2					1			3
	S			GRASSLAND		CDamm009	Erythronium grandiflorum-Luzula hitchcockii community Arnica diversifolia-Ranunculus eschscholtzii variant		9, 6, 5, 7	0	5, 4	3, 4, 2	Damm 1999, Keen		23		0
A	S			GRASSLAND	FESTUCA BRACHYPHYLLA HERBACEOUS ALLIANCE	CEGL001797	Festuca brachyphylla - Trisetum spicatum		7, 5, 9	0	4, 5	4			1		2
	S	M	F	GRASSLAND	FESTUCA IDAHOENSIS HERBACEOUS ALLIANCE (Idaho fescue)	CEGL001628	Festuca campestris - Festuca idahoensis (Idaho fescue) Herbaceous Vegetation		0	6	4	3, 4	H42, H28?	1		5	1

ZONE				CLASS	Alliance Name	ELCODE	Association Name	EAST WEST	GRADSECT VARIABLES				COMMENTS	1999 PLOTS	GNP PLOTS	WLNP PLOTS	Original Plots Needed
A= ALP-INE	S= SUB-ALPINE	M= MON-TANE	F= FOOT-HILL						SOIL GEOLOGY	DISTUR-BANCE	ELEV-ATION	ASPECT					
A	S			GRASSLAND	FESTUCA CAMPESTRIS HERBACEOUS ALLIANCE (rough fescue)	CEGL001627	Festuca campestris Herbaceous Vegetation		7, 5, 6	0	4, 5, 3	3, 2, 4	Damm 1999, H28	1	10	7	0
		M	F	GRASSLAND	FESTUCA CAMPESTRIS HERBACEOUS ALLIANCE (rough fescue)	CEGL001629	Festuca campestris - Pseudoroegneria spicata (bluebunch wheatgrass) Herbaceous Vegetation		0	6	1 to 3	4	H27			9	1
A	S			GRASSLAND	FESTUCA IDAHOENSIS HERBACEOUS ALLIANCE (Idaho fescue)	CEGL001623	Festuca idahoensis - Potentilla diversifolia (varileaf cinquefoil) Herbaceous Vegetation		5, 6, 7	0	5, 4	4, 3	Damm 1999		31		0
		M		GRASSLAND	FESTUCA IDAHOENSIS HERBACEOUS ALLIANCE (Idaho fescue)	CEGL001624	Festuca idahoensis - Pseudoroegneria spicata Herbaceous										3
		M	F	GRASSLAND	FESTUCA IDAHOENSIS HERBACEOUS ALLIANCE (Idaho fescue)	CEGL001625	Festuca idahoensis - Stipa richardsonii Herbaceous Vegetation				1 to 3						3
		M	F	GRASSLAND	DESCHAMPSIA CESPITOSA TEMPORARILY FLOODED HERBACEOUS ALLIANCE (tufted hairgrass)	CEGL001900	Festuca idahoensis (Idaho fescue) - Deschampsia cespitosa Herbaceous Vegetation		1, 2, 3								3
	S			GRASSLAND	FESTUCA KINGII HERBACEOUS ALLIANCE	CEGL001914	Festuca kingii - Poa fendleriana ssp. fendleriana Herbaceous Vegetation, ID		5	0	5	3	Damm 1999		1		2
			F	GRASSLAND	JUNCUS BALTICUS SEASONALLY FLOODED HERBACEOUS ALLIANCE (Baltic rush)	CEGL001838	Juncus balticus Herbaceous Vegetation		2								3
		M		GRASSLAND	JUNCUS BALTICUS SEASONALLY FLOODED HERBACEOUS ALLIANCE (Baltic rush)	CEGL001838	Juncus balticus Herbaceous Vegetation		1, 2				minor				3
A				GRASSLAND	JUNCUS DRUMMONDII HERBACEOUS ALLIANCE (Drummond's rush)	CEGL001904	Juncus drummondii - Antennaria lanata (wooly pussytoes) Herbaceous Vegetation		12	0	5						3
A	S			GRASSLAND	KOBRESIA MYOSUROIDES HERBACEOUS ALLIANCE	CEGL001907	Kobresia myosuroides - Carex rupestris var. drummondiana Herb. Veg.		5, 9	0	5, 6	3	Damm 1999		11		0
			F	GRASSLAND	PENTAPHYLLOIDES FLORIBUNDA SHRUB (shrubby cinquefoil) HERBACEOUS ALLIANCE	CEGL001503	Pentaphylloides floribunda / Festuca campestris (rough fescue) Shrub Herbaceous Vegetation							1			3
			F	GRASSLAND	PENTAPHYLLOIDES FLORIBUNDA SHRUB (shrubby cinquefoil) HERBACEOUS ALLIANCE	CEGL001502	Pentaphylloides floribunda / Festuca idahoensis (Idaho fescue) Shrub Herbaceous Vegetation		5	0	5	3		1	1		2
	S			GRASSLAND	PENTAPHYLLOIDES FLORIBUNDA SHRUB	A.1534	PENTAPHYLLOIDES FLORIBUNDA SHRUB		0	6	4	2	L03			4	1

ZONE				CLASS	Alliance Name	ELCODE	Association Name	EAST WEST	GRADSECT VARIABLES				COMMENTS	1999 PLOTS	GNP PLOTS	WLNP PLOTS	Original Plots Needed
A= ALP-INE	S= SUB-ALPINE	M= MON-TANE	F= FOOT-HILL						SOIL GEOLOGY	DISTUR-BANCE	ELEV-ATION	ASPECT					
					HERBACEOUS ALLIANCE		HERBACEOUS ALLIANCE										
A	S			GRASSLAND		CDamm013	Phacelia hastata-Pentstemon ellipticus-talus slope community Stellaria americana-Arenaria nuttallii-Eriogonum ovalifolium		5, 6, 7, 8	0	5, 4, 6	4, 3, 2	Damm 1999		22		0
A				GRASSLAND		CEGL001928	Polemonium viscosum Herbaceous Vegetation				5, 6		H37 (Saxafraga spp.)			7	1
			F	GRASSLAND	POLYGONUM AMPHIBIUM PERMANENTLY FLOODED HERBACEOUS ALLIANCE (water knotweed)	CEGL002002	Polygonum amphibium Herbaceous Vegetation [Provisional]		2								3
			F	GRASSLAND	POTAMOGETON PECTINATUS PERMANENTLY FLOODED HERBACEOUS ALLIANCE (sago pondweed)	CEGL002003	Potamogeton pectinatus - Myriophyllum spicatum (spike watermilfoil) Herbaceous Vegetation		2								3
			F	GRASSLAND	POTAMOGETON PECTINATUS PERMANENTLY FLOODED HERBACEOUS ALLIANCE (sago pondweed)	CEGL002004	Potamogeton pectinatus - Ruppia maritima (widgeongrass) Herbaceous Vegetation		2								3
			F	GRASSLAND	POTAMOGETON PECTINATUS PERMANENTLY FLOODED HERBACEOUS ALLIANCE (sago pondweed)	CEGL002005	Potamogeton pectinatus - Zannichellia palustris (horned pondweed) Herbaceous Vegetation		2								3
			F	GRASSLAND	POTAMOGETON RICHARDSONII PERMANENTLY FLOODED HERBACEOUS ALLIANCE (Richardson's pondweed)	CEGL002006	Potamogeton richardsonii - Myriophyllum spicatum (spike watermilfoil) Herbaceous Vegetation		2								3
		M	F	GRASSLAND	PSEUDOROEGNERIA SPICATA HERBACEOUS ALLIANCE	CEGL001677	Pseudoroegneria spicata - Poa secunda Herbaceous Vegetation						H42				3
	S			GRASSLAND		CDamm011	Saxifraga lyallii streambank community		5, 6, 7, 8	0	5	2, 4, 3	Damm 1999		7		0
	S	M		GRASSLAND		CDamm017	Selaginella wallacei community		7, 4	0	4, 3	4, 2, 3	Damm 1999		23		0
	S	M	F	GRASSLAND	SENECIO TRIANGULARIS TEMPORARILY FLOODED HERBACEOUS ALLIANCE	CEGL001987	Senecio triangularis Herbaceous Vegetation		1, 2, 3		5, 4	4	H31	2		5	1
A	S			GRASSLAND	SILENE ACAULIS HERBACEOUS ALLIANCE (moss campion)	CEGL001934	Silene acaulis Herbaceous Vegetation		6, 5, 7	0	5, 6, 4	4, 2, 3	Damm 1999		40		0
A				GRASSLAND		A.1697	TOFIELDIA GLUTINOSA - PARNASSIA GLAUCA SATURATED HERBACEOUS ALLIANCE										

ZONE				CLASS	Alliance Name	ELCODE	Association Name	EAST WEST	GRADSECT VARIABLES				COMMENTS	1999 PLOTS	GNP PLOTS	WLNP PLOTS	Original Plots Needed
A= ALP-INE	S= SUB-ALPINE	M= MON-TANE	F= FOOT-HILL						SOIL GEOLOGY	DISTUR-BANCE	ELEV-ATION	ASPECT					
	S			GRASSLAND		Cdamm	Tofieldia glutinosa-Parnassia fimbriata-Trollius laxus community Salix arctica-Castilleja occidentalis-community		6, 5, 9	0	5, 4	3, 4, 2	Damm 1999		26		0
A				GRASSLAND		CDamm012	Tofieldia glutinosa-Parnassia fimbriata-Trollius laxus community Salix arctica-Castilleja occidentalis-community		6, 5, 9	0	5, 4	3, 4, 2	Damm 1999		26		0
	S			GRASSLAND	XEROPHYLLUM TENAX HERBACEOUS ALLIANCE	A.1600	XEROPHYLLUM TENAX HERBACEOUS ALLIANCE										
	S			GRASSLAND	XEROPHYLLUM TENAX HERBACEOUS ALLIANCE	CDamm019	Xerophyllum tenax-community		7	0	4	2	Damm 1999	1	1		2
A	S			SPARSE VEGETATION		CDamm008	Athyrium distentifolium boulder-field community	W	8, 9	0	4, 5	2, 3	Damm 1999		W (8)		0
A	S			SPARSE VEGETATION	NONVASCULAR-SPARSE VEGETATION ALLIANCE	GNP028	Consolidated bedrock - lichen non-vascular vegetation		5, 6, 9, 10	0	3 to 6						3
A	S			SPARSE VEGETATION	FESTUCA BRACHYPHYLLA SPARSE HERBACEOUS ALLIANCE	GNP027	Festuca brachyphylla - Trisetum spicatum sparsely vegetated talus		5, 9	0	4, 5						3
A	S	M		SPARSE VEGETATION		CDamm015	Saxifraga bronchialis Scree Slope Community		5, 6, 7, 8, 10	0	4, 5, 6	4, 2, 3	Damm 1999		13		0
A				SPARSE VEGETATION		WLNP036	SAXICOLOUS LICHEN TUNDRA		0	0	6	0	H12			4	1
A	S			SPARSE VEGETATION	NONVASCULAR-SPARSE VEGETATION ALLIANCE	CDamm016	Saxifraga mertensiana cliff-crevice community		5, 7	0	4, 5, 6	4, 3, 2	Damm 1999		4		0
A	S			SPARSE VEGETATION		CDamm020	Sibbaldia procumbens-Juncus parryi-Antennaria alpina-Hieracium gracile late melting meadow community		5, 9, 6, 8	0	5, 6	3, 4, 2	Damm 1999		28		0
		M	F	SPARSE VEGETATION		GNP030	SPARSELY VEGETATED GRAVEL BAR/LAKE SHORE		1		1 to 4			3			3
	S	M		SPARSE VEGETATION		CDamm018	Suksdorfia ranunculifolia - Dodecatheon pulchellum spring-seeped outcrops		6, 7	0	4, 3, 5	3, 4	Damm 1999		6		0

USGS-NPS Vegetation Mapping Program Waterton-Glacier International Peace Park

AUGUST 2007

Appendix C

Plot Sampling Form and Field Manual

PLOT SURVEY FORM, GLACIER NP VEGETATION MAPPING PROJECT:

IDENTIFICATION AND LOCATION:

UNITS: ft. m
PLOT NO. GLAC. POLYGON NO.: MON: DAY: YEAR:
EXAMINER(S): _____
PROVIS. ASSOC. NAME: _____
SITE NAME: _____ STATE: MT COUNTY: _____
USGS QUAD NAME: _____ QUAD CODE: _____
GPS REF. NO.: _____ Field UTM X mE Field UTM Y mN
Corrected UTM X mE Corrected Field UTM Y mN UTM Zone
GPS Error +/- m
OWNERSHIP (circle): Private (Name: _____), U. S. Forest Service, BLM, Tribal, Bur. of Rec. , State MT, _____
PLOT TYPES: _____ PLOT SIZE: _____ RADIUS/LN; _____ WIDTH SURVEY: _____
PHOTOGRAPHY: (type, azimuth, etc.) _____
DIRECTIONS (to plot): _____

ENVIRONMENTAL FEATURES:

SOIL TEXTURE:(circle one) clay; sandy clay; silty clay; clay loam; silty clay loam; sandy clay loam; loam; silt loam; silt; sandy loam; loamy sand; sand; x= unable to assess
PARENT MATERIAL(S): _____ LANDFORM: _____
PLOT POSITION: _____
ASPECT(%): SLOPE (%): ELEVATION: (ft. or M)
SPECIAL FEATURE(S): _____
GROUND COVER (by cover classes): SOIL+ GRAVEL+ ROCK + LITTER + WOOD + MOSS + BASAL VEG. + OTHER =100%
(bare soil = <2mm fraction; gravel = 2mm to <10cm; rock [inc. cobbles, boulders] = > 10cm, wood = > 1cm; litter = organic < 1 cm; other = water, lichen, specify

RIPARIAN/WETLAND FEATURES:

COWARDIN CLASS.: SYST. Palustrine, Lacustrine, Riverine (circle), SUBSYT _____
VALLEY FLOOR GRADIENT: _____ FLOODPLAIN WIDTH: (m, ft.) _____ BED MATERIAL: _____
SURFACE (STANDING) WATER DEPTH: _____ (cm or in., observed): _____ MEAN _____ MAXIMUM
DIST. FROM WATER: _____ AVE. ANN. HIGH WATER: _____ (OBSERVED OR ESTIMATE, CIRCLE)
INUNDATION PERIOD/HYDRO. REGIME: (circle one) Permanently Flooded; Saturated; Semipermanently Flooded; Seasonally Flooded; Temporarily Fld.; Intermittently Fld.

GENERAL SITE DESCRIPTION (landscape features, position in landscape, and position on catena, **adjacent associations or structural stages**, etc.):

DISTURBANCE TYPE: (circle type and note details below. If more than one type, refer to each by its number when describing below)

- 1) Recent fire or suppression activity (e.g. fire lines) 2) Blister rust (specify trees and % mortality)
- 3) Mountain pine beetle damage 4) Trespass grazing evidence 5) Development
- 6) Recreation (campsites, etc.) 6) Bear digs (light, moderate, or heavy)
- 7) Significant weed invasion (e.g. knapweed, St. John's Wort, leafy spurge, timothy)

OTHER DISTURBANCES (type, intensity, frequency, season, other diseases):

OCULAR PLANT SPECIES DATA:

PLOT NUMBER: GLAC. _____ **PROVISIONAL ASSOC. NAME:** _____
MINIMUM COVER VALUE: _____

TREES: TOTAL CV. _____ MEAN HT. _____ **FORBS:** TOTAL CV. _____ MEAN HT. _____
 TALL CV. _____ MED. CV. _____ MED. CV. _____ LOW CV. _____
 LOW CV. _____ GRND.CV. _____ GRND. CV. _____

HEIGHT TO LIVE CROWN _____
 Tree Height|Canopy Cover by Dia. Class

SPECIES IDENT.*	>18"	<18"	<9"	<5"	1"	SPECIES IDENTIFICATION	HT.	CCC
T 1	_____	_____	_____	_____	_____	F 1	_____	_____
T 2	_____	_____	_____	_____	_____	F 2	_____	_____
T 3	_____	_____	_____	_____	_____	F 3	_____	_____
T 4	_____	_____	_____	_____	_____	F 4	_____	_____
T 5	_____	_____	_____	_____	_____	F 5	_____	_____
T 6	_____	_____	_____	_____	_____	F 6	_____	_____
T 7	_____	_____	_____	_____	_____	F 7	_____	_____
T 8	_____	_____	_____	_____	_____	F 8	_____	_____
						F 9	_____	_____
						F10	_____	_____
						F11	_____	_____
						F12	_____	_____
						F13	_____	_____
						F14	_____	_____
						F15	_____	_____
						F16	_____	_____
						F17	_____	_____
						F18	_____	_____
						F19	_____	_____
						F20	_____	_____
						F21	_____	_____
						F22	_____	_____
						F23	_____	_____
						F24	_____	_____
						F25	_____	_____
						F26	_____	_____
						F27	_____	_____
						F28	_____	_____
						F29	_____	_____
						F30	_____	_____
						F31	_____	_____
						F32	_____	_____
						F33	_____	_____
						F34	_____	_____
						F35	_____	_____
						F36	_____	_____

SHRUBS: TOTAL CV. _____ MEAN HT. _____
 TALL CV. _____ MED CV. _____
 LOW CV. _____ GRND.CV. _____

S 1	_____	_____	_____	_____	_____
S 2	_____	_____	_____	_____	_____
S 3	_____	_____	_____	_____	_____
S 4	_____	_____	_____	_____	_____
S 5	_____	_____	_____	_____	_____
S 6	_____	_____	_____	_____	_____
S 7	_____	_____	_____	_____	_____
S 8	_____	_____	_____	_____	_____
S 9	_____	_____	_____	_____	_____
S10	_____	_____	_____	_____	_____
S11	_____	_____	_____	_____	_____
S12	_____	_____	_____	_____	_____

GRAMINOIDS: TOT. CV. _____ MEAN HT. _____
 MED. CV. _____ LOW CV. _____
 GRND. CV. _____

G 1	_____	_____	_____	_____	_____
G 2	_____	_____	_____	_____	_____
G 3	_____	_____	_____	_____	_____
G 4	_____	_____	_____	_____	_____
G 5	_____	_____	_____	_____	_____
G 6	_____	_____	_____	_____	_____
G 7	_____	_____	_____	_____	_____
G 8	_____	_____	_____	_____	_____
G 9	_____	_____	_____	_____	_____
G10	_____	_____	_____	_____	_____
G11	_____	_____	_____	_____	_____
G12	_____	_____	_____	_____	_____
G13	_____	_____	_____	_____	_____
G14	_____	_____	_____	_____	_____
G15	_____	_____	_____	_____	_____
G16	_____	_____	_____	_____	_____

FERNS AND ALLIED FORMS (E.G. EQUIRETUM, LYCOPODIUM):
 TOTAL CV. _____ MEAN HT. _____ MED. CV. _____
 LOW CV. _____ GRND CV. _____

F 1	_____	_____	_____	_____	_____
F 2	_____	_____	_____	_____	_____
F 3	_____	_____	_____	_____	_____
F 4	_____	_____	_____	_____	_____
F 5	_____	_____	_____	_____	_____

BRYOIDS & LICHENS: TOTAL CV. Brioids: _____ TOTAL CV. Lichens: _____

B 1	_____ / _____ [_____]	L 1	_____ / _____ [_____]
B 2	_____ / _____ [_____]	L 2	_____ / _____ [_____]
B 3	_____ / _____ [_____]	L 3	_____ / _____ [_____]
B 4	_____ / _____ [_____]	L 4	_____ / _____ [_____]
B 5	_____ / _____ [_____]	L 5	_____ / _____ [_____]
B 6	_____ / _____ [_____]	L 6	_____ / _____ [_____]
B 7	_____ / _____ [_____]	L 7	_____ / _____ [_____]
B 8	_____ / _____ [_____]	L 8	_____ / _____ [_____]

COMMENTS _____

² Tree canopy cover for mature (> 5 in. dbh) and seedlings/saplings (< 5 in. dbh.) is the minimum breakdown for tree stratum, for any species;
¹ Canopy Cover Classes (Percent Values): 0; T = >0, <1; P = E1, <5; 1 = E5, <15; 2 = E15, <25; 3 = E25, <35; 4 = E35, <45; 5 = E45, <55; 6 = E55, <65;
 7 = E65, <75; 8 = E75, <85; 9 = E85, <95; F = E95
 *First three letters of genus and species; write complete species name if confusion possible within lifeform: use © to indicate collected taxon

Sampling at Glacier National Park

A Basic Guide for Field Work

Prepared for the 1999 Field Season, USGS-NPS Vegetation Mapping Program
(Partially reformatted/edited for this project report)

This document is intended to give you general instructions and guidelines for conducting your field work at Glacier National Park. Detailed, field-by-field coding conventions for the primary form you'll be completing in the field (the Plot Survey form) are provided in the 'cheat sheet' at the back, along with an example of a completed form. A completed Fuel Inventory form and Accuracy Assessment Point form—other forms you'll become very familiar with—are also included at the back for reference.

Overview

The data that you collect in Glacier this year will be used to create a relatively fine-scale delineation of vegetation pattern in Glacier National Park and its environs, an area of nearly 1 million acres across the east and west slopes of the northern Rocky Mountains. The range of habitats, and the corresponding diversity of vegetation types, found here is extremely complex. The understanding of finer-scale, ecologically distinct vegetation types that you will help create may be used by the Park to plan appropriate management activities, monitor the results of these activities, track long-term changes in vegetation, direct searches for rare species, model fire behavior, and portray the wealth of natural diversity on Park lands to the public.

Establishing a field sampling strategy that captures—in only two or three field seasons—sufficient data on all the distinct vegetation types in an area as large, diverse, and rugged as Glacier is an ongoing challenge. To make the sampling as efficient as possible, the key environmental variables thought to be driving vegetation pattern were identified. These included factors such as elevation, aspect, fire history, and soils (see TNC 1998). The geographic locations of various classes of these environmental factors were then overlaid and areas with unique combinations (called biophysical units or BPUs) were mapped. (For example an East Slope, 2001–2400 meter elevation, south-facing site with wet soils was identified as a different biophysical unit from an East Slope, 2001–2400 meter elevation, south-facing site with alluvial and floodplain soils.) The basic idea being that by identifying and placing samples in the range of BPUs we would be likely to sample the range of vegetation types. Next, wherever possible, areas with clusters of these different BPUs in close proximity to each other *and* in close proximity to roads and trails were located, so that getting to these places could be as easy as possible.

In the next (ongoing) step, photo interpreters are examining aerial photos of the areas identified by the (as yet unsampled) BPUs and will make an educated guess about what types of vegetation will be found there. The photo interpreters will supply mylar overlays with polygons delineated and labeled with vegetation types. The vegetation "types" they are choosing to tag their polygons are those included in the preliminary classification of Park vegetation created using the U.S. National Vegetation Classification system (Grossman et al. 1998). For the 1999 field season, a relatively coarse level of this classification hierarchy (formation group level) is used (e.g., evergreen woodland, mixed deciduous-evergreen shrubland). The coarse level of interpretation is necessary because the photos are relatively small scale (1:24,000) which limits finer level interpretation, and because the photo interpreters have yet to do extensive ground-truthing on the east side of the park.

The interpreted overlays, when attached to the photo prints, are useful in the field to help find the vegetation types to sample. The delineated polygons provide a perspective of accessibility to selected points and also indicate the size of homogenous stands so that sampling can be placed to best advantage

within the types. The photo interpreters will give the selected, delineated polygons labeled with U.S. National Vegetation Classification types to the Field Coordinator, who will be keeping a running tally of the number of plots that still need to be established and sampled for each type.

The Field Coordinator will give you and your field partner your assignments based on the tally. You, your partner, and the Field Coordinator will be evaluating the data you collect in the field, assigning a second (still preliminary) vegetation type, and updating the tally of vegetation types x number of plots still needed. This tally will be updated approximately every two weeks during the field season. The goal of this constant feedback and revision is to use *your* time as efficiently as possible: we are trying our best to avoid oversampling of some types and undersampling of others. Deciding where to sample to capture the full range of diversity over the Park is going to be very much an iterative process as the field season goes along!

Getting There

Once you've been given an 'assignment' by your Field Coordinator, what you'll actually have in-hand is a photo print with a transparency of delineated vegetation types. (The polygons will, of course, be various sizes, dependent on how extensive the vegetation type is.) You will also have a Digital Ortho Quarter Quad (DOQQ) with the BPU's you are to sample indicated with red lines, and a yellow dot within each selected BPU unit indicating the representative. You and your partner will navigate towards each selected BPU using your road and trail maps, the DOQQ and photo, and/or GPS, along with guidance from your Field Coordinator. The DOQQ's will have roads and trails highlighted on them to help you as well. (You'll be concentrating on 'zones' of the Park in sequence, so you won't have to traipse all over the Park to do your field work.)

Before you leave... check that you have all the materials needed to complete your field work (Please see the checklist and "considerations for mission planning" at the end of this document to help you).

Every single morning... check your GPS receiver to make sure it is set to NAD 83.

and

Along the way... look around. Digital data layers are great, but they do *not* replace human perception. If, on the way to one vegetation type, you see an assemblage of plants that seems unique and that you think is not included on the list of vegetation types to be sampled, use your radio to contact the Field Coordinator. If there are multiple teams working and you may potentially overlap with vegetation types they are sampling on a given day, be sure to contact them using your radios and discuss what you have found, so that efforts are not duplicated or opportunities missed. You and the field coordinator or other team may decide to change your plans and sample the vegetation pattern you discovered. This will be more likely to occur as the season progresses and you become more familiar with the vegetation types and how they can look on the ground.

Once There

Establishing a Plot

1) Figure out where to place your plot. This is a subjective process. You'll want to place your plots in areas that seem to be both relatively **homogenous** and **representative** of the vegetation of the polygon as a whole. In other words, avoid areas where the vegetation appears to be transitioning from one type to another, and areas with anomalous or heterogeneous structure or species composition. Take some time to do this carefully, because the plots you set up will be *permanent*; relocated and resampled over time in order to determine responses to management and other useful things. Look at *all* the vegetation strata to

determine if the area is structurally and floristically uniform and generally try to place your plots at least 30 m from what you see as the ‘boundary’ between this vegetation type and any neighboring, distinctly different types. During the training period this step will be emphasized and discussed in detail. However, the rule-of-thumb is to conduct a reconnaissance of the plot if time and topography allows. If not, rely on the polygons from the aerial photointerpreter as a guide to where you should place your plot.

Note: In cases where a polygon is very heterogeneous, more than one plot may be needed. Again, look around, use that human perception, and contact your Field Coordinator via radio if you need guidance about whether or not to establish more than one plot.

2) Drive a wooden stake with the plot number written on it into the ground with a rock or hammer. This will be the **SOUTHEAST** edge or corner of your plot (depending on whether you’re establishing a circular or rectangular plot).

3) Using your GPS receiver, record the UTM of this corner of the plot under the **Field UTM X** and **Field UTM Y** on the field form. Remember that this is about to become a permanent plot, so being able to *find* it again will be key: use the GPS, rather than estimating! (If you cannot get a GPS reading, estimate the coordinates from the topo map and note on the form that you had to resort to this method.)

4) The default plot shape will be circular but it may make more sense to establish rectangular plots in linear vegetation types (e.g., riparian or ridgeline types). For circular plots, use the compass to direct your partner northwest (315 degrees). Using the tape measure, your partner will walk out that line the appropriate distance for the vegetation type being sampled to establish the center of the circular plot. For forest and woodland types he or she would walk out 11.35 m, for example. The point where he or she is standing is now the center of the plot, not where the wooden stake is located. For rectangular plots, stand at the stake with your compass and direct your partner, who has the tape measure, to measure plot boundaries to the north and west (don’t forget to correct for magnetic declination). Leave the tapes down as borders while working. Mark only the one corner with a stake. Standard plot sizes should be as follows:

If you’re in a ...	You should usually make your plot...	Giving you a plot area of...
Forest (i.e., trees have their crowns overlapping, usually forming 60-100% cover)	11.35 m radius OR 20 m x 20 m	404 m ² 400 m ²
Woodland (i.e., open stands of trees with crowns usually not touching. Canopy tree cover is 25-60% Or exceeds shrub, dwarf-shrub, herb, and nonvascular cover).	11.35 m radius OR 20 m x 20 m	404 m ² 400 m ²
Shrubland (i.e., shrubs greater than 0.5 m tall are dominant, usually forming more than 25% cover OR exceeding tree, dwarf-shrub, herb, and nonvascular cover)	11.35 m radius OR 20 m x 20 m	404 m ² 400 m ²
Dwarf-shrubland (heath) (i.e., Shrubs less than 0.5 m tall are dominant, usually forming more than 25% cover OR exceeding tree, shrub, herb, and nonvascular cover).	5.65 m radius OR 10 m x 10 m	100 m ² 100 m ²
Herbaceous (i.e., Herbs dominant, usually forming more than 25 percent cover OR exceeding tree, shrub, dwarf-shrub, and nonvascular cover).	5.65 m radius OR 10 m x 10 m	100 m ² 100 m ²
Nonvascular (i.e., nonvascular cover dominant, usually forming more than 25% cover).	2.82 m radius OR 5 m x 5 m	25 m ² 25 m ²

Note: You can deviate from the standard plot *shapes* where that makes sense, but the total plot *area* encompassed by the boundaries should be as listed above for each major class of vegetation. For example, forested riparian vegetation, may be sampled in a more linear, 10 x 40 m (400 m²) plot; herbaceous riparian or ridgeline vegetation in a 2 x 50 m (100 m²) plot.

5) Once the plot is established, it is generally a good time to fill out the **Identifiers/Locators** part of your Plot Survey Form (see the cheat sheet) and take the plot photos.

Taking photographs

Instructions from Park staff?

Data Collection

Environmental Description

See the coding instructions at the end of this document for guidance on the specific fields.

Vegetation Description

For guidance on the specific fields on the second page of the form, see the coding instructions.

As you begin to collect the species, DBH and cover information, keep these four rules in mind—they will speed your data collection considerably:

1) Except in very diverse plots, don't spend more than **20 minutes** looking for new and different species to record. Remember that these plot data are to be used to classify the overall vegetation of the Park, not to make a complete species list for it. And if you had to spend much more than 20 minutes to *find* a species, it probably isn't going to be important in characterizing the vegetation type. For diverse plots with over 25 taxa you may take up to 30 minutes on the listing process.

2) If you can't identify a plant to species, record the species on your form as "unknown species 1," "unknown species 2," "Carex unknown sp. 1," etc. Record associated cover class and other data for the unknown as you would for any other species.

Then do one of two things:

If you need the species identified right away because it appears to be dominant or diagnostic (you're seeing it all over the place or you're seeing much more in this particular vegetation type than in others), take a sample of the species with as much of the plant as possible, especially intact sexual parts, if present). Place the sample in a baggie, and label the baggie with the plot code and the name you gave it on the data form.

If you don't need the plant keyed right away, press it. Mark the pressed specimen with the plot code and the name you gave it on the data form.

Give all your specimens, bagged and pressed, to the Field Coordinator for keying. You can, of course, key some of these out yourself if you want to, but don't let plant keying get in the way of your primary responsibility: *field data collection*. No one expects you to identify every plant; that's why keying is considered part of the Field Coordinator's routine responsibilities. A quick prioritization of what to key and what to press may be made based on the recurrence of the species in samples and on the cover-class estimate of the species in a particular plot. If the species has a high cover value (>1%) it is more of a priority to identify. Field crews should mark the specimen tag with its cover class estimate as well as its unique identifying number for the vegetation sample.

A sample completed Plot Survey form is provided at the end of this document.

Forest Fuel Inventory

In addition to the Plot Survey form, you'll also be completing a Forest Fuel inventory for every plot you establish.

Fuel Data Collection Protocol

Dead and Downed Fuel Inventory: This data is collected along the long axis of the plot (or most northerly direction from plot marker at SE corner if plot is square). For the purpose of the fuel inventory, this plot boundary will be referred to as the fuel transect.

SLOPE: Record in degrees for the slope along the fuel transect.

DOWNED WOOD TALLY: Count all wood sticks crossing the transect line that are under 7.6 cm (3 inches) in diameter (<100 hour time lag fuels). Count twigs in three categories along the length of the transect indicated:

<u>Fuel Type</u>	<u>Fuel Diameter</u>	<u>Tally Location</u>
1) 1-hr	Less than 0.6cm (<1/4 in.)	First 2 m of transect
2) 10-hr	0.6cm to 2.5cm (1/4-1 in.)	First 2 m of transect
3) 100-hr	2.5cm to 7.6cm (1-3 ins.)	First 4 m of transect

Begin at the 0.0 meter mark of the transect. Count all intercepts with the transect lines that are <0.6cm for the first 2 m of each transect line. Count all intercepts in the second category (0.6–2.5cm) that cross the transect lines in the same two meters. Count all intercepts in the third category (2.5–7.6cm) for the first four meters of the transect. A "Go-no-go," a metal template with size classes indicated, is useful during this tally.

LITTER and LIT/DUF: Measure the depth of the litter layer and the litter plus duff layer at the 0.5 and 1.5 m points on the transect. Record to the nearest 0.1 cm. The litter plus duff layer includes material from mineral soil to the top of the litter layer. The litter layer includes litter from current year only.

SPECIES of 0–2.5 cm branchwood: Identify the dominant species represented by the 0–2.5 cm branchwood. If several species, estimate proportion of the 2 or 3 most common species.

DEAD FUEL DEPTH: Record greatest depth for each of three adjacent 0.3 m lengths of the transect. Measure the heights from bottom of freshly fallen material up to the highest intersected dead particle, and record the 3 measurements to the nearest cm. Include logs, overlapping large woody debris, and branches protruding vertically from the ground.

SOUND and ROTTEN Wood: Measure the diameter of all downed wood that is greater than 7.6 cm (3 inches) in diameter intersecting any part of the 15 m transect. Measure only if the transect passes through the heartwood of the branch or log and if at least half of the branch or log is above ground. Record measurements to the nearest centimeter, and classify according to whether the branch is sound or rotten. Rotten wood is still holding its shape, yet is soft and punky.

Standing Fuel Inventory: This information is based on standing vegetation on the entire plot and follows guidelines and photos developed by R. E. Burgan and R. C. Rothermel (1984).

Herbaceous Fuel:

TYPE (1–4): Classify grasses into one of four types according to general morphology. Include herbaceous plants and grasses. Classify typical grasses and herbs rather than averaging a few plants or tufts over the entire plot.

1 = Fine, e.g., cheatgrass (*Bromus tectorum*)

2 = Medium, e.g., California brome (*Bromus carinatus*)

3 = Coarse, e.g., deergrass (*Muhlenbergia rigens*)

4 = Very coarse, e.g., sawgrass (*Mariscus*) (probably nothing in Glacier area this coarse)

CLASS: (1–6) Further divide this type into one of six density classes (see photos).

DPTH: Record the average depth of herbaceous plants in cm. If there are ≥ 2 types present, record type, class, and depth of the "flashier" or more combustible one.

LIVE: Estimate what percent of the grass is alive at any point during the growing season. This will always be 100% for annual species, somewhat less for perennials with previous year's litter attached.

Shrub Fuel:

Classify shrubs present in the entire plot according to Burgan and Rothermel guidelines. Average all species present.

TYPE (1–5): Classify shrubs into one of four types according to general morphology.

1 = Fine stems, thin leaves, e.g., mountain misery (*Chamaebatia foliolosa*)

2 = Medium stems, thin leaves, e.g., ninebark (*Physocarpus*)

3 = Medium stems, thick leaves, e.g., *Ceanothus*

4 = Densely packed fine stems and leaves, e.g., chamise (*Adenostoma fasciculatum*)

5 = Thick stems and leaves, e.g., manzanita (*Arctostaphylos* spp.)

CLASS (1–6): Determine to which of the five density classes the shrubs within the plot belong. Refer to Burgan and Rothermel photos.

DEAD 1HR, 10HR, 100HR and LIVE 1HR: Examine the dead wood and 1-hr live wood within the shrubs in the plot. Estimate what percent of the shrub is 1-hr live (<0.6cm), 1-hr dead, 10-hr dead (0.6–2.5cm), and 100-hr dead (2.5–7.6cm). The four percentages should add up to 100 per cent.

WAX: If the leaves are waxy, sclerophyllous, or heavy with volatile oils (e.g., *Chamaebatia foliolosa*), enter Yes. Otherwise, enter No.

Litter and Woody Fuel:

% COVER: Estimate the percent of the plot covered by litter (1–100%).

SOURCE: This refers to the source of the leaf litter. Examine the litter on the ground and classify the source of the litter as conifer, hardwood, or both if they both contribute at least 30 percent.

NEEDLES: Classify needle litter (where present) as Medium/Long (e.g., PIPO) or Short (e.g., ABCO).

COMPACTNESS: If the needles are loose and fresh, classify them as loose (e.g., ponderosa pine). If not, classify them as either normal or compact (e.g., red fir).

Total to 100%: Ocularly estimate the contribution from 1 hour, 10 hour, and 100 hour time lag fuels to the total litter on the ground in the plot. Leaf litter is included in the 1 hour class. Ensure that the three percentages add up to 100%.

A sample completed Forest Fuel Inventory form is provided at the end of this document.

Accuracy Assessment Point Form

Occasionally, you will need to collect some plot-free data. This will happen when:

- 1) The photointerpreters can't tell what kind of vegetation is in a particular polygon [as noted on the mylar] *or*
- 2) The photointerpreters were wrong about what kind of vegetation is in a polygon *and* sufficient plot data has already been collected for the kind of vegetation that is actually there.

(Check with your Field Coordinator via radio if you think this is the case.)

In these two cases, there is no need to establish a plot. However, you will help the photo interpreters identify this type in the future if you collect some data. You will navigate to the polygon as usual, scout out the polygon briefly to get a feel for what it is like, and record some general data to characterize it on an Accuracy Assessment Point form. This is an abbreviated version of the Plot Survey form, and the same cheat sheet can be used to help with filling it out. GPS points may be taken at any part of the polygon as long as it is >30 m from its edge, to verify its location.

A sample completed Accuracy Assessment Point form is provided at the end of this document.

We hope you find your field season at Glacier enjoyable and rewarding. Best of luck!

Literature Cited

Grossman, D. H., D. Faber-Langendoen, A. S. Weakley, M. Anderson, P. Bourgeron, R. Crawford, K. Goodin, S. Landaal, K. Metzler, K. D. Patterson, M. Pyne, M. Reid, and L. Sneddon. 1998. International classification of ecological communities: terrestrial vegetation of the United States. Volume I. The National Vegetation Classification System: development, status, and applications. The Nature Conservancy, Arlington, Virginia.

The Nature Conservancy [TNC]. 1998. An environmentally-driven approach to vegetation sampling and mapping at Yosemite National Park. Report prepared for the U.S. Department of the Interior, National Biological Survey and National Park Service. The Nature Conservancy, Arlington, Virginia.

Instructions for filling out Fields in the PLOT SURVEY FORM (Glacier version, 1999)
(Partially reformatted/edited for this project report)

Plot Code

Code indicating the specific plot within the vegetation polygon. For the 1999 field season, the codes will be “GLAC.XXX”. Begin with GLAC.1 and go from there. If another team is working, decide with them which plot numbers each team will use to identify the data they gather. For example, if a second team is working one week and approximately 100 plots have already been collected, they may get plots GLAC.100 through GLAC.115.

BPU Code

The biophysical unit identified—will be provided by your Field Coordinator. This is a less important field this year and can be filled in based on a post processing of GIS data from the GIS analysts (Mike Schindel and/or Richard Menicke).

Provisional Community Name

Using the provisional classification of the Park with which you’ve been provided, assign the name of the vegetation type which most closely resembles this type. Enter the finest level of the classification possible. What you put here may or may not agree with the photo interpretation. In fact, *none* of the names may be a good fit; you may have found a new type. The Field Coordinator will review the ‘provisional community name’ in light of the data you collect and her knowledge of the Park vegetation and of the classification. The ‘provisional community name’ that is assigned will be used to update the tally of types x number of plots needed.

State

MT

Park Name

GLACIER NP

Park Site Name

Provisional name assigned by field worker that describes where the data were collected. It should represent an identifiable feature on a topographic map.

Quad Name

Appropriate name/scale from survey map used; use 7.5-minute quadrangle if possible.

Quad Code

Code of quadrangle map.

Field UTM X

Use GPS; do not estimate. If you can't get a GPS reading, estimate coordinates from a topo map and note on the form that this method was used.

Field UTM Y

Use GPS; do not estimate. If you can't get a GPS reading, estimate coordinates from a topo map and note on the form that this method was used.

Survey Date

Date the survey was taken; year, month, day.

Surveyors

Names of surveyors, with principal surveyor (usually the Lead Ecologist) listed first.

Directions to Plot

Precise directions to the site using a landmark (e.g., a named point on the topo map, a major highway, using park naming conventions for roads) readily locatable on a 7.5-minute topo map as the starting point. Use clear sentences that will be understandable to someone who is unfamiliar with the area and has only your directions to follow. Give distances as closely as possible to the 0.1 mile and use compass directions. Give additional directions to the plot within the site. Do not take more than a couple of minutes to fill this out.

Plot Length and Plot Width

Enter diameter for circular plots and width and length dimensions for square or rectangular plots. Choose the appropriate plot size based on the following:

Vegetation Class	Standard Plot Dimensions	PLOT Area
Forest	11.35 m radius or 20 m x 20 m	404 m ² or 400 m ²
Woodland	11.35 m radius or 20 m x 20 m	404 m ² or 400 m ²
Shrubland	11.35 m radius or 20 m x 20 m	404 m ² or 400 m ²
Dwarf-shrubland (heath)	5.65 m radius or 10 m x 10 m	100 m ²
Herbaceous	5.65 m radius or 10 m x 10 m	100 m ²
Nonvascular	2.82 m radius or 5 m x 5 m	25 m ²

Plot Photos/Roll Number/Frame Numbers

Indicate (Y or N) if photos of the plot have been taken at the time of sampling, and the roll and frame numbers of any photos.

Plot Permanent

Check off that the plot has been permanently marked (all plots within the National Park are 'permanently marked' with a wooden stake).

Plot Representativeness

Does this plot represent the full variability of the polygon? If not, were additional plots taken? Note additional species not seen in plot in the space provided below. Note: we distinguish in this section the plot's ability to represent the stand or polygon you are sampling as one component and the ability of this sample to represent the range of variability of the association in the entire mapping area. The former comment may be ascertained by reconnaissance of the stand. The latter comment comes only after some familiarity with the vegetation type throughout the mapping area and may be left blank if you have no opinion at this time.

Environmental Description

Elevation

Elevation of the plot. **Specify whether in feet or meters** (this will depend on the units used on the GPS or on the topographic map being used). In general, we have determined that the reading you get from a topo map provided you are certain where you are, is more accurate than the average reading from the GPS unit. Thus, please attempt to estimate your elevation with the topo map.

Slope

Measure the slope in degrees using a clinometer.

Aspect

Measure the slope aspect using a compass (be sure to correct for the magnetic declination). Note: all compasses should be pre-set to an average declination for the park and thus, readings from the compasses carried by the field crews may be directly noted.

Topographic Position

Topographic position of the plot. Choose one:

INTERFLUVE (crest, summit, ridge) - Linear top of ridge, hill, or mountain; the elevated area between two fluves (drainageways) that sheds water to the drainageways.

HIGH SLOPE (shoulder slope, upper slope, convex creep slope) - Geomorphic component that forms the uppermost inclined surface at the top of a slope. Includes the transition zone from backslope to summit. Surface is dominantly convex in profile and erosional in origin.

HIGH LEVEL (mesa) - Level top of a plateau.

MIDSLOPE (transportational midslope, middle slope) - Intermediate slope position.

BACKSLOPE (dipslope) - Subset of midslopes that are steep, linear, and may include cliff segments (fall faces).

STEP IN SLOPE (ledge, terracette) - Nearly level shelf interrupting a steep slope, rock wall, or cliff face.

LOWSLOPE (lower slope, foot slope, colluvial footslope) - Inner gently inclined surface at the base of a slope. Surface profile is generally concave and a transition between midslope or backslope, and toeslope.

TOESLOPE (alluvial toeslope) - Outermost gently inclined surface at base of a slope. In profile, commonly gentle and linear and characterized by alluvial deposition.

LOW LEVEL (terrace) - Valley floor or shoreline representing the former position of an alluvial plain, lake, or shore.

CHANNEL WALL (bank) - Sloping side of a channel.

CHANNEL BED (narrow valley bottom, gully arroyo) - Bed of single or braided watercourse commonly barren of vegetation and formed of modern alluvium.

BASIN FLOOR (depression) - Nearly level to gently sloping, bottom surface of a basin.

Landform

Enter the landform that describes the site where the plot was taken. Your choices are: Note on the code sheet the landform choices are listed by being either macro, or meso in scale. Thus, one can select one from each of these two landscape scales for any plot (e.g., mountain could be macro and cirque headwall could be meso).

- alluvial fan
- alluvial flat
- alluvial terrace
- bank
- basin
- beach
- bench
- butte
- channel
- cirque
- cirque floor
- cirque headwall
- cliff
- colluvial slope
- debris slide
- depression
- drainage
- drainage channel (undifferentiated)
- dune (undifferentiated)
- escarpment
- flood plain
- foothills
- gap
- glacier
- gorge
- hills

hogback
interfluve
lake
lowland
mid slope
moraine (undifferentiated)
mountain valley
mountain(s)
mud flat
noseslope
periglacial boulderfield
piedmont
plain
plateau
ravine
ridge
rim
rock fall avalanche
saddle
sag pond
seep
shoreline
sinkhole (undifferentiated)
slide
slope
slough
soil creep slope
stream terrace (undifferentiated)
streambed
swale
talus
toe slope
valley floor

Surficial Geology

Note the geologic substrate influencing the plant community (bedrock or surficial materials). The list below provides an example of the values that might be included.

IGNEOUS ROCKS

Granitic (Granite, Schyolite, Syenite, Trachyte)

Ioritic (Diorite, Dacite, Andesite)

Gabbroic (Gabbro, Basalt, Pyroxenite, Peridotite)

SEDIMENTARY ROCKS

Conglomerates and Breccias

Sandstone

Siltstone

Shale

Limestone and Dolomite

Marble

Gypsum

METAMORPHIC ROCKS

Gneiss

Schist

Slate and Phyllite

Marble

Serpentine

GLACIAL DEPOSITS

Undifferentiated glacial deposit

Till

Moraine

Bedrock and till

Glacio-fluvial deposits (outwash plains, ice-contacted GF deposits, eskers, kames, proglacial deltas, crevasse filling, etc.)

Deltaic deposits (alluvial cones, deltaic complexes)

Lacustrine and fluvial deposits (glacio-fluvial, fluvio-lacustrine, freshwater sandy beaches, stony/gravelly shoreline)

ORGANIC DEPOSITS

Peat (with clear fibric structure)

Muck

Marsh, regularly flooded by lake or river (high mineral content)

SLOPE AND MODIFIED DEPOSITS

talus and scree slopes

colluvial

solifluction, landslide

AEOLIAN DEPOSITS

dunes

aeolian sand flats

cover sands

Cowardin System

If the system is a wetland, check off the name of the USFWS system which best describes its hydrology and landform. Indicate “upland” if the system is not a wetland.

Assess the hydrologic regime of the plot using the descriptions below (adapted from Cowardin et al. 1979).

SEMIPERMANENTLY FLOODED - Surface water persists throughout growing season in most years except during periods of drought. Land surface is normally saturated when water level drops below soil surface. Includes Cowardin's Intermittently Exposed and Semipermanently Flooded modifiers.

SEASONALLY FLOODED - Surface water is present for extended periods during the growing season, but is absent by the end of the growing season in most years. The water table after flooding ceases is very variable, extending from saturated to a water table well below the ground surface. Includes Cowardin's Seasonal, Seasonal-Saturated, and Seasonal-Well Drained modifiers.

SATURATED - Surface water is seldom present, but substrate is saturated to surface for extended periods during the growing season. Equivalent to Cowardin's Saturated modifier.

TEMPORARILY FLOODED - Surface water present for brief periods during growing season, but water table usually lies well below soil surface. Often characterizes flood-plain wetlands. Equivalent to Cowardin's Temporary modifier.

INTERMITTENTLY FLOODED - Substrate is usually exposed, but surface water can be present for variable periods without detectable seasonal periodicity. Inundation is not predictable to a given season and is dependent upon highly localized rain storms. This modifier was developed for use in the arid West for water regimes of Playa lakes, intermittent streams, and dry washes but can be used in other parts of the U.S. where appropriate. This modifier can be applied to both wetland and non-wetland situations. Equivalent to Cowardin's Intermittently Flooded modifier.

PERMANENTLY FLOODED - Water covers the land surface at all times of the year in all years. Equivalent to Cowardin's "permanently flooded."

UNKNOWN - The water regime of the area is not known. The unit is simply described as a non-tidal wetland.

Environmental Comments

Enter any additional noteworthy comments on the environmental setting. This field can be used to describe site history such as fire events (date since last fire or evidence of severity) as well as other disturbance or reproduction factors

Soil Taxon/Description (this does not apply for the Glacier Project)

Unvegetated Surface

Estimate the approximate percentage of the *total* surface area covered by each category. Only include categories with over 5 percent cover.

Soil Texture

Using the key below, assess average soil texture.

Simplified Key to Soil Texture (Brewer and McCann 1982)

- A1 Soil does not remain in a ball when squeezed.....*sand*
- A2 Soil remains in a ball when squeezed.....B
- B1 Squeeze the ball between your thumb and forefinger, attempting to make a ribbon that you push up over your finger. Soil makes no ribbon.....*loamy sand*
- B2 Soil makes a ribbon; may be very short.....C

C1	Ribbon extends less than 1 inch before breaking.....	D
C2	Ribbon extends 1 inch or more before breaking.....	E
D1	Add excess water to small amount of soil. Soil feels at least slightly gritty.....	<i>loam or sandy loam</i>
D2	Soil feels smooth.....	<i>silt loam</i>
E1	Soil makes a ribbon that breaks when 1 2 inches long; cracks if bent into a ring.....	F
E2	Soil makes a ribbon 2+ inches long; does not crack when bent into a ring.....	G
F1	Add excess water to small amount of soil; soil feels at least slightly gritty.....	<i>sandy clay loam or clay loam</i>
F2	Soil feels smooth.....	<i>silty clay loam or silt</i>
G1	Add excess water to a small amount of soil; soil feels at least slightly gritty.....	<i>sandy clay or clay</i>
G2	Soil feels smooth.....	<i>silty clay</i>

Soil Drainage

The soil drainage classes are defined in terms of (1) actual moisture content (in excess of field moisture capacity) and (2) the extent of the period during which excess water is present in the plant-root zone. It is recognized that permeability, level of groundwater, and seepage are factors affecting moisture status. However, because these are not easily observed or measured in the field, they cannot generally be used as criteria of moisture status. It is further recognized that soil profile morphology, for example mottling, normally, but not always, reflects soil moisture status. Although soil morphology may be a valuable field indication of moisture status, it should not be the overriding criterion. Soil drainage classes cannot be based solely on the presence or absence of mottling. Topographic position and vegetation as well as soil morphology are useful field criteria for assessing soil moisture status.

RAPIDLY DRAINED - The soil moisture content seldom exceeds field capacity in any horizon except immediately after water addition. Soils are free from any evidence of gleying throughout the profile. Rapidly drained soils are commonly coarse textured or soils on steep slopes.

WELL DRAINED - The soil moisture content does not normally exceed field capacity in any horizon (except possibly the C) for a significant part of the year. Soils are usually free from mottling in the upper 3 feet, but may be mottled below this depth. B horizons, if present, are reddish, brownish, or yellowish.

MODERATELY WELL DRAINED - The soil moisture in excess of field capacity remains for a small but significant period of the year. Soils are commonly mottled (chroma < 2) in the lower B and C horizons or below a depth of 2 feet. The Ae horizon, if present, may be faintly mottled in fine-textured soils and in medium-textured soils that have a slowly permeable layer below the solum. In grassland soils the B and C horizons may be only faintly mottled and the A horizon may be relatively thick and dark.

SOMEWHAT POORLY DRAINED - The soil moisture in excess of field capacity remains in subsurface horizons for moderately long periods during the year. Soils are commonly mottled in the B and C horizons; the Ae horizon, if present, may be mottled. The matrix generally has a lower chroma than in the well-drained soil on similar parent material.

POORLY DRAINED - The soil moisture in excess of field capacity remains in all horizons for a large part of the year. The soils are usually very strongly gleyed. Except in high-chroma parent materials the B, if present, and upper C horizons usually have matrix colors of low chroma. Faint mottling may occur throughout.

VERY POORLY DRAINED - Free water remains at or within 12 inches of the surface most of the year. The soils are usually very strongly gleyed. Subsurface horizons usually are of low chroma and yellowish to bluish hues. Mottling may be present but at the depth in the profile. Very poorly drained soils usually have a mucky or peaty surface horizon.

Vegetation Description

Leaf Phenology

Select the value which best describes the leaf phenology of the dominant stratum. The dominant stratum is the uppermost stratum that contains at least 10% cover.

EVERGREEN - Greater than 75% of the total woody cover is never without green foliage.

COLD DECIDUOUS - Greater than 75% of the total woody cover sheds its foliage in connection with an unfavorable season mainly characterized by winter frost.

MIXED EVERGREEN-COLD DECIDUOUS - Evergreen and deciduous species generally contribute 25–75% of the total woody cover. Evergreen and cold-deciduous species admixed.

PERENNIAL - Herbaceous vegetation composed of more than 50% perennial species.

ANNUAL - Herbaceous vegetation composed of more than 50% annual species.

Leaf Type

Select one value which best describes the leaf form of the dominant stratum. The dominant stratum is the uppermost stratum that contains at least 10% cover.

BROAD-LEAVED - Woody vegetation primarily broad-leaved (generally contributes greater than 50 percent of the total woody cover).

NEEDLE-LEAVED - Woody vegetation primarily needle-leaved (generally contributes greater than 50 percent cover).

MICROPHYLOUS - Woody cover primarily microphyllous.

GRAMINOID - Herbaceous vegetation composed of more than 50 percent graminoid/stipe leaf species.

FORB (BROAD-LEAF-HERBACEOUS) - Herbaceous vegetation composed of more than 50% broad-leaf forb species.

PTERIDOPHYTE - Herbaceous vegetation composed of more than 50 percent species with frond or frond-like leaves.

Physiognomic Class

Choose one:

Forest: Trees with their crowns overlapping (generally forming 60–100% cover).

Woodland: Open stands of trees with crowns not usually touching (generally forming 25–60% cover). Canopy tree cover may be less than 25% in cases where it exceeds shrub, dwarf-shrub, herb, and nonvascular cover, respectively.

Shrubland: Shrubs generally greater than 0.5 m tall with individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees generally less

than 25% cover). Shrub cover may be less than 25% where it exceeds tree, dwarf-shrub, herb, and nonvascular cover, respectively. Vegetation dominated by woody vines is generally treated in this class.

- Dwarf-Shrubland:** Low-growing shrubs usually under 0.5 m tall. Individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees and tall shrubs generally less than 25% cover). Dwarf-shrub cover may be less than 25% where it exceeds tree, shrub, herb, and nonvascular cover, respectively
- Herbaceous:** Herbs (graminoids, forbs, and ferns) dominant (generally forming at least 25% cover; trees, shrubs, and dwarf-shrubs generally with less than 25% cover). Herb cover may be less than 25% where it exceeds tree, shrub, dwarf-shrub, and nonvascular cover, respectively.
- Nonvascular:** Nonvascular cover (bryophytes, non-crustose lichens, and algae) dominant (generally forming at least 25% cover). Nonvascular cover may be less than 25% where it exceeds tree, shrub, dwarf-shrub, and herb cover, respectively.
- Sparse Vegetation:** Abiotic substrate features dominant. Vegetation is scattered to nearly absent and generally restricted to areas of concentrated resources (total vegetation cover is typically less than 25% and greater than 0%).

Strata/Lifeform, Height, Cover, Diagnostic Species

Visually divide the community into vegetation layers (strata). Indicate the average height class of the stratum in the first column, using the Height Scale on the form. Enter the average percent cover class of the whole stratum in the second column, using the Cover Scale on the form. Height and Cover classes are also listed below.

Trees are defined as single-stemmed woody plants, generally 5 m in height or greater at maturity and under optimal growing conditions. Shrubs are defined as multiple-stemmed woody plants generally less than 5 m in height at maturity and under optimal growing conditions.

List the dominant species in each stratum. If species known to be diagnostic of a particular vegetation type are present, list these as well, marking them with an asterisk.

Cover Scale for Strata		Height Scale for Strata	
01	<1%	01	<0.5 m
02	1–5%	02	0.5–1m
03	5–25%	03	1–2 m
04	25–50%	04	2–5 m
05	50–75%	05	5–10 m
06	75–100%	06	10–15 m
		07	15–20 m
		08	20–35 m
		09	35–50 m
		10	>50 m

Animal Use Evidence

Comment on any evidence of use of the plot/polygon by non-domestic animals (i.e., tracks, scat, gopher or prairie dog mounds, etc.). Notes on domestic animals should be made in the field below.

Natural and Anthropogenic Disturbance

Comment on any evidence of natural or anthropogenic disturbance and specify the source.

Other Comments

Any other comments.

Species/DBH/Percent Cover Table

Starting with the uppermost stratum, list all the species present and cover class (using the scale provided below) and percent cover of each species in that particular stratum. Indicate strata in the left-hand columns. If in the tree layer (single-stemmed woody plants, generally 5 m in height or greater at maturity), note in the “T” column if T1 (emergent tree), T2 (tree canopy), or T3 (tree sub-canopy). If in the shrub layer, note in the “S” column if S1 (tall shrub) or S2 (short shrub). If in the ground layer, note in the “G” column if H (herbaceous), N (nonvascular), V (vine/liana), or E (epiphyte).

For plots with trees, list the DBH (in cm) of all trees above 10 cm diameter. Separate the measurements with a comma. For plots with very high tree density DBH measurements will be done in a subplot. If the number of trees with a DBH greater than 10 cm is more than about 25, divide the plot into quarters and measure the DBH of trees in the southeast quadrant, or the quadrant nearest southeast. CLEARLY NOTE on the form that this is what you’ve done.

Cover Scale for Species percent Cover		
Code	Range	Class Mid point
T	0–1%	0.5%
P	>1–5%	3%
1	>5–15%	10%
2	>15–25%	20%
3	>25–35%	30%
4	>35–45%	40%
5	>45–55%	50%
6	>55–65%	60%
7	>65–75%	70%
8	>75–85%	80%
9	>85–95%	90%
10	>95%	97.5%

GLACIER CODE LIST

LANDFORM

Bench
 bottomland
 canyon
 channel
 cirque floor
 cirque headwall
 cliff
 col
 colluvial slope
 dome
 drainage channel (undifferentiated)
 draw
 earth flow
 eroded bench
 eroding stream channel system
 erosional stream terrace
 escarpment
 flood plain
 fluvial
 glaciated uplands
 gorge
 ground moraine
 hanging valley
 hills
 hillslope bedrock outcrop
 island
 knob
 knoll
 lake/pond
 lake bed
 lake plain
 lake terrace
 lateral moraine
 lava flow (undifferentiated)
 ledge
 levee
 meander belt
 meander scar
 moraine (undifferentiated)
 mound
 mountain valley
 mountain (s)
 mountain-valley fan
 mud flat
 patterned ground (undifferentiated)
 periglacial boulderfield
 pinnacle
 plateau
 ravine
 ridge
 ridge & valley
 ridgetop bedrock outcrop
 rim
 riverbed
 rock fall avalanche
 saddle
 scour
 seep
 upper 1/3 of slope
 middle 1/3 of slope
 lower 1/3 of slope
 slump pond
 soil creep slope
 stream terrace (undifferentiated)
 streambed
 swale
 talus
 tarn
 toe slope
 valley floor

ASPECT

flat (n/a)
 variable
 N 338-22
 NE 23-67
 E 68-112
 SE 113-157
 S 158-202
 SW 203-247
 W 248-292
 NW 293-337

TOPOGRAPHIC POSITION

<u>Designation</u>	<u>Synonym(s)</u>
Interfluve	crest, summit, ridge
High slope	shoulder slope, upper slope, convex creep slope
High level	mesa
Midslope	transportational midslope, middle slope
Backslope	dipslope
Step in slope	ledge, terracette
Lowslope	lower slope, foot slope, colluvial footslope
Toeslope	alluvial toeslope
Low level	terrace
Channel wall	bank
Channel bed	narrow valley bottom, gully arroyo
Basin floor	depression

SOIL TEXTURE

Sand
 Sandy loam
 Loam
 Silt loam
 Clay loam
 Clay
 Peat
 Muck

DRAINAGE

Rapidly drained
 Well drained
 Moderately well drained
 Somewhat poorly drained
 Poorly drained
 Very poorly drained

SURFICIAL GEOLOGY

Igneous Rocks: Granitic
 Igneous Rocks: Dioritic
 Igneous Rocks: Gabbroic
 Sedimentary Rocks: Conglomerates and Breccias
 Sedimentary Rocks: Sandstone
 Sedimentary Rocks: Siltstone
 Sedimentary Rocks: Shale
 Sedimentary Rocks: Limestone and Dolomite
 Metamorphic Rocks: Gneiss
 Metamorphic Rocks: Schist
 Metamorphic Rocks: Slate and Phyllite
 Metamorphic Rocks: Marble
 Metamorphic Rocks: Serpentine
 Glacial Deposits: Undifferentiated glacial deposit
 Glacial Deposits: Till
 Glacial Deposits: Moraine
 Glacial Deposits: Bedrock and till
 Glacial Deposits: Glacial-fluvial deposits
 Glacial Deposits: Deltaic deposits
 Glacial Deposits: Lacustrine and fluvial deposits
 Organic Deposits: Peat
 Organic Deposits: Muck
 Organic Deposits: Marsh: regularly flooded by lake or river

IMPACTS

01 Recent Fire Suppression Activity (e.g. fire lines)
 02 Mountain Pine Beetle Damage
 03 Blister Rust (specify tree species and mortality)
 04 Trespass Grazing Evidenced
 05 Development
 06 Recreation (campsites, etc.)
 07 Significant Weed Invasion (e.g. knapweed, St. Johns Wort, leafy spurge, timothy)
 08 Bear Digs

Slope & Modified Deposits: Talus and scree slopes
Slope & Modified Deposits: Colluvial
Slope & Modified Deposits: Solifluction, landslide
Aeolian Deposits: Aeolian sand flats
Aeolian Deposits: Cover sands

Materials checklist

road / trail maps

DBH tape

2 tape measure(s)

DBH tape or plastic DBH measurement device

compass

wooden stake (1 per plot, plus extra)

small sledgehammer (for driving stakes into ground)

PLGR

GPS receiver (checked daily to ensure that it is set to NAD 83)

radio

clinometer

camera & film (allow at least 3 exposures per plot)

baggies

plant press & paper

pens / permanent markers

Plot Survey forms

Forest Fuel forms

Accuracy Assessment Point forms

white board

dry-erase markers (for white board)

most recent version of provisional classification of the Park x number of plots needed per type (updated approx. every 2 weeks)

CONSIDERATIONS FOR MISSION PLANNING: PHASE I FIELD SAMPLING FOR GLACIER VEGETATION MAPPING PROJECT

Draft May 6, 1999

(Partially reformatted for this project report)

Planning for the day: (ecologist/team leader)

1. Safety and sustenance issues (plenty of food, water, first-aid kit bring water filter if long steep hike where water can be obtained)
2. Field communications:
 - a. Develop plan with other team (if necessary) for radio check-in time re: plot types and contingencies for duplication problems
 - b. Do you have radio and are batteries charged?
3. Check on GPS (batteries, memory available, waypoints for priority samples logged using AIS spreadsheet?)
4. Check list for all other field equipment
 - a. clipboard
 - b. pens, pencils
 - c. compass-clinometer
 - d. two tape measures
 - e. plastic bags for plants
 - f. masking tape and sharpies for labeling specimens
 - g. if longer mission, small plant press with adequate blotters and newspaper
 - h. sufficient field forms for all possible samples
 - i. all ancillary information? (cheat sheet, species list, key, sampling priority list for zone, fuels protocol, main sampling protocol)
5. Plan day's mission before departure for day using one copy per team of a) USGS quad, b) hardcopy DOQQ with flagged points, and c) aerial photo with coded overlay
6. Considerations for mission planning:
 - a. considerations based on topography, existing access routes, density and complexity of vegetation (more time for forest and woodland plots, less for herbaceous and scrub),
 - b. considerations based on priority needs
 - c. considerations based on possible redundancy of other team (adequate alternative samples)

Planning for the Week: (field coordinator)

1. With which 7.5' quads will you be working? Do you have all appropriate maps, photos and DOQQ's?
2. Develop an estimate of reasonable expectations of plots to choose for each team broken up by day and based on an estimate of individual team's travel logistics for the week.
3. Develop plan of attack for the week capture all essential associations in work area.
4. Balance points two and three above with the expected work schedule of the teams and ensure adequate time-off and reduce over-time concerns.
5. Do you have all necessary information for weekly planning? a) DOQQ's for the zone, b) adequate field copies of air photos (1 per team if both will be working same photo) , c) blank field forms.
6. Communication with management team (Jim, Coop, Tara, Marion, or some appropriate subset) and field crews.

- a. update matrix of sampled plots by type, (enter plot number and provisional community name in plots database.
 - b. all uncertainties dealt with (new types seen should we sample?, problems with interpreting PI information, personnel issues, problems in interpreting classification/key, park-related logistics.).
7. Communication with field crews:
- a. obtain QC'ed field forms (allow time for your Q.C. and resolving your questions about the forms with crews)
 - b. obtain all plants not identified (allow time for plant I.D.)
 - c. what were their questions about the polygons they visited?
 - d. What was accomplished, what was not accomplished?

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Appendix D

Gradsect Sampling Design Methodology

The most basic purpose of vegetation surveys is to obtain a description of the range of plant communities, both the common and extensive and the rare or unique (Austin and Heyligers 1991). This goal differs dramatically from the usual purpose of statistical surveys, which is to obtain an unbiased estimate of the mean for some variable of the whole population. The development of a random sampling frame to provide a complete enumeration of the vegetative diversity would never be achievable for the unknown vegetation of a large region such as Waterton Glacier International Peace Park (IPP).

To cost-effectively capture the full spectrum of vegetation types within Glacier National Park (GNP), it was necessary to optimally locate sampling plots. Gradsect sampling (gradient-oriented transect) is one survey method that addresses (1) the need for a compromise between statistical sampling, practical logistical problems, and costs, (2) the need for representative sampling based on environmental stratification, and (3) the value of replicated and randomized sampling (Austin and Heyligers 1999). The original Gradsect approach (Gillison and Brewer 1985) does in fact define linear transects that contain the steepest environmental gradients within an area to ensure capturing the maximum range of vegetation variation. This results in increased efficiency of sampling a large environmentally and vegetatively diverse area.

The sampling design for GNP deviated from the Gradsect approach in that we did not use transects through the Park, but rather used GIS to stratify the park into different biophysical settings. In the analysis for GNP, spatial data for several environmental variables were coupled to a 30-meter digital elevation model (DEM) with the assumption this would predict vegetative diversity. A working group of USGS, NPS, TNC, and MTNHP ecologists/botanists familiar with the Northern Rocky Mountains selected the GIS driving variables; those determining vegetation response. The Continental Divide (CD) was recognized as a convenient and ecologically significant demarcation between large-scale biophysical phenomena that were predominantly east or west of the CD in their occurrence (for example, east of the CD has a much greater frequency and strength of Chinook winds). Thus, GNP was stratified into analysis areas east and west of the CD, and developed separate environmental stratifications for each.

Variables selected for the environmental stratification were elevation, aspect, soils, and disturbance (as captured in fire history; see the three tables below—Stratification Variables and Classes—for classes delineated for each variable). Elevation and aspect are derived from DEMs. National Park Service staff provided coverage of soil classes and fire history of GNP. These datasets were transformed into grids with the same cell size and reference as the DEM. All coverages and grids were in the Universal Transverse Mercator (UTM) zones 11 and 12 projection, North American Datum of 1983 (NAD 83). For the gradsect analysis, all grid data were projected in UTM zone 12, again using NAD 83.

For each variable, the grid cells were reclassified into the classes established by the working group. The grids were then intersected to find the unique spatial combinations of variables that constituted polygons, termed Biophysical Units (BPUs), which became the units of landscape (environmental) stratification. An example of a BPU, which could have many polygons, would be “Deep soils of argillite or quartzite, between 1351–1700 m in elevation, with pre-1840 fire, on north aspects.”

In the year 2000, the environmental stratification was modified to (1) smooth the 30-meter DEM to remove noise, (2) reduce the artificial proliferation of BPUs by renumbering the classes (data layers and classes unchanged), and (3) combine polygons (BPUs) less than 0.18 ha with their nearest neighbors. To ensure that the full environmental gradient east of the CD was sampled, it was divided into the Hudson Bay and the Missouri River (northern-portion and southern-portion) watersheds. Each BPU east of the CD was then attributed by drainage. This coverage was joined spatially to the plots already collected, and the resulting BPUs previously sampled were removed from consideration for the 2000 field sampling. BPUs occurring in only one drainage were deleted from consideration. Remaining in the sampling pool were those BPUs completely unsampled or sampled only in one portion of range of occurrence. West of the CD was not comparably stratified to accommodate north-south variation.

The year 2000 analysis resulted in 17,808 polygons attributed to 377 BPUs across GNP east and west of the CD. To winnow this number of BPUs to one capable of being efficiently accessed and sampled, the coverage of BPUs was joined to an accumulated cost surface of GNP. Sites were selected to complete the full sampling of each BPU based on size and travel cost (selecting BPUs in physical proximity of one another). Several BPU types were deleted as targets because no examples of sufficient size occurred (all polygons of 0.18 ha in size or smaller were dissolved into the adjacent polygons), or because the only available polygons would have been hazardous for the field crews to sample. If possible, at least three polygons of each BPU were selected for sampling. These were distributed throughout the range of the BPU, thus replicating examples of each BPU type. Polygons covering hazardous area were masked from selection for sampling; for example, polygons where the average slope was 50° or steeper were not selected. The average polygon size was 7.45 ha and on average required approximately 800 m (about 0.5 mi.) of hiking on moderate terrain to access.

ENVIRONMENTAL STRATIFICATION VARIABLES AND CLASSES FOR GLACIER NP.							
see Methods text above for a description of how these were derived and used in the analysis.							
GLACIER N.P. EAST STRATIFICATION VARIABLES AND CLASSES: 1999 Analysis							
CODE	SOIL/GEOLOGY	CODE	DISTURBANCE	CODE	ELEVATION	CODE	ASPECT
1	ALLUVIAL & FLOODPLAIN	0	no data	1	< 900 m	1	flat
2	WET SOILS	1	barren, no vegetation	2	900-1350 m	2	N 321-45
3	HIGH CLAY CONTENT	2	pre-1840 fire	3	1351-1700 m	3	E/W 46-150/251-321
4	GLACIAL LANDSLIDE & MIXED	3	1840-1900 fire	4	1701-2000 m	4	S 151-250
5	BEDROCK: QUARTSITE/ARGILITE, TALUS	4	1901-1960 fire	5	2001-2400 m		
6	BEDROCK: QUARTSITE/ARGILITE, SHALLOW & MOD DEEP	5	post-1960 disturbance	6	2401-3173 m		
7	BEDROCK: QUARTSITE/ARGILITE, DEEP SOILS	6	herb/shrub - no record				
8	BEDROCK: QUARTSITE/ARGILITE, ALPINE MEADOW						
9	BEDROCK: LIMESTONE, TALUS						
10	BEDROCK: LIMESTONE, SHALLOW & MOD DEEP						
11	BEDROCK: LIMESTONE, DEEP SOILS						
12	BEDROCK: LIMESTONE, ALPINE MEADOW						
gridcode order was soils, disturbance, elevation, aspect							

GLACIER N.P. EAST STRATIFICATION VARIABLES AND CLASSES: 2000 Analysis							
	SOIL/GEOLOGY		ELEVATION		DISTURBANCE		ASPECT
0	ALLUVIAL & FLOODPLAIN	10	< 900 m	no data	no data	1000	flat
1	WET SOILS	20	900-1350 m	100	barren, no vegetation	2000	N 321-45
2	HIGH CLAY CONTENT	30	1351-1700 m	200	pre-1840 fire	3000	E/W 46-150/251-32
3	GLACIAL LANDSLIDE & MIXED	40	1701-2000 m	300	1840-1900 fire	4000	S 151-250
4	BEDROCK: QUARTSITE/ARGILITE, TALUS	50	2001-2400 m	400	1901-1960 fire		
5	BEDROCK: QUARTSITE/ARGILITE, SHALLOW &	60	2401-3173 m	500	post-1960 disturbance		
6	BEDROCK: QUARTSITE/ARGILITE, DEEP SOILS						
7	BEDROCK: QUARTSITE/ARGILITE, ALPINE MEADOW						
8	BEDROCK: LIMESTONE, TALUS						
9	BEDROCK: LIMESTONE, SHALLOW & MOD DEEP						
The remaining soil classes from the original 1999 gradsect weren't present on the east side.							
gridcode order was aspect, disturbance, elevation, soils							

GLACIER N.P. WEST STRATIFICATION VARIABLES AND CLASSES: 2000 Analysis							
CODE	SOIL/GEOLOGY	CODE	DISTURBANCE	CODE	ELEVATION	CODE	ASPECT
11	ALLUVIAL FLOODPLAINS	100	pre 1844	1000	< 1220 meters	10000	Flat
12	ALLUVIAL FANS & HIGH TERRACES	200	1844 - 1910	2000	1220 - 1770 m	20000	250 - 70 (North)
13	BEDROCK: QUARTZITE/ARGILLITE, TALUS & OUTCROPS	300	1910 - 1967	3000	1770 - 2072 m	30000	70 - 250 (South)
14	BEDROCK: QUARTZITE/ARGILLITE/LIMESTONE, DEEP SOILS	400	1967 - present	4000	> 2072 m		
15	BEDROCK: QUARTZITE/ARGILLITE/LIMESTONE, SHALLOW & MOD DEEP; ALPINE MEADOW	500	herb / shrub				
16	GLACIAL LANDSLIDE & MIXED	600	barren				
17	BEDROCK: LIMESTONE, TALUS & OUTCROP	No Data	water				
18	WET SOILS						
The remaining soil classes from the original 1999 gradsect weren't present on the west side.							
gridcode order was aspect, elevation, disturbance, soils							

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Appendix E

Classification Relationship between Damm and Waterton-Glacier International Peace Park Vegetation Mapping Project

The following table shows the crosswalk between Damm's classification of alpine and subalpine vegetation types in Glacier National Park (Damm 2001) and the final NVC vegetation classification of Waterton-Glacier International Peace Park.

Worth noting, some of Damm's associations may have been split into two or more NVC plant associations; not all possible NVC associations are shown for each Damm type. Also included are notes from S.V. Cooper of each vegetation type.

The following pages are formatted to letter-size page (8.5" x 11") in landscape position.

C. Damm's Designation; Braun-Blanquet Concept	S.V. Cooper Proposed Name	Final NVC Plant Association	Cooper Comments
Northern Rocky Mountain Fellfield Communities			
Myosotido alpestris - Caricetum albonigrae	Carex albonigra / Myosotis alpestris	Carex albonigra - Myosotis asiatica Herbaceous Vegetation, and Dryas octopetala - Polygonum viviparum Dwarf-shrub Herbaceous Vegetation	Fellfield; large expanses of upper alpine rolling uplands and summits; part is typical of most extreme high elev. c.t along w/ AGR-POLVIS; high degree rock expos. with spp. rich scattered veg. DRYOCT and SALARC dom. some variants which highly complicates a crosswalk.
Oxytropido campestris - Bupleuretum americanum	Oxytropus campestris - Bupleurum americanum	Arctostaphylos uva-ursi / Festuca campestris - Festuca idahoensis Dwarf-shrubland, and Festuca idahoensis - (Festuca campestris) / Potentilla diversifolia Herbaceous Vegetation	Fellfield; severe wind-exposed w/ fair degree of rock expos (blown free of snow), yet most spp. rich of alpine c.ts.; upper alpine frost rubble with little relief; CARRUP may be dominant, posing class. predicament; variants could represent independent PAs FESIDA-CARRUP, DRYOCT,SELWAL, dominated:
Arenario capillaris - Festucetum idahoensis	Festuca idahoensis / Arenaria capillaris	Festuca idahoensis - (Festuca campestris) / Potentilla diversifolia Herbaceous Vegetation	Meadows w/ late-melting snow, lush veg.; smooth mid to low alpine frost rubble plateaus and slopes;
Salici nivalis - Dryadetum octopetalae	Salix nivalis - Dryas octopetala	Dryas octopetala - Carex rupestris Dwarf-shrub Herbaceous Vegetation, and Salix arctica / Polygonum bistortoides Dwarf-shrubland, and Dryas octopetala - Polygonum viviparum Dwarf-shrub Herbaceous Vegetation	Fellfield; vernal moist to mesic (but drying by mid summer?); very extensive, typifies the scattered patches, to "DRyOCT banked terraces" to extensive expanses of solid turf; typ. Spp. incld. HEDSUL, SALNIV, ANEDRU, POLVIV; (but DRYOCT dom.)
Euphrasio arcticae - Kobresietum myosuroides	Kobresia myosuroides / Euphrasia arctica	Kobresia myosuroides - Euphrasia disjuncta Herbaceous Vegetation, and Dryas octopetala - Polygonum viviparum Dwarf-shrub Herbaceous Vegetation	Fellfield; Moist turf; subirrigated and generally gently rolling to 30%; considerable wind expos.; soils humus rich; turf formed from KOBMYO, KOBsim, & CARSCI share dom. along w/ DRYOCT (often dom.). Moist. indicating spp. inc. HEDSUL, CARSCI, ZIGELE, SEDROS;
Tofieldio pusillae - Kobresietum simpliciusculae	Kobresia simpliciuscula / Tofieldia pusilla	Dryas octopetala - Polygonum viviparum Dwarf-shrub Herbaceous Vegetation	Fellfield?; springs & seeps, very restricted and unique outside AK and far north;
Zigadeno elegantis - Caricetum scirpoideae	Carex scirpoidea / Zigadenus elegans	Carex scirpoidea - Zigadenus elegans Herbaceous Vegetation, and Dryas octopetala - Polygonum viviparum Dwarf-shrub Herbaceous Vegetation	Alpine meadow community; lush veg., debris slopes below cliff faces; an extensive type?(SVC)

C. Damm's Designation; Braun-Blanquet Concept	S.V. Cooper Proposed Name	Final NVC Plant Association	Cooper Comments
Solidagini multiradiatae - Arctostaphyletum uva-ursi	Arctostaphylos uva-ursi / Solidago mutiradiata	Arctostaphylos uva-ursi / Solidago multiradiata Dwarf-shrubland, and Arctostaphylos uva-ursi / Festuca campestris - Festuca idahoensis Dwarf-shrubland	Fellfield (only DRYOCTsubass.) most subass. transitional between subalpine heath & alpine fellfld; Damm recognizes three subassociations that might be the same as what Cooper has treated as PAs: ARCUVA-PENFLO / FESSCA; ARCUVA-PENFLO / PSESPI; ARCUVA-PENFLO; the last named may be equivalent to ARCUVA / SOLMUL but will have to check abiotics to see whether alpine elev.; Char. spp. ARCUVA, JUNCOM, SHECAN, ASTABO; found east of CD w/ west-facing expos.
Astragalo bourgovii - Salicetum articae	Salix arctica / Astragalus bougovii	Salix arctica / Polygonum bistortoides Dwarf-shrubland	Fellfield?: vegetation carpets covering mostly sloping landforms; some spp. indicate persist. snow (ARNRYD, ARECAP) or more mesic soil moist. regime (ASTBOU, HEDSUL, GENCAL) than other fellfields (which it is not, rather turf according to SVC)
Artemisio michauxianae - Potentilletum fruticosae	Dasiphora floribunda - Artemisia michauxiana	Dasiphora fruticosa ssp. floribunda / Artemisia michauxiana Dwarf-shrubland [Provisional]	Colluvial slope & cliff-ledge comm: very unstable steep lower to mid-elev alpine scree slopes w/ coarse to fine rock debris to stable patches oriented vertically; POTFRU is dom. here; type occurs as FESCA variant; FRAVIR variant; common alp. Group POPDIV, SOLMUL, AREOBT, CALPUR, SEDLAN, OXYCAM;
Saxifraga bronchialis C. T.	Saxifraga bronchialis	Saxifraga bronchialis Scree Slope Sparse Vegetation	Scree slope c.t.; then why doesn't Damm have under Talus & Scree?; very heterogeneous veg. but SAXBRO dom. From very steep scree slopes (slightly stabilized) to flat ridges; very similar to ARTMIC - PENFLO floristically and envir.
Talus and Scree Slope Communities			
Aquilegio flavescens - Senecietum megacephali	Aquilegia flavescens - Senecio megacephala	Aquilegia flavescens - Senecio megacephalus Sparse Vegetation, and Valeriana sitchensis - Veratrum viride Herbaceous Vegetation	Talus slope of low to mid alpine; open tall herb comm. with much visible mineral soil substrate on extremely steep, unstable surfaces; char spp. & ASTFOL, EPIANG overtop the lwr. species w. more cover e.g. PHAHAS, PENELL;
Phacelia hastata - Penstemon ellipticus basal comm.	Phacelia hastata - Penstemon ellipticus	Phacelia hastata - (Penstemon ellipticus) Sparse Vegetation	Talus slope; v. steep alpine talus slopes w/ 65-90% exposed rock w/ fine soils not seen at surface (but subsurface); scattered larger rocks & boulders; only rarely are coherent veg. patches developed on less steep slope; very little litter (in veg. clumps);

C. Damm's Designation; Braun-Blanquet Concept	S.V. Cooper Proposed Name	Final NVC Plant Association	Cooper Comments
Phacelio sericeae - Arenarietum nuttallii	Phacelia sericea - Arenaria nuttallii	Phacelia hastata - (Penstemon ellipticus) Sparse Vegetation	Talus slope; v. steep alpine talus slopes w/ 65-90% exposed rock w/ fine soils not seen at surface (but subsurface); combines a number of heterogeneous spp. groups; tough to define!
Cryptogrammo crispae - Athyrietum distentifolii	Athyrium disentifolia - Cryptogramma acrostichoides	Athyrium americanum - Cryptogramma acrostichoides Sparse Vegetation	Alpine (low to mid) & Subalp. boulder fields, mostly steep slope comm.; ferns poking from boulder complex; micro-sites between boulders (90-98 % cov.) catch cold air and snow (which melts late like SB comm.) and site of mineral soil, some organic accum.;
Saxifragetum metensianae	Saxifraga metensiana	Saxifraga mertensiana Cliff Crevice Sparse Vegetation	Cliff crevice lmicro.comm. (0.1 to 1.0+ meters); large, moist cliff crevices in red/green argillit in high subalpine & alpine; mostly min. soils, but organic soils can accum. Due to colonization by abundant bryophytes; SAXBRO appears accompanied by several other SAX and Cryptogramma spp/
Western Cordilleran Snowbed Communities			
Caricetum nigricantis	Carex nigricans	Carex nigricans - Sibbaldia procumbens Herbaceous Vegetation	Snowbed community;
Phleo commutati - Caricetum nigricantis	Carex nigricans - Pheum alpinum (which SVC changed to CARNIG / SIBPRO for GNP as Damm suggests)	Carex nigricans - Sibbaldia procumbens Herbaceous Vegetation	Snowbed community; PHLALP predom. In Southern RM so SVC changed to SIBPRO which is abund. in GNP examples
Arnico diverifoliae - Caricetum spectabilis	Carex spectabilis / Arnica diversifolia	Carex spectabilis - Arnica X diversifolia Herbaceous Vegetation	Pioneer community (seral c.t.?); chionophilic, pioneer c.t. of recently deglaciated areas w/ shallow slopes and rocky soils; strong clumps of CARSPE indicate recent occupancy of barren substrate
Sibbaldio - Juncetum parryi	Juncus parryi - Sibbaldia procumbens	Juncus parryi / Sibbaldia procumbens Herbaceous Vegetation	Snowbed community; from very open w/ lichen and broids dom. to herb-rich cover up to 80%cc; JUNDRO & ANTALP can be dom.
Politricho piliferi - Arenarietum capillaris	Arenaria capillaris / Politrichum piliferum	Arenaria capillaris / Polytrichum piliferum Herbaceous Vegetation	Meadow w/ late melting snowbed; leeslopes of ridge, depressions; cc from 20-90 vasculars; borders on FESIDA / ARECAP but with ARECAP dom.
Lepario caesioalbae - Salicetum arcticae	Salix arctica - Leparia caesioalba	Juncus parryi / Sibbaldia procumbens Herbaceous Vegetation, and Salix arctica / Carex nigricans Dwarf-shrubland	Snowbed community; struct. simple w/ loose mats, 3 cm high SALARC w/ interstices dominated by grey lichen soil crusts; depressed & protected sites w/ long-persisting snow

C. Damm's Designation; Braun-Blanquet Concept	S.V. Cooper Proposed Name	Final NVC Plant Association	Cooper Comments
Dryado octopetalae - Cassiopetum tetragonae	Dryas octopetala - Cassiope tetragona	Dryas octopetala - Cassiope tetragona	Snowbed community; defined for coast and AK; rare in GNP because CASTET rare: Type identified from N Cascades, not Glacier
Phyllodoco - Cassiopetum mertensianae	Phyllococe empetriformis - Cassiope mertensiana	Phyllococe empetriformis - Cassiope mertensiana	Snowbed community; only coastal? Certainly in Middle Rockies; type identified from elsewhere in the Rockies by Damm, but not in Glacier
Sibbaldio procumbentis -Phyllodocetum glanduliflorae	Phyllococe glanduliflora / Sibbaldia procumbens	Phyllococe glanduliflora / Sibbaldia procumbens Dwarf-shrubland	Snowbed community; forms a belt around longer-persisting CARNIG type; includes PHYEMP as char. sp.; no ANTLAN in GNP
Valerianetum sitchensis	Valeriana sitchensis	Valeriana sitchensis - Veratrum viride Herbaceous Vegetation	Snowbed community?; Archer thesis (1963) from coastal B.C. (Garibaldi N.P.); type "validated" by Damm (SVC takes this to mean Damm found it in GNP); incld. CARSPE, CARNIG, LUPLAT from coastal loc. as codoms
Luzulo hitchcockii - Erythronietum grandiflorae	Luzula glabrata v. hitchcockii / Erythronium grandiflorum	Luzula glabrata var. hitchcockii - Erythronium grandiflorum Herbaceous Vegetation	Snowbed community; very common lower alpine, below talus slps. and in ABILAS forest openings; rolling topo; also w/ ARNLAT, ARNMOL, ERIPER, ARNDIV, SENTRI;
Riparian / Wetland Communities			
Senecio triangularis - Mimuletum lewisii	Senecio triangularis - Mimulus lewisii	Senecio triangularis Herbaceous Vegetation	Streambank community;
Epilobio latifolii - Mimuletum lewisii	Epilobium latifolia - Mimulus lewisii	Senecio triangularis Herbaceous Vegetation	Streambank community; a type described by others "Validated " by Damm (in GNP?); diagnostic spp. in name;
Leptarrheno pyrolifoliae - Calthetum leptosepala	Caltha leptosepala / Leptarrhena pyrolifolia	Senecio triangularis Herbaceous Vegetation	Streambank community; Brook defined for B.C.; Damm included for completeness & understanding of alliance & "lectotypification"; SVC presumes Damm "saw" this type in GNP;
Aulacomnio - Kalmietum microphyllae	Kalmia microphylla / Aulacomnium palustre	Kalmia microphylla / Carex nigricans Dwarf-shrubland	Moist heath community; late-melting; subalpine undulating slopes and basins; CD recognizes three Subassoc. that may be elevated to Assoc. KALMIC / PHYGLA; KALMIC / PEDGRO; KALMIC / SALARC (which is really SALARC SB)
Trollio - Parnassietum fimbriatae	Trollius laxus - Parnassia fimbriata	Trollius laxus - Parnassia fimbriata Herbaceous Vegetation, and Senecio triangularis Herbaceous Vegetation	Wet subalpine & low alpine lush & dense meadow along streambnks, seeped slopes, impeded drainage flats; dom. by shorter forbs TROLAX, PARFIM, VERWOR, TOFGLU, HYPFOR;

C. Damm's Designation; Braun-Blanquet Concept	S.V. Cooper Proposed Name	Final NVC Plant Association	Cooper Comments
Unclassified by B-B standards (CD)	<i>Carex haydeniana</i> / <i>Fragaria virginiana</i>	<i>Valeriana sitchensis</i> - <i>Veratrum viride</i> Herbaceous Vegetation	lush subalpine to lower alpine meadow at the bottom of colluvial slopes (must be subirrigated); prolonged snow cover; ARNDIV appears to be the dom. herb;
Types Unclassified by C. Damm			
<i>Hieracio albertini</i> - <i>Caricetum geyeri</i>	<i>Carex geyeri</i> / <i>Hieracium albertinum</i>	<i>Carex geyeri</i> Herbaceous Vegetation	"Ravine" community of upper subalp & lwr alp.; upper slopes of intermt. or perennial steamlets; aspect of rel. tall forb, spectacularly flowering comm.; signif. amts of exposed soil and rock; FESIDA co-dom. W/ CARGEY on some sites; HIEALB & LOMDIS confined to this type as good diagnostic spp.
<i>Xerophyllum tenacis</i>	<i>Xerophyllum tenax</i> Community Type	<i>Xerophyllum tenax</i> Herbaceous Vegetation	"Slope" community (subalpine); coincides w/ upper treeline; mod. To very steep slopes; constant spp. incl. ERIPER, VACMEM, VACSCO, LUZGLA, VALSIT, CARGEY;
<i>Dodecatheo pulchelli</i> - <i>Suksdorfietum ranunculifoliae</i>	<i>Suksdorfia ranunculifolia</i> - <i>Dodecatheon pulchella</i>	<i>Carex scirpoidea</i> - <i>Zigadenus elegans</i> Herbaceous Vegetation	Seep community; w/ BOTSIM moist-wet rock outcrops& ledges, seeping consolidated talus; w/ thin, dark, organic soil on "large" mountain slopes; "rare" c.t.; very bizarre contant spp. e.g. FESIDA other xeric site spp.; CARSCI is "very dianostic" but not a char. Spp. (is typical of seasonally moist, humus-rich c.t. at these elevs.;
<i>Tofieldio glutinosae</i> - <i>Caricetum lenticularis</i>	<i>Carex lenticularis</i> / <i>Tofieldia glutinosa</i>	<i>Trollius laxus</i> - <i>Parnassia fimbriata</i> Herbaceous Vegetation	Subalpine, lwr. alp. emergent wetland w/ peat soils along steam margins, swales (seep areas); scattered vascular veg. & dominated by broids

USGS-NPS Vegetation Mapping Program Waterton-Glacier International Peace Park

AUGUST 2007

Appendix F

Plant Species List of Waterton-Glacier International Peace Park

From vegetation sampling plots and accuracy assessment observation plots, numerous plant species were identified and documented of Waterton-Glacier International Peace Park (IPP). Plant species, along with other sample data, were entered into the PLOTS Database for subsequent analyses (plant community descriptions and map assessment). The following table is an export of plant species generated from the PLOTS Database. This list is not intended to be comprehensive of every species occurring at Waterton-Glacier IPP, nor does it provide a true frequency of occurrence. This species list dictates plant species that were identified and documented during sampling vegetation plots and accuracy assessment observation plots for this mapping project.

Included in the table is a column verifying documentation of plant species presence within each park unit. The letter “G” represents Glacier National Park and “W” represents Waterton Lakes National Park. We included a column listing the occurrence frequency from the plot samples and AA observation sites. Please note these occurrences are only generalizations; they do not necessarily represent overall occurrence throughout Waterton-Glacier IPP. The plant species list is organized alphabetically by plant families and then by scientific names. Nomenclature follows the PLANTS database (U.S. Department of Agriculture 2004).

Family	Scientific Name with Author	Common Name	Location	Occur
Acarosporaceae	Pleopsidium chlorophanum (Wahlenb.) Zopf		W	2
Aceraceae	Acer glabrum Torr.	Rocky Mountain maple	G, W	514
Aceraceae	Acer L.	maple	G	2
Agyriaceae	Xylographa vitiligo (Ach.) J. R. Laundon		W	1
Alectoriaceae	Alectoria Ach.	witch's hair lichen	W	1
Alectoriaceae	Alectoria imshaugii Brodo & D. Hawksw.	Imshaug's witch's hair lichen	W	1
Alectoriaceae	Alectoria sarmentosa (Ach.) Ach. ssp. sarmentosa	witch's hair lichen	W	11
Alismataceae	Alisma triviale Pursh	northern water plantain	G	1
Alismataceae	Sagittaria cuneata Sheldon	arumleaf arrowhead	W	3
Amblystegiaceae	Amblystegium serpens (Hedw.) Schimp. in B.S.G.	amblystegium moss	W	9
Amblystegiaceae	Calliergon giganteum (Schimp.) Kindb.	giant calliergon moss	W	1
Amblystegiaceae	Calliergon richardsonii (Mitt.) Kindb. in Warnst.	Richardson's calliergon moss	W	1
Amblystegiaceae	Campylium chrysophyllum (Brid.) J. Lange	goldenleaf campylium moss	W	1
Amblystegiaceae	Campylium polygamum (Schimp. in B.S.G.) C. Jens.	campylium moss	W	2
Amblystegiaceae	Campylium stellatum (Hedw.) C. Jens.	star campylium moss	W	7
Amblystegiaceae	Cratoneuron filicinum (Hedw.) Spruce	cratoneuron moss	W	4
Amblystegiaceae	Drepanocladus aduncus (Hedw.) Warnst.	drepanocladus moss	W	2
Amblystegiaceae	Leptodictyum riparium (Hedw.) Warnst.	streamside leptodictyum moss	W	1
Amblystegiaceae	Limprichtia revolvens (Sw.) Loeske	limprichtia moss	W	8
Amblystegiaceae	Sanionia uncinata (Hedw.) Loeske var. uncinata	sanionia moss	G, W	9
Amblystegiaceae	Scorpidium scorpioides (Hedw.) Limpr.	scorpidium moss	W	3
Anacardiaceae	Toxicodendron rydbergii (Small ex Rydb.) Greene	western poison ivy	G	1
Apiaceae	Angelica arguta Nutt.	Lyll's angelica	G, W	325
Apiaceae	Angelica dawsonii S. Wats.	Dawson's angelica	G, W	79
Apiaceae	Angelica L.	angelica	G, W	2
Apiaceae	Bupleurum americanum Coult. & Rose	American thorum wax	G, W	63
Apiaceae	Cicuta douglasii (DC.) Coult. & Rose	western water hemlock	G, W	6
Apiaceae	Cicuta L.	water hemlock	G	1
Apiaceae	Cicuta maculata L.	spotted water hemlock	W	6
Apiaceae	Heracleum maximum Bartr.	common cowparsnip	G, W	407
Apiaceae	Heracleum sphondylium L.	eltrot	W	22
Apiaceae	Lomatium bicolor (S. Wats.) Coult. & Rose	Wasatch desertparsley	G	1
Apiaceae	Lomatium cous (S. Wats.) Coult. & Rose	cous biscuitroot	G	3
Apiaceae	Lomatium dissectum (Nutt.) Mathias & Constance	fernleaf biscuitroot	G, W	113
Apiaceae	Lomatium foeniculaceum (Nutt.) Coult. & Rose ssp. maccougali (Coult. & Rose) Theobald	Macdougal's biscuitroot	G	1
Apiaceae	Lomatium macrocarpum (Nutt. ex Torr. & Gray) Coult. & Rose	bigseed biscuitroot	G, W	38
Apiaceae	Lomatium Raf.	desertparsley	G, W	6
Apiaceae	Lomatium sandbergii (Coult. & Rose) Coult. & Rose	Sandberg's biscuitroot	G, W	9
Apiaceae	Lomatium triternatum (Pursh) Coult. & Rose	nineleaf biscuitroot	G, W	177
Apiaceae	Musineon divaricatum (Pursh) Raf.	leafy wildparsley	W	1
Apiaceae	Osmorhiza berteroi DC.	sweetcicely	G, W	238
Apiaceae	Osmorhiza depauperata Phil.	bluntseed sweetroot	W	36
Apiaceae	Osmorhiza occidentalis (Nutt. ex Torr. & Gray) Torr.	western sweetroot	G, W	295

Family	Scientific Name with Author	Common Name	Location	Occur
Apiaceae	<i>Osmorhiza purpurea</i> (Coul. & Rose) Suksdorf	purple sweetroot	G, W	5
Apiaceae	<i>Osmorhiza</i> Raf.	sweetroot	G, W	3
Apiaceae	<i>Perideridia gairdneri</i> (Hook. & Arn.) Mathias	Gardner's yampah	G	26
Apiaceae	<i>Sanicula graveolens</i> Poepp. ex DC.	northern sanicle	G	3
Apiaceae	<i>Sanicula</i> L.	sanicle	G	1
Apiaceae	<i>Sanicula marilandica</i> L.	Maryland sanicle	G, W	47
Apiaceae	<i>Sium suave</i> Walt.	hemlock waterparsnip	G, W	5
Apiaceae	<i>Zizia aptera</i> (Gray) Fern.	meadow zizia	G, W	7
Apocynaceae	<i>Apocynum androsaemifolium</i> L.	spreading dogbane	G, W	50
Araliaceae	<i>Aralia nudicaulis</i> L.	wild sarsaparilla	G, W	110
Araliaceae	<i>Oplopanax horridus</i> Miq.	devilsclub	G	56
Asteraceae	<i>Achillea millefolium</i> L.	common yarrow	G, W	638
Asteraceae	<i>Adenocaulon bicolor</i> Hook.	American trailplant	G, W	107
Asteraceae	<i>Agoseris aurantiaca</i> (Hook.) Greene	orange agoseris	G, W	17
Asteraceae	<i>Agoseris glauca</i> (Pursh) Raf.	pale agoseris	G, W	190
Asteraceae	<i>Agoseris</i> Raf.	agoseris	G, W	8
Asteraceae	<i>Anaphalis margaritacea</i> (L.) Benth.	western pearly everlasting	G, W	92
Asteraceae	<i>Antennaria alpina</i> (L.) Gaertn.	alpine pussytoes	G, W	17
Asteraceae	<i>Antennaria anaphaloides</i> Rydb.	pearly pussytoes	G	64
Asteraceae	<i>Antennaria</i> Gaertn.	pussytoes	G, W	44
Asteraceae	<i>Antennaria howellii</i> Greene	Howell's pussytoes	G	6
Asteraceae	<i>Antennaria lanata</i> (Hook.) Greene	woolly pussytoes	W	2
Asteraceae	<i>Antennaria media</i> Greene	Rocky Mountain pussytoes	G	7
Asteraceae	<i>Antennaria microphylla</i> Rydb.	littleleaf pussytoes	G, W	35
Asteraceae	<i>Antennaria neglecta</i> Greene	field pussytoes	G, W	20
Asteraceae	<i>Antennaria parvifolia</i> Nutt.	small-leaf pussytoes	G, W	42
Asteraceae	<i>Antennaria pulcherrima</i> (Hook.) Greene	showy pussytoes	G, W	6
Asteraceae	<i>Antennaria racemosa</i> Hook.	raceme pussytoes	G, W	80
Asteraceae	<i>Antennaria rosea</i> Greene	rosy pussytoes	G, W	129
Asteraceae	<i>Antennaria umbrinella</i> Rydb.	umber pussytoes	G, W	150
Asteraceae	<i>Arctium minus</i> Bernh.	lesser burdock	W	2
Asteraceae	<i>Arnica × diversifolia</i> Greene (pro sp.)	rayless arnica	G, W	60
Asteraceae	<i>Arnica amplexicaulis</i> Nutt.	clasping arnica	W	1
Asteraceae	<i>Arnica angustifolia</i> ssp. <i>tomentosa</i> (Macoun) G.W. & G.R. Dougl.	narrowleaf arnica	G	8
Asteraceae	<i>Arnica angustifolia</i> Vahl	narrowleaf arnica	W	3
Asteraceae	<i>Arnica angustifolia</i> Vahl ssp. <i>tomentosa</i> (Macoun) G.W. Douglas & G. Ruyle-Douglas	narrowleaf arnica	G	3
Asteraceae	<i>Arnica chamissonis</i> Less.	Chamisso arnica	G, W	17
Asteraceae	<i>Arnica cordifolia</i> Hook.	heartleaf arnica	G, W	424
Asteraceae	<i>Arnica fulgens</i> Pursh	foothill arnica	G, W	4
Asteraceae	<i>Arnica</i> L.	arnica	G, W	66
Asteraceae	<i>Arnica latifolia</i> Bong.	broadleaf arnica	G, W	91
Asteraceae	<i>Arnica longifolia</i> D.C. Eat.	spearleaf arnica	G	1
Asteraceae	<i>Arnica mollis</i> Hook.	hairy arnica	G, W	8

Family	Scientific Name with Author	Common Name	Location	Occur
Asteraceae	<i>Arnica rydbergii</i> Greene	Rydberg's arnica	G, W	20
Asteraceae	<i>Arnica sororia</i> Greene	twin arnica	G, W	57
Asteraceae	<i>Artemisia campestris</i> L.	field sagewort	G, W	14
Asteraceae	<i>Artemisia frigida</i> Willd.	prairie sagewort	G, W	18
Asteraceae	<i>Artemisia</i> L.	sagebrush	G, W	2
Asteraceae	<i>Artemisia ludoviciana</i> Nutt.	white sagebrush	G, W	24
Asteraceae	<i>Artemisia ludoviciana</i> Nutt. ssp. <i>ludoviciana</i>	white sagebrush	G	1
Asteraceae	<i>Artemisia michauxiana</i> Bess.	Michaux's wormwood	G, W	28
Asteraceae	<i>Artemisia tridentata</i> Nutt. ssp. <i>vaseyana</i> (Rydb.) Beetle	mountain big sagebrush	G	19
Asteraceae	<i>Aster</i> L.	aster	G, W	93
Asteraceae	<i>Balsamorhiza sagittata</i> (Pursh) Nutt.	arrowleaf balsamroot	G, W	60
Asteraceae	<i>Brickellia grandiflora</i> (Hook.) Nutt.	tasselflower brickellbush	G	5
Asteraceae	<i>Canadanthus modestus</i> (Lindl.) Nesom	giant mountain aster	G	7
Asteraceae	<i>Centaurea biebersteinii</i> DC.	spotted knapweed	G, W	40
Asteraceae	<i>Centaurea macrocephala</i> Puschk. ex Willd.	bighead knapweed	G	1
Asteraceae	<i>Cirsium arvense</i> (L.) Scop.	Canada thistle	G, W	72
Asteraceae	<i>Cirsium flodmanii</i> (Rydb.) Arthur	Flodman's thistle	G	1
Asteraceae	<i>Cirsium foliosum</i> (Hook.) DC.	elk thistle	W	2
Asteraceae	<i>Cirsium hookerianum</i> Nutt.	white thistle	G, W	189
Asteraceae	<i>Cirsium</i> P. Mill.	thistle	G, W	15
Asteraceae	<i>Cirsium scariosum</i> Nutt.	meadow thistle	W	1
Asteraceae	<i>Cirsium undulatum</i> (Nutt.) Spreng.	wavyleaf thistle	G, W	7
Asteraceae	<i>Cirsium vulgare</i> (Savi) Ten.	bull thistle	G, W	13
Asteraceae	<i>Conyza canadensis</i> (L.) Cronq.	Canadian horseweed	G	1
Asteraceae	<i>Crepis atribarba</i> Heller	slender hawksbeard	G, W	4
Asteraceae	<i>Crepis elegans</i> Hook.	elegant hawksbeard	G	12
Asteraceae	<i>Crepis intermedia</i> Gray	limestone hawksbeard	G, W	7
Asteraceae	<i>Crepis</i> L.	hawksbeard	G, W	5
Asteraceae	<i>Crepis nana</i> Richards.	dwarf alpine hawksbeard	W	1
Asteraceae	<i>Crepis runcinata</i> (James) Torr. & Gray	fiddleleaf hawksbeard	G, W	6
Asteraceae	<i>Crepis tectorum</i> L.	narrowleaf hawksbeard	G	1
Asteraceae	<i>Erigeron acris</i> L.	bitter fleabane	G, W	5
Asteraceae	<i>Erigeron caespitosus</i> Nutt.	tufted fleabane	G, W	60
Asteraceae	<i>Erigeron compositus</i> Pursh	cutleaf daisy	G, W	52
Asteraceae	<i>Erigeron flabellifolius</i> Rydb.	fanleaf fleabane	G	1
Asteraceae	<i>Erigeron glabellus</i> Nutt.	streamside fleabane	G, W	12
Asteraceae	<i>Erigeron gracilis</i> Rydb.	quill fleabane	G	2
Asteraceae	<i>Erigeron humilis</i> Graham	arctic alpine fleabane	G, W	3
Asteraceae	<i>Erigeron</i> L.	fleabane	G, W	25
Asteraceae	<i>Erigeron ochroleucus</i> Nutt.	buff fleabane	G	3
Asteraceae	<i>Erigeron peregrinus</i> (Banks ex Pursh) Greene	subalpine fleabane	G, W	128
Asteraceae	<i>Erigeron simplex</i> Greene	onestem fleabane	G	2
Asteraceae	<i>Erigeron speciosus</i> (Lindl.) DC.	aspen fleabane	G, W	66

Family	Scientific Name with Author	Common Name	Location	Occur
Asteraceae	<i>Erigeron strigosus</i> Muhl. ex Willd.	prairie fleabane	G	2
Asteraceae	<i>Erigeron subtrinervis</i> Rydb. ex Porter & Britt.	threenerve fleabane	G	20
Asteraceae	<i>Eucephalus engelmannii</i> (D.C. Eat.) Greene	Engelmann's aster	G, W	146
Asteraceae	<i>Eurybia conspicua</i> (Lindl.) Nesom	eastern showy aster	G, W	289
Asteraceae	<i>Eurybia sibirica</i> (L.) Nesom	arctic aster	G, W	9
Asteraceae	<i>Gaillardia aristata</i> Pursh	common gaillardia	G, W	188
Asteraceae	<i>Grindelia squarrosa</i> (Pursh) Dunal	curlycup gumweed	W	2
Asteraceae	<i>Heterotheca</i> Cass.	false goldenaster	G	1
Asteraceae	<i>Heterotheca villosa</i> (Pursh) Shinners	hairy false goldenaster	G, W	44
Asteraceae	<i>Hieracium albiflorum</i> Hook.	white hawkweed	G, W	173
Asteraceae	<i>Hieracium aurantiacum</i> L.	orange hawkweed	G	1
Asteraceae	<i>Hieracium cynoglossoides</i> Arv.-Touv.	houndstongue hawkweed	G, W	95
Asteraceae	<i>Hieracium gracile</i> Hook.	slender hawkweed	G	2
Asteraceae	<i>Hieracium</i> L.	hawkweed	G	16
Asteraceae	<i>Hieracium scouleri</i> Hook.	Scouler's woollyweed	G, W	42
Asteraceae	<i>Hieracium triste</i> Willd. ex Spreng.	woolly hawkweed	W	12
Asteraceae	<i>Hieracium umbellatum</i> L.	narrowleaf hawkweed	G, W	22
Asteraceae	<i>Lactuca</i> L.	lettuce	G	2
Asteraceae	<i>Leucanthemum vulgare</i> Lam.	oxeye daisy	G, W	28
Asteraceae	<i>Liatis punctata</i> Hook.	dotted blazing star	W	1
Asteraceae	<i>Machaeranthera canescens</i> (Pursh) Gray ssp. <i>canescens</i> var. <i>canescens</i>	hoary tansyaster	G	1
Asteraceae	<i>Microseris nutans</i> (Hook.) Schultz-Bip.	nodding microceris	G, W	11
Asteraceae	<i>Oreostemma alpigenum</i> (Torr. & Gray) Greene var. <i>alpigenum</i>	tundra aster	G	2
Asteraceae	<i>Packera cana</i> (Hook.) W.A. Weber & A. Löve	woolly groundsel	G, W	96
Asteraceae	<i>Packera contermina</i> (Greenm.) T.M. Barkl., comb. nov. ined.		G	2
Asteraceae	<i>Packera cymbalaria</i> (Pursh) W.A. Weber & A. Löve	dwarf arctic ragwort	G	8
Asteraceae	<i>Packera cymbalarioides</i> (Buck) W.A. Weber & A. Löve	cleftleaf groundsel	G, W	18
Asteraceae	<i>Packera flettii</i> (Wieg.) W.A. Weber & A. Löve	Flett's ragwort	G	1
Asteraceae	<i>Packera indecora</i> (Greene) A. & D. Löve	elegant groundsel	G, W	2
Asteraceae	<i>Packera pauciflora</i> (Pursh) A. & D. Löve	alpine groundsel	G, W	7
Asteraceae	<i>Packera pauperula</i> (Michx.) A. & D. Löve	balsam groundsel	G, W	20
Asteraceae	<i>Packera pseudaurea</i> (Rydb.) W.A. Weber & A. Löve var. <i>flavula</i> (Greene) W.A. Weber & A. Löve	falsegold groundsel	W	1
Asteraceae	<i>Packera pseudaurea</i> (Rydb.) W.A. Weber & A. Löve var. <i>pseudaurea</i>	falsegold groundsel	G, W	61
Asteraceae	<i>Packera streptanthifolia</i> (Greene) W.A. Weber & A. Löve	Rocky Mountain groundsel	G	25
Asteraceae	<i>Petasites sagittatus</i> (Banks ex Pursh) Gray	arrowleaf sweet coltsfoot	G, W	28
Asteraceae	<i>Prenanthes sagittata</i> (Gray) A. Nels.	arrowleaf rattlesnakeroot	G	10
Asteraceae	<i>Pyrrocoma carthamoides</i> Hook.	largeflower goldenweed	G	2
Asteraceae	<i>Pyrrocoma carthamoides</i> Hook. var. <i>carthamoides</i>	largeflower goldenweed	G	3
Asteraceae	<i>Pyrrocoma lanceolata</i> (Hook.) Greene	lanceleaf goldenweed	G	1
Asteraceae	<i>Senecio canus</i> Hook.	= <i>Packera cana</i>	W	1
Asteraceae	<i>Senecio fremontii</i> Torr. & Gray	dwarf mountain ragwort	G, W	4
Asteraceae	<i>Senecio hydrophiloides</i> Rydb.	tall groundwel	G, W	69
Asteraceae	<i>Senecio hydrophilus</i> Nutt.	water ragwort	G	6

Family	Scientific Name with Author	Common Name	Location	Occur
Asteraceae	<i>Senecio integerrimus</i> Nutt.	lambstongue ragwort	G	15
Asteraceae	<i>Senecio jacobaea</i> L.	stinking willie	G	1
Asteraceae	<i>Senecio</i> L.	ragwort	G, W	47
Asteraceae	<i>Senecio megacephalus</i> Nutt.	rocky ragwort	G, W	13
Asteraceae	<i>Senecio pseudoarnica</i> Less.	seaside ragwort	G	1
Asteraceae	<i>Senecio triangularis</i> Hook.	arrowleaf ragwort	G, W	313
Asteraceae	<i>Solidago canadensis</i> L.	Canada goldenrod	G, W	86
Asteraceae	<i>Solidago gigantea</i> Ait.	giant goldenrod	G, W	11
Asteraceae	<i>Solidago</i> L.	goldenrod	G, W	60
Asteraceae	<i>Solidago missouriensis</i> Nutt.	Missouri goldenrod	G, W	67
Asteraceae	<i>Solidago multiradiata</i> Ait.	Rocky Mountain goldenrod	G, W	98
Asteraceae	<i>Solidago simplex</i> Kunth ssp. <i>simplex</i> var. <i>spathulata</i> (DC.) Cronq.	Mt. Albert goldenrod	G, W	55
Asteraceae	<i>Sonchus arvensis</i> L.	field sowthistle	G	1
Asteraceae	<i>Sonchus</i> L.	sowthistle	W	2
Asteraceae	<i>Symphotrichum ascendens</i> (Lindl.) Nesom	western aster	G	1
Asteraceae	<i>Symphotrichum campestre</i> (Nutt.) Nesom var. <i>campestre</i>	western meadow aster	G	4
Asteraceae	<i>Symphotrichum ciliatum</i> (Ledeb.) Nesom	rayless alkali aster	W	1
Asteraceae	<i>Symphotrichum ciliolatum</i> (Lindl.) A. & D. Löve	Lindley's aster	W	49
Asteraceae	<i>Symphotrichum cordifolium</i> (L.) Nesom	common blue wood aster	G	1
Asteraceae	<i>Symphotrichum eatonii</i> (Gray) Nesom	Eaton's aster	G, W	10
Asteraceae	<i>Symphotrichum falcatum</i> (Lindl.) Nesom var. <i>falcatum</i>	white prairie aster	G	1
Asteraceae	<i>Symphotrichum foliaceum</i> (DC.) Nesom	alpine leafybract aster	G, W	131
Asteraceae	<i>Symphotrichum laeve</i> (L.) A. & D. Löve var. <i>geyeri</i> (Gray) Nesom	Geyer's aster	G	1
Asteraceae	<i>Symphotrichum laeve</i> (L.) A. & D. Löve var. <i>laeve</i>	smooth blue aster	G, W	244
Asteraceae	<i>Symphotrichum lanceolatum</i> (Willd.) Nesom ssp. <i>lanceolatum</i> var. <i>lanceolatum</i>	white panicle aster	G	1
Asteraceae	<i>Symphotrichum spathulatum</i> (Lindl.) Nesom var. <i>spathulatum</i>	western mountain aster	G	2
Asteraceae	<i>Symphotrichum subspicatum</i> (Nees) Nesom var. <i>subspicatum</i>	Douglas aster	W	9
Asteraceae	<i>Tanacetum vulgare</i> L.	common tansy	G	2
Asteraceae	<i>Taraxacum</i> G.H. Weber ex Wiggers	dandelion	G	1
Asteraceae	<i>Taraxacum officinale</i> G.H. Weber ex Wiggers	common dandelion	G, W	336
Asteraceae	<i>Taraxacum officinale</i> G.H. Weber ex Wiggers ssp. <i>ceratophorum</i> (Ledeb.) Schinz ex Thellung	common dandelion	G, W	4
Asteraceae	<i>Townsendia hookeri</i> Beaman	Hooker's Townsend daisy	W	4
Asteraceae	<i>Townsendia parryi</i> D.C. Eat.	Parry's Townsend daisy	G, W	2
Asteraceae	<i>Tragopogon dubius</i> Scop.	yellow salsify	G, W	65
Aulacomniaceae	<i>Aulacomnium androgynum</i> (Hedw.) Schwaegr.	aulacomnium moss	W	5
Aulacomniaceae	<i>Aulacomnium palustre</i> (Hedw.) Schwaegr.	aulacomnium moss	W	9
Baeomycetaceae	<i>Icmadophila ericetorum</i> (L.) Zahlbr.	peppermint drop lichen	W	1
Bartramiaceae	<i>Philonotis fontana</i> (Hedw.) Brid.	philonotis moss	W	1
Bartramiaceae	<i>Philonotis fontana</i> (Hedw.) Brid. var. <i>fontana</i>	philonotis moss	W	2
Berberidaceae	<i>Mahonia repens</i> (Lindl.) G. Don	creeping barberry	G, W	537
Betulaceae	<i>Alnus incana</i> (L.) Moench	gray alder	G, W	65
Betulaceae	<i>Alnus incana</i> (L.) Moench ssp. <i>rugosa</i> (Du Roi) Clausen	speckled alder	G	1

Family	Scientific Name with Author	Common Name	Location	Occur
Betulaceae	<i>Alnus incana</i> (L.) Moench ssp. <i>tenuifolia</i> (Nutt.) Breitung	thinleaf alder	G	1
Betulaceae	<i>Alnus viridis</i> (Vill.) Lam. & DC.	green alder	G, W	4
Betulaceae	<i>Alnus viridis</i> (Vill.) Lam. & DC. ssp. <i>crispa</i> (Ait.) Turrill	mountain alder	G	1
Betulaceae	<i>Alnus viridis</i> (Vill.) Lam. & DC. ssp. <i>sinuata</i> (Regel) A.& D. Löve	Sitka alder	G, W	259
Betulaceae	<i>Betula nana</i> L.	dwarf birch	G, W	42
Betulaceae	<i>Betula neoalaskana</i> Sarg.	resin birch	G	1
Betulaceae	<i>Betula occidentalis</i> Hook.	water birch	G, W	30
Betulaceae	<i>Betula papyrifera</i> Marsh.	paper birch	G, W	165
Boraginaceae	<i>Cryptantha celosioides</i> (Eastw.) Payson	buttecandle	G	1
Boraginaceae	<i>Cynoglossum officinale</i> L.	gypsyflower	G, W	8
Boraginaceae	<i>Cynoglossum virginianum</i> L. var. <i>boreale</i> (Fern.) Cooperrider	wild comfrey	W	1
Boraginaceae	<i>Hackelia floribunda</i> (Lehm.) I.M. Johnston	manyflower stickseed	G, W	25
Boraginaceae	<i>Hackelia micrantha</i> (Eastw.) J.L. Gentry	Jessica sticktight	G, W	15
Boraginaceae	<i>Lithospermum ruderales</i> Dougl. ex Lehm.	western stoneseed	G, W	148
Boraginaceae	<i>Mertensia lanceolata</i> (Pursh) DC.	prairie bluebells	W	1
Boraginaceae	<i>Mertensia longiflora</i> Greene	small bluebells	W	2
Boraginaceae	<i>Mertensia</i> Roth	bluebells	G	1
Boraginaceae	<i>Myosotis arvensis</i> (L.) Hill	field forget-me-not	G	3
Boraginaceae	<i>Myosotis asiatica</i> (Vesterg.) Schischkin & Sergievskaja	Asian forget-me-not	G, W	19
Boraginaceae	<i>Myosotis</i> L.	forget-me-not	G	2
Boraginaceae	<i>Myosotis laxa</i> Lehm.	bay forget-me-not	G	1
Boraginaceae	<i>Myosotis scorpioides</i> L.	true forget-me-not	G	22
Brachytheciaceae	<i>Brachythecium acuminatum</i> (Hedw.) Aust.	acuminate brachythecium moss	W	1
Brachytheciaceae	<i>Brachythecium albicans</i> (Hedw.) Schimp. in B.S.G.	brachythecium moss	W	4
Brachytheciaceae	<i>Brachythecium collinum</i> (Schleich. ex C. Müll.) Schimp. in B.S.G.	brachythecium moss	W	3
Brachytheciaceae	<i>Brachythecium erythrorrhizon</i> Schimp. in B.S.G.	brachythecium moss	W	4
Brachytheciaceae	<i>Brachythecium frigidum</i> (C. Müll.) Besch.	cold brachythecium moss	W	1
Brachytheciaceae	<i>Brachythecium groenlandicum</i> (C. Jens.) Schljak.	Greenland brachythecium moss	W	10
Brachytheciaceae	<i>Brachythecium hyalotapetum</i> B. Hig. & N. Hig.	brachythecium moss	W	8
Brachytheciaceae	<i>Brachythecium leibergii</i> Grout	Leiberg's brachythecium moss	W	29
Brachytheciaceae	<i>Brachythecium mildeanum</i> (Schimp.) Schimp. ex Milde	brachythecium moss	W	3
Brachytheciaceae	<i>Brachythecium oedipodium</i> (Mitt.) Jaeg.	brachythecium moss	W	6
Brachytheciaceae	<i>Brachythecium plumosum</i> (Hedw.) Schimp. in B.S.G.	brachythecium moss	W	2
Brachytheciaceae	<i>Brachythecium reflexum</i> (Starke in Web. & Mohr) Schimp. in B.S.G. var. <i>pacificum</i> Ren. & Card. in Röhl	Pacific brachythecium moss	W	4
Brachytheciaceae	<i>Brachythecium reflexum</i> (Starke in Web. & Mohr) Schimp. in B.S.G. var. <i>reflexum</i>	brachythecium moss	W	1
Brachytheciaceae	<i>Brachythecium rutabulum</i> (Hedw.) Schimp. in B.S.G.	brachythecium moss	W	1
Brachytheciaceae	<i>Brachythecium salebrosum</i> (Web. & Mohr) Schimp. in B.S.G.	brachythecium moss	W	13
Brachytheciaceae	<i>Brachythecium</i> Schimp. in B.S.G.	brachythecium moss	W	18
Brachytheciaceae	<i>Brachythecium starkei</i> (Brid.) Schimp. in B.S.G.	Starke's brachythecium moss	W	28
Brachytheciaceae	<i>Brachythecium turgidum</i> (Hartm.) Kindb.	turgid brachythecium moss	W	1
Brachytheciaceae	<i>Brachythecium velutinum</i> (Hedw.) Schimp. in B.S.G.	brachythecium moss	W	1

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Brachytheciaceae	<i>Cirriphyllum cirrosus</i> (Schwaegr. in Schultes) Grout	cirriphyllum moss	W	1
Brachytheciaceae	<i>Eurhynchium pulchellum</i> (Hedw.) Jenn.	eurhynchium moss	W	13
Brachytheciaceae	<i>Tomentypnum nitens</i> (Hedw.) Loeske	tomentypnum moss	W	6
Brassicaceae	<i>Alyssum alyssoides</i> (L.) L.	pale madwort	G, W	10
Brassicaceae	<i>Arabis ×divaricarpa</i> A. Nels. (pro sp.)	spreadingpod rockcress	G, W	8
Brassicaceae	<i>Arabis drummondii</i> Gray	Drummond's rockcress	G, W	21
Brassicaceae	<i>Arabis glabra</i> (L.) Bernh.	tower rockcress	G, W	41
Brassicaceae	<i>Arabis hirsuta</i> (L.) Scop.	hairy rockcress	G, W	27
Brassicaceae	<i>Arabis holboellii</i> Hornem.	Holboell's rockcress	G, W	14
Brassicaceae	<i>Arabis</i> L.	rockcress	G, W	30
Brassicaceae	<i>Arabis lemmonii</i> S. Wats.	Lemmon's rockcress	G, W	2
Brassicaceae	<i>Arabis lyallii</i> S. Wats.	Lyall's rockcress	G, W	7
Brassicaceae	<i>Arabis nuttallii</i> B.L. Robins.	Nuttall's rockcress	G, W	88
Brassicaceae	<i>Barbarea orthoceras</i> Ledeb.	American yellowrocket	G	2
Brassicaceae	<i>Brassica juncea</i> (L.) Czern.	India mustard	G	1
Brassicaceae	<i>Braya humilis</i> (C.A. Mey.) B.L. Robins.	low northern-rockcress	W	3
Brassicaceae	<i>Camelina microcarpa</i> DC.	littlepod false flax	G	2
Brassicaceae	<i>Cardamine pensylvanica</i> Muhl. ex Willd.	Pennsylvania bittercress	G	2
Brassicaceae	<i>Caulanthus amplexicaulis</i> S. Wats. var. <i>amplexicaulis</i>	claspingleaf wild cabbage	G	2
Brassicaceae	<i>Descurainia incana</i> (Bernh. ex Fisch. & C.A. Mey.) Dorn	mountain tansymustard	G	5
Brassicaceae	<i>Descurainia pinnata</i> (Walt.) Britt.	western tansymustard	G	2
Brassicaceae	<i>Descurainia sophia</i> (L.) Webb ex Prantl	herb sophia	G	3
Brassicaceae	<i>Draba albertina</i> Greene	slender draba	G	1
Brassicaceae	<i>Draba aurea</i> Vahl ex Hornem.	golden draba	G, W	12
Brassicaceae	<i>Draba crassifolia</i> Graham	snowbed draba	G	2
Brassicaceae	<i>Draba incerta</i> Payson	Yellowstone draba	W	1
Brassicaceae	<i>Draba</i> L.	draba	G, W	14
Brassicaceae	<i>Draba lonchocarpa</i> Rydb.	lancepod draba	W	1
Brassicaceae	<i>Draba nemorosa</i> L.	woodland draba	G	6
Brassicaceae	<i>Draba nivalis</i> Lilj.	yellow arctic draba	G	3
Brassicaceae	<i>Draba oligosperma</i> Hook.	fewseed draba	G	3
Brassicaceae	<i>Draba paysonii</i> J.F. Macbr.	Payson's draba	W	1
Brassicaceae	<i>Draba porsildii</i> Mulligan	Porsild's draba	W	1
Brassicaceae	<i>Draba praealta</i> Greene	tall draba	W	1
Brassicaceae	<i>Draba verna</i> L.	spring draba	W	1
Brassicaceae	<i>Erysimum cheiranthoides</i> L.	wormseed wallflower	G, W	13
Brassicaceae	<i>Erysimum inconspicuum</i> (S. Wats.) MacM.	shy wallflower	G, W	9
Brassicaceae	<i>Rorippa palustris</i> (L.) Bess.	bog yellowcress	G	1
Brassicaceae	<i>Smelowskia calycina</i> (Steph. ex Willd.) C.A. Mey.	alpine smelowskia	G, W	44
Brassicaceae	<i>Thlaspi arvense</i> L.	field pennycress	G	9
Bryaceae	<i>Bryum argenteum</i> Hedw.	silvergreen bryum moss	W	1
Bryaceae	<i>Bryum caespiticium</i> Hedw.	dry calcareous bryum moss	W	5
Bryaceae	<i>Bryum calophyllum</i> R. Br.	bryum moss	W	1

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Bryaceae	<i>Bryum flaccidum</i> Brid.	bryum moss	W	1
Bryaceae	<i>Bryum</i> Hedw.	bryum moss	G, W	7
Bryaceae	<i>Bryum lisae</i> De Not. var. <i>cuspidatum</i> (Bruch & Schimp. in B.S.G.) Marg.	bryum moss	W	3
Bryaceae	<i>Bryum pallescens</i> Schleich. ex Schwaegr.	bryum moss	W	1
Bryaceae	<i>Bryum pseudotriquetrum</i> (Hedw.) Gaertn. et. al.	common green bryum moss	W	8
Bryaceae	<i>Bryum stirtonii</i> Schimp.	Stirton's bryum moss	W	3
Bryaceae	<i>Pohlia cruda</i> (Hedw.) Lindb.	pohlia moss	W	6
Bryaceae	<i>Pohlia nutans</i> (Hedw.) Lindb.	pohlia moss	W	39
Bryaceae	<i>Pohlia wahlenbergii</i> (Web. & Mohr) Andrews	Wahlenberg's pohlia moss	W	2
Bryaceae	<i>Roellia roellii</i> (Broth. in Röhl) Andrews ex Crum	Roell's moss	W	15
Callitricaceae	<i>Callitriche hermaphroditica</i> L.	northern water-starwort	W	1
Campanulaceae	<i>Campanula rotundifolia</i> L.	bluebell bellflower	G, W	414
Candelariaceae	<i>Candelariella canadensis</i> H. Magn.	Canada eggycork lichen	G	1
Caprifoliaceae	<i>Linnaea borealis</i> L.	twinline	G, W	228
Caprifoliaceae	<i>Lonicera dioica</i> L.	limber honeysuckle	W	3
Caprifoliaceae	<i>Lonicera involucrata</i> Banks ex Spreng.	twinline honeysuckle	G, W	270
Caprifoliaceae	<i>Lonicera utahensis</i> S. Wats.	Utah honeysuckle	G, W	237
Caprifoliaceae	<i>Sambucus racemosa</i> L.	red elderberry	G, W	79
Caprifoliaceae	<i>Symphoricarpos albus</i> (L.) Blake	common snowberry	G, W	794
Caprifoliaceae	<i>Symphoricarpos</i> Duham.	snowberry	G	2
Caprifoliaceae	<i>Symphoricarpos occidentalis</i> Hook.	western snowberry	G, W	81
Caprifoliaceae	<i>Viburnum edule</i> (Michx.) Raf.	squashberry	G	6
Caryophyllaceae	<i>Arenaria capillaris</i> Poir.	slender mountain sandwort	G, W	90
Caryophyllaceae	<i>Arenaria capillaris</i> Poir. ssp. <i>americana</i> Maguire	fescue sandwort	G	6
Caryophyllaceae	<i>Arenaria congesta</i> Nutt.	ballhead sandwort	G	3
Caryophyllaceae	<i>Arenaria</i> L.	sandwort	G, W	16
Caryophyllaceae	<i>Arenaria serpyllifolia</i> L.	thymeleaf sandwort	G	4
Caryophyllaceae	<i>Cerastium arvense</i> L.	field chickweed	G, W	244
Caryophyllaceae	<i>Cerastium beeringianum</i> Cham. & Schlecht.	Bering chickweed	W	3
Caryophyllaceae	<i>Cerastium</i> L.	mouse-ear chickweed	G	1
Caryophyllaceae	<i>Dianthus barbatus</i> L.	sweetwilliam	G	1
Caryophyllaceae	<i>Minuartia austromontana</i> S.J. Wolf & Packer	Columbian stitchwort	W	19
Caryophyllaceae	<i>Minuartia</i> L.	stitchwort	G	3
Caryophyllaceae	<i>Minuartia nuttallii</i> (Pax) Briq.	Nuttall's sandwort	G, W	14
Caryophyllaceae	<i>Minuartia nuttallii</i> (Pax) Briq. ssp. <i>nuttallii</i>	Nuttall's sandwort	G	5
Caryophyllaceae	<i>Minuartia obtusiloba</i> (Rydb.) House	twinline sandwort	G, W	57
Caryophyllaceae	<i>Minuartia rossii</i> (R. Br. ex Richards.) Graebn.	Ross' sandwort	G	1
Caryophyllaceae	<i>Minuartia rubella</i> (Wahlenb.) Hiern.	beautiful sandwort	G, W	29
Caryophyllaceae	<i>Moehringia lateriflora</i> (L.) Fenzl	bluntleaf sandwort	G, W	45
Caryophyllaceae	<i>Sagina saginoides</i> (L.) Karst.	arctic pearlwort	G, W	5
Caryophyllaceae	<i>Silene acaulis</i> (L.) Jacq.	moss campion	G, W	51
Caryophyllaceae	<i>Silene</i> L.	catchfly	G	3
Caryophyllaceae	<i>Silene latifolia</i> Poir.	bladder campion	G	1

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Caryophyllaceae	<i>Silene menziesii</i> Hook.	Menzies' campion	G, W	4
Caryophyllaceae	<i>Silene parryi</i> (S. Wats.) C.L. Hitchc. & Maguire	Parry's silene	G, W	66
Caryophyllaceae	<i>Silene repens</i> Patrin ex Pers.	pink campion	G	1
Caryophyllaceae	<i>Silene vulgaris</i> (Moench) Garcke	maidenstears	G	2
Caryophyllaceae	<i>Stellaria americana</i> (Porter ex B.L. Robins.) Standl.	American chickweed	G, W	3
Caryophyllaceae	<i>Stellaria borealis</i> Bigelow	boreal starwort	G	2
Caryophyllaceae	<i>Stellaria calycantha</i> (Ledeb.) Bong.	northern starwort	G	1
Caryophyllaceae	<i>Stellaria crispa</i> Cham. & Schlecht.	curled starwort	G	2
Caryophyllaceae	<i>Stellaria</i> L.	starwort	G, W	4
Caryophyllaceae	<i>Stellaria longifolia</i> Muhl. ex Willd.	longleaf starwort	G, W	3
Caryophyllaceae	<i>Stellaria longipes</i> Goldie	longstalk starwort	G, W	13
Caryophyllaceae	<i>Stellaria obtusa</i> Engelm.	Rocky Mountain chickweed	G	1
Celastraceae	<i>Paxistima myrsinites</i> (Pursh) Raf.	Oregon boxleaf	G, W	229
Chenopodiaceae	<i>Chenopodium botrys</i> L.	Jerusalem oak goosefoot	G	1
Chenopodiaceae	<i>Monolepis nuttalliana</i> (J.A. Schultes) Greene	Nuttall's povertyweed	W	1
Cladoniaceae	<i>Cladina</i> (Nyl.) Nyl.	reindeer lichen	G	1
Cladoniaceae	<i>Cladonia carneola</i> (Fr.) Fr.	cup lichen	W	2
Cladoniaceae	<i>Cladonia chlorophaea</i> (Florke ex Sommerf.) Sprengel	cup lichen	W	3
Cladoniaceae	<i>Cladonia coniocraea</i> auct.	cup lichen	W	4
Cladoniaceae	<i>Cladonia cornuta</i> (L.) Hoffm.	cup lichen	W	1
Cladoniaceae	<i>Cladonia cornuta</i> (L.) Hoffm. ssp. <i>cornuta</i>	cup lichen	W	1
Cladoniaceae	<i>Cladonia crispata</i> (Ach.) Flotow	cup lichen	W	1
Cladoniaceae	<i>Cladonia cristatella</i> Tuck.	cup lichen	W	1
Cladoniaceae	<i>Cladonia ecmocyna</i> Leighton	cup lichen	W	5
Cladoniaceae	<i>Cladonia fimbriata</i> (L.) Fr.	cup lichen	W	10
Cladoniaceae	<i>Cladonia gracilis</i> (L.) Willd.	cup lichen	W	5
Cladoniaceae	<i>Cladonia grayi</i> G. Merr. ex Sandst.	Gray's cup lichen	W	3
Cladoniaceae	<i>Cladonia norvegica</i> Tonsberg & Holien	cup lichen	W	1
Cladoniaceae	<i>Cladonia</i> P. Browne	cup lichen	G, W	21
Cladoniaceae	<i>Cladonia pocillum</i> (Ach.) Grognot	cup lichen	W	1
Cladoniaceae	<i>Cladonia pyxidata</i> (L.) Hoffm.	cup lichen	W	6
Cladoniaceae	<i>Cladonia rei</i> Schaerer	cup lichen	W	1
Cladoniaceae	<i>Cladonia squamosa</i> (Scop.) Hoffm. var. <i>subsquamosa</i> (Nyl. ex Leighton) Vainio	cup lichen	W	1
Cladoniaceae	<i>Cladonia squamosa</i> Hoffm.	cup lichen	W	1
Cladoniaceae	<i>Cladonia sulphurina</i> (Michaux) Fr.	sulphur cup lichen	W	1
Clusiaceae	<i>Hypericum perforatum</i> L.	common St. Johnswort	G, W	29
Clusiaceae	<i>Hypericum scouleri</i> Hook.	Scouler's St. Johnswort	G, W	51
Cornaceae	<i>Cornus canadensis</i> L.	bunchberry dogwood	G, W	108
Cornaceae	<i>Cornus sericea</i> L.	redosier dogwood	G, W	292
Crassulaceae	<i>Rhodiola integrifolia</i> Raf. ssp. <i>integrifolia</i>	ledge stonecrop	G, W	6
Crassulaceae	<i>Rhodiola rosea</i> L.	roseroot stonecrop	G, W	16
Crassulaceae	<i>Sedum</i> L.	stonecrop	G, W	4
Crassulaceae	<i>Sedum lanceolatum</i> Torr.	spearleaf stonecrop	G, W	211

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Crassulaceae	<i>Sedum stenopetalum</i> Pursh	wormleaf stonecrop	G, W	17
Cupressaceae	<i>Juniperus communis</i> L.	common juniper	G, W	315
Cupressaceae	<i>Juniperus horizontalis</i> Moench	creeping juniper	G, W	65
Cupressaceae	<i>Juniperus scopulorum</i> Sarg.	Rocky Mountain juniper	G, W	12
Cupressaceae	<i>Thuja plicata</i> Donn ex D. Don	western red cedar	G	175
Cyperaceae	<i>Carex albonigra</i> Mackenzie	blackandwhite sedge	G, W	7
Cyperaceae	<i>Carex aperta</i> Boott	Columbian sedge	G, W	4
Cyperaceae	<i>Carex aquatilis</i> Wahlenb.	water sedge	G, W	41
Cyperaceae	<i>Carex arcta</i> Boott	northern cluster sedge	G	5
Cyperaceae	<i>Carex atherodes</i> Spreng.	wheat sedge	G, W	2
Cyperaceae	<i>Carex athrostachya</i> Olney	slenderbeak sedge	G	1
Cyperaceae	<i>Carex atosquama</i> Mackenzie	lesser blackscale sedge	G, W	4
Cyperaceae	<i>Carex aurea</i> Nutt.	golden sedge	G, W	7
Cyperaceae	<i>Carex backii</i> Boott	Back's sedge	W	1
Cyperaceae	<i>Carex bebbii</i> Olney ex Fern.	Bebb's sedge	G, W	5
Cyperaceae	<i>Carex buxbaumii</i> Wahlenb.	Buxbaum's sedge	G, W	8
Cyperaceae	<i>Carex canescens</i> L.	silvery sedge	G	13
Cyperaceae	<i>Carex capillaris</i> L.	hairlike sedge	G, W	4
Cyperaceae	<i>Carex concinna</i> R. Br.	low northern sedge	W	1
Cyperaceae	<i>Carex concinnoides</i> Mackenzie	northwestern sedge	G, W	79
Cyperaceae	<i>Carex crawfordii</i> Fern.	Crawford's sedge	G, W	4
Cyperaceae	<i>Carex deweyana</i> Schwein.	Dewey sedge	G, W	25
Cyperaceae	<i>Carex diandra</i> Schrank	lesser panicled sedge	G, W	5
Cyperaceae	<i>Carex disperma</i> Dewey	softleaf sedge	G	20
Cyperaceae	<i>Carex duriuscula</i> C.A. Mey.	needleleaf sedge	G	2
Cyperaceae	<i>Carex eburnea</i> Boott	bristleleaf sedge	W	1
Cyperaceae	<i>Carex elynoides</i> Holm	blackroot sedge	G	4
Cyperaceae	<i>Carex filifolia</i> Nutt.	threadleaf sedge	G, W	17
Cyperaceae	<i>Carex flava</i> L.	yellow sedge	G, W	11
Cyperaceae	<i>Carex foenea</i> Willd.	dryspike sedge	G, W	4
Cyperaceae	<i>Carex foenea</i> Willd. var. <i>foenea</i>	dryspike sedge	W	1
Cyperaceae	<i>Carex geyeri</i> Boott	Geyer's sedge	G, W	458
Cyperaceae	<i>Carex gynocrates</i> Wormsk. ex Drej.	northern bog sedge	G, W	4
Cyperaceae	<i>Carex haydeniana</i> Olney	cloud sedge	G	7
Cyperaceae	<i>Carex heteroneura</i> W. Boott var. <i>epapillosa</i> (Mackenzie) F.J. Herm.	different nerve sedge	G	1
Cyperaceae	<i>Carex hoodii</i> Boott	Hood's sedge	G, W	26
Cyperaceae	<i>Carex interior</i> Bailey	inland sedge	G, W	9
Cyperaceae	<i>Carex</i> L.	sedge	G, W	164
Cyperaceae	<i>Carex lachenalii</i> Schkuhr	twotipped sedge	G	3
Cyperaceae	<i>Carex laeviculmis</i> Meinh.	smoothstem sedge	G	1
Cyperaceae	<i>Carex lasiocarpa</i> Ehrh.	woollyfruit sedge	G, W	20
Cyperaceae	<i>Carex lenticularis</i> Michx.	lakeshore sedge	G	4
Cyperaceae	<i>Carex leptalea</i> Wahlenb.	bristlystalked sedge	G, W	4

Family	Scientific Name with Author	Common Name	Location	Occur
Cyperaceae	<i>Carex limosa</i> L.	mud sedge	G, W	6
Cyperaceae	<i>Carex magellanica</i> Lam. ssp. <i>irrigua</i> (Wahlenb.) Hultén	boreal bog sedge	G	1
Cyperaceae	<i>Carex meadii</i> Dewey	Mead's sedge	W	1
Cyperaceae	<i>Carex mertensii</i> Prescott ex Bong.	Mertens' sedge	G	1
Cyperaceae	<i>Carex microptera</i> Mackenzie	smallwing sedge	G, W	20
Cyperaceae	<i>Carex nardina</i> Fries	spike sedge	G, W	9
Cyperaceae	<i>Carex nigricans</i> C.A. Mey.	black alpine sedge	G, W	21
Cyperaceae	<i>Carex norvegica</i> Retz.	Norway sedge	W	1
Cyperaceae	<i>Carex norvegica</i> Retz. ssp. <i>inferalpina</i> (Wahlenb.) Hultén	closedhead sedge	G	1
Cyperaceae	<i>Carex obtusata</i> Lilj.	obtuse sedge	G	96
Cyperaceae	<i>Carex pachystachya</i> Cham. ex Steud.	chamisso sedge	G	3
Cyperaceae	<i>Carex paysonis</i> Clokey	Payson's sedge	G	21
Cyperaceae	<i>Carex peltita</i> Muhl ex Willd.	woolly sedge	G, W	5
Cyperaceae	<i>Carex pensylvanica</i> Lam.	Pennsylvania sedge	W	2
Cyperaceae	<i>Carex petasata</i> Dewey	Liddon sedge	G	109
Cyperaceae	<i>Carex phaeocephala</i> Piper	dunhead sedge	G, W	25
Cyperaceae	<i>Carex platylepis</i> Mackenzie	broadscale sedge	G	1
Cyperaceae	<i>Carex podocarpa</i> R. Br.	shortstalk sedge	G	11
Cyperaceae	<i>Carex praegracilis</i> W. Boott	clustered field sedge	G	4
Cyperaceae	<i>Carex prairea</i> Dewey ex Wood	prairie sedge	W	1
Cyperaceae	<i>Carex praticola</i> Rydb.	meadow sedge	G	1
Cyperaceae	<i>Carex preslii</i> Steud.	Presl's sedge	G	13
Cyperaceae	<i>Carex raynoldsii</i> Dewey	Raynolds' sedge	G, W	29
Cyperaceae	<i>Carex retrorsa</i> Schwein.	knotsheath sedge	W	2
Cyperaceae	<i>Carex rossii</i> Boott	Ross' sedge	G, W	44
Cyperaceae	<i>Carex rostrata</i> Stokes	beaked sedge	G	3
Cyperaceae	<i>Carex rupestris</i> All.	curly sedge	G, W	45
Cyperaceae	<i>Carex sartwellii</i> Dewey	Sartwell's sedge	G	1
Cyperaceae	<i>Carex scirpoidea</i> Michx.	northern singlespike sedge	G, W	26
Cyperaceae	<i>Carex scopulorum</i> Holm	mountain sedge	G	2
Cyperaceae	<i>Carex simulata</i> Mackenzie	analogue sedge	W	1
Cyperaceae	<i>Carex spectabilis</i> Dewey	showy sedge	G, W	2
Cyperaceae	<i>Carex sprengei</i> Dewey ex Spreng.	Sprengel's sedge	W	1
Cyperaceae	<i>Carex stipata</i> Muhl. ex Willd.	owlfruit sedge	G	1
Cyperaceae	<i>Carex tahoensis</i> Smiley	Tahoe sedge	G	3
Cyperaceae	<i>Carex utriculata</i> Boott	Northwest Territory sedge	G, W	91
Cyperaceae	<i>Carex vesicaria</i> L.	blister sedge	G, W	22
Cyperaceae	<i>Carex viridula</i> Michx.	little green sedge	W	1
Cyperaceae	<i>Dulichium arundinaceum</i> (L.) Britt.	threeway sedge	G	2
Cyperaceae	<i>Eleocharis acicularis</i> (L.) Roemer & J.A. Schultes	needle spikerush	G	1
Cyperaceae	<i>Eleocharis palustris</i> (L.) Roemer & J.A. Schultes	common spikerush	G, W	17
Cyperaceae	<i>Eleocharis quinqueflora</i> (F.X. Hartmann) Schwarz	fewflower spikerush	W	2
Cyperaceae	<i>Eriophorum angustifolium</i> Honckeny ssp. <i>subarcticum</i> (Vassiljev) Hultén ex Kartesz & Gandhi	tall cottongrass	W	2

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Cyperaceae	<i>Eriophorum chamissonis</i> C.A. Mey.	Chamisso's cottongrass	G	3
Cyperaceae	<i>Eriophorum</i> L.	cottongrass	G	1
Cyperaceae	<i>Eriophorum viridicarinatum</i> (Engelm.) Fern.	thinleaf cottongsedge	G	2
Cyperaceae	<i>Kobresia myosuroides</i> (Vill.) Fiori	Bellardi bog sedge	W	4
Cyperaceae	<i>Kobresia</i> Willd.	bog sedge	W	1
Cyperaceae	<i>Schoenoplectus tabernaemontani</i> (K.C. Gmel.) Palla	softstem bulrush	G, W	5
Cyperaceae	<i>Scirpus microcarpus</i> J.& K. Presl	panicled bulrush	G	1
Cyperaceae	<i>Trichophorum caespitosum</i> (L.) Hartman	tufted bulrush	W	1
Dennstaedtiaceae	<i>Pteridium aquilinum</i> (L.) Kuhn	western brackenfern	G, W	66
Dicranaceae	<i>Dichodontium olympicum</i> Ren. & Card.	Olympic dichodontium moss	W	1
Dicranaceae	<i>Dichodontium pellucidum</i> (Hedw.) Schimp.	dichodontium moss	W	2
Dicranaceae	<i>Dicranoweisia crispula</i> (Hedw.) Lindb. ex Milde	dicranoweisia moss	W	5
Dicranaceae	<i>Dicranum brevifolium</i> (Lindb.) Lindb.	shortleaf dicranum moss	W	1
Dicranaceae	<i>Dicranum fuscescens</i> Turn.	dicranum moss	W	13
Dicranaceae	<i>Dicranum groenlandicum</i> Brid.	Greenland dicranum moss	W	1
Dicranaceae	<i>Dicranum</i> Hedw.	dicranum moss	G, W	2
Dicranaceae	<i>Dicranum muehlenbeckii</i> Bruch & Schimp. in B.S.G.	Muehlenbeck's dicranum moss	W	17
Dicranaceae	<i>Dicranum polysetum</i> Sw.	dicranum moss	W	2
Dicranaceae	<i>Dicranum scoparium</i> Hedw.	dicranum moss	G, W	37
Dicranaceae	<i>Dicranum tauricum</i> Sapeh.	dicranum moss	W	15
Dicranaceae	<i>Oncophorus wahlenbergii</i> Brid.	Wahlenberg's oncophorus moss	W	1
Ditrichaceae	<i>Ceratodon</i> Brid.	ceratodon moss	W	1
Ditrichaceae	<i>Ceratodon purpureus</i> (Hedw.) Brid.	ceratodon moss	W	16
Ditrichaceae	<i>Distichium capillaceum</i> (Hedw.) Bruch & Schimp. in B.S.G.	distichium moss	W	2
Ditrichaceae	<i>Ditrichum flexicaule</i> (Schwaegr.) Hampe	ditrichum moss	W	3
Droseraceae	<i>Drosera anglica</i> Huds.	English sundew	G	1
Droseraceae	<i>Drosera</i> L.	sundew	G	1
Droseraceae	<i>Drosera rotundifolia</i> L.	roundleaf sundew	G	3
Dryopteridaceae	<i>Athyrium americanum</i> (Butters) Maxon	alpine ladyfern	G	1
Dryopteridaceae	<i>Athyrium filix-femina</i> (L.) Roth	common ladyfern	G, W	119
Dryopteridaceae	<i>Athyrium</i> Roth	ladyfern	G	22
Dryopteridaceae	<i>Cystopteris fragilis</i> (L.) Bernh.	brittle bladderfern	G, W	35
Dryopteridaceae	<i>Dryopteris</i> Adans.	woodfern	G	3
Dryopteridaceae	<i>Dryopteris campyloptera</i> Clarkson	mountain woodfern	G	2
Dryopteridaceae	<i>Dryopteris carthusiana</i> (Vill.) H.P. Fuchs	spinulose woodfern	G, W	6
Dryopteridaceae	<i>Dryopteris cristata</i> (L.) Gray	crested woodfern	G	2
Dryopteridaceae	<i>Dryopteris expansa</i> (K. Presl) Fraser-Jenkins & Jermy	spreading woodfern	G, W	13
Dryopteridaceae	<i>Dryopteris filix-mas</i> (L.) Schott	male fern	G, W	21
Dryopteridaceae	<i>Gymnocarpium disjunctum</i> (Rupr.) Ching	Pacific oakfern	G	11
Dryopteridaceae	<i>Gymnocarpium dryopteris</i> (L.) Newman	western oakfern	G, W	73
Dryopteridaceae	<i>Polystichum andersonii</i> Hopkins	Anderson's hollyfern	G	1
Dryopteridaceae	<i>Polystichum lonchitis</i> (L.) Roth	northern hollyfern	G, W	51
Dryopteridaceae	<i>Polystichum munitum</i> (Kaulfuss) K. Presl	western swordfern	G	1

Family	Scientific Name with Author	Common Name	Location	Occur
Dryopteridaceae	<i>Polystichum</i> Roth	hollyfern	G	4
Dryopteridaceae	<i>Woodsia oregana</i> D.C. Eat.	Oregon cliff fern	G	8
Dryopteridaceae	<i>Woodsia</i> R. Br.	cliff fern	G	1
Dryopteridaceae	<i>Woodsia scopulina</i> D.C. Eat.	Rocky Mountain woodsia	G	2
Elaeagnaceae	<i>Elaeagnus commutata</i> Bernh. ex Rydb.	silverberry	G, W	27
Elaeagnaceae	<i>Shepherdia canadensis</i> (L.) Nutt.	russet buffaloberry	G, W	274
Encalyptaceae	<i>Encalypta affinis</i> Hedw. f. in Web. & Mohr	candle snuffer moss	W	2
Encalyptaceae	<i>Encalypta alpina</i> Sm.	alpine candle snuffer moss	W	1
Encalyptaceae	<i>Encalypta ciliata</i> Hedw.	fringed candle snuffer moss	W	1
Encalyptaceae	<i>Encalypta</i> Hedw.	candle snuffer moss	W	1
Encalyptaceae	<i>Encalypta procera</i> Bruch	candle snuffer moss	W	1
Encalyptaceae	<i>Encalypta rhaptocarpa</i> Schwaegr.	yellow awn candle snuffer moss	W	2
Encalyptaceae	<i>Encalypta vulgaris</i> Hedw.	common candle snuffer moss	W	1
Equisetaceae	<i>Equisetum arvense</i> L.	field horsetail	G, W	275
Equisetaceae	<i>Equisetum fluviatile</i> L.	water horsetail	G, W	27
Equisetaceae	<i>Equisetum hyemale</i> L.	scouringrush horsetail	G, W	34
Equisetaceae	<i>Equisetum</i> L.	horsetail	G	1
Equisetaceae	<i>Equisetum laevigatum</i> A. Braun	smooth horsetail	G, W	11
Equisetaceae	<i>Equisetum palustre</i> L.	marsh horsetail	G	4
Equisetaceae	<i>Equisetum pratense</i> Ehrh.	meadow horsetail	G, W	7
Equisetaceae	<i>Equisetum scirpoides</i> Michx.	dwarf scouringrush	W	1
Equisetaceae	<i>Equisetum sylvaticum</i> L.	woodland horsetail	G	7
Equisetaceae	<i>Equisetum variegatum</i> Schleich. ex F. Weber & D.M.H. Mohr	variegated scouringrush	G, W	12
Ericaceae	<i>Arctostaphylos uva-ursi</i> (L.) Spreng.	kinnikinnick	G, W	379
Ericaceae	<i>Cassiope mertensiana</i> (Bong.) D. Don	western moss heather	G, W	3
Ericaceae	<i>Gaultheria ovatifolia</i> Gray	western teaberry	G	1
Ericaceae	<i>Kalmia microphylla</i> (Hook.) Heller	alpine laurel	G	6
Ericaceae	<i>Kalmia polifolia</i> Wangenh.	bog laurel	G	2
Ericaceae	<i>Ledum glandulosum</i> Nutt.	western Labrador tea	W	2
Ericaceae	<i>Menziesia ferruginea</i> Sm.	rusty menziesia	G, W	281
Ericaceae	<i>Phyllodoce empetriformis</i> (Sm.) D. Don	pink mountainheath	G, W	18
Ericaceae	<i>Phyllodoce glanduliflora</i> (Hook.) Coville	yellow mountainheath	G, W	7
Ericaceae	<i>Phyllodoce</i> Salisb.	mountainheath	G	1
Ericaceae	<i>Rhododendron albiflorum</i> Hook.	Cascade azalea	W	1
Ericaceae	<i>Vaccinium caespitosum</i> Michx.	dwarf bilberry	G, W	155
Ericaceae	<i>Vaccinium</i> L.	blueberry	W	2
Ericaceae	<i>Vaccinium membranaceum</i> Dougl. ex Torr.	thinleaf huckleberry	G, W	544
Ericaceae	<i>Vaccinium myrtilloides</i> Michx.	velvetleaf huckleberry	G, W	8
Ericaceae	<i>Vaccinium myrtillus</i> L.	whortleberry	G, W	180
Ericaceae	<i>Vaccinium scoparium</i> Leib. ex Coville	grouse whortleberry	G, W	166
Euphorbiaceae	<i>Euphorbia esula</i> L.	leafy spurge	G	4
Euphorbiaceae	<i>Euphorbia</i> L.	spurge	G	1
Fabaceae	<i>Astragalus agrestis</i> Dougl. ex G. Don	purple milkvetch	G, W	11

Family	Scientific Name with Author	Common Name	Location	Occur
Fabaceae	<i>Astragalus alpinus</i> L.	alpine milkvetch	G, W	20
Fabaceae	<i>Astragalus australis</i> (L.) Lam.	Indian milkvetch	G	3
Fabaceae	<i>Astragalus bourgovii</i> Gray	Bourgov's milkvetch	G, W	5
Fabaceae	<i>Astragalus gilviflorus</i> Sheldon	plains milkvetch	W	1
Fabaceae	<i>Astragalus</i> L.	milkvetch	G, W	31
Fabaceae	<i>Astragalus laxmannii</i> Jacq. var. <i>robustior</i> (Hook.) Barneby & Welsh	prairie milkvetch	G, W	8
Fabaceae	<i>Astragalus miser</i> Dougl.	timber milkvetch	W	1
Fabaceae	<i>Astragalus robbinsii</i> (Oakes) Gray	Robbins' milkvetch	G, W	9
Fabaceae	<i>Astragalus tenellus</i> Pursh	looseflower milkvetch	G, W	14
Fabaceae	<i>Astragalus vexilliflexus</i> Sheldon	bentflower milkvetch	G, W	14
Fabaceae	<i>Glycyrrhiza lepidota</i> Pursh	American licorice	G	3
Fabaceae	<i>Hedysarum alpinum</i> L.	alpine sweetvetch	G, W	3
Fabaceae	<i>Hedysarum boreale</i> Nutt.	boreal sweetvetch	G	4
Fabaceae	<i>Hedysarum</i> L.	sweetvetch	G, W	9
Fabaceae	<i>Hedysarum sulphurescens</i> Rydb.	white sweetvetch	G, W	234
Fabaceae	<i>Lathyrus</i> L.	pea	G	2
Fabaceae	<i>Lathyrus ochroleucus</i> Hook.	cream pea	G, W	199
Fabaceae	<i>Lupinus argenteus</i> Pursh	silvery lupine	G	30
Fabaceae	<i>Lupinus</i> L.	lupine	G, W	4
Fabaceae	<i>Lupinus lepidus</i> Dougl. ex Lindl.	Pacific lupine	W	2
Fabaceae	<i>Lupinus sericeus</i> Pursh	silky lupine	G, W	390
Fabaceae	<i>Lupinus sericeus</i> Pursh ssp. <i>sericeus</i>	silky lupine	G	3
Fabaceae	<i>Medicago lupulina</i> L.	black medick	G	23
Fabaceae	<i>Melilotus alba</i> Medikus	white sweetclover	G	16
Fabaceae	<i>Melilotus officinalis</i> (L.) Lam.	yellow sweetclover	G, W	10
Fabaceae	<i>Melilotus</i> P. Mill.	sweetclover	G	1
Fabaceae	<i>Oxytropis borealis</i> DC.	boreal locoweed	G	7
Fabaceae	<i>Oxytropis campestris</i> (L.) DC.	field locoweed	G, W	73
Fabaceae	<i>Oxytropis</i> DC.	locoweed	W	5
Fabaceae	<i>Oxytropis deflexa</i> (Pallas) DC.	nodding locoweed	G, W	2
Fabaceae	<i>Oxytropis monticola</i> Gray	yellowflower locoweed	W	3
Fabaceae	<i>Oxytropis podocarpa</i> Gray	stalkpod locoweed	G	3
Fabaceae	<i>Oxytropis sericea</i> Nutt.	white locoweed	G, W	33
Fabaceae	<i>Oxytropis splendens</i> Dougl. ex Hook.	showy locoweed	G, W	64
Fabaceae	<i>Trifolium aureum</i> Pollich	golden clover	G	17
Fabaceae	<i>Trifolium campestre</i> Schreb.	field clover	G	1
Fabaceae	<i>Trifolium hybridum</i> L.	alsike clover	G	6
Fabaceae	<i>Trifolium</i> L.	clover	G	18
Fabaceae	<i>Trifolium pratense</i> L.	red clover	G, W	21
Fabaceae	<i>Trifolium repens</i> L.	white clover	G, W	28
Fabaceae	<i>Vicia americana</i> Muhl. ex Willd.	American vetch	G, W	255
Fabaceae	<i>Vicia</i> L.	vetch	W	17
Fissidentaceae	<i>Fissidens bryoides</i> Hedw.	bryoid fissidens moss	W	2

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Fontinalaceae	<i>Dichelyma uncinatum</i> Mitt.	dichelyma moss	W	3
Fumariaceae	<i>Corydalis aurea</i> Willd.	scrambled eggs	G	1
Fumariaceae	<i>Corydalis sempervirens</i> (L.) Pers.	rock harlequin	G	1
Gentianaceae	<i>Gentiana calycosa</i> Griseb.	Rainier pleated gentian	G, W	19
Gentianaceae	<i>Gentiana prostrata</i> Haenke	pygmy gentian	W	2
Gentianaceae	<i>Gentianella amarella</i> (L.) Boerner	autumn dwarf gentian	G, W	30
Gentianaceae	<i>Gentianella propinqua</i> (Richards.) J. Gillett	fourpart dwarf gentian	W	1
Gentianaceae	<i>Gentianopsis detonsa</i> (Rottb.) Ma ssp. <i>detonsa</i>	windmill fringed gentian	G, W	5
Geocalycaceae	<i>Lophocolea heterophylla</i> (Schrad.) Dumort.		W	1
Geocalycaceae	<i>Lophocolea minor</i> Nees		W	1
Geraniaceae	<i>Geranium bicknellii</i> Britt.	Bicknell's cranesbill	G	3
Geraniaceae	<i>Geranium</i> L.	geranium	W	2
Geraniaceae	<i>Geranium richardsonii</i> Fisch. & Trautv.	Richardson's geranium	G, W	52
Geraniaceae	<i>Geranium viscosissimum</i> Fisch. & C.A. Mey. ex C.A. Mey.	sticky purple geranium	G, W	304
Grimmiaceae	<i>Grimmia affinis</i> Hoppe & Hornsch. ex Hornsch.	grimmia dry rock moss	W	1
Grimmiaceae	<i>Grimmia</i> Hedw.	grimmia dry rock moss	W	1
Grimmiaceae	<i>Grimmia plagiopodia</i> Hedw.	grimmia dry rock moss	W	1
Grimmiaceae	<i>Racomitrium</i> Brid.	racomitrium moss	G	2
Grimmiaceae	<i>Racomitrium canescens</i> (Hedw.) Brid.	racomitrium moss	W	5
Grimmiaceae	<i>Racomitrium heterostichum</i> (Hedw.) Brid.	racomitrium moss	W	2
Grimmiaceae	<i>Racomitrium lanuginosum</i> (Hedw.) Brid.	racomitrium moss	W	1
Grimmiaceae	<i>Schistidium apocarpum</i> (Hedw.) Bruch & Schimp. in B.S.G.	schistidium moss	W	7
Grossulariaceae	<i>Ribes cereum</i> Dougl.	wax currant	G	6
Grossulariaceae	<i>Ribes hudsonianum</i> Richards.	northern black currant	G	10
Grossulariaceae	<i>Ribes inerme</i> Rydb.	whitestem gooseberry	G, W	81
Grossulariaceae	<i>Ribes</i> L.	currant	G, W	21
Grossulariaceae	<i>Ribes lacustre</i> (Pers.) Poir.	prickly currant	G, W	379
Grossulariaceae	<i>Ribes montigenum</i> McClatchie	gooseberry currant	G	3
Grossulariaceae	<i>Ribes oxycanthoides</i> L.	Canadian gooseberry	G, W	6
Grossulariaceae	<i>Ribes oxycanthoides</i> L. ssp. <i>irriguum</i> (Dougl.) Sinnott	Idaho gooseberry	G	2
Grossulariaceae	<i>Ribes oxycanthoides</i> L. ssp. <i>setosum</i> (Lindl.) Sinnott	inland gooseberry	G	1
Grossulariaceae	<i>Ribes viscosissimum</i> Pursh	sticky currant	G, W	39
Haloragaceae	<i>Myriophyllum sibiricum</i> Komarov	shortspike watermilfoil	G, W	8
Hydrangeaceae	<i>Philadelphus lewisii</i> Pursh	Lewis' mock orange	G	5
Hydrophyllaceae	<i>Hydrophyllum capitatum</i> Dougl. ex Benth.	ballhead waterleaf	G	6
Hydrophyllaceae	<i>Hydrophyllum</i> L.	waterleaf	G	2
Hydrophyllaceae	<i>Phacelia hastata</i> Dougl. ex Lehm.	silverleaf phacelia	G, W	74
Hydrophyllaceae	<i>Phacelia</i> Juss.	phacelia	W	1
Hydrophyllaceae	<i>Phacelia leptosepala</i> Rydb.	narrowsepal phacelia	W	1
Hydrophyllaceae	<i>Phacelia lyallii</i> (Gray) Rydb.	alpine phacelia	G, W	8
Hydrophyllaceae	<i>Phacelia sericea</i> (Graham) Gray	silky phacelia	G, W	44
Hydrophyllaceae	<i>Romanzoffia sitchensis</i> Bong.	Sitka mistmaiden	W	1
Hylocomiaceae	<i>Hylocomium</i> Schimp. in B.S.G.	hylocomium feather moss	G	1

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Hylocomiaceae	Hylocomium splendens (Hedw.) Schimp. in B.S.G.	splendid feather moss	G, W	8
Hylocomiaceae	Pleurozium Mitt.	big red stem moss	G	1
Hylocomiaceae	Pleurozium schreberi (Brid.) Mitt.	Schreber's big red stem moss	G, W	28
Hylocomiaceae	Rhytidiadelphus (Lindb. ex Limpr.) Warnst.	goose neck moss	G	1
Hylocomiaceae	Rhytidiadelphus triquetrus (Hedw.) Warnst.	rough goose neck moss	G, W	11
Hylocomiaceae	Rhytidiopsis Broth.	rhytidiopsis moss	G	1
Hylocomiaceae	Rhytidiopsis robusta (Hook.) Broth.	robust rhytidiopsis moss	W	22
Hypnaceae	Hypnum cupressiforme Hedw.	hypnum moss	W	2
Hypnaceae	Hypnum lindbergii Mitt.	Lindberg's hypnum moss	W	3
Hypnaceae	Hypnum pratense (Rabenh.) W. Koch ex Spruce	hypnum moss	W	1
Hypnaceae	Hypnum revolutum (Mitt.) Lindb.	revolute hypnum moss	W	19
Hypnaceae	Isopterygiopsis pulchella (Hedw.) Iwats.	isopterygiopsis moss	W	1
Hypnaceae	Platydictya jungermannioides (Brid.) Crum	Jungermann's platydictya moss	W	3
Hypnaceae	Ptilium crista-castrensis (Hedw.) De Not.	knights plume moss	W	14
Hypnaceae	Pylaisiella polyantha (Hedw.) Grout	pylaisiella moss	W	6
Iridaceae	Sisyrinchium montanum Greene	strict blue-eyed grass	G, W	52
Juncaceae	Juncus alpinoarticulatus Chaix	northern green rush	G, W	3
Juncaceae	Juncus balticus Willd.	Baltic rush	G, W	50
Juncaceae	Juncus bufonius L.	toad rush	W	1
Juncaceae	Juncus compressus Jacq.	roundfruit rush	G	2
Juncaceae	Juncus confusus Coville	Colorado rush	G	1
Juncaceae	Juncus drummondii E. Mey.	Drummond's rush	G, W	69
Juncaceae	Juncus ensifolius Wikstr.	swordleaf rush	G, W	8
Juncaceae	Juncus filiformis L.	thread rush	G	2
Juncaceae	Juncus L.	rush	G, W	9
Juncaceae	Juncus longistylis Torr.	longstyle rush	W	1
Juncaceae	Juncus mertensianus Bong.	Mertens' rush	G, W	20
Juncaceae	Juncus nevadensis S. Wats.	Sierra rush	G	1
Juncaceae	Juncus nodosus L.	knotted rush	W	1
Juncaceae	Juncus parryi Engelm.	Parry's rush	G, W	8
Juncaceae	Juncus saximontanus A. Nels.	Rocky Mountain rush	W	1
Juncaceae	Luzula campestris (L.) DC.	field woodrush	G	2
Juncaceae	Luzula DC.	woodrush	G	1
Juncaceae	Luzula glabrata (Hoppe ex Rostk.) Desv.	smooth woodrush	G	3
Juncaceae	Luzula glabrata (Hoppe ex Rostk.) Desv. var. hitchcockii (Hämet-Ahti) Dorn	Hitchcock's smooth woodrush	G, W	160
Juncaceae	Luzula multiflora (Ehrh.) Lej.	common woodrush	G	2
Juncaceae	Luzula parviflora (Ehrh.) Desv.	smallflowered woodrush	G, W	23
Juncaceae	Luzula piperi (Coville) M.E. Jones	Piper's woodrush	W	2
Juncaceae	Luzula spicata (L.) DC.	spiked woodrush	G, W	44
Juncaginaceae	Triglochin maritimum L.	seaside arrowgrass	W	7
Juncaginaceae	Triglochin palustre L.	marsh arrowgrass	W	4
Jungermanniaceae	Barbilophozia floerkei (F. Weber & D. Mohr) Loeske		W	3
Jungermanniaceae	Barbilophozia hatcheri (A. Evans) Loeske		W	7

Family	Scientific Name with Author	Common Name	Location	Occur
Jungermanniaceae	Barbilophozia lycopodioides (Wallr.) Loeske		W	19
Jungermanniaceae	Lophozia longidens (Lindb.) Macoun ssp. longidens		W	3
Jungermanniaceae	Lophozia ventricosa (Dicks.) Dumort.		W	2
Jungermanniaceae	Lophozia ventricosa (Dicks.) Dumort. var. ventricosa		W	19
Jungermanniaceae	Tritomaria quinqueidentata (Huds.) H. Buch		W	1
Lamiaceae	Agastache urticifolia (Benth.) Kuntze	nettleleaf giant hyssop	G, W	2
Lamiaceae	Dracocephalum parviflorum Nutt.	American dragonhead	G	1
Lamiaceae	Lycopus uniflorus Michx.	northern bugleweed	G	1
Lamiaceae	Mentha arvensis L.	wild mint	G, W	36
Lamiaceae	Mentha L.	mint	G	1
Lamiaceae	Monarda bradburiana Beck	eastern beebalm	G	2
Lamiaceae	Monarda fistulosa L.	wild bergamot	G, W	80
Lamiaceae	Monarda fistulosa L. ssp. fistulosa var. menthifolia (Graham) Fern.	wild bergamot	G	19
Lamiaceae	Prunella L.	selfheal	G	3
Lamiaceae	Prunella vulgaris L.	common selfheal	G, W	33
Lamiaceae	Scutellaria galericulata L.	marsh skullcap	G, W	6
Lamiaceae	Stachys palustris L.	marsh hedgenettle	W	1
Lamiaceae	Stachys pilosa Nutt. var. pilosa	hairy hedgenettle	G	1
Lecanoraceae	Lecanora Ach.	rim lichen	W	1
Lecanoraceae	Rhizoplaca melanophthalma (DC.) Leuckert & Poelt	rimmed navel lichen	W	4
Lecideaceae	Lecidea atrobrunnea (Raymond ex Lam. & DC.) Schaerer		W	1
Lentibulariaceae	Utricularia intermedia Hayne	flatleaf bladderwort	G	1
Lentibulariaceae	Utricularia macrorhiza Le Conte	common bladderwort	G, W	2
Leskeaceae	Pseudoleskea incurvata (Hedw.) Loeske var. incurvata	pseudoleskea moss	W	5
Leskeaceae	Pseudoleskea patens (Lindb.) Kindb.	pseudoleskea moss	W	2
Leskeaceae	Pseudoleskea radicata (Mitt.) Mac. & Kindb. var. radicata	pseudoleskea moss	W	23
Leskeaceae	Pseudoleskea stenophylla Ren. & Card. in Röhl	pseudoleskea moss	W	4
Leskeaceae	Pseudoleskeella sibirica (Arnell) P. Wils. & Norris	Siberian pseudoleskeella moss	W	1
Liliaceae	Allium cepa L.	garden onion	G	1
Liliaceae	Allium cernuum Roth	nodding onion	G, W	219
Liliaceae	Allium fibrillum M.E. Jones	Cuddy Mountain onion	G	2
Liliaceae	Allium L.	onion	G	4
Liliaceae	Allium schoenoprasum L.	wild chives	G, W	28
Liliaceae	Allium similimum Henderson	simil onion	G	1
Liliaceae	Allium textile A. Nels. & J.F. Macbr.	textile onion	G, W	11
Liliaceae	Calochortus apiculatus Baker	pointedtip mariposa lily	G, W	164
Liliaceae	Camassia quamash (Pursh) Greene	small camas	G	13
Liliaceae	Clintonia uniflora (Menzies ex J.A. & J.H. Schultes) Kunth	bride's bonnet	G, W	427
Liliaceae	Disporum hookeri (Torr.) Nichols.	drops of gold	G, W	105
Liliaceae	Disporum hookeri (Torr.) Nichols. var. hookeri	drops of gold	G	30
Liliaceae	Disporum trachycarpum (S. Wats.) Benth. & Hook. f.	roughfruit fairybells	G, W	99
Liliaceae	Erythronium grandiflorum Pursh	yellow avalanche-lily	G, W	162
Liliaceae	Erythronium grandiflorum Pursh ssp. grandiflorum	yellow avalanche-lily	G	10

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Liliaceae	<i>Fritillaria pudica</i> (Pursh) Spreng.	yellow fritillary	G	1
Liliaceae	<i>Lilium philadelphicum</i> L.	wood lily	W	6
Liliaceae	<i>Maianthemum racemosum</i> (L.) Link	feathery false lily of the vally	G, W	24
Liliaceae	<i>Maianthemum racemosum</i> (L.) Link ssp. <i>amplexicaule</i> (Nutt.) LaFrankie	feathery false lily of the vally	G, W	171
Liliaceae	<i>Maianthemum stellatum</i> (L.) Link	starry false lily of the vally	G, W	448
Liliaceae	<i>Stenanthium occidentale</i> Gray	western featherbells	G, W	42
Liliaceae	<i>Streptopus amplexifolius</i> (L.) DC.	clasp leaf twistedstalk	G, W	170
Liliaceae	<i>Streptopus amplexifolius</i> (L.) DC. var. <i>chalazatus</i> Fassett	tubercle twistedstalk	G	1
Liliaceae	<i>Streptopus streptopoides</i> (Ledeb.) Frye & Rigg	small twistedstalk	W	1
Liliaceae	<i>Tofieldia glutinosa</i> (Michx.) Pers.	sticky tofieldia	G	7
Liliaceae	<i>Trillium ovatum</i> Pursh	Pacific trillium	G	37
Liliaceae	<i>Veratrum viride</i> Ait.	green false hellebore	G, W	432
Liliaceae	<i>Xerophyllum tenax</i> (Pursh) Nutt.	common beargrass	G, W	567
Liliaceae	<i>Zigadenus elegans</i> Pursh	mountain deathcamas	G, W	137
Liliaceae	<i>Zigadenus venenosus</i> S. Wats.	meadow deathcamas	G, W	39
Linaceae	<i>Linum</i> L.	flax	W	1
Linaceae	<i>Linum lewisii</i> Pursh	prairie flax	G, W	35
Linaceae	<i>Linum perenne</i> L.	blue flax	G, W	4
Lobariaceae	<i>Lobaria linita</i> (Ach.) Rabenh.	lung lichen	W	1
Lycopodiaceae	<i>Lycopodium alpinum</i> L.	alpine clubmoss	G	1
Lycopodiaceae	<i>Lycopodium annotinum</i> L.	stiff clubmoss	G, W	27
Lycopodiaceae	<i>Lycopodium clavatum</i> L.	running clubmoss	G	1
Lycopodiaceae	<i>Lycopodium complanatum</i> L.	groundcedar	G	12
Lycopodiaceae	<i>Lycopodium</i> L.	clubmoss	G	1
Malvaceae	<i>Iliamna rivularis</i> (Dougl. ex Hook.) Greene	streambank wild hollyhock	G, W	3
Marchantiaceae	<i>Preissia quadrata</i> (Scop.) Nees		W	1
Meesiaceae	<i>Meesia triquetra</i> (Richt.) Ångstr.	meesia moss	W	1
Menyanthaceae	<i>Menyanthes trifoliata</i> L.	buckbean	G, W	15
Mniaceae	<i>Mnium ambiguum</i> H. Müll.	ambiguous calcareous moss	W	5
Mniaceae	<i>Mnium arizonicum</i> Amann	Arizona calcareous moss	W	7
Mniaceae	<i>Mnium blyttii</i> Bruch & Schimp in B.S.G.	Blytt's calcareous moss	W	4
Mniaceae	<i>Mnium</i> Hedw.	mnium calcareous moss	G, W	10
Mniaceae	<i>Mnium marginatum</i> (With.) Brid. ex P. Beauv.	olivegreen calcareous moss	W	1
Mniaceae	<i>Mnium spinulosum</i> Bruch & Schimp. in B.S.G.	largetooth calcareous moss	W	25
Mniaceae	<i>Mnium thomsonii</i> Schimp.	Thomson's calcareous moss	W	2
Mniaceae	<i>Plagiomnium cuspidatum</i> (Hedw.) T. Kop.	toothed plagiomnium moss	W	2
Mniaceae	<i>Plagiomnium ellipticum</i> (Brid.) T. Kop.	elliptic plagiomnium moss	W	3
Mniaceae	<i>Plagiomnium medium</i> (Bruch & Schimp. in B.S.G.) T. Kop.	medium plagiomnium moss	W	6
Mniaceae	<i>Rhizomnium magnifolium</i> (Horik.) T. Kop.	grandleaf rhizomnium moss	W	1
Mniaceae	<i>Rhizomnium pseudopunctatum</i> (Bruch & Schimp.) T. Kop.	rhizomnium moss	W	1
Monotropaceae	<i>Monotropa hypopithys</i> L.	pinemap	G, W	3
Monotropaceae	<i>Monotropa uniflora</i> L.	Indianpipe	G, W	4
Monotropaceae	<i>Pterospora andromedea</i> Nutt.	woodland pinedrops	G, W	10

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Moraceae	Castilla Cerv.	castilla	G	2
Mycocaliciaceae	Chaenothecopsis epithallina Tibell		G	1
Nephromataceae	Nephroma parile (Ach.) Ach.	kidney lichen	W	1
Nymphaeaceae	Nuphar lutea (L.) Sm.	yellow pond-lily	G	1
Nymphaeaceae	Nuphar lutea (L.) Sm. ssp. polysepala (Engelm.) E.O. Beal	Rocky Mountain pond-lily	G	1
Onagraceae	Chamerion angustifolium (L.) Holub	fireweed	G, W	184
Onagraceae	Chamerion angustifolium (L.) Holub ssp. angustifolium	fireweed	G, W	668
Onagraceae	Chamerion latifolium (L.) Holub	dwarf fireweed	G, W	21
Onagraceae	Circaea ×intermedia Ehrh. (pro sp.)		G	1
Onagraceae	Circaea alpina L.	small enchanter's nightshade	G, W	65
Onagraceae	Epilobium anagallidifolium Lam.	pimpernel willowherb	G, W	38
Onagraceae	Epilobium brachycarpum K. Presl	tall annual willowherb	G	7
Onagraceae	Epilobium ciliatum Raf.	fringed willowherb	G, W	33
Onagraceae	Epilobium ciliatum Raf. ssp. glandulosum (Lehm.) Hoch & Raven	fringed willowherb	W	1
Onagraceae	Epilobium clavatum Trel.	talus willowherb	G	1
Onagraceae	Epilobium glaberrimum Barbey	glaucus willowherb	G	2
Onagraceae	Epilobium halleanum Hausskn.	glandular willowherb	G	3
Onagraceae	Epilobium hornemannii Reichenb.	Hornemann's willowherb	G, W	3
Onagraceae	Epilobium L.	willowherb	G, W	27
Onagraceae	Epilobium lactiflorum Hausskn.	milkflower willowherb	G	1
Onagraceae	Epilobium palustre L.	marsh willowherb	G	1
Onagraceae	Epilobium saximontanum Hausskn.	Rocky Mountain willowherb	G	6
Onagraceae	Gaura coccinea Nutt. ex Pursh	scarlet beeblossom	W	1
Ophioglossaceae	Botrychium hesperium (Maxon & Clausen) W.H. Wagner & Lellinger	western moonwort	G	1
Ophioglossaceae	Botrychium lunaria (L.) Sw.	common moonwort	G	19
Ophioglossaceae	Botrychium minganense Victorin	Mingan moonwort	G	1
Ophioglossaceae	Botrychium simplex E. Hitchc.	little grapefern	G	1
Ophioglossaceae	Botrychium Sw.	grapefern	G, W	7
Ophioglossaceae	Botrychium virginianum (L.) Sw.	rattlesnake fern	G, W	10
Orchidaceae	Amerorchis rotundifolia (Banks ex Pursh) Hultén	roundleaf orchid	W	1
Orchidaceae	Calypso bulbosa (L.) Oakes	fairy slipper	G, W	6
Orchidaceae	Coeloglossum viride (L.) Hartman var. viride	longbract frog orchid	G, W	4
Orchidaceae	Corallorrhiza Gagnebin	coralroot	G, W	3
Orchidaceae	Corallorrhiza maculata (Raf.) Raf.	summer coralroot	G, W	35
Orchidaceae	Corallorrhiza striata Lindl.	hooded coralroot	G	15
Orchidaceae	Corallorrhiza trifida Chatelain	yellow coralroot	G, W	12
Orchidaceae	Cypripedium montanum Dougl. ex Lindl.	mountain lady's slipper	G	1
Orchidaceae	Goodyera oblongifolia Raf.	western rattlesnake plantain	G, W	201
Orchidaceae	Goodyera R. Br. ex Ait. f.	rattlesnake plantain	G	1
Orchidaceae	Goodyera repens (L.) R. Br. ex Ait. f.	lesser rattlesnake plantain	W	4
Orchidaceae	Habenaria Willd.	bog orchid	G	3
Orchidaceae	Listera borealis Morong	northern twayblade	W	1
Orchidaceae	Listera caurina Piper	northwestern twayblade	G	28

Family	Scientific Name with Author	Common Name	Location	Occur
Orchidaceae	<i>Listera cordata</i> (L.) R. Br. ex Ait. f.	heartleaf twayblade	G, W	32
Orchidaceae	<i>Listera</i> R. Br. ex Ait. f.	twayblade	G, W	5
Orchidaceae	<i>Piperia elegans</i> (Lindl.) Rydb. ssp. <i>elegans</i>	elegant piperia	G	1
Orchidaceae	<i>Piperia unalascensis</i> (Spreng.) Rydb.	slender-spire orchid	G, W	33
Orchidaceae	<i>Platanthera dilatata</i> (Pursh) Lindl. ex Beck	scentbottle	G, W	18
Orchidaceae	<i>Platanthera hyperborea</i> (L.) Lindl. var. <i>hyperborea</i>	northern green orchid	W	10
Orchidaceae	<i>Platanthera</i> L.C. Rich.	fringed orchid	G, W	5
Orchidaceae	<i>Platanthera obtusata</i> (Banks ex Pursh) Lindl.	bluntleaved orchid	G, W	4
Orchidaceae	<i>Platanthera orbiculata</i> (Pursh) Lindl.	lesser roundleaved orchid	G	16
Orchidaceae	<i>Platanthera stricta</i> Lindl.	slender bog orchid	G, W	9
Orchidaceae	<i>Spiranthes romanzoffiana</i> Cham.	hooded ladies'-tresses	G	5
Orobanchaceae	<i>Orobanche fasciculata</i> Nutt.	clustered broomrape	W	1
Orobanchaceae	<i>Orobanche uniflora</i> L.	oneflowered broomrape	G	3
Orthotrichaceae	<i>Orthotrichum</i> Hedw.	orthotrichum moss	W	1
Orthotrichaceae	<i>Orthotrichum laevigatum</i> Zett.	orthotrichum moss	W	2
Orthotrichaceae	<i>Orthotrichum obtusifolium</i> Brid.	obtuseleaf aspen moss	W	2
Orthotrichaceae	<i>Orthotrichum pumilum</i> Sw.	orthotrichum moss	W	1
Orthotrichaceae	<i>Orthotrichum speciosum</i> Nees in Sturm	lanceolateleaf rock moss	W	1
Pannariaceae	<i>Leproloma diffusum</i> J. R. Laundon		W	1
Pannariaceae	<i>Psoroma hypnorum</i> (Vahl) Gray	bowl lichen	W	1
Papaveraceae	<i>Papaver pygmaeum</i> Rydb.	alpine poppy	W	1
Parmeliaceae	<i>Ahtiana sphaerosporella</i> (Mull. Arg.) Goward	ahtiana lichen	W	8
Parmeliaceae	<i>Brodoa oroarctica</i> (Krog) Goward		W	3
Parmeliaceae	<i>Bryoria Brodo & D. Hawksw.</i>	horsehair lichen	W	3
Parmeliaceae	<i>Bryoria capillaris</i> (Ach.) Brodo & D. Hawksw.	horsehair lichen	W	6
Parmeliaceae	<i>Bryoria fremontii</i> (Tuck.) Brodo & D. Hawksw.	Fremont's horsehair lichen	W	13
Parmeliaceae	<i>Bryoria friabilis</i> Brodo & D. Hawksw.	horsehair lichen	W	1
Parmeliaceae	<i>Bryoria fuscescens</i> (Gyelnik) Brodo & D. Hawksw.	horsehair lichen	W	28
Parmeliaceae	<i>Bryoria glabra</i> (Mot.) Brodo & D. Hawksw.	horsehair lichen	W	6
Parmeliaceae	<i>Bryoria implexa</i> (Hoffm.) Brodo & D. Hawksw.	horsehair lichen	W	22
Parmeliaceae	<i>Bryoria lanestris</i> (Ach.) Brodo & D. Hawksw.	horsehair lichen	W	5
Parmeliaceae	<i>Bryoria nadvornikiana</i> (Gyelnik) Brodo & D. Hawksw.	Nadvornik's horsehair lichen	W	1
Parmeliaceae	<i>Bryoria pseudofuscescens</i> (Gyelnik) Brodo & D. Hawksw.	horsehair lichen	W	6
Parmeliaceae	<i>Cetraria aculeata</i> (Schreber) Fr.		W	3
Parmeliaceae	<i>Cetraria ericetorum</i> Opiz		G, W	7
Parmeliaceae	<i>Cetraria islandica</i> (L.) Ach.		W	6
Parmeliaceae	<i>Dactylina arctica</i> (Richardson) Nyl.		W	1
Parmeliaceae	<i>Evernia mesomorpha</i> Nyl.	ring lichen	W	3
Parmeliaceae	<i>Flavocetraria cucullata</i> (Bellardi) Karnefelt & Thell		W	8
Parmeliaceae	<i>Flavocetraria nivalis</i> (L.) Karnefelt & Thell		W	4
Parmeliaceae	<i>Hypogymnia</i> (Nyl.) Nyl.	tube lichen	W	1
Parmeliaceae	<i>Hypogymnia imshaugii</i> Krog	Imshaug's tube lichen	W	14
Parmeliaceae	<i>Hypogymnia metaphysodes</i> (Asah.) Rass.	tube lichen	W	2

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Parmeliaceae	Hypogymnia physodes (L.) Nyl.	tube lichen	W	44
Parmeliaceae	Hypogymnia rugosa (G. Merr.) L. Pike	tube lichen	W	3
Parmeliaceae	Hypogymnia tubulosa (Schaerer) Hav.	tube lichen	W	6
Parmeliaceae	Imshaugia aleurites (Ach.) S. F. Meyer	Imshaug's lichen	W	1
Parmeliaceae	Kaernefeltia merrillii (Du Rietz) Thell & Goward		W	1
Parmeliaceae	Letharia columbiana (Nutt.) J. W. Thomson	wolf lichen	W	9
Parmeliaceae	Letharia vulpina (L.) Hue	wolf lichen	W	60
Parmeliaceae	Melanelia albertana (Ahti) Essl.		G	1
Parmeliaceae	Melanelia commixta (Nyl.) Thell		W	1
Parmeliaceae	Nodobryoria abbreviata (Mull. Arg.) Common & Brodo		W	3
Parmeliaceae	Parmelia saxatilis (L.) Ach.	shield lichen	W	1
Parmeliaceae	Parmelia sulcata Taylor	shield lichen	W	18
Parmeliaceae	Parmeliopsis ambigua (Wulfen) Nyl.	ambiguous bran lichen	W	28
Parmeliaceae	Parmeliopsis hyperopta (Ach.) Arnold	bran lichen	W	9
Parmeliaceae	Platismatia glauca (L.) Culb. & C. Culb.	ragged lichen	W	8
Parmeliaceae	Pseudephebe pubescens (L.) Choisy	blackcurly lichen	W	8
Parmeliaceae	Tuckermannopsis chlorophylla (Willd.) Hale		W	6
Parmeliaceae	Tuckermannopsis playtphylla (Tuck.) Hale		W	2
Parmeliaceae	Usnea glabrata (Ach.) Vainio	beard lichen	W	1
Parmeliaceae	Usnea hirta (L.) F. H. Wigg.	beard lichen	W	2
Parmeliaceae	Usnea lapponica Vainio	Lapland beard lichen	W	29
Parmeliaceae	Usnea scabrata Nyl.	beard lichen	W	3
Parmeliaceae	Usnea substerilis Mot.	beard lichen	W	2
Parmeliaceae	Vulpicida pinastri (Scop.) J.-E. Mattsson & M. J. Lai		W	14
Parmeliaceae	Xanthoparmelia coloradoensis (Gyelnik) Hale		W	5
Parmeliaceae	Xanthoparmelia cumberlandia (Gyelnik) Hale		W	2
Peltigeraceae	Peltigera aphthosa (L.) Willd.	felt lichen	G, W	19
Peltigeraceae	Peltigera canina (L.) Willd.	felt lichen	W	3
Peltigeraceae	Peltigera collina (Ach.) Schrader	felt lichen	G	1
Peltigeraceae	Peltigera didactyla (With.) J. R. Laundon	felt lichen	W	1
Peltigeraceae	Peltigera kristinssonii Vitik.	Kristinsson's felt lichen	W	2
Peltigeraceae	Peltigera lepidophora (Vainio) Bitter	felt lichen	W	1
Peltigeraceae	Peltigera leucophlebia (Nyl.) Gyelnik	felt lichen	W	3
Peltigeraceae	Peltigera malacea (Ach.) Funck	felt lichen	W	1
Peltigeraceae	Peltigera membranacea (Ach.) Nyl.	membranous felt lichen	W	1
Peltigeraceae	Peltigera ponojensis Gyelnik	felt lichen	W	1
Peltigeraceae	Peltigera praetextata (Florke ex Sommerf.) Zopf	felt lichen	W	2
Peltigeraceae	Peltigera rufescens (Weiss) Humb.	felt lichen	W	4
Peltigeraceae	Peltigera Willd.	felt lichen	G, W	13
Peltigeraceae	Solorina bispora Nyl.	chocolate chip lichen	W	1
Physciaceae	Phaeophyscia endococcina (Korber) Moberg	wreath lichen	W	1
Physciaceae	Phaeophyscia orbicularis (Necker) Moberg	wreath lichen	W	2
Physciaceae	Physconia muscigena (Ach.) Poelt	frosted lichen	W	1

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Physciaceae	Rinodina archaea (Ach.) Arnold		W	1
Pinaceae	Abies grandis (Dougl. ex D. Don) Lindl.	grand fir	G	12
Pinaceae	Abies lasiocarpa (Hook.) Nutt.	subalpine fir	G, W	2303
Pinaceae	Abies P. Mill.	fir	G	2
Pinaceae	Larix lyallii Parl.	subalpine larch	G, W	109
Pinaceae	Larix occidentalis Nutt.	western larch	G, W	271
Pinaceae	Picea A. Dietr.	spruce	G	2
Pinaceae	Picea engelmannii Parry ex Engelm.	Engelmann spruce	G, W	1622
Pinaceae	Pinus albicaulis Engelm.	whitebark pine	G, W	244
Pinaceae	Pinus contorta Dougl. ex Loud.	lodgepole pine	G, W	853
Pinaceae	Pinus contorta Dougl. ex Loud. var. latifolia Engelm. ex S. Wats.	tall lodgepole pine	G	204
Pinaceae	Pinus flexilis James	limber pine	G, W	94
Pinaceae	Pinus monticola Dougl. ex D. Don	western white pine	G, W	94
Pinaceae	Pinus ponderosa P.& C. Lawson	ponderosa pine	G	44
Pinaceae	Pseudotsuga menziesii (Mirbel) Franco	Douglas-fir	G, W	1188
Pinaceae	Tsuga heterophylla (Raf.) Sarg.	western hemlock	G	165
Plagiotheciaceae	Plagiothecium laetum Schimp. in B.S.G.	plagiothecium moss	W	14
Plantaginaceae	Plantago major L.	common plantain	G	5
Poaceae	Achnatherum nelsonii (Scribn.) Barkworth	Columbia needlegrass	G, W	115
Poaceae	Achnatherum nelsonii (Scribn.) Barkworth ssp. dorei (Barkworth & Maze) Barkworth	Dore's needlegrass	G, W	61
Poaceae	Achnatherum occidentale (Thurb. ex S. Wats.) Barkworth ssp. occidentale	western needlegrass	G	5
Poaceae	Achnatherum richardsonii (Link) Barkworth	Richardson's needlegrass	G, W	52
Poaceae	Agropyron Gaertn.	wheatgrass	W	1
Poaceae	Agrostis elliottiana J.A. Schultes	Elliott's bentgrass	G	1
Poaceae	Agrostis exarata Trin.	spike bentgrass	G	12
Poaceae	Agrostis humilis Vasey	alpine bentgrass	G, W	9
Poaceae	Agrostis L.	bentgrass	G, W	6
Poaceae	Agrostis scabra Willd.	rough bentgrass	G, W	58
Poaceae	Agrostis stolonifera L.	creeping bentgrass	G, W	49
Poaceae	Agrostis variabilis Rydb.	mountain bentgrass	G	2
Poaceae	Alopecurus aequalis Sobol.	shortawn foxtail	G	2
Poaceae	Alopecurus alpinus Sm.	boreal alopecurus	G, W	14
Poaceae	Alopecurus L.	foxtail	G	2
Poaceae	Alopecurus pratensis L.	meadow foxtail	G	2
Poaceae	Bromus anomalus Rupr. ex Fourn.	nodding brome	G	33
Poaceae	Bromus carinatus Hook. & Arn.	California brome	G, W	166
Poaceae	Bromus ciliatus L.	fringed brome	G, W	45
Poaceae	Bromus inermis Leyss.	smooth brome	G, W	113
Poaceae	Bromus inermis Leyss. ssp. pumpellianus (Scribn.) Wagnon	Pumpelly's brome	G, W	59
Poaceae	Bromus inermis Leyss. ssp. pumpellianus (Scribn.) Wagnon var. pumpellianus (Scribn.) C.L. Hitchc.	Pumpelly's brome	G, W	49
Poaceae	Bromus L.	brome	G, W	19
Poaceae	Bromus marginatus Nees ex Steud.	mountain brome	G, W	76

Family	Scientific Name with Author	Common Name	Location	Occur
Poaceae	<i>Bromus tectorum</i> L.	cheatgrass	G	2
Poaceae	<i>Bromus vulgaris</i> (Hook.) Shear	Columbia brome	G, W	159
Poaceae	<i>Calamagrostis</i> Adans.	reedgrass	G, W	3
Poaceae	<i>Calamagrostis canadensis</i> (Michx.) Beauv.	bluejoint	G, W	309
Poaceae	<i>Calamagrostis koelerioides</i> Vasey	fire reedgrass	G	1
Poaceae	<i>Calamagrostis montanensis</i> Scribn. ex Vasey	plains reedgrass	W	4
Poaceae	<i>Calamagrostis purpurascens</i> R. Br.	purple reedgrass	G, W	48
Poaceae	<i>Calamagrostis rubescens</i> Buckl.	pinegrass	G, W	397
Poaceae	<i>Calamagrostis stricta</i> (Timm) Koel.	slimstem reedgrass	G, W	16
Poaceae	<i>Cinna latifolia</i> (Trev. ex Goebb.) Griseb.	drooping woodreed	G, W	27
Poaceae	<i>Dactylis glomerata</i> L.	orchardgrass	G, W	19
Poaceae	<i>Danthonia californica</i> Boland.	California oatgrass	W	6
Poaceae	<i>Danthonia</i> DC.	oatgrass	W	1
Poaceae	<i>Danthonia intermedia</i> Vasey	timber oatgrass	G, W	223
Poaceae	<i>Danthonia parryi</i> Scribn.	Parry's oatgrass	G, W	34
Poaceae	<i>Danthonia unispicata</i> (Thurb.) Munro ex Macoun	onespike danthonia	W	1
Poaceae	<i>Deschampsia caespitosa</i> (L.) Beauv.	tufted hairgrass	G, W	34
Poaceae	<i>Elymus alakanus</i> (Scribn. & Merr.) A. Löve	Alaskan wheatgrass	W	12
Poaceae	<i>Elymus alakanus</i> (Scribn. & Merr.) A. Löve ssp. <i>latiglumis</i> (Scribn. & J.G. Sm.) A. Löve	Alaskan wheatgrass	G	1
Poaceae	<i>Elymus canadensis</i> L.	Canada wildrye	G, W	14
Poaceae	<i>Elymus caninus</i> (L.) L.	bearded wheatgrass	G, W	5
Poaceae	<i>Elymus elymoides</i> (Raf.) Swezey	squirreltail	G	4
Poaceae	<i>Elymus glaucus</i> Buckl.	blue wildrye	G, W	346
Poaceae	<i>Elymus</i> L.	wildrye	G, W	8
Poaceae	<i>Elymus lanceolatus</i> (Scribn. & J.G. Sm.) Gould	streambank wheatgrass	G, W	9
Poaceae	<i>Elymus lanceolatus</i> (Scribn. & J.G. Sm.) Gould ssp. <i>lanceolatus</i>	streambank wheatgrass	W	4
Poaceae	<i>Elymus repens</i> (L.) Gould	quackgrass	G, W	57
Poaceae	<i>Elymus trachycaulus</i> (Link) Gould ex Shinners	slender wheatgrass	G, W	232
Poaceae	<i>Elymus trachycaulus</i> (Link) Gould ex Shinners ssp. <i>subsecundus</i> (Link) A.& D. Löve	slender wheatgrass	G	10
Poaceae	<i>Elymus trachycaulus</i> (Link) Gould ex Shinners ssp. <i>trachycaulus</i>	slender wheatgrass	G	9
Poaceae	<i>Festuca altaica</i> Trin.	Altai fescue	G	1
Poaceae	<i>Festuca arvernensis</i> Auquier, Kerguélen & Markgr.-Dannenb.	field fescue	G	1
Poaceae	<i>Festuca baffinensis</i> Polunin	Baffin fescue	W	1
Poaceae	<i>Festuca brachyphylla</i> J.A. Schultes ex J.A. & J.H. Schultes	alpine fescue	G, W	36
Poaceae	<i>Festuca brachyphylla</i> J.A. Schultes ex J.A. & J.H. Schultes ssp. <i>brachyphylla</i>	alpine fescue	W	2
Poaceae	<i>Festuca campestris</i> Rydb.	rough fescue	G, W	409
Poaceae	<i>Festuca idahoensis</i> Elmer	Idaho fescue	G, W	431
Poaceae	<i>Festuca</i> L.	fescue	G	15
Poaceae	<i>Festuca occidentalis</i> Hook.	western fescue	G, W	48
Poaceae	<i>Festuca rubra</i> L.	red fescue	G	1
Poaceae	<i>Festuca saximontana</i> Rydb.	Rocky Mountain fescue	G, W	18
Poaceae	<i>Festuca subulata</i> Trin.	bearded fescue	G, W	28

Family	Scientific Name with Author	Common Name	Location	Occur
Poaceae	<i>Festuca viviparoidea</i> Krajina ex Pavlick	northern fescue	G	1
Poaceae	<i>Glyceria borealis</i> (Nash) Batchelder	small floating mannagrass	G, W	4
Poaceae	<i>Glyceria</i> R. Br.	mannagrass	G	3
Poaceae	<i>Glyceria striata</i> (Lam.) A.S. Hitchc.	fowl mannagrass	G, W	21
Poaceae	<i>Helictotrichon hookeri</i> (Scribn.) Henr.	spikeoat	G	29
Poaceae	<i>Hesperostipa comata</i> (Trin. & Rupr.) Barkworth ssp. <i>comata</i>	needle and thread	G	2
Poaceae	<i>Hierochloa odorata</i> (L.) Beauv.	vanilla grass	W	2
Poaceae	<i>Hordeum brachyantherum</i> Nevski	meadow barley	G	1
Poaceae	<i>Hordeum jubatum</i> L.	foxtail barley	W	1
Poaceae	<i>Koeleria macrantha</i> (Ledeb.) J.A. Schultes	prairie Junegrass	G, W	248
Poaceae	<i>Leymus innovatus</i> (Beal) Pilger	downy ryegrass	G, W	2
Poaceae	<i>Melica bulbosa</i> Geyer ex Porter & Coult.	oniongrass	G	1
Poaceae	<i>Melica</i> L.	melicgrass	G	2
Poaceae	<i>Melica smithii</i> (Porter ex Gray) Vasey	Smith's melicgrass	G, W	38
Poaceae	<i>Melica spectabilis</i> Scribn.	purple oniongrass	G, W	13
Poaceae	<i>Melica subulata</i> (Griseb.) Scribn.	Alaska oniongrass	G, W	42
Poaceae	<i>Muhlenbergia glomerata</i> (Willd.) Trin.	spiked muhly	G	1
Poaceae	<i>Muhlenbergia richardsonis</i> (Trin.) Rydb.	mat muhly	G	26
Poaceae	<i>Nassella viridula</i> (Trin.) Barkworth	green needlegrass	W	1
Poaceae	<i>Oryzopsis asperifolia</i> Michx.	roughleaf ricegrass	G, W	57
Poaceae	<i>Panicum capillare</i> L.	witchgrass	W	1
Poaceae	<i>Pascopyrum smithii</i> (Rydb.) A. Löve	western wheatgrass	G, W	46
Poaceae	<i>Phalaris arundinacea</i> L.	reed canarygrass	G, W	25
Poaceae	<i>Phleum alpinum</i> L.	alpine timothy	G, W	74
Poaceae	<i>Phleum pratense</i> L.	timothy	G, W	462
Poaceae	<i>Piptatherum exiguum</i> (Thurb.) Barkworth, comb. nov. ined.	little ricegrass	G, W	9
Poaceae	<i>Piptatherum micranthum</i> (Trin. & Rupr.) Barkworth	littleseed ricegrass	G	1
Poaceae	<i>Poa abbreviata</i> R. Br.	short bluegrass	G	1
Poaceae	<i>Poa alpina</i> L.	alpine bluegrass	G, W	85
Poaceae	<i>Poa arctica</i> R. Br.	arctic bluegrass	G	5
Poaceae	<i>Poa compressa</i> L.	Canada bluegrass	G	50
Poaceae	<i>Poa cusickii</i> Vasey	Cusick's bluegrass	G	1
Poaceae	<i>Poa fendleriana</i> (Steud.) Vasey ssp. <i>fendleriana</i>	muttongrass	G, W	23
Poaceae	<i>Poa glauca</i> Vahl	glaucous bluegrass	G, W	8
Poaceae	<i>Poa</i> L.	bluegrass	G, W	61
Poaceae	<i>Poa leptocoma</i> Trin.	marsh bluegrass	G	1
Poaceae	<i>Poa nemoralis</i> L. ssp. <i>interior</i> (Rydb.) W.A. Weber	inland bluegrass	G, W	37
Poaceae	<i>Poa palustris</i> L.	fowl bluegrass	G, W	65
Poaceae	<i>Poa pratensis</i> L.	Kentucky bluegrass	G, W	305
Poaceae	<i>Poa secunda</i> J. Presl	Sandberg bluegrass	G, W	51
Poaceae	<i>Poa stenantha</i> Trin.	northern bluegrass	G	2
Poaceae	<i>Poa wheeleri</i> Vasey	Wheeler's bluegrass	G	2
Poaceae	<i>Pseudoroegneria spicata</i> (Pursh) A. Löve	bluebunch wheatgrass	G, W	267

Family	Scientific Name with Author	Common Name	Location	Occur
Poaceae	<i>Pseudoroegneria spicata</i> (Pursh) A. Löve ssp. <i>spicata</i>	bluebunch wheatgrass	G, W	35
Poaceae	<i>Puccinellia nuttalliana</i> (J.A. Schultes) A.S. Hitchc.	Nuttall's alkaligrass	W	1
Poaceae	<i>Schizachne purpurascens</i> (Torr.) Swallen	false melic	G	8
Poaceae	<i>Stipa</i> L.		G	1
Poaceae	<i>Torreyochloa pallida</i> (Torr.) Church var. <i>pauciflora</i> (J. Presl) J.I. Davis	pale false mannagrass	G	1
Poaceae	<i>Trisetum canescens</i> Buckl.	tall trisetum	G, W	28
Poaceae	<i>Trisetum</i> Pers.	oatgrass	G	5
Poaceae	<i>Trisetum spicatum</i> (L.) Richter	spike trisetum	G, W	96
Poaceae	<i>Trisetum wolfii</i> Vasey	Wolf's trisetum	G, W	10
Poaceae	<i>Vahlodea atropurpurea</i> (Wahlenb.) Fries ex Hartman	mountain hairgrass	G, W	37
Polemoniaceae	<i>Collomia linearis</i> Nutt.	tiny trumpet	G, W	19
Polemoniaceae	<i>Linanthus</i> Benth.	linanthus	G	1
Polemoniaceae	<i>Linanthus septentrionalis</i> Mason	northern linanthus	G	1
Polemoniaceae	<i>Phlox gracilis</i> (Hook.) Greene ssp. <i>gracilis</i>	slender phlox	G	36
Polemoniaceae	<i>Phlox hoodii</i> Richards.	spiny phlox	G, W	22
Polemoniaceae	<i>Polemonium pulcherrimum</i> Hook.	Jacob's-ladder	G, W	34
Polemoniaceae	<i>Polemonium viscosum</i> Nutt.	sticky polemonium	G, W	15
Polygonaceae	<i>Eriogonum androsaceum</i> Benth.	rockjasmine buckwheat	G, W	8
Polygonaceae	<i>Eriogonum flavum</i> Nutt.	alpine golden buckwheat	G, W	62
Polygonaceae	<i>Eriogonum</i> Michx.	buckwheat	G, W	6
Polygonaceae	<i>Eriogonum ovalifolium</i> Nutt.	cushion buckwheat	G, W	40
Polygonaceae	<i>Eriogonum umbellatum</i> Torr.	sulphur-flower buckwheat	G, W	165
Polygonaceae	<i>Oxyria digyna</i> (L.) Hill	alpine mountainsorrel	G, W	17
Polygonaceae	<i>Polygonum amphibium</i> L.	water knotweed	G, W	8
Polygonaceae	<i>Polygonum aviculare</i> L.	prostrate knotweed	G	2
Polygonaceae	<i>Polygonum bistortoides</i> Pursh	American bistort	G, W	49
Polygonaceae	<i>Polygonum douglasii</i> Greene	Douglas' knotweed	G	36
Polygonaceae	<i>Polygonum</i> L.	knotweed	G	3
Polygonaceae	<i>Polygonum viviparum</i> L.	alpine bistort	G, W	31
Polygonaceae	<i>Rumex acetosa</i> L.	garden sorrel	G	2
Polygonaceae	<i>Rumex acetosella</i> L.	common sheep sorrel	G, W	10
Polygonaceae	<i>Rumex aquaticus</i> L. var. <i>fenestratus</i> (Greene) Dorn	western dock	W	1
Polygonaceae	<i>Rumex crispus</i> L.	curly dock	G	8
Polygonaceae	<i>Rumex</i> L.	dock	G, W	4
Polygonaceae	<i>Rumex salicifolius</i> Weinm.	willow dock	G	1
Polypodiaceae	<i>Polypodium hesperium</i> Maxon	western polypody	G	4
Polytrichaceae	<i>Atrichum selwynii</i> Aust.	Selwyn's atrichum moss	W	1
Polytrichaceae	<i>Polytrichastrum alpinum</i> (Hedw.) G. L. Sm. var. <i>alpinum</i>	alpine polytrichastrum moss	W	6
Polytrichaceae	<i>Polytrichum commune</i> Hedw.	polytrichum moss	W	7
Polytrichaceae	<i>Polytrichum</i> Hedw.	polytrichum moss	G	5
Polytrichaceae	<i>Polytrichum juniperinum</i> Hedw.	juniper polytrichum moss	G, W	32
Polytrichaceae	<i>Polytrichum piliferum</i> Hedw.	polytrichum moss	W	15
Porellaceae	<i>Porella platyphylla</i> (L.) Pfeiff.		W	1

Family	Scientific Name with Author	Common Name	Location	Occur
Porpidiaceae	Porpidia cinereoatra (Ach.) Hertel & Knoph		W	1
Portulacaceae	Claytonia lanceolata Pall. ex Pursh	lanceleaf springbeauty	G, W	16
Portulacaceae	Claytonia megarhiza (Gray) Parry ex S. Wats.	alpine springbeauty	W	4
Portulacaceae	Claytonia parviflora Dougl. ex Hook. ssp. parviflora	streambank springbeauty	G	6
Portulacaceae	Claytonia sibirica L.	Siberian springbeauty	G	1
Portulacaceae	Lewisia pygmaea (Gray) B.L. Robins.	alpine lewisia	G	1
Portulacaceae	Lewisia triphylla (S. Wats.) B.L. Robins.	threeleaf lewisia	G	2
Portulacaceae	Montia L.	minerslettuce	G	1
Portulacaceae	Montia linearis (Dougl. ex Hook.) Greene	narrowleaf minerslettuce	G, W	2
Portulacaceae	Montia parvifolia (Moc. ex DC.) Greene	littleleaf minerslettuce	G	2
Potamogetonaceae	Potamogeton gramineus L.	variableleaf pondweed	G, W	8
Potamogetonaceae	Potamogeton L.	pondweed	G	1
Potamogetonaceae	Potamogeton richardsonii (Benn.) Rydb.	Richardson's pondweed	W	4
Potamogetonaceae	Stuckenia pectinatus (L.) Boerner	sago pondweed	W	5
Pottiaceae	Anoetangium aestivum (Hedw.) Mitt.	anoetangium moss	W	1
Pottiaceae	Barbula convoluta Hedw.	convoluted barbula moss	W	1
Pottiaceae	Bryoerythrophyllum recurvirostre (Hedw.) Chen	bryoerythrophyllum moss	W	6
Pottiaceae	Desmatodon latifolius (Hedw.) Brid.	wideleaf desmatodon moss	W	5
Pottiaceae	Tortella fragilis (Hook. & Wils. in Drum.) Limpr.	fragile tortella moss	W	1
Pottiaceae	Tortella tortuosa (Hedw.) Limpr.	tortured tortella moss	W	12
Pottiaceae	Tortula Hedw.	tortula moss	G	2
Pottiaceae	Tortula muralis Hedw.	tortula moss	G	1
Pottiaceae	Tortula norvegica (Web.) Wahlenb. ex Lindb.	Norwegian tortula moss	W	11
Pottiaceae	Tortula ruralis (Hedw.) Gaertn. et al.	tortula moss	G, W	35
Pottiaceae	Weissia controversa Hedw.	controversial weissia moss	W	1
Primulaceae	Androsace chamaejasme Wulfen	sweetflower rockjasmine	G, W	20
Primulaceae	Androsace septentrionalis L.	pygmyflower rockjasmine	G, W	16
Primulaceae	Dodecatheon conjugens Greene	Bonneville shootingstar	G, W	102
Primulaceae	Dodecatheon L.	shootingstar	G, W	8
Primulaceae	Dodecatheon pulchellum (Raf.) Merr.	darkthroat shootingstar	G, W	16
Primulaceae	Douglasia montana Gray	Rocky Mountain dwarf-primrose	G, W	3
Primulaceae	Lysimachia ciliata L.	fringed loosestrife	G, W	4
Pseudolepicoleaceae	Blepharostoma trichophyllum (L.) Dumort.		W	1
Pteridaceae	Adiantum aleuticum (Rupr.) Paris	Aleutian maidenhair	G	1
Pteridaceae	Cheilanthes gracillima D.C. Eat.	lace lipfern	G	2
Pteridaceae	Cryptogramma acrostichoides R. Br.	American rockbrake	G, W	64
Pteridaceae	Cryptogramma stelleri (Gmel.) Prantl	fragile rockbrake	W	1
Pteridaceae	Pellaea bridgesii Hook.	Bridges' cliffbrake	G	2
Ptilidiaceae	Ptilidium californicum (Austin) Pearson		W	1
Ptilidiaceae	Ptilidium ciliare (L.) Hampe		W	1
Ptilidiaceae	Ptilidium pulcherrimum (Weber) Vainio		W	9
Pyrolaceae	Chimaphila Pursh	prince's pine	G	1
Pyrolaceae	Chimaphila umbellata (L.) W. Bart.	pipsissewa	G, W	204

Family	Scientific Name with Author	Common Name	Location	Occur
Pyrolaceae	<i>Moneses uniflora</i> (L.) Gray	single delight	G, W	23
Pyrolaceae	<i>Orthilia</i> Raf.	orthilia	G	1
Pyrolaceae	<i>Orthilia secunda</i> (L.) House	sidebells wintergreen	G, W	193
Pyrolaceae	<i>Pyrola asarifolia</i> Michx.	liverleaf wintergreen	G, W	87
Pyrolaceae	<i>Pyrola asarifolia</i> Michx. ssp. <i>bracteata</i> (Hook.) Haber	pink wintergreen	W	2
Pyrolaceae	<i>Pyrola chlorantha</i> Sw.	greenflowered wintergreen	G, W	40
Pyrolaceae	<i>Pyrola</i> L.	wintergreen	G, W	12
Pyrolaceae	<i>Pyrola minor</i> L.	snowline wintergreen	W	2
Pyrolaceae	<i>Pyrola picta</i> Sm.	whiteveined wintergreen	G, W	4
Ranunculaceae	<i>Actaea rubra</i> (Ait.) Willd.	red baneberry	G, W	224
Ranunculaceae	<i>Anemone</i> L.	anemone	G, W	10
Ranunculaceae	<i>Anemone lithophila</i> Rydb.	Little Belt Mountain thimbleweed	G, W	12
Ranunculaceae	<i>Anemone multifida</i> Poir.	Pacific anemone	G, W	231
Ranunculaceae	<i>Anemone parviflora</i> Michx.	smallflowered anemone	G, W	17
Ranunculaceae	<i>Anemone tetonensis</i> Porter ex Britt.	Teton anemone	G	3
Ranunculaceae	<i>Aquilegia flavescens</i> S. Wats.	yellow columbine	G, W	116
Ranunculaceae	<i>Aquilegia jonesii</i> Parry	Jones' columbine	G, W	3
Ranunculaceae	<i>Caltha leptosepala</i> DC.	white marsh marigold	G	2
Ranunculaceae	<i>Clematis columbiana</i> (Nutt.) Torr. & Gray	rock clematis	G	62
Ranunculaceae	<i>Clematis</i> L.	leather flower	W	1
Ranunculaceae	<i>Clematis ligusticifolia</i> Nutt.	western white clematis	G	1
Ranunculaceae	<i>Clematis occidentalis</i> (Hornem.) DC.	western blue virginsbower	G, W	96
Ranunculaceae	<i>Clematis occidentalis</i> (Hornem.) DC. var. <i>grosseserrata</i> (Rydb.) J. Pringle	western blue virginsbower	G	1
Ranunculaceae	<i>Clematis virginiana</i> L.	devil's darning needles	W	1
Ranunculaceae	<i>Delphinium bicolor</i> Nutt.	little larkspur	G, W	24
Ranunculaceae	<i>Delphinium</i> L.	larkspur	G	1
Ranunculaceae	<i>Pulsatilla occidentalis</i> (S. Wats.) Freyn	white pasqueflower	G, W	15
Ranunculaceae	<i>Pulsatilla patens</i> (L.) P. Mill.	American pasqueflower	G, W	64
Ranunculaceae	<i>Pulsatilla patens</i> (L.) P. Mill. ssp. <i>multifida</i> (Pritz.) Zamels	cutleaf anemone	G	6
Ranunculaceae	<i>Ranunculus abortivus</i> L.	littleleaf buttercup	G	2
Ranunculaceae	<i>Ranunculus acris</i> L.	tall buttercup	G, W	5
Ranunculaceae	<i>Ranunculus aquatilis</i> L.	whitewater crowfoot	W	1
Ranunculaceae	<i>Ranunculus eschscholtzii</i> Schlecht.	Eschscholtz's buttercup	G, W	16
Ranunculaceae	<i>Ranunculus flammula</i> L.	greater creeping spearwort	G	2
Ranunculaceae	<i>Ranunculus flammula</i> L. var. <i>filiformis</i> (Michx.) Hook.	greater creeping spearwort	W	2
Ranunculaceae	<i>Ranunculus glaberrimus</i> Hook.	sagebrush buttercup	G	1
Ranunculaceae	<i>Ranunculus inamoenus</i> Greene	graceful buttercup	G	1
Ranunculaceae	<i>Ranunculus</i> L.	buttercup	G, W	11
Ranunculaceae	<i>Ranunculus macounii</i> Britt.	Macoun's buttercup	G	1
Ranunculaceae	<i>Ranunculus pedatifidus</i> Sm.	surefoot buttercup	W	1
Ranunculaceae	<i>Ranunculus uncinatus</i> D. Don ex G. Don	woodland buttercup	G, W	33
Ranunculaceae	<i>Ranunculus verecundus</i> B.L. Robins. ex Piper	wetslope buttercup	G	1
Ranunculaceae	<i>Thalictrum dasycarpum</i> Fisch. & Avé-Lall.	purple meadow-rue	W	1

Family	Scientific Name with Author	Common Name	Location	Occur
Ranunculaceae	<i>Thalictrum</i> L.	meadow-rue	W	3
Ranunculaceae	<i>Thalictrum occidentale</i> Gray	western meadow-rue	G, W	974
Ranunculaceae	<i>Thalictrum venulosum</i> Trel.	veiny meadow-rue	G, W	5
Ranunculaceae	<i>Trollius laxus</i> Salisb.	American globeflower	G	3
Ranunculaceae	<i>Trollius laxus</i> Salisb. ssp. <i>albiflorus</i> (Gray) A. & D. Löve & Kapoor	American globeflower	W	6
Rhamnaceae	<i>Ceanothus sanguineus</i> Pursh	redstem ceanothus	G, W	10
Rhamnaceae	<i>Ceanothus velutinus</i> Dougl. ex Hook.	snowbrush ceanothus	G	17
Rhamnaceae	<i>Frangula purshiana</i> (DC.) Cooper	Pursh's buckthorn	G	1
Rhamnaceae	<i>Rhamnus alnifolia</i> L'Hér.	alderleaf buckthorn	G, W	95
Rhizocarpaceae	<i>Rhizocarpon geographicum</i> (L.) DC.	world map lichen	W	20
Rhytidiaceae	<i>Rhytidium rugosum</i> (Hedw.) Kindb.	rhytidium moss	W	2
Rosaceae	<i>Amelanchier alnifolia</i> (Nutt.) Nutt. ex M. Roemer	Saskatoon serviceberry	G, W	1072
Rosaceae	<i>Argentina anserina</i> (L.) Rydb.	silverweed cinquefoil	G, W	12
Rosaceae	<i>Argentina</i> Hill	silverweed	W	1
Rosaceae	<i>Comarum palustre</i> L.	purple marshlocks	G	24
Rosaceae	<i>Crataegus douglasii</i> Lindl.	black hawthorn	G, W	71
Rosaceae	<i>Crataegus</i> L.	hawthorn	W	1
Rosaceae	<i>Dasiphora floribunda</i> (Pursh) Kartesz, comb. nov. ined.	shrubby cinquefoil	G, W	466
Rosaceae	<i>Dryas drummondii</i> Richards. ex Hook.	Drummond's mountain-avens	G, W	15
Rosaceae	<i>Dryas</i> L.	mountain-avens	G	2
Rosaceae	<i>Dryas octopetala</i> L.	eightpetal mountain-avens	G, W	70
Rosaceae	<i>Fragaria</i> L.	strawberry	G, W	14
Rosaceae	<i>Fragaria vesca</i> L.	woodland strawberry	G, W	85
Rosaceae	<i>Fragaria virginiana</i> Duchesne	Virginia strawberry	G, W	578
Rosaceae	<i>Geum aleppicum</i> Jacq.	yellow avens	G, W	16
Rosaceae	<i>Geum</i> L.	avens	W	1
Rosaceae	<i>Geum macrophyllum</i> Willd.	largeleaf avens	G, W	142
Rosaceae	<i>Geum macrophyllum</i> Willd. var. <i>perincisum</i> (Rydb.) Raup	largeleaf avens	G	7
Rosaceae	<i>Geum rivale</i> L.	purple avens	G, W	13
Rosaceae	<i>Geum triflorum</i> Pursh	old man's whiskers	G, W	75
Rosaceae	<i>Holodiscus discolor</i> (Pursh) Maxim.	oceanspray	G	29
Rosaceae	<i>Physocarpus malvaceus</i> (Greene) Kuntze	mallow ninebark	G	1
Rosaceae	<i>Potentilla argentea</i> L.	silver cinquefoil	G	5
Rosaceae	<i>Potentilla arguta</i> Pursh	tall cinquefoil	G, W	19
Rosaceae	<i>Potentilla arguta</i> Pursh ssp. <i>arguta</i>	tall cinquefoil	G	1
Rosaceae	<i>Potentilla concinna</i> Richards.	elegant cinquefoil	W	1
Rosaceae	<i>Potentilla diversifolia</i> Lehm.	varileaf cinquefoil	G, W	90
Rosaceae	<i>Potentilla glandulosa</i> Lindl.	sticky cinquefoil	G, W	155
Rosaceae	<i>Potentilla gracilis</i> Dougl. ex Hook.	slender cinquefoil	G, W	314
Rosaceae	<i>Potentilla hippiana</i> Lehm.	woolly cinquefoil	G, W	56
Rosaceae	<i>Potentilla hookeriana</i> Lehm.	Hooker's cinquefoil	W	1
Rosaceae	<i>Potentilla</i> L.	cinquefoil	G, W	5
Rosaceae	<i>Potentilla nivea</i> L.	snow cinquefoil	G, W	12

Family	Scientific Name with Author	Common Name	Location	Occur
Rosaceae	<i>Potentilla norvegica</i> L.	Norwegian cinquefoil	G	1
Rosaceae	<i>Potentilla ovina</i> Macoun ex J.M. Macoun	sheep cinquefoil	G, W	8
Rosaceae	<i>Potentilla pectinisecta</i> Rydb.	combleaf cinquefoil	G	1
Rosaceae	<i>Potentilla pensylvanica</i> L.	Pennsylvania cinquefoil	G, W	20
Rosaceae	<i>Potentilla recta</i> L.	sulphur cinquefoil	G	2
Rosaceae	<i>Potentilla rivalis</i> Nutt.	brook cinquefoil	W	2
Rosaceae	<i>Potentilla uniflora</i> Ledeb.	oneflower cinquefoil	G, W	8
Rosaceae	<i>Potentilla villosa</i> Pallas ex Pursh	villous cinquefoil	W	3
Rosaceae	<i>Prunus americana</i> Marsh.	American plum	G	2
Rosaceae	<i>Prunus emarginata</i> (Dougl. ex Hook.) D. Dietr.	bitter cherry	G, W	27
Rosaceae	<i>Prunus</i> L.	plum	G	2
Rosaceae	<i>Prunus pensylvanica</i> L. f.	pin cherry	G, W	27
Rosaceae	<i>Prunus virginiana</i> L.	chokecherry	G, W	198
Rosaceae	<i>Prunus virginiana</i> L. var. <i>melanocarpa</i> (A. Nels.) Sarg.	black chokecherry	G	1
Rosaceae	<i>Rosa acicularis</i> Lindl.	prickly rose	G, W	340
Rosaceae	<i>Rosa gymnocarpa</i> Nutt.	dwarf rose	G	42
Rosaceae	<i>Rosa</i> L.	rose	G	82
Rosaceae	<i>Rosa woodsii</i> Lindl.	Woods' rose	G, W	456
Rosaceae	<i>Rubus arcticus</i> L.	arctic blackberry	G, W	8
Rosaceae	<i>Rubus arcticus</i> L. ssp. <i>acaulis</i> (Michx.) Focke	dwarf raspberry	G	1
Rosaceae	<i>Rubus idaeus</i> L.	American red raspberry	G, W	125
Rosaceae	<i>Rubus</i> L.	blackberry	G	5
Rosaceae	<i>Rubus laciniatus</i> Willd.	cutleaf blackberry	G	1
Rosaceae	<i>Rubus parviflorus</i> Nutt.	thimbleberry	G, W	672
Rosaceae	<i>Rubus parviflorus</i> Nutt. var. <i>parviflorus</i>	thimbleberry	G	3
Rosaceae	<i>Rubus pedatus</i> Sm.	strawberryleaf raspberry	G	1
Rosaceae	<i>Rubus pubescens</i> Raf.	dwarf red blackberry	G, W	22
Rosaceae	<i>Sibbaldia procumbens</i> L.	creeping sibbaldia	G, W	42
Rosaceae	<i>Sorbus californica</i> Greene	California mountain ash	W	1
Rosaceae	<i>Sorbus</i> L.	mountain ash	G	1
Rosaceae	<i>Sorbus scopulina</i> Greene	Greene's mountain ash	G, W	362
Rosaceae	<i>Sorbus sitchensis</i> M. Roemer	western mountain ash	G, W	41
Rosaceae	<i>Spiraea betulifolia</i> Pallas	white spirea	G, W	842
Rosaceae	<i>Spiraea douglasii</i> Hook.	rose spirea	G	1
Rosaceae	<i>Spiraea splendens</i> Baumann ex K. Koch var. <i>splendens</i>	rose meadowsweet	G, W	27
Rubiaceae	<i>Galium bifolium</i> S. Wats.	twinleaf bedstraw	G	3
Rubiaceae	<i>Galium boreale</i> L.	northern bedstraw	G, W	609
Rubiaceae	<i>Galium circaezans</i> Michx. var. <i>circaezans</i>	licorice bedstraw	G	7
Rubiaceae	<i>Galium</i> L.	bedstraw	G, W	3
Rubiaceae	<i>Galium trifidum</i> L.	threepetal bedstraw	G, W	55
Rubiaceae	<i>Galium triflorum</i> Michx.	fragrant bedstraw	G, W	414
Salicaceae	<i>Populus balsamifera</i> L.	balsam poplar	G, W	84
Salicaceae	<i>Populus balsamifera</i> L. ssp. <i>balsamifera</i>	balsam poplar	G	6

Family	Scientific Name with Author	Common Name	Location	Occur
Salicaceae	<i>Populus balsamifera</i> L. ssp. <i>trichocarpa</i> (Torr. & Gray ex Hook.) Brayshaw	black cottonwood	G, W	457
Salicaceae	<i>Populus tremuloides</i> Michx.	quaking aspen	G, W	770
Salicaceae	<i>Salix amygdaloides</i> Anderss.	peachleaf willow	G	1
Salicaceae	<i>Salix arctica</i> Pallas	arctic willow	G	22
Salicaceae	<i>Salix bebbiana</i> Sarg.	Bebb willow	G, W	73
Salicaceae	<i>Salix boothii</i> Dorn	Booth's willow	G, W	68
Salicaceae	<i>Salix brachycarpa</i> Nutt.	shortfruit willow	G, W	8
Salicaceae	<i>Salix candida</i> Flueggé ex Willd.	sageleaf willow	G, W	14
Salicaceae	<i>Salix commutata</i> Bebb	undergreen willow	G	10
Salicaceae	<i>Salix discolor</i> Muhl.	pussy willow	W	4
Salicaceae	<i>Salix drummondiana</i> Barratt ex Hook.	Drummond's willow	G, W	146
Salicaceae	<i>Salix eriocephala</i> Michx.	Missouri River willow	G, W	2
Salicaceae	<i>Salix exigua</i> Nutt.	narrowleaf willow	G, W	24
Salicaceae	<i>Salix farriarum</i> Ball	Farr's willow	G, W	8
Salicaceae	<i>Salix geeyeriana</i> Anderss.	Geyer's willow	G, W	13
Salicaceae	<i>Salix glauca</i> L.	grayleaf willow	G, W	13
Salicaceae	<i>Salix</i> L.	willow	G, W	13
Salicaceae	<i>Salix lucida</i> Muhl.	shining willow	W	8
Salicaceae	<i>Salix lucida</i> Muhl. ssp. <i>lasiandra</i> (Benth.) E. Murr.	Pacific willow	G, W	4
Salicaceae	<i>Salix lutea</i> Nutt.	yellow willow	W	12
Salicaceae	<i>Salix maccalliana</i> Rowlee	McCalla's willow	W	4
Salicaceae	<i>Salix melanopsis</i> Nutt.	dusky willow	G	25
Salicaceae	<i>Salix myrtillofolia</i> Anderss.	blueberry willow	W	1
Salicaceae	<i>Salix nivalis</i> Hook.	snow willow	G, W	10
Salicaceae	<i>Salix petiolaris</i> Sm.	meadow willow	W	1
Salicaceae	<i>Salix planifolia</i> Pursh	diamondleaf willow	G, W	6
Salicaceae	<i>Salix prolixa</i> Anderss.	MacKenzie's willow	G, W	8
Salicaceae	<i>Salix pseudomonticola</i> Ball	false mountain willow	G, W	35
Salicaceae	<i>Salix reticulata</i> L.	netleaf willow	G	1
Salicaceae	<i>Salix scouleriana</i> Barratt ex Hook.	Scouler's willow	G, W	165
Salicaceae	<i>Salix serissima</i> (Bailey) Fern.	autumn willow	W	6
Salicaceae	<i>Salix sitchensis</i> Sanson ex Bong.	Sitka willow	G, W	51
Salicaceae	<i>Salix vestita</i> Pursh	rock willow	G, W	14
Santalaceae	<i>Comandra umbellata</i> (L.) Nutt.	bastard toadflax	G, W	40
Santalaceae	<i>Geocaulon lividum</i> (Richards.) Fern.	false toadflax	W	6
Saxifragaceae	<i>Heuchera cylindrica</i> Dougl. ex Hook.	roundleaf alumroot	G, W	181
Saxifragaceae	<i>Heuchera cylindrica</i> Dougl. ex Hook. var. <i>septentrionalis</i> Rosendahl, Butters & Lakela	roundleaf alumroot	W	1
Saxifragaceae	<i>Heuchera glabra</i> Willd. ex Roemer & J.A. Schultes	alpine heuchera	W	14
Saxifragaceae	<i>Heuchera</i> L.	alumroot	G, W	4
Saxifragaceae	<i>Heuchera parvifolia</i> Nutt. ex Torr. & Gray	littleleaf alumroot	G, W	29
Saxifragaceae	<i>Lithophragma parviflorum</i> (Hook.) Nutt. ex Torr. & Gray	smallflower woodland-star	G	1
Saxifragaceae	<i>Mitella breweri</i> Gray	Brewer's miterwort	G, W	60
Saxifragaceae	<i>Mitella</i> L.	miterwort	G	41

Family	Scientific Name with Author	Common Name	Location	Occur
Saxifragaceae	<i>Mitella nuda</i> L.	naked miterwort	G, W	30
Saxifragaceae	<i>Mitella pentandra</i> Hook.	fivestamen miterwort	G, W	14
Saxifragaceae	<i>Mitella stauropetala</i> Piper	smallflower miterwort	G	3
Saxifragaceae	<i>Mitella trifida</i> Graham	threeparted miterwort	W	2
Saxifragaceae	<i>Parnassia fimbriata</i> Koenig	fringed grass of Parnassus	G, W	37
Saxifragaceae	<i>Parnassia</i> L.	grass of Parnassus	W	1
Saxifragaceae	<i>Parnassia palustris</i> L.	marsh grass of Parnassus	G, W	4
Saxifragaceae	<i>Saxifraga adscendens</i> L.	wedgeleaf saxifrage	W	2
Saxifragaceae	<i>Saxifraga bronchialis</i> L.	yellowdot saxifrage	G, W	120
Saxifragaceae	<i>Saxifraga bronchialis</i> L. ssp. <i>austromontana</i> (Wieg.) Piper	matted saxifrage	G	2
Saxifragaceae	<i>Saxifraga caespitosa</i> L.	tufted alpine saxifrage	W	8
Saxifragaceae	<i>Saxifraga cernua</i> L.	nodding saxifrage	G, W	6
Saxifragaceae	<i>Saxifraga ferruginea</i> Graham	russethair saxifrage	G, W	17
Saxifragaceae	<i>Saxifraga flagellaris</i> Willd. ex Sternb.	whiplash saxifrage	G	1
Saxifragaceae	<i>Saxifraga hyperborea</i> R. Br.	pygmy saxifrage	W	4
Saxifragaceae	<i>Saxifraga</i> L.	saxifrage	G, W	11
Saxifragaceae	<i>Saxifraga lyallii</i> Engl.	redstem saxifrage	G, W	9
Saxifragaceae	<i>Saxifraga mertensiana</i> Bong.	wood saxifrage	G, W	7
Saxifragaceae	<i>Saxifraga nelsoniana</i> D. Don	heartleaf saxifrage	W	2
Saxifragaceae	<i>Saxifraga nivalis</i> L.	alpine saxifrage	G	1
Saxifragaceae	<i>Saxifraga occidentalis</i> S. Wats.	Alberta saxifrage	G, W	10
Saxifragaceae	<i>Saxifraga oppositifolia</i> L.	purple mountain saxifrage	W	1
Saxifragaceae	<i>Saxifraga oregana</i> T.J. Howell	Oregon saxifrage	G	1
Saxifragaceae	<i>Saxifraga rhomboidea</i> Greene	diamondleaf saxifrage	G	7
Saxifragaceae	<i>Saxifraga subapetala</i> E. Nels.	Yellowstone saxifrage	G	2
Saxifragaceae	<i>Tellima grandiflora</i> (Pursh) Dougl. ex Lindl.	bigflower tellima	G	9
Saxifragaceae	<i>Tiarella trifoliata</i> L.	threeleaf foamflower	G, W	194
Saxifragaceae	<i>Tiarella trifoliata</i> L. var. <i>unifoliata</i> (Hook.) Kurtz	oneleaf foamflower	W	23
Scheuchzeriaceae	<i>Scheuchzeria palustris</i> L.	rannoch-rush	G	3
Scrophulariaceae	<i>Besseyia wyomingensis</i> (A. Nels.) Rydb.	Wyoming besseyia	G, W	49
Scrophulariaceae	<i>Castilleja cusickii</i> Greenm.	Cusick's Indian paintbrush	G	7
Scrophulariaceae	<i>Castilleja hispida</i> Benth.	harsh Indian paintbrush	G, W	43
Scrophulariaceae	<i>Castilleja lutescens</i> (Greenm.) Rydb.	stiff yellow Indian paintbrush	G, W	26
Scrophulariaceae	<i>Castilleja miniata</i> Dougl. ex Hook.	giant red Indian paintbrush	G, W	117
Scrophulariaceae	<i>Castilleja miniata</i> Dougl. ex Hook. ssp. <i>dixonii</i> (Fern.) Kartesz, comb. nov. ined.	giant red Indian paintbrush	G	1
Scrophulariaceae	<i>Castilleja Mutis</i> ex L. f.	Indian paintbrush	G, W	71
Scrophulariaceae	<i>Castilleja occidentalis</i> Torr.	western Indian paintbrush	G, W	26
Scrophulariaceae	<i>Castilleja rhexiifolia</i> Rydb.	splitleaf Indian paintbrush	G, W	42
Scrophulariaceae	<i>Castilleja sulphurea</i> Rydb.	sulphur Indian paintbrush	G	21
Scrophulariaceae	<i>Collinsia linearis</i> Gray	narrowleaf blue eyed Mary	G, W	2
Scrophulariaceae	<i>Collinsia parviflora</i> Lindl.	maiden blue eyed Mary	G, W	29
Scrophulariaceae	<i>Linaria vulgaris</i> P. Mill.	butter and eggs	G	22
Scrophulariaceae	<i>Melampyrum lineare</i> Desr.	narrowleaf cowwheat	G	12

Family	Scientific Name with Author	Common Name	Location	Occur
Scrophulariaceae	Mimulus breweri (Greene) Coville	Brewer's monkeyflower	G	1
Scrophulariaceae	Mimulus floribundus Lindl.	manyflowered monkeyflower	G	1
Scrophulariaceae	Mimulus guttatus DC.	seep monkeyflower	G	3
Scrophulariaceae	Mimulus lewisii Pursh	purple monkeyflower	G, W	14
Scrophulariaceae	Mimulus tilingii Regel	Tiling's monkeyflower	G	2
Scrophulariaceae	Orthocarpus luteus Nutt.	yellow owl's-clover	G, W	4
Scrophulariaceae	Orthocarpus tenuifolius (Pursh) Benth.	thinleaved owl's-clover	G	11
Scrophulariaceae	Pedicularis bracteosa Benth.	bracted lousewort	G, W	172
Scrophulariaceae	Pedicularis contorta Benth.	coiled lousewort	G, W	43
Scrophulariaceae	Pedicularis groenlandica Retz.	elephanthead lousewort	G, W	18
Scrophulariaceae	Pedicularis L.	lousewort	G, W	2
Scrophulariaceae	Pedicularis labradorica Wirsing	Labrador lousewort	W	1
Scrophulariaceae	Pedicularis racemosa Dougl. ex Benth.	sicketop lousewort	G	5
Scrophulariaceae	Penstemon albertinus Greene	Alberta beardtongue	G, W	52
Scrophulariaceae	Penstemon albidus Nutt.	white penstemon	G	8
Scrophulariaceae	Penstemon confertus Dougl. ex Lindl.	yellow penstemon	G, W	287
Scrophulariaceae	Penstemon ellipticus Coult. & Fisher	rocky ledge penstemon	G, W	58
Scrophulariaceae	Penstemon eriantherus Pursh	fuzzytongue penstemon	W	2
Scrophulariaceae	Penstemon floribundus D. Danley	Cordillia's beardtongue	G	1
Scrophulariaceae	Penstemon fruticosus (Pursh) Greene	bush penstemon	G	18
Scrophulariaceae	Penstemon lyallii (Gray) Gray	Lyall's beardtongue	G, W	30
Scrophulariaceae	Penstemon nitidus Dougl. ex Benth.	waxleaf penstemon	W	1
Scrophulariaceae	Penstemon procerus Dougl. ex Graham	littleflower penstemon	G	2
Scrophulariaceae	Penstemon Schmidel	beardtongue	G	8
Scrophulariaceae	Penstemon wilcoxii Rydb.	Wilcox's penstemon	G	1
Scrophulariaceae	Rhinanthus minor L.	little yellowrattle	G, W	22
Scrophulariaceae	Rhinanthus minor L. ssp. minor	little yellowrattle	G	27
Scrophulariaceae	Verbascum thapsus L.	common mullein	G, W	28
Scrophulariaceae	Veronica americana Schwein. ex Benth.	American speedwell	G, W	9
Scrophulariaceae	Veronica anagallis-aquatica L.	water speedwell	G	1
Scrophulariaceae	Veronica L.	speedwell	G	2
Scrophulariaceae	Veronica officinalis L.	common gypsyweed	G	19
Scrophulariaceae	Veronica peregrina L.	neckweed	W	1
Scrophulariaceae	Veronica scutellata L.	skullcap speedwell	G	1
Scrophulariaceae	Veronica serpyllifolia L.	thymeleaf speedwell	G	3
Scrophulariaceae	Veronica verna L.	spring speedwell	G	1
Scrophulariaceae	Veronica wormsjkoldii Roemer & J.A. Schultes	American alpine speedwell	G, W	41
Selaginellaceae	Selaginella Beauv.	spikemoss	G	184
Selaginellaceae	Selaginella densa Rydb.	lesser spikemoss	G, W	121
Selaginellaceae	Selaginella wallacei Hieron.	Wallace's spikemoss	G	1
Solanaceae	Solanum dulcamara L.	climbing nightshade	G	1
Sparganiaceae	Sparganium angustifolium Michx.	narrowleaf bur-reed	G	2
Sparganiaceae	Sparganium L.	bur-reed	G	1

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Sphagnaceae	<i>Sphagnum angustifolium</i> (C. Jens. ex Russ.) C. Jens. in Tolf	sphagnum	G	1
Sphagnaceae	<i>Sphagnum warnstorffii</i> Russ.	Warnstorff's sphagnum	W	1
Stereocaulaceae	<i>Stereocaulon glareosum</i> (Savicz) H. Magn.	glare snow lichen	W	1
Stereocaulaceae	<i>Stereocaulon tomentosum</i> Fr.	tomentose snow lichen	W	2
Taxaceae	<i>Taxus brevifolia</i> Nutt.	Pacific yew	G	42
Teloschistaceae	<i>Xanthoria elegans</i> (Link) Th. Fr.	elegant orange wall lichen	W	2
Tetraphidaceae	<i>Tetraphis pellucida</i> Hedw.	tetraphis moss	W	2
Thelypteridaceae	<i>Phegopteris connectilis</i> (Michx.) Watt	long beechfern	G	1
Thelypteridaceae	<i>Thelypteris augescens</i> (Link) Munz & Johnston	abrupttip maiden fern	G	1
Thelypteridaceae	<i>Thelypteris opposita</i> (Vahl) Ching	oppositeleaf maiden fern	G	1
Thuidiaceae	<i>Abietinella abietina</i> (Hedw.) Fleisch.	abietinella moss	W	2
Timmiaaceae	<i>Timmia austriaca</i> Hedw.	Austria timmia moss	W	12
Timmiaaceae	<i>Timmia megapolitana</i> Hedw.	timmia moss	W	1
Typhaceae	<i>Typha latifolia</i> L.	broadleaf cattail	G, W	13
Umbilicariaceae	<i>Umbilicaria arctica</i> (Ach.) Nyl.	arctic navel lichen	W	3
Umbilicariaceae	<i>Umbilicaria Hoffm.</i>	navel lichen	W	3
Umbilicariaceae	<i>Umbilicaria hyperborea</i> (Ach.) Hoffm.	navel lichen	W	1
Umbilicariaceae	<i>Umbilicaria krascheninnikovii</i> (Savicz) Zahlbr.	Krascheninnikov's navel lichen	W	2
Umbilicariaceae	<i>Umbilicaria virginis</i> Schaerer	navel lichen	W	2
Uncertain Lichen Family	<i>Thamnia subuliformis</i> (Ehrh.) Culb.	whiteworm lichen	W	4
Uncertain Lichen Family	<i>Thamnia vermicularis</i> (Sw.) Ach. ex Schaerer	whiteworm lichen	G, W	5
Urticaceae	<i>Urtica dioica</i> L.	stinging nettle	G, W	191
Urticaceae	<i>Urtica dioica</i> L. ssp. <i>gracilis</i> (Ait.) Seland.	California nettle	W	2
Valerianaceae	<i>Valeriana dioica</i> L.	marsh valerian	G, W	30
Valerianaceae	<i>Valeriana</i> L.	valerian	G	1
Valerianaceae	<i>Valeriana sitchensis</i> Bong.	Sitka valerian	G, W	220
Verbenaceae	<i>Verbena officinalis</i> L.	herb of the cross	G	1
Verrucariaceae	<i>Catapyrenium cinereum</i> (Pers.) Korber	earth lichen	W	1
Verrucariaceae	<i>Verrucaria viridula</i> (Schradler) Ach.	wart lichen	G	6
Violaceae	<i>Viola adunca</i> Sm.	hookedspur violet	G, W	63
Violaceae	<i>Viola canadensis</i> L.	Canadian white violet	G, W	182
Violaceae	<i>Viola glabella</i> Nutt.	pioneer violet	G, W	199
Violaceae	<i>Viola</i> L.	violet	G, W	54
Violaceae	<i>Viola macloskeyi</i> Lloyd	small white violet	G	2
Violaceae	<i>Viola nephrophylla</i> Greene	northern bog violet	G	1
Violaceae	<i>Viola nuttallii</i> Pursh	Nuttall's violet	G, W	8
Violaceae	<i>Viola orbiculata</i> Geyer ex Holz.	darkwoods violet	G, W	262
Violaceae	<i>Viola renifolia</i> Gray	white violet	W	4
Violaceae	<i>Viola sororia</i> Willd.	common blue violet	G	2
Violaceae	<i>Viola vallicola</i> A. Nels. var. <i>major</i> (Hook.) Fabijan	valley violet	G	1
	<i>Aster/Solidago</i> sp.		W	1
	<i>Bromus/Elymus</i> sp.		W	1
	<i>Chara</i>		W	6

Family	Scientific Name with Author	Common Name	Location	Occur
	Fern		G	1
	Grass		G, W	17
	Lichen		G, W	12
	Moss		G, W	363
	Moss and Lichen		G	7
	Moss and Liverwort		G	1
	Mustard		G	2
	Orchid		G	2
	Poa/Trisetum		W	1
	Volvox		W	3

USGS-NPS Vegetation Mapping Program Waterton-Glacier International Peace Park

AUGUST 2007

Appendix G

Descriptions to Plant Associations of Waterton-Glacier International Peace Park

**U.S. NATIONAL VEGETATION
CLASSIFICATION STANDARD:**

TERRESTRIAL ECOLOGICAL CLASSIFICATIONS

Waterton-Glacier International Peace Park
Local and Global Association Descriptions

30 May 2007

by

NatureServe

1101 Wilson Blvd., 15th floor
Arlington, VA 22209

This subset of the International Ecological Classification Standard covers local and global descriptions of vegetation associations attributed to Waterton-Glacier International Peace Park. This classification has been developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications. Comments and suggestions regarding the contents of this subset should be directed to Mary J. Russo, Central Ecology Data Manager at mary_russo@natureserve.org and Marion S. Reid, Senior Regional Ecologist at marion_reid@natureserve.org



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¹ NatureServe is an international organization including NatureServe regional offices, a NatureServe central office, U.S. State Natural Heritage Programs, and Conservation Data Centres (CDC) in Canada and Latin America and the Caribbean. Ecologists from the following organizations have contributed the development of the ecological systems classification:

United States

Central NatureServe Office, Arlington, VA; Eastern Regional Office, Boston, MA; Midwestern Regional Office, Minneapolis, MN; Southeastern Regional Office, Durham, NC; Western Regional Office, Boulder, CO; Alabama Natural Heritage Program, Montgomery AL; Alaska Natural Heritage Program, Anchorage, AK; Arizona Heritage Data Management Center, Phoenix AZ; Arkansas Natural Heritage Commission Little Rock, AR; Blue Ridge Parkway, Asheville, NC; California Natural Heritage Program, Sacramento, CA; Colorado Natural Heritage Program, Fort Collins, CO; Connecticut Natural Diversity Database, Hartford, CT; Delaware Natural Heritage Program, Smyrna, DE; District of Columbia Natural Heritage Program/National Capital Region Conservation Data Center, Washington DC; Florida Natural Areas Inventory, Tallahassee, FL; Georgia Natural Heritage Program, Social Circle, GA; Great Smoky Mountains National Park, Gatlinburg, TN; Gulf Islands National Seashore, Gulf Breeze, FL; Hawaii Natural Heritage Program, Honolulu, Hawaii; Idaho Conservation Data Center, Boise, ID; Illinois Natural Heritage Division/Illinois Natural Heritage Database, Springfield, IL; Indiana Natural Heritage Data Center, Indianapolis, IN; Iowa Natural Areas Inventory, Des Moines, IA; Kansas Natural Heritage Inventory, Lawrence, KS; Kentucky Natural Heritage Program, Frankfort, KY; Louisiana Natural Heritage Program, Baton Rouge, LA; Maine Natural Areas Program, Augusta, ME; Mammoth Cave National Park, Mammoth Cave, KY; Maryland Wildlife & Heritage Division, Annapolis, MD; Massachusetts Natural Heritage & Endangered Species Program, Westborough, MA; Michigan Natural Features Inventory, Lansing, MI; Minnesota Natural Heritage & Nongame Research and Minnesota County Biological Survey, St. Paul, MN; Mississippi Natural Heritage Program, Jackson, MI; Missouri Natural Heritage Database, Jefferson City, MO; Montana Natural Heritage Program, Helena, MT; National Forest in North Carolina, Asheville, NC; National Forests in Florida, Tallahassee, FL; National Park Service, Southeastern Regional Office, Atlanta, GA; Navajo Natural Heritage Program, Window Rock, AZ; Nebraska Natural Heritage Program, Lincoln, NE; Nevada Natural Heritage Program, Carson City, NV; New Hampshire Natural Heritage Inventory, Concord, NH; New Jersey Natural Heritage Program, Trenton, NJ; New Mexico Natural Heritage Program, Albuquerque, NM; New York Natural Heritage Program, Latham, NY; North Carolina Natural Heritage Program, Raleigh, NC; North Dakota Natural Heritage Inventory, Bismarck, ND; Ohio Natural Heritage Database, Columbus, OH; Oklahoma Natural Heritage Inventory, Norman, OK; Oregon Natural Heritage Program, Portland, OR; Pennsylvania Natural Diversity Inventory, PA; Rhode Island Natural Heritage Program, Providence, RI; South Carolina Heritage Trust, Columbia, SC; South Dakota Natural Heritage Data Base, Pierre, SD; Tennessee Division of Natural Heritage, Nashville, TN; Tennessee Valley Authority Heritage Program, Norris, TN; Texas Conservation Data Center, San Antonio, TX; Utah Natural Heritage Program, Salt Lake City, UT; Vermont Nongame & Natural Heritage Program, Waterbury, VT; Virginia Division of Natural Heritage, Richmond, VA; Washington Natural Heritage Program, Olympia, WA; West Virginia Natural Heritage Program, Elkins, WV; Wisconsin Natural Heritage Program, Madison, WI; Wyoming Natural Diversity Database, Laramie, WY

Canada

Alberta Natural Heritage Information Centre, Edmonton, AB, Canada; Atlantic Canada Conservation Data Centre, Sackville, New Brunswick, Canada; British Columbia Conservation Data Centre, Victoria, BC, Canada; Manitoba Conservation Data Centre, Winnipeg, MB, Canada; Ontario Natural Heritage Information Centre, Peterborough, ON, Canada; Quebec Conservation Data Centre, Quebec, QC, Canada; Saskatchewan Conservation Data Centre, Regina, SK, Canada; Yukon Conservation Data Centre, Yukon, Canada

Latin American and Caribbean

Centro de Datos para la Conservacion de Bolivia, La Paz, Bolivia; Centro de Datos para la Conservacion de Colombia, Cali, Valle, Columbia; Centro de Datos para la Conservacion de Ecuador, Quito, Ecuador; Centro de Datos para la Conservacion de Guatemala, Ciudad de Guatemala, Guatemala; Centro de Datos para la Conservacion de Panama, Quarry Heights, Panama; Centro de Datos para la Conservacion de Paraguay, San Lorenzo, Paraguay; Centro de Datos para la Conservacion de Peru, Lima, Peru; Centro de Datos para la Conservacion de Sonora, Hermosillo, Sonora, Mexico; Netherlands Antilles Natural Heritage Program, Curacao, Netherlands Antilles; Puerto Rico-Departamento De Recursos Naturales Y Ambientales, Puerto Rico; Virgin Islands Conservation Data Center, St. Thomas, Virgin Islands.

NatureServe also has partnered with many International and United States Federal and State organizations, which have also contributed significantly to the development of the International Classification. Partners include the following The Nature Conservancy; Provincial Forest Ecosystem Classification Groups in Canada; Canadian Forest Service; Parks Canada; United States Forest Service; National GAP Analysis Program; United States National Park Service; United States Fish and Wildlife Service; United States Geological Survey; United States Department of Defense; Ecological Society of America; Environmental Protection Agency; Natural Resource Conservation Services; United States Department of Energy; and the Tennessee Valley Authority. Many individual state organizations and people from academic institutions have also contributed to the development of this classification.

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I. FOREST

I.A.8.N.b. Rounded-crowned temperate or subpolar needle-leaved evergreen forest

Pinus contorta Forest Alliance

Pinus contorta / *Arnica cordifolia* Forest

LOGEPOLE PINE / HEARTLEAF LEOPARDBANE FOREST

IDENTIFIER: C EGL000135

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b.)
Alliance	<i>Pinus contorta</i> Forest Alliance (A.118)
Alliance (English name)	Lodgepole Pine Forest Alliance
Association	<i>Pinus contorta</i> / <i>Arnica cordifolia</i> Forest
Association (English name)	Lodgepole Pine / Heartleaf Leopardbane Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Lodgepole Pine Forest (CES306.820)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is found in the upper montane and subalpine zone of the central and northern Rocky Mountains. Stands typically occur on cool, dry sites on gentle to moderate slopes with variable aspects depending on elevation. Soils are well-drained, gravelly loams, silts or silty clay loams generally derived from acidic, noncalcareous parent materials. Ground cover is mostly litter, often with duff over 3 cm deep, but bare ground and rock cover may be significant in some stands (to 20% cover). The vegetation is characterized by a *Pinus contorta*-dominated tree canopy with *Arnica cordifolia* dominant in the understory. The tree canopy varies from moderately dense to nearly closed (40-90% cover) and is often solely dominated by *Pinus contorta*. However, in some stands scattered *Abies lasiocarpa*, *Picea engelmannii*, *Pinus albicaulis*, *Pinus flexilis*, *Populus tremuloides*, or *Pseudotsuga menziesii* trees may be present, especially in the subcanopy. Stands generally have a depauperate understory, which may include sparse shrub layers composed of scattered tree saplings, *Ribes lacustre*, *Shepherdia canadensis*, or *Symphoricarpos oreophilus*. *Vaccinium scoparium* is absent or rare. *Arnica cordifolia* (indicator species) generally dominates in the sparse to moderately dense herbaceous layer. Other frequent herbs include *Antennaria racemosa*, *Astragalus miser*, *Chamerion angustifolium*, *Orthilia secunda* (= *Pyrola secunda*), and *Thalictrum occidentale*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: A stand of this forest association is found at 1659 m (6440 feet) on a moderate south-facing slope of glacial till. The soil tends to be well-drained clay loam with red and green argillites present. The ground surface is mostly covered with litter and duff.

GLOBAL ENVIRONMENT: This association is found in the upper montane and subalpine zone of the central and northern Rocky Mountains. Elevations range from 2255 to 2926 m (7400-9600 feet) in northwestern Wyoming, east-central Idaho and western Montana, and is more common near and east of the Continental Divide. It typically occurs on cool, dry sites on gentle to moderate slopes with variable aspects depending on elevation. Soils are well-drained, gravelly loams, silts or silty clay loams generally derived from acidic, noncalcareous parent materials such as quartzite, granite, andesite, dacite, trachyte, latite, and quartz monzonite (Cooper 1975, Pfister et al. 1977, Steele et al. 1981, 1983). Ground cover is mostly litter, often with duff over 3 cm deep, but bare ground and rock cover may be significant in some stands (to 20% cover).

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This forest association is dominated by a pole to mature open tree canopy of *Pinus contorta* (40% average cover). The height of this species varies between 20 and 35 m. The tree subcanopy layer is dominated by *Abies lasiocarpa*. *Alnus viridis* ssp. *sinuata* and *Spiraea betulifolia* are found in the sparse shrub

layer with less than 10% average cover. *Arnica cordifolia* (60% average cover) clearly dominates the diverse herbaceous layer; this species is perhaps more broadly distributed than any other forest-associated forb and as such conveys little information about environment. Numerous species are present in the herbaceous layer, contributing 10% average cover in total, and none have sufficient cover to be indicative of conditions other than those indicated by *Arnica cordifolia* dominance. Common species include *Calamagrostis rubescens*, *Chamerion angustifolium*, and *Xerophyllum tenax*.

GLOBAL VEGETATION: This forest association is characterized by a *Pinus contorta*-dominated tree canopy with *Arnica cordifolia* dominant in the understory. The tree canopy varies from moderately dense to nearly closed (40-90% cover) and is often solely dominated by *Pinus contorta*. However, in some stands scattered *Abies lasiocarpa*, *Picea engelmannii*, *Pinus albicaulis*, *Pinus flexilis*, *Populus tremuloides*, or *Pseudotsuga menziesii* trees may be present, especially in the subcanopy. Stands generally have a depauperate understory, which may include sparse shrub layers composed of scattered tree saplings, *Ribes lacustre*, *Shepherdia canadensis*, or *Symphoricarpos oreophilus*. *Vaccinium scoparium* is absent or rare. *Arnica cordifolia* (indicator species) generally dominates in the sparse to moderately dense herbaceous layer. Other frequent herbs include *Antennaria racemosa*, *Astragalus miser*, *Chamerion angustifolium*, *Orthilia secunda* (= *Pyrola secunda*), and *Thalictrum occidentale*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Tree subcanopy	Needle-leaved tree	<i>Abies lasiocarpa</i>
Herb (field)	Forb	<i>Arnica cordifolia</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Tree subcanopy	Needle-leaved tree	<i>Abies lasiocarpa</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Astragalus miser</i> , <i>Thalictrum occidentale</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Arnica cordifolia*, *Pinus contorta*

GLOBAL: *Arnica cordifolia*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4? (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Arnica cordifolia* Forest (CEGL000298)
- *Pinus contorta* / *Shepherdia canadensis* Forest (CEGL000163)
- *Pseudotsuga menziesii* / *Arnica cordifolia* Forest (CEGL000427)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Arnica cordifolia* Plant Association (Johnston 1987) B
- *Abies lasiocarpa* / *Arnica cordifolia* Habitat Type (Steele et al. 1981) B
- *Abies lasiocarpa* / *Arnica cordifolia* Habitat Type (Steele et al. 1983) B
- *Abies lasiocarpa* / *Arnica cordifolia* Habitat Type (Pfister et al. 1977) B
- *Abies lasiocarpa* / *Arnica cordifolia* Habitat Type *Arnica cordifolia* Phase (Steele et al. 1983) I
- *Abies lasiocarpa* / *Arnica cordifolia* Habitat Type, *Astragalus miser* Phase (Steele et al. 1983) I
- *Abies lasiocarpa* / *Thalictrum occidentale* Habitat Type, *Arnica cordifolia* Phase (Cooper 1975) I
- *Pinus contorta* / *Arnica cordifolia* Community Type (Steele et al. 1983) =

- *Pinus contorta/Arnica cordifolia* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from one stand located in Glacier National Park, east of the Continental Divide. It is located near Many Glacier Entrance.

GLOBAL RANGE: This association is found in the upper montane and subalpine zone of the central and northern Rocky Mountains of Idaho, Montana and Wyoming.

NATIONS: US

STATES/PROVINCES: ID:S3?, MT:S3?, WY:S3?

USFS ECOREGIONS: M331A:CC, M331D:CC, M332B:CC, M332C:CC, M332D:CC

FEDERAL LANDS: NPS (Glacier, Yellowstone); USFS (Shoshone)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.74.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Cooper 1975, Cooper et al. 1987, Driscoll et al. 1984, Johnston 1987, Jones and Ogle 2000, MTNHP 2002b, Pfister and Daubenmire 1975, Pfister et al. 1977, Steele et al. 1981, Steele et al. 1983, Western Ecology Working Group n.d.

Pinus contorta / *Calamagrostis rubescens* Forest LODGEPOLE PINE / PINEGRASS FOREST

IDENTIFIER: C EGL000139

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b.)
Alliance	<i>Pinus contorta</i> Forest Alliance (A.118)
Alliance (English name)	Lodgepole Pine Forest Alliance
Association	<i>Pinus contorta</i> / <i>Calamagrostis rubescens</i> Forest
Association (English name)	Lodgepole Pine / Pinegrass Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Poor-Site Lodgepole Pine Forest (CES306.960)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is found in the upper montane and subalpine zone of the central and northern Rocky Mountains on cool, dry sites. It typically occurs on gentle to moderately steep, lower slopes, benches and valley bottoms where soils are better developed. Soils are gravelly, sandy or silt loams. Ground cover is dominated by litter with low cover of rock and bare ground. The vegetation is characterized by a *Pinus contorta*-dominated tree canopy with a grassy understory. The tree canopy varies from open to nearly closed (30-90% cover) and often is solely dominated by *Pinus contorta*. However, in some stands *Abies lasiocarpa*, *Picea engelmannii*, *Pinus albicaulis*, or *Pseudotsuga menziesii* trees may be present, especially in the subcanopy. Scattered dwarf- and short shrubs are often present, but they seldom form a distinct layer. Common dwarf- and short shrubs may include *Arctostaphylos uva-ursi*, *Amelanchier alnifolia*, *Mahonia repens*, *Paxistima myrsinites*, *Prunus virginiana*, *Spiraea betulifolia*, *Symphoricarpos oreophilus*, *Lonicera utahensis*, and *Vaccinium scoparium*. The moderately dense (30-50% cover) herbaceous layer is dominated by the perennial graminoids *Calamagrostis rubescens* and *Carex geyeri*. Diagnostic of this association is the dominance of *Pinus contorta* in the tree canopy with *Calamagrostis rubescens* dominating the graminoid layer. Also, the cover of *Calamagrostis rubescens* is greater than *Vaccinium scoparium*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this forest association are found on benches and valley floors on glacio-fluvial deposits or siltstone. This type occurs on gentle slopes, usually on southwesterly aspects or flats. The sampled elevation range of this type was between 1050 and 1091m (3448-3580 feet). The light tan/yellowish soil tends to be well-drained with silty to sandy loams predominating; gravel and small stone content is negligible. Litter and duff cover much of the ground surface, and older stands will have high cover of moss or lichen. An ash layer is present under the duff layer. One sampled occurrence is early successional, following the Red Burn Fire of 1988, and had numerous downed conifers and heavy fuel.

GLOBAL ENVIRONMENT: This association is found in the upper montane and subalpine zone of the central and northern Rocky Mountains. It is more common east of the Continental Divide. Elevations range between 1050 and 2477 m (3440-8122 feet) depending on longitude and aspect. It typically occurs on cool, dry sites on lower slopes, benches and valley bottoms where soils are better developed. Topography is rolling with gentle to moderately steep slopes. Soils are gravelly, sandy, silt loams, or clay-based, derived from a variety of parent materials, excepting alkaline, calcareous, sedimentary substrates (Cooper 1975). Ground cover is dominated by litter with low cover of rock and bare ground.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This forest association is dominated by a tree canopy (50% average cover) of *Pinus contorta*. Older stands will have trees up to 15 m in height, while early-successional occurrences will often be less than 5 m in height. Tree seedlings established in the understory can include *Picea engelmannii*, *Abies lasiocarpa*, *Pinus contorta*, *Larix occidentalis*, and *Pseudotsuga menziesii* (all with minimal percent cover). The shrub layer generally has low cover and can include *Symphoricarpos albus*, *Rosa woodsii*, *Amelanchier alnifolia*, *Spiraea betulifolia*, while *Mahonia repens* dominates the dwarf-shrub layer. Cover in each shrub layer is sparse. The graminoid component is dominated by *Calamagrostis rubescens* with 30% cover. The herbaceous layer is an array of scattered forbs and graminoids, including those of high constancy, such as *Symphyotrichum laeve* (= *Aster laevis*), *Chamerion angustifolium*, *Solidago canadensis*, and *Agrostis stolonifera*. *Cirsium arvense*, *Dactylis glomerata*, and *Poa pratensis* are a few exotic species that were sampled from one stand.

GLOBAL VEGETATION: This upper montane and subalpine conifer association is characterized by a *Pinus contorta*-dominated tree canopy with a grassy understory. The tree canopy varies from open to nearly closed (30-90% cover) and is often solely dominated by *Pinus contorta*. However, in some stands scattered *Abies lasiocarpa*, *Picea engelmannii*, *Pinus albicaulis*, *Pseudotsuga menziesii*, *Populus tremuloides*, or *Pinus flexilis* trees may be present, especially in the subcanopy. Some stands have only a tall-shrub canopy of trees, with no mature canopy cover, as the site was burned 10-15 years prior. Scattered dwarf- and short shrubs are often present, but they seldom form a distinct layer and except for *Arctostaphylos uva-ursi* have low cover. Common dwarf- and short shrubs may include *Amelanchier alnifolia*, *Lonicera utahensis*, *Mahonia repens*, *Paxistima myrsinites*, *Prunus virginiana*, *Spiraea betulifolia*, *Symphoricarpos oreophilus*, and *Vaccinium scoparium*. The moderately dense (30-50% cover) herbaceous layer is dominated by the perennial graminoids *Calamagrostis rubescens* and *Carex geyeri*. The herbaceous layer is densest in openings between trees. Other common herbaceous species include *Arnica cordifolia*, *Carex rossii*, *Chamerion angustifolium*, *Lupinus argenteus*, *Festuca idahoensis*, *Orthilia secunda*, *Geranium viscosissimum*, and *Packera streptanthifolia*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Herb (field)	Dwarf-shrub	<i>Mahonia repens</i> , <i>Paxistima myrsinites</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Calamagrostis rubescens*

GLOBAL: *Calamagrostis rubescens*, *Carex geyeri*, *Mahonia repens*, *Pinus contorta*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Cirsium arvense*, *Cirsium vulgare*, *Dactylis glomerata*, *Poa compressa*, *Poa pratensis*, *Taraxacum officinale*, *Trifolium pratense*, *Verbascum thapsus*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: One stand sampled is in a very early seral stage where *Pinus contorta* is the dominant conifer, and *Picea engelmannii* is reproducing as well. Classification of this stand is complicated by weed invasion and the presence of nearby grassland species.

GLOBAL COMMENTS: Most forests in this association are early- to mid-successional forests which developed following fires and are considered seral to *Abies lasiocarpa* - *Picea engelmannii* / *Calamagrostis rubescens* Forest (CEGL000301) or *Pseudotsuga menziesii* / *Calamagrostis rubescens* Woodland (CEGL000429) (Oswald 1966, Cooper 1975, Pfister et al. 1977, Steele et al. 1981, 1983), while other stands have a canopy that is dominated by more persistent *Pinus contorta* that is successfully regenerating, especially on more extreme sites with only scattered *Abies lasiocarpa*, *Picea engelmannii*, *Pinus flexilis*, or *Pseudotsuga menziesii*.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Calamagrostis rubescens* Forest (CEGL000301)
- *Pinus contorta* / *Spiraea betulifolia* Forest (CEGL000164)
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Woodland (CEGL000429)

GLOBAL RELATED CONCEPTS:

- *Pinus contorta* / *Calamagrostis rubescens* Association (Johnson and Clausnitzer 1992) =
- *Pinus contorta* / *Calamagrostis rubescens* Community (Oswald 1966) =
- *Pinus contorta* / *Calamagrostis rubescens* Community Type (Pfister et al. 1977) =
- *Pinus contorta* / *Calamagrostis rubescens* Community Type (Steele et al. 1983) =
- *Pinus contorta*/ *Calamagrostis rubescens* (Bourgeron and Engelking 1994) =
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Habitat Type (Cooper 1975) B
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from two stands in Glacier National Park on the west side of the Continental Divide.

GLOBAL RANGE: This association occurs in the upper montane and subalpine zone of the central and northern Rocky Mountains.

NATIONS: US

STATES/PROVINCES: ID:S4, MT:S5, OR, WA?, WY:S4?

USFS ECOREGIONS: M331A:CC, M331D:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton, Rockefeller, Yellowstone); USFS (Bridger-Teton, Caribou-Targhee, Wallowa-Whitman)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2009, GLAC.2099.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz, mod. G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Cooper 1975, Cooper et al. 1987, Driscoll et al. 1984, Horton 1971, Johnson and Clausnitzer 1992, MTNHP 2002b, Mauk and Henderson 1984, Oswald 1966, Pfister et al. 1977, Steele et al. 1981, Steele et al. 1983, Tisdale and McLean 1957, WNHP unpubl. data, Western Ecology Working Group n.d.

Pinus contorta / *Clintonia uniflora* Forest

LODGEPOLE PINE / BRIDE'S BONNET FOREST

IDENTIFIER: CEGL005916

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b.)
Alliance	<i>Pinus contorta</i> Forest Alliance (A.118)
Alliance (English name)	Lodgepole Pine Forest Alliance
Association	<i>Pinus contorta</i> / <i>Clintonia uniflora</i> Forest
Association (English name)	Lodgepole Pine / Bride's Bonnet Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Lodgepole Pine Forest (CES306.820)

ELEMENT CONCEPT

GLOBAL SUMMARY: Broadly distributed throughout the northern Rocky Mountains and adjacent terrain, this large-patch to matrix seral lodgepole pine forest association occupies relatively moist (mesic) and warm to cool sites having free air drainage and lacking frost-pocket conditions. It occurs on slopes of all degrees of steepness and aspect orientation, though it is more likely to occur in predominantly collecting positions. At the dry extreme of its distribution it is more strongly associated with protected positions such as concave slopes, moist depressions in gently sloping plateau areas, stringers along perennial stream bottoms, toeslopes and northeastern aspects. In the north it ranges from 760 to 1585 m (450-5200 feet), whereas to the south it ranges from 1060 to 1710 m (3500-5600 feet). A wide variety of parent materials are represented including those as disparate as granite, limestone, and all manner of glacio-fluvial material. It is also routinely found on ash caps, ranging from 3 to 60 cm in depth. The soil textures are predominantly loams and silt loams; soils typically have less than 15% coarse-fragment content and are well-drained. This mesic, wholly seral association is characterized by *Pinus contorta* dominating the upper canopy. Other tree species do occur in the overstory but with much less cover, including the seral *Larix occidentalis* and *Pinus monticola* as well as those from warmer environments: *Pinus ponderosa*, *Pseudotsuga menziesii*, *Thuja plicata*, and *Tsuga heterophylla*, and those of colder environments: *Abies lasiocarpa*, *Abies grandis*, and *Picea engelmannii*. The shrub layer may be highly diverse with tall shrubs (e.g., *Acer glabrum*, *Taxus brevifolia*, *Amelanchier alnifolia*), short shrubs (*Symphoricarpos albus*, *Paxistima myrsinites*, *Rubus parviflorus*, *Spiraea betulifolia*), and dwarf-shrubs (e.g., *Chimaphila umbellata*, *Linnaea borealis*, *Mahonia repens*) abundantly represented. The graminoid component is inconspicuous. The cover of the diagnostic forbs *Clintonia uniflora* and *Tiarella trifoliata* is greatest when this type occurs in warmer environments, up to 30% canopy cover. In the colder environments cover of these diagnostics and all forbs is generally less. Other forbs of high constancy are *Aralia nudicaulis*, *Adenocaulon bicolor*, *Coptis occidentalis*, *Cornus canadensis*, *Galium triflorum*, *Goodyera oblongifolia*, *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, *Trillium ovatum*, *Viola glabella* (or *Viola canadensis*), and *Viola orbiculata*.

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this forest association are found predominately on all positions of flat to steep slopes. They also occur on ridgetops, benches, and mountain valleys. These mesic sites are usually situated on glacial and thin colluvial deposits between the elevations of 1360 and 1690 m (4426-5541 feet). The soils tend to be well-drained sandy loams, Orthic Gray Luvisol, or Orthic Eutric Brunisol. Most of the ground surface is covered with litter, duff, and wood. One-half of the stands have minimal cover of small rocks.

GLOBAL ENVIRONMENT: Broadly distributed throughout the northern Rocky Mountains and adjacent terrain, this large-patch to matrix seral community occupies relatively moist (mesic) and warm to cool sites having free air drainage and lacking frost-pocket conditions. It occurs on slopes of all degrees of steepness and aspect orientation, though it is more likely to occur from toeslope through midslope positions (predominantly collecting positions). At the dry extreme of its distribution it is more strongly associated with protected positions such as concave slopes, moist depressions in gently sloping plateau areas, stringers along perennial stream bottoms, toeslopes and northeastern aspects. In the north it ranges from 760 to 1585 m (450-5200 feet) (extreme outliers at 1710 m (5600 feet)), whereas to the south it ranges from 1060 to 1710 m (3500-5600 feet). A wide variety of parent materials are represented, including all major rock types (sedimentary, metamorphic and igneous) with examples as disparate as granite and limestone; all manner of glacio-fluvial material blankets stream and river terraces, and glacial till is common on the upland benches. In eastern Washington, northern Idaho and northwestern Montana it is routinely found on ash caps, ranging from 3 to 60 cm in depth. Soil textures are predominantly from the fine end of the spectrum with loams and silt loams common (reflecting in part a volcanic ash component, if not ash cap); soils typically have less than 15% coarse-fragment content and are well-drained.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This forest association is dominated by a pole to mature open tree canopy of *Pinus contorta* (34% average cover). The average height of this species varies between 15 and 30 m. *Picea engelmannii* and *Larix occidentalis*, each with 8% average cover, are also present in this layer. Tree seedlings established in the

understory are *Pinus contorta*, *Picea engelmannii*, and *Abies lasiocarpa*. The tall- to short-shrub layer, consisting of *Acer glabrum*, *Spiraea betulifolia*, and *Rubus parviflorus*, has less than 23% total cover. The variance in shrub height is likely a result of uneven-aged shrubs and browsing. The dwarf-shrub layer has a moderate to high constancy of *Linnaea borealis* and *Vaccinium myrtillus*. The average cover of each species is 20% and 10%, respectively. The herbaceous layer is dominated by *Clintonia uniflora*, which is always present and averages 5% cover. Other common species present (74% or greater) include *Calamagrostis rubescens*, *Arnica cordifolia*, *Eurybia conspicua* (= *Aster conspicuus*), and *Chimaphila umbellata*. The herbaceous layer has numerous other graminoid and forb species, but all have insignificant cover, constancy, or both. There is also a 17% average cover of nonvascular species.

GLOBAL VEGETATION: This mesic, wholly seral association is characterized by *Pinus contorta* dominating the upper canopy, by definition having three times the cover of other canopy tree species; other tree species do occur in the overstory but with much less cover, including both other species considered almost exclusively seral (*Larix occidentalis* and *Pinus monticola*) and those capable of functioning as both seral and climax species, including those from warmer environments, *Pinus ponderosa*, *Pseudotsuga menziesii*, *Thuja plicata*, and *Tsuga heterophylla* and those of colder environments, *Abies lasiocarpa*, *Abies grandis*, and *Picea engelmannii*. The shrub layer may be highly diverse with tall shrubs (e.g., *Acer glabrum*, *Taxus brevifolia*, *Amelanchier alnifolia*), short shrubs (*Symphoricarpos albus*, *Paxistima myrsinites*, *Rubus parviflorus*, *Spiraea betulifolia*), and dwarf-shrubs (e.g., *Chimaphila umbellata*, *Linnaea borealis*, *Mahonia repens*) abundantly represented. Often one of the forenamed short shrubs will be dominant; historical accident suffices for an explanation of this shifting dominance until such time as a thorough analysis is undertaken. The graminoid component is inconspicuous with no one species exhibiting high constancy, though *Bromus vulgaris*, *Bromus ciliatus*, and *Calamagrostis rubescens* are more consistently present and with greater cover than other graminoids. The cover of the diagnostic forbs *Clintonia uniflora* and *Tiarella trifoliata* is greatest when this type occurs in the zones potentially dominated by *Thuja plicata* and *Tsuga heterophylla*, up to 30% canopy cover (can even be dominant forbs), whereas in the colder environments characterized by *Abies lasiocarpa*, *Abies grandis* and *Picea engelmannii*, cover of these diagnostics and all forbs is generally less. Other forbs of high constancy, at least in some portion of this association's considerable range, are *Aralia nudicaulis*, *Adenocaulon bicolor*, *Coptis occidentalis*, *Cornus canadensis*, *Galium triflorum*, *Goodyera oblongifolia*, *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, *Trillium ovatum*, *Viola glabella* (or *Viola canadensis*), and *Viola orbiculata*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i>
Herb (field)	Dwarf-shrub	<i>Linnaea borealis</i>
Herb (field)	Forb	<i>Clintonia uniflora</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Pinus contorta</i> , <i>Pseudotsuga menziesii</i>
Tree subcanopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Pseudotsuga menziesii</i> , <i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Acer glabrum</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rosa gymnocarpa</i> , <i>Spiraea betulifolia</i> , <i>Symphoricarpos albus</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Dwarf-shrub	<i>Chimaphila umbellata</i> , <i>Linnaea borealis</i> , <i>Mahonia repens</i>
Herb (field)	Forb	<i>Adenocaulon bicolor</i> , <i>Clintonia uniflora</i> , <i>Coptis occidentalis</i> , <i>Maianthemum stellatum</i> , <i>Thalictrum occidentale</i> , <i>Tiarella trifoliata</i> , <i>Viola orbiculata</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Arnica cordifolia*, *Calamagrostis rubescens*, *Chimaphila umbellata*, *Clintonia uniflora*, *Pinus contorta*

GLOBAL: *Aralia nudicaulis*, *Clintonia uniflora*, *Pinus contorta*, *Tiarella trifoliata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Cirsium arvense*, *Phleum pratense*, *Poa pratensis*, *Taraxacum officinale*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (2-Mar-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: With the comparatively recent emphasis on developing descriptions of (and keys to) existing vegetation (Grossman et al. 1998), it has yet to be determined at what cover values forest vegetation types will be distinguished one from another when the canopy tree species are mostly, or exclusively, seral in nature and have a broad environmental range (broad niche). Pfister et al. (1977) recognized *Pinus contorta* community types only when no other, more shade-tolerant tree species could be found on site. With *Pinus contorta*, which is exclusively seral, except with respect to some subspecies on unusual substrates or atypical environments, researchers in Glacier National Park took the position that this very shade-intolerant, stand-replacing fire-adapted species should have several times the cover of the next most abundant canopy species for a *Pinus contorta* type to be recognized. What is really being indicated by this second approach are areas that have experienced stand-replacing fires (or similar catastrophic disturbance, e.g., clearcutting). Another approach when treating existing vegetation could simply be to recognize the plurality of cover in assigning stands to particular associations. The stands representing this type are climax in a number of different tree series, including *Abies lasiocarpa*, *Abies grandis*, *Tsuga heterophylla*, *Tsuga mertensiana*, and *Thuja plicata*. That this association in fact occurs in the states and USFS Sections listed derives from this writer's interpretation of constancy/cover tables of various authors/publications; where *Pinus contorta* is listed as a major seral species, the inference has been made that stands quite likely occur on the landscape where this species strongly dominates the upper canopy (often observed throughout northern Idaho and western Montana) (S. Cooper pers. comm.). It should also be noted that this type is probably less common in zones where *Thuja plicata*, *Tsuga heterophylla*, and *Abies amabilis* are the climax dominants. This is because following disturbance in these zones the climax trees are quick to reclaim the site, i.e., they comprise a significant cover on the earliest forested successional stages (*Pinus contorta* may seldom be a major seral component on these sites and thus the association is rare as well), and *Pinus contorta* is favored by stand-replacing fire which is uncommon in these mesic forests. Note that the *Aralia nudicaulis* Phase of the *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Habitat Type (Pfister et al. 1977, Steele et al. 1981, Cooper et al. 1987) has been combined with the *Clintonia uniflora* Phase because it could not be established that it consistently defined unique environments. Thus, all of the recently defined, seral tree-dominated associations that had been subsumed in the *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Habitat Type are somewhat more broadly defined.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies grandis* / *Clintonia uniflora* Forest (CEGL000272)
- *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Forest (CEGL005912)
- *Larix occidentalis* / *Clintonia uniflora* Forest (CEGL005880)
- *Pseudotsuga menziesii* / *Clintonia uniflora* Forest (CEGL005850)
- *Thuja plicata* / *Clintonia uniflora* Forest (CEGL000474)
- *Tsuga heterophylla* / *Clintonia uniflora* Forest (CEGL000493)
- *Tsuga mertensiana* / *Clintonia uniflora* Forest (CEGL000504)

GLOBAL RELATED CONCEPTS:

- *Abies grandis* / *Acer circinatum* / *Clintonia uniflora* Plant Association (Lillybridge et al. 1995) I
- *Abies grandis* / *Acer glabrum* / *Clintonia uniflora* Plant Association (Williams et al. 1995) I
- *Abies grandis* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Pfister et al. 1977) I
- *Abies grandis* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Cooper et al. 1987) I
- *Abies grandis* / *Clintonia uniflora* Plant Association (Johnson and Simon 1987) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Aralia nudicaulis* Phase (Steele et al. 1981) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Aralia nudicaulis* Phase (Pfister et al. 1977) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Aralia nudicaulis* Phase (Cooper et al. 1987) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Steele et al. 1981) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Cooper et al. 1987) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Pfister et al. 1977) I
- *Abies lasiocarpa* / *Clintonia uniflora* Plant Association (Johnson and Simon 1987) I
- *Abies lasiocarpa* / *Clintonia uniflora* Plant Association (Williams et al. 1995) I
- *Abies lasiocarpa* / *Pachistima myrsinites* Habitat Type (Daubenmire and Daubenmire 1968) I
- *Thuja plicata* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Pfister et al. 1977) I
- *Thuja plicata* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Cooper et al. 1987) I
- *Tsuga heterophylla* / *Acer circinatum* / *Clintonia uniflora* Plant Association (Lillybridge et al. 1995) I

- *Tsuga heterophylla* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Pfister et al. 1977) I
- *Tsuga heterophylla* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Cooper et al. 1987) I
- *Tsuga heterophylla* / *Pachistima myrsinites* / *Clintonia uniflora* Plant Association (Lillybridge et al. 1995) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from throughout Glacier National Park, predominately west of the Continental Divide, and from Waterton Lakes National Park.

GLOBAL RANGE: This association occurs from the southern portion of the Idaho Batholith of central Idaho northward to the eastern fringes of the Colville National Forest of northeastern Washington, across northern Idaho and southeastern British Columbia and eastward into western Montana, predominantly west of the Continental Divide to its northeast extremes in southwestern Alberta.

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT:S5, OR, WA

USFS ECOREGIONS: M332A:CC, M332B:CC, M332C:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes); USFS (Colville NF, Wallowa-Whitman, Wenatchee)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.1022, GLAC.2008, GLAC.2013, GLAC.2057, GLAC.2058, GLAC.2200, GLAC.2205, GLAC.2503, GLAC.1023, GLAC.2663, WATE.4006, WATE.4007, WATE.4050, WATE.5006, WATE.5026, WATE.5028, WATE.5035, WATE.5039, WATE.5041, WATE.5095, WATE.5141, WATE.5146, WATE.5147, WATE.9015, WATE.9024, WATE.9028, WATE.9030.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Achuff et al. 2002a, Cooper et al. 1987, Cooper pers. comm., Daubenmire and Daubenmire 1968, Grossman et al. 1998, Johnson and Simon 1987, Lillybridge et al. 1995, Lotan and Perry 1983, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d., Williams and Lillybridge 1983, Williams et al. 1995

Pinus contorta / *Linnaea borealis* Forest

LOGEPOLE PINE / AMERICAN TWINFLOWER FOREST

IDENTIFIER: CEG000153

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b.)
Alliance	<i>Pinus contorta</i> Forest Alliance (A.118)
Alliance (English name)	Lodgepole Pine Forest Alliance
Association	<i>Pinus contorta</i> / <i>Linnaea borealis</i> Forest
Association (English name)	Lodgepole Pine / American Twinflower Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Lodgepole Pine Forest (CES306.820)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is found in the upper montane and subalpine zone of the central and northern Rocky Mountains. It is more common near and east of the Continental Divide. It typically occurs on cool, moist sites, often on north aspect middle to toeslopes, alluvial terraces and flats and benches. However, stands may occur on gentle to very steep slopes on any aspect. Soils are moderately well-drained, moderately deep silt or sandy loams, silts or silty clay loams derived from a variety of noncalcareous parent materials. Ground cover is mostly litter, often with duff over 6 cm deep. The vegetation is characterized by a *Pinus contorta*-dominated tree canopy with *Linnaea borealis* common in the understory. The tree canopy varies from moderately dense to nearly closed (40-90% cover) and may be solely dominated by *Pinus contorta*. However, some stands have scattered *Abies lasiocarpa*, *Larix occidentalis*, *Picea engelmannii*, *Picea glauca*, *Pinus albicaulis*, *Pinus ponderosa*, *Populus tremuloides*, or

Pseudotsuga menziesii trees present, especially in the subcanopy. Some stands have tall- or short-shrub layers composed of tree saplings, *Amelanchier alnifolia*, *Spiraea betulifolia*, *Symphoricarpos albus*, and *Vaccinium membranaceum*. *Linnaea borealis* (indicator species) is common in the dwarf-shrub layer. Other dwarf-shrubs may include *Juniperus communis* (usually found on dry sites), *Paxistima myrsinites*, and *Vaccinium scoparium*. The sparse to moderately dense (30-50% cover) herbaceous layer is variable and may be dominated or codominated by perennial graminoids such as *Calamagrostis rubescens*, *Carex geyeri*, *Carex rossii*, and *Oryzopsis asperifolia*, or forbs like *Arnica cordifolia*, *Campanula rotundifolia*, *Chamerion angustifolium*, and *Maianthemum stellatum*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This forest association is found on mesic sites of morainal or colluvial deposits. It occurs at mid elevations from 1500 to 1570 m (4920-5150 feet) on gentle to steep mid and upper slopes. The soil tends to be a well-drained Orthic Regosol. Stands can have high cover of litter/duff or bryophytes, but have little bare or rocky surface.

GLOBAL ENVIRONMENT: This association is found in the upper montane and subalpine zone of the central and northern Rocky Mountains. It is more common near and east of the Continental Divide. Elevations range from 1280 m (4200 feet) in the Little Rocky Mountains of north-central Montana to 2260 m (7400 feet) in Idaho and northwestern Wyoming. It typically occurs on cool, moist sites, often on north-aspect middle to toeslopes, alluvial terraces and flats and benches. However, stands may occur on gentle to very steep slopes on any aspect. Soils are moderately well-drained, moderately deep silt or sandy loams, silts or silty clay loams derived from a variety of noncalcareous parent materials such as glacial till, andesite, basalt colluvium, ash, (Cooper 1975, Pfister et al. 1977, Roberts 1980, Steele et al. 1981). Ground cover is mostly litter, often with duff over 6 cm deep.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This association is dominated by an open tree canopy (40-60% average cover) of *Pinus contorta*. The height of this species in the canopy is typically 10 to 15 m to somewhat taller. Other species that may occur in the canopy include *Pseudotsuga menziesii* and *Betula papyrifera*. The tree regeneration layer can consist of *Pinus contorta*, *Abies lasiocarpa*, and *Populus tremuloides*. The tall- and short-shrub layers are sparse with minimal cover. However, *Spiraea betulifolia* occupies the short-shrub layer with 5-15% cover, and *Vaccinium myrtillus* and *Linnaea borealis* occupy the dwarf-shrub layer with a combined average cover of 20%. The herbaceous layer has low to moderate cover (10-40%) and is dominated by *Arnica cordifolia*, *Campanula rotundifolia*, and *Chamerion angustifolium*. Bryophyte species, including *Hylocomium splendens*, *Ptilium crista-castrensis*, *Rhytidiopsis robusta*, and *Peltigera aphthosa*, have high cover on the ground surface in some occurrences.

GLOBAL VEGETATION: This forest association is characterized by a *Pinus contorta*-dominated tree canopy with *Linnaea borealis* common in the understory. The tree canopy varies from moderately dense to nearly closed (40-90% cover) and is often solely dominated by *Pinus contorta*. However, in some stands scattered *Abies lasiocarpa*, *Larix occidentalis*, *Picea engelmannii*, *Picea glauca*, *Pinus albicaulis*, *Pinus ponderosa*, *Populus tremuloides*, or *Pseudotsuga menziesii* trees may be present, especially in the subcanopy. Some stands have open to moderately dense tall- or short-shrub layers composed of tree saplings, *Amelanchier alnifolia*, *Spiraea betulifolia*, *Symphoricarpos albus*, and/or *Vaccinium membranaceum*. *Linnaea borealis* (indicator species) is common in the dwarf-shrub layer. Other dwarf-shrubs may include *Juniperus communis* (usually found on dry sites), *Paxistima myrsinites*, and *Vaccinium scoparium*. The sparse to moderately dense (30-50% cover) herbaceous layer is variable and may be dominated or codominated by perennial graminoids or forbs. Common graminoids include *Calamagrostis rubescens*, *Carex geyeri*, *Carex rossii*, or *Oryzopsis asperifolia*, and common forbs include *Arnica cordifolia*, *Campanula rotundifolia*, *Chamerion angustifolium*, *Lupinus argenteus*, *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Thalictrum occidentale*, and *Viola* spp.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Herb (field)	Forb	<i>Linnaea borealis</i>
Nonvascular	Moss	<i>Hylocomium splendens</i> , <i>Ptilium crista-castrensis</i> , <i>Rhytidiopsis robusta</i>
Nonvascular	Lichen	<i>Peltigera aphthosa</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Herb (field)	Forb	<i>Linnaea borealis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Linnaea borealis*, *Pinus contorta*

GLOBAL: *Linnaea borealis*, *Pinus contorta*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association may also occur in Idaho or Nevada.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Linnaea borealis* Forest (CEGL000315)
- *Pinus contorta* / *Vaccinium caespitosum* Forest (CEGL000168)
- *Pseudotsuga menziesii* / *Linnaea borealis* Forest (CEGL000441)

GLOBAL RELATED CONCEPTS:

- *Abies grandis* / *Linnaea borealis* Habitat Type (Cooper et al. 1987) B
- *Abies lasiocarpa* / *Linnaea borealis* Association (Johnson and Simon 1987) B
- *Abies lasiocarpa* / *Linnaea borealis* Habitat Type (Cooper 1975) B
- *Abies lasiocarpa* / *Linnaea borealis* Habitat Type (Steele et al. 1981) B
- *Pinus contorta* / *Linnaea borealis* Community Type (Steele et al. 1983) =
- *Pinus contorta* / *Linnaea borealis* Community Type (Pfister et al. 1977) =
- *Pinus contorta* / *Linnaea borealis* Community Type (Roberts 1980) =
- *Pinus contorta*/ *Linnaea borealis* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from three locations in Waterton Lakes National Park.

GLOBAL RANGE: This forest association is found in the upper montane and subalpine zone of the central and northern Rocky Mountains and is more common near and east of the Continental Divide.

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S5, OR:S2, WY:S3?

USFS ECOREGIONS: M331A:CC, M331J:CC, M332A:C?, M332C:CP, M332G:CC, M333C:CC

FEDERAL LANDS: NPS (Yellowstone); PC (Waterton Lakes); USFS (Shoshone, Wallowa-Whitman)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.5027, WATE.5038.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Cooper 1975, Cooper et al. 1987, Driscoll et al. 1984, Johnson and Simon 1987, Jones and Ogle 2000, Kagan et al. 2000, MTNHP 2002b, Pfister et al. 1977, Roberts 1980, Steele et al. 1981, Steele et al. 1983, Western Ecology Working Group n.d.

***Pinus contorta* / *Menziesia ferruginea* / *Clintonia uniflora* Forest**
LOGEPOLE PINE / FOOL'S-HUCKLEBERRY / BRIDE'S BONNET FOREST

IDENTIFIER: C EGL005922

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b.)
Alliance	<i>Pinus contorta</i> Forest Alliance (A.118)
Alliance (English name)	Lodgepole Pine Forest Alliance
Association	<i>Pinus contorta</i> / <i>Menziesia ferruginea</i> / <i>Clintonia uniflora</i> Forest
Association (English name)	Lodgepole Pine / Fool's-huckleberry / Bride's Bonnet Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Lodgepole Pine Forest (CES306.820)

ELEMENT CONCEPT

GLOBAL SUMMARY: This seral, large-patch to matrix lodgepole pine forest occupies the relatively cold and dry environments across a number of climax tree series and associated geographic regions. Thus, this cold mesic type is found throughout the northern Rocky Mountains and may extend as far west as the Cascade Crest on environments characterized as montane to lower and even mid-subalpine. The association's possible elevation range is from 915 to 1800 m (3000-5700 feet), and it consistently occurs on cool northwest- through east-facing slopes with moderate to extreme degrees of slope. It is generally associated with collecting positions from midslope to toeslope and foot-slopes when it occurs in subalpine zones, but in the more mesic montane zones, it can be found on all positions. The range of parent materials is literally as great as possible types occurring in the northern Rocky Mountains and northernmost middle Rocky Mountains and may include some ultramafics east of the Cascade Crest. The soils are acidic to very acidic, uniformly moderately well-drained to well-drained and have a highly variable coarse-fragment content. Ground surfaces have virtually no exposed rock or bare soil, and duff accumulations vary from moderate to deep. The overstory canopy is often on the cusp between open and closed (defined as 60%) and decidedly dominated by *Pinus contorta*, but its cover is often less than 40%. A number of other conifers may be present; on warmer sites these include *Thuja plicata*, *Tsuga heterophylla*, and *Abies grandis*, and on colder or higher elevation sites are found *Abies lasiocarpa*, *Tsuga mertensiana*, and *Picea engelmannii*. However, the most frequent canopy codominants or associates are the seral species *Larix occidentalis*, *Pseudotsuga menziesii*, and in a restricted portion of the type's range *Pinus monticola*. *Menziesia ferruginea* conspicuously dominates the tall-shrub layer. *Alnus viridis* ssp. *sinuata* and *Taxus brevifolia* are the only other tall shrubs consistently present. The short-shrub layer exhibits greater diversity with *Vaccinium membranaceum*, *Paxistima myrsinites*, *Rosa gymnocarpa*, *Rubus parviflorus*, and *Spiraea betulifolia* being consistently present. *Linnaea borealis*, *Chimaphila umbellata*, and *Vaccinium scoparium* have high constancy in the dwarf-shrub layer. *Bromus vulgaris* (or *Bromus ciliatus*) are the only graminoids of note. The diagnostic forbs *Clintonia uniflora* and *Tiarella trifoliata* have high constancy (both approaching 100%) and/or cover; however, a number of other forbs also exhibit high constancy across this type's range, including *Arnica latifolia*, (*Arnica cordifolia* at lower elevations), *Coptis occidentalis*, *Cornus canadensis*, *Galium triflorum*, *Goodyera oblongifolia*, *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, *Trillium ovatum*, *Viola orbiculata*, and *Xerophyllum tenax*. As with the forb layer, the bryoid layer cover apparently varies inversely with the degree of canopy closure.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this forest association are found predominately on middle portions of moderate to steep slopes of cool northwest to northeast aspects. These mesic sites are usually situated on glacial or colluvial deposits between the elevations of 1165 and 1637 m (3820-5370 feet). Soils tend to be well-drained sandy loams or rapidly drained Orthic Gray Luvisols. The ground surface is mostly covered with litter, duff, and wood.

GLOBAL ENVIRONMENT: This seral, large-patch to matrix type occupies relatively cold and moist environments across a number of climax tree series and associated geographic regions; the species defining these series include, but are not limited to, *Thuja plicata*, *Tsuga heterophylla*, *Tsuga mertensiana*, *Abies grandis*, *Abies lasiocarpa*, and *Picea engelmannii*. Thus, this cold mesic type is found throughout the northern Rocky Mountains and may extend as far west as the Cascade Crest on environments characterized as montane to lower and even mid-subalpine. The association's possible elevation range is from 915 to 1800 m (4000-5700 feet), and regardless of the climax series in which it is found, it consistently occurs on cool northwest- through east-facing slopes with moderate to extreme degrees of slope. It is generally associated with collecting positions from midslope to toeslope and foot-slopes when it occurs in subalpine zones, but in the more mesic montane zones, it can be found on all positions. It has been recorded as low as 910 m

(3000 feet) on benches and swales where cold air ponds. The range of parent materials is, with the exception of highly unusual substrates like serpentinite, literally as great as possible types occurring in the northern Rocky Mountains and northernmost middle Rocky Mountains and may include some ultramafics east of the Cascade Crest. It is difficult to simply characterize the soils as well, but they are uniformly moderately well-drained to well-drained and have a highly variable coarse-fragment content, but are mostly moderately gravelly throughout (at least when the type occurs in the subalpine zone). Soil reactions vary from acidic to very acidic. Ground surfaces have virtually no exposed rock or bare soil, and duff accumulations vary from moderate to deep.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This forest association is dominated by a pole to mature open tree canopy of *Pinus contorta* (37% average cover). *Picea engelmannii* is also present in 60% of stands and averages 6% cover. The tall-shrub layer includes *Alnus viridis* ssp. *sinuata* and *Salix scouleriana*. *Menziesia ferruginea* is almost always present in the short- to dwarf-shrub layer, and ranges in cover from 3-23%. Other shrubs within these layers include *Spiraea betulifolia*, *Rubus parviflorus*, and *Linnaea borealis*. The herbaceous layer is represented by a diversity of graminoids and forbs that contribute moderate canopy cover (58%). *Clintonia uniflora*, an indicator of mesic conditions, is always present, and *Chimaphila umbellata* nearly so, but they both tend to have insignificant average cover. Species that are present in 60% of stands and contribute low average cover include *Arnica cordifolia*, *Xerophyllum tenax*, and *Calamagrostis rubescens*. Other common species are *Goodyera oblongifolia*, *Viola orbiculata*, and *Hieracium albiflorum*. Nonvascular species contribute 12% average total cover.

GLOBAL VEGETATION: The overstory canopy is often, especially in subalpine environments, on the cusp between open and closed (currently defined as 60%) and decidedly dominated by *Pinus contorta*, but its cover is often less than 40%. A whole host of tree species is capable of playing a subordinate role early in the sere; on warmer sites these include *Thuja plicata*, *Tsuga heterophylla*, and *Abies grandis*, and on colder or higher elevation sites are found *Abies lasiocarpa*, *Tsuga mertensiana*, and *Picea engelmannii*. However, the most frequent canopy codominants or associates are the seral species *Larix occidentalis*, *Pseudotsuga menziesii*, and in a restricted portion of the type's range *Pinus monticola*. *Menziesia ferruginea* conspicuously dominates the tall-shrub layer, however, its height is quite dependent on environment, exceeding 3.5 m (10 feet) on montane slopes and actually classed as a short shrub (<2 m [6.5 feet]) within much of its subalpine range (where sites are potentially dominated by *Abies lasiocarpa*, *Picea engelmannii*, and *Tsuga mertensiana*); *Alnus viridis* ssp. *sinuata* and *Taxus brevifolia* (predominantly in Idaho and western Montana) are the only other tall shrubs consistently present. The short-shrub layer exhibits greater diversity than the other shrub components with *Vaccinium membranaceum*, *Paxistima myrsinites*, *Rosa gymnocarpa*, *Rubus parviflorus*, and *Spiraea betulifolia* being consistently present. In the montane environments *Linnaea borealis* and *Chimaphila umbellata* have high constancy in the dwarf-shrub layer, whereas in the subalpine they are considerably reduced, and *Vaccinium scoparium* is consistently present with up to 50% cover. *Bromus vulgaris* (or *Bromus ciliatus*) are the only graminoids of note. The diagnostic forbs *Clintonia uniflora* and *Tiarella trifoliata* have high constancy (both approaching 100%) and/or cover; however, a number of other forbs also exhibit high constancy across this type's range, including *Arnica latifolia*, (*Arnica cordifolia* at lower elevations), *Coptis occidentalis* (peculiar to central and northern Idaho), *Cornus canadensis*, *Galium triflorum*, *Goodyera oblongifolia*, *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, *Trillium ovatum*, *Viola orbiculata*, and *Xerophyllum tenax*. As with the forb layer, bryoid cover apparently varies inversely with the degree of canopy closure; however, tree canopy closure here is never what it is on sites lacking such a prolific tall-shrub layer.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Alnus viridis</i> ssp. <i>sinuata</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Menziesia ferruginea</i>
Herb (field)	Forb	<i>Clintonia uniflora</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Pinus contorta</i> , <i>Pseudotsuga menziesii</i>
Tall shrub/sapling	Needle-leaved shrub	<i>Taxus brevifolia</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Alnus viridis</i> ssp. <i>sinuata</i> , <i>Menziesia ferruginea</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus parviflorus</i> , <i>Vaccinium membranaceum</i>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Paxistima myrsinites</i>
Herb (field)	Dwarf-shrub	<i>Chimaphila umbellata</i> , <i>Linnaea borealis</i> , <i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Clintonia uniflora</i> , <i>Thalictrum occidentale</i> , <i>Tiarella trifoliata</i> , <i>Xerophyllum tenax</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Clintonia uniflora*, *Menziesia ferruginea*, *Pinus contorta*

GLOBAL: *Clintonia uniflora*, *Menziesia ferruginea*, *Pinus contorta*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Bromus inermis*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4G5 (2-Mar-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This is a seral stage of the *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Menziesia ferruginea* Phase of Pfister et al. (1977); the abundant representation of *Picea engelmannii* in the reproductive layers indicates the future direction canopy composition will take.

GLOBAL COMMENTS: With the comparatively recent emphasis on developing descriptions of (and keys to) existing vegetation (Grossman et al. 1998), it has yet to be determined at what cover value forest vegetation types will be distinguished one from another when the canopy tree species are mostly, or exclusively, seral in nature and have a broad environmental range (broad niche). Pfister et al. (1977) recognized *Pinus contorta* community types only when no other, more shade-tolerant tree species could be found on site. With *Pinus contorta*, which is exclusively seral except with respect to some subspecies on unusual substrates or atypical environments, researchers in Glacier National Park took the position that this very shade-intolerant, stand-replacing fire-adapted species should have several times the cover of the next most abundant canopy species for a *Pinus contorta* type to be recognized. What is really being indicated by this approach are areas having experienced stand-replacing fires (or similar catastrophic disturbance, e.g., clearcutting). Another approach could simply recognize the plurality of cover in assigning stands to particular associations treating existing vegetation. The stands representing this type are climax in a number of different tree series, including *Abies lasiocarpa*, *Abies grandis*, *Tsuga heterophylla*, *Tsuga mertensiana*, and *Thuja plicata*. That this association in fact occurs in the states and USFS Sections listed derives from this writer's interpretation of constancy/cover tables of various authors/publications; where *Pinus contorta* is listed as a major seral species, the inference has been made that stands quite likely occur on the landscape where this species strongly dominates the upper canopy (often observed throughout northern Idaho and western Montana) (S. Cooper pers. comm.). It should also be noted that this type is probably less common in zones where *Thuja plicata*, *Tsuga heterophylla*, and *Abies amabilis* are the climax dominants. This is because, following disturbance in these zones, the climax trees are quick to reclaim the site, i.e., they comprise a significant cover on the earliest forested successional stages (*Pinus contorta* may seldom be a major seral component on these sites and thus the association is rare as well), and *Pinus contorta* is favored by stand-replacing fire which is uncommon in these mesic forests.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies grandis* / *Clintonia uniflora* Forest (CEGL000272)
- *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Forest (CEGL005912)
- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005893)
- *Picea (engelmannii X glauca, engelmannii)* / *Clintonia uniflora* Forest (CEGL000406)
- *Pinus contorta* / *Menziesia ferruginea* Forest (CEGL005928)
- *Pseudotsuga menziesii* / *Clintonia uniflora* Forest (CEGL005850)
- *Pseudotsuga menziesii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005851)
- *Thuja plicata* / *Clintonia uniflora* Forest (CEGL000474)
- *Tsuga heterophylla* / *Clintonia uniflora* Forest (CEGL000493)
- *Tsuga mertensiana* / *Clintonia uniflora* Forest (CEGL000504)

GLOBAL RELATED CONCEPTS:

- *Abies grandis* / *Clintonia uniflora* Habitat Type, *Menziesia ferruginea* Phase (Cooper et al. 1987) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Menziesia ferruginea* Phase (Pfister et al. 1977) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Menziesia ferruginea* Phase (Cooper et al. 1987) I
- *Abies lasiocarpa* / *Rhododendron albiflorum* / *Xerophyllum tenax* Plant Association (Williams et al. 1995) I
- *Abies lasiocarpa* / *Rhododendron albiflorum* Plant Association (Williams et al. 1995) I
- *Picea engelmannii* - *Abies lasiocarpa* / *Menziesia ferruginea* - *Tiarella trifoliata* Habitat Type (Ogilvie 1962) I
- *Thuja plicata* / *Clintonia uniflora* Habitat Type, *Menziesia ferruginea* Phase (Cooper et al. 1987) I
- *Tsuga heterophylla* / *Clintonia uniflora* Habitat Type, *Menziesia ferruginea* Phase (Cooper et al. 1987) I
- *Tsuga mertensiana* / *Clintonia uniflora* Habitat Type, *Menziesia ferruginea* Phase (Cooper et al. 1987) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from throughout Glacier National Park and Waterton Lakes National Park.

GLOBAL RANGE: This association occurs from the southern portion of the Idaho Batholith of central Idaho northward to the eastern fringes of the Colville National Forest of northeastern Washington and across northern Idaho and into western Montana, predominantly west of the Continental Divide, and as far eastward as southwestern Alberta. Given the opportunity for more complete crosswalking, this type might well be documented from British Columbia and the east slope of the Cascades.

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT:S4, OR?, WA?

USFS ECOREGIONS: M242C:??, M332A:CC, M332B:CC, M332C:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes); USFS (Colville NF)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2294, GLAC.60, GLAC.293, WATE.5036, WATE.9016.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Achuff et al. 2002a, Cooper et al. 1987, Cooper pers. comm., Daubenmire and Daubenmire 1968, Grossman et al. 1998, Johnson and Simon 1987, Lillybridge et al. 1995, Ogilvie 1962, Pfister et al. 1977, Western Ecology Working Group n.d., Williams et al. 1995

Pinus contorta / *Menziesia ferruginea* Forest LODGEPOLE PINE / FOOL'S-HUCKLEBERRY FOREST

IDENTIFIER: CEG005928

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b.)
Alliance	<i>Pinus contorta</i> Forest Alliance (A.118)
Alliance (English name)	Lodgepole Pine Forest Alliance
Association	<i>Pinus contorta</i> / <i>Menziesia ferruginea</i> Forest
Association (English name)	Lodgepole Pine / Fool's-huckleberry Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Lodgepole Pine Forest (CES306.820)

ELEMENT CONCEPT

GLOBAL SUMMARY: This subalpine forest association is known from the northern Rocky Mountains from northwestern Montana and northern Idaho. It occurs on relatively cold and mesic sites ranging from 1500 to 2200 m (4900-7200 feet), but may extend down to 915 m (3000 feet) in frost pockets. Sites at lower elevation and latitude are typically found on sheltered, steep, northerly aspects. Higher elevation sites also occur on gentler slopes with eastern and more westerly aspects. The vegetation is characterized by an overstory tree canopy dominated by *Pinus contorta* with *Menziesia ferruginea* prominent in the understory. The tree subcanopy may be dominated by *Picea engelmannii* with *Pinus albicaulis* or *Populus tremuloides* present. *Menziesia ferruginea* is important (10% or more cover) in the short-shrub layer. *Vaccinium membranaceum*, *Vaccinium myrtillus*, or *Vaccinium scoparium* (in drier and higher elevation sites) occupies the dwarf-shrub layer. The sparse to moderately dense herbaceous layer is composed of a variety of forbs.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: A stand of this forest association is found at 1569 m (5143 feet) on a moderate northwest-facing toeslope that is situated on bedrock and till. The soil tends to be a grayish pink, well-drained sandy loam with 55% gravel. The majority of the ground surface is covered with litter and duff.

GLOBAL ENVIRONMENT: This subalpine forest association is known from the northern Rocky Mountains. It occurs on relatively cold and mesic sites ranging from 1500 to 2200 m (4900-7200 feet), but may extend down to 915 m (3000 feet) in frost pockets. Sites at lower elevation and latitude are typically found on sheltered, steep, northerly aspects. Higher elevation sites also occur on gentler slopes with eastern and more westerly aspects and protected ridgeline benches. Though sites are relatively mesic, higher elevation sites are often located on slopes that receive additional moisture from blowing snow, and are stressful due the frequency of high winds and cold temperatures. Parent materials are various, typically comprised of colluvium derived from gneiss, quartzite, schist phyllite, or granites. Soil texture is often silt or silt loam. Litter dominates the ground cover.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This forest association is dominated by a pole to mature dense tree canopy (80% cover) of *Pinus contorta*. The tree subcanopy is dominated by *Picea engelmannii*. *Menziesia ferruginea* (10% cover) is prominent in the short-shrub layer, and *Vaccinium myrtillus* occupies the dwarf-shrub layer. The herbaceous layer is largely comprised of an assortment of forbs. The most abundant forbs are *Orthilia secunda* and *Chimaphila umbellata* with average covers of 20% and 10%, respectively. Other forbs each contribute less than 10% cover.

GLOBAL VEGETATION: This forest association is characterized by an overstory tree canopy dominated by *Pinus contorta* with *Menziesia ferruginea* prominent in the understory. The tree subcanopy may be dominated by *Picea engelmannii* with *Pinus albicaulis* or *Populus tremuloides* present. *Menziesia ferruginea* is important (10% or more cover) in the short-shrub layer. Northern stands may be codominated by *Rhododendron albiflorum*. *Vaccinium membranaceum*, *Vaccinium myrtillus*, or *Vaccinium scoparium* (in drier and higher elevation sites) occupy the dwarf-shrub layer. The sparse to moderately dense herbaceous layer is composed of a variety of forbs. The most common species are *Arnica latifolia*, *Chimaphila umbellata*, *Goodyera oblongifolia*, *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, *Viola orbiculata*, and *Xerophyllum tenax*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Tree subcanopy	Needle-leaved tree	<i>Picea engelmannii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Menziesia ferruginea</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium myrtillus</i>
Herb (field)	Forb	<i>Chimaphila umbellata</i> , <i>Orthilia secunda</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Menziesia ferruginea</i> , <i>Vaccinium membranaceum</i> , <i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Arnica latifolia</i> , <i>Orthilia secunda</i> , <i>Thalictrum occidentale</i> , <i>Xerophyllum tenax</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Pinus contorta*

GLOBAL: *Menziesia ferruginea*, *Pinus contorta*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4 (5-Apr-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association includes *Pinus contorta*-dominated stands within the *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type (Pfister et al. 1977) and both the *Vaccinium scoparium* and *Xerophyllum tenax* phases of *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type and the *Xerophyllum tenax* Phase of *Tsuga mertensiana* / *Menziesia ferruginea* Habitat Type of Cooper et al. (1987) for northern Idaho.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* Forest (CEGL000319)
- *Pinus contorta* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005922)
- *Tsuga mertensiana* / *Menziesia ferruginea* Forest (CEGL000506)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type (Pfister et al. 1977) B
- *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type, *Vaccinium scoparium* Phase (Cooper et al. 1987) B
- *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987) B
- *Tsuga mertensiana* / *Menziesia ferruginea* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from Glacier National Park, east of the Continental Divide near Red Rock Falls.

GLOBAL RANGE: This subalpine forest association is known from the northern Rocky Mountains from northwestern Montana and northern Idaho. It is likely to occur in the mountains of Alberta.

NATIONS: CA?, US

STATES/PROVINCES: AB?, ID, MT:S3?

USFS ECOREGIONS: M332C:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.330.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Cooper et al. 1987, Pfister et al. 1977, Western Ecology Working Group n.d.

***Pinus contorta* / *Spiraea betulifolia* Forest**

LOGEPOLE PINE / SHINYLEAF MEADOWSWEET FOREST

IDENTIFIER: CEGL000164

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b.)
Alliance	<i>Pinus contorta</i> Forest Alliance (A.118)
Alliance (English name)	Lodgepole Pine Forest Alliance
Association	<i>Pinus contorta</i> / <i>Spiraea betulifolia</i> Forest
Association (English name)	Lodgepole Pine / Shinyleaf Meadowsweet Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Lodgepole Pine Forest (CES306.820)

ELEMENT CONCEPT

GLOBAL SUMMARY: This subalpine forest association is known from the central and northern Rocky Mountains from northwestern Wyoming, across Idaho and western Montana into Canada. Elevations range from 1070 to 2500 m (3500-8200 feet). Stands occur on a variety of sites from steep colluvial slopes to gentle rolling terrain on relatively warm, dry sites. Sites at lower

elevation and latitude are typically restricted to northerly aspects or limestone substrate. Higher elevation sites occur on a variety of aspects with the most northerly stands restricted to dry southern aspects. Parent materials are various. Tree litter is often 4-6 cm deep and dominates ground cover. Vegetation is characterized by an overstory tree canopy dominated by *Pinus contorta* with *Spiraea betulifolia* prominent in the understory. *Picea engelmannii*, *Pseudotsuga menziesii*, or *Populus tremuloides* may be present in the subcanopy. Sites are generally too cool for *Pinus ponderosa*. *Spiraea betulifolia* is a major component in the short-shrub layer with *Mahonia repens* or *Paxistima myrsinites* sometimes abundant. Other common shrubs include *Acer glabrum*, *Amelanchier alnifolia*, *Lonicera utahensis*, *Prunus virginiana*, *Shepherdia canadensis*, *Sorbus scopulina*, *Symphoricarpos oreophilus*, or *Symphoricarpos albus*. The sparse to moderately dense herbaceous layer is dominated by graminoids *Calamagrostis rubescens*, *Carex geyeri*, *Festuca idahoensis*, or *Pseudoroegneria spicata*, with a variety of forbs.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this forest association are found at an average elevation of 1585 m (5197 feet) on all positions of moderate southeast-facing to southwest-facing slopes and ridges. These mesic sites are usually situated on thin colluvial or glacial deposits. Soils tend to be well-drained and of various types. The ground surface is mostly covered with litter and duff, and a low percentage of small rocks is present.

GLOBAL ENVIRONMENT: This subalpine forest association is known from the central and northern Rocky Mountains. Elevations range from 1070 to 2500 m (3500-8200 feet). Stands occur on a variety of sites from steep colluvial slopes to gentle rolling terrain on relatively warm, dry sites. Sites at lower elevation and latitude are typically restricted to northerly aspects or limestone substrate. Higher elevation sites occur on a variety of aspects with the most northerly stands restricted to dry southern aspects. Parent materials are various, typically comprised of colluvium or residuum derived from andesite, basalt, granites, gneiss, quartzite, schist phyllite, or limestone. Soils tend to be coarser textured, gravelly loam, sandy loam, or sandy clay. Tree litter, often 4-6 cm deep, dominates the ground cover.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This forest association is dominated by a pole to mature open tree canopy of *Pinus contorta* (41% average cover). The height of this species varies between 5 and 15 m. Tree seedlings established in the understory are *Picea engelmannii*, *Pinus contorta*, and *Abies lasiocarpa*. The tall-shrub layer is insignificant. *Spiraea betulifolia* dominates the short-shrub layer with 14% average cover. Other shrubs at less than 1 m in height are *Shepherdia canadensis*, *Juniperus communis*, and *Amelanchier alnifolia*. The herbaceous layer is diverse, but no one species contributes significant cover. Most species average less than 5% average cover. Common species include *Campanula rotundifolia*, *Arnica cordifolia*, *Calamagrostis rubescens*, and *Eurybia conspicua* (= *Aster conspicuus*).

GLOBAL VEGETATION: This forest association is characterized by an overstory tree canopy dominated by *Pinus contorta* with *Spiraea betulifolia* prominent in the understory. *Picea engelmannii*, *Abies lasiocarpa*, *Pseudotsuga menziesii*, or *Populus tremuloides* may be present in the subcanopy. Sites are generally too cool for *Pinus ponderosa*. *Spiraea betulifolia* is a major component in the short-shrub layer with *Mahonia repens* or *Paxistima myrsinites* sometimes abundant. Other common shrubs include *Acer glabrum*, *Amelanchier alnifolia*, *Lonicera utahensis*, *Prunus virginiana*, *Ribes viscosissimum*, *Shepherdia canadensis*, *Sorbus scopulina*, *Symphoricarpos oreophilus*, or *Symphoricarpos albus*. The sparse to moderately dense herbaceous layer is dominated by graminoids *Calamagrostis rubescens*, *Carex geyeri*, *Elymus glaucus*, *Festuca idahoensis*, or *Pseudoroegneria spicata*, with a variety of forbs. The most common forb species are *Arnica cordifolia*, *Astragalus miser*, *Balsamorhiza sagittata*, *Fragaria virginiana*, *Goodyera oblongifolia*, *Hieracium albiflorum*, *Maianthemum racemosum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Orthilia secunda* (= *Pyrola secunda*), *Chamerion angustifolium*, *Chimaphila umbellata*, *Geranium viscosissimum*, *Campanula rotundifolia*, *Fragaria virginiana*, and *Thalictrum occidentale*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i>
Herb (field)	Forb	<i>Campanula rotundifolia</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Spiraea betulifolia*

GLOBAL: *Calamagrostis rubescens*, *Carex geyeri*, *Pinus contorta*, *Spiraea betulifolia*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association includes *Pinus contorta*-dominated stands within the *Pseudotsuga menziesii* / *Spiraea betulifolia* Habitat Type of Cooper et al. (1987), Pfister et al. (1977), Steele et al. (1981, 1983), but not the *Pinus ponderosa* Phase of Steele et al. (1981). This association also includes lodgepole-dominated stands of the *Abies lasiocarpa* / *Spiraea betulifolia* Habitat Type (Steele et al. 1981, 1983). *Pinus contorta* is not a seral component of the *Pseudotsuga menziesii* / *Spiraea betulifolia* or *Abies lasiocarpa* / *Spiraea betulifolia* plant associations described in Johnson and Simon (1987) for northeastern Oregon.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* / *Spiraea betulifolia* Forest (CEGL000335)
- *Pinus contorta* / *Calamagrostis rubescens* Forest (CEGL000139)
- *Populus tremuloides* - Conifer / *Spiraea betulifolia* - *Symphoricarpos albus* Forest (CEGL005911)
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Woodland (CEGL000429)
- *Pseudotsuga menziesii* / *Spiraea betulifolia* Forest (CEGL000457)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Spiraea betulifolia* Habitat Type (Steele et al. 1983) B
- *Abies lasiocarpa* / *Spiraea betulifolia* Habitat Type (Steele et al. 1981) B
- *Pinus contorta* / *Spiraea betulifolia* Community Type (Steele et al. 1983) =
- *Pinus contorta*/ *Spiraea betulifolia* (Bourgeron and Engelking 1994) =
- *Pseudotsuga menziesii* / *Spiraea betulifolia* Habitat Type (Cooper et al. 1987) B
- *Pseudotsuga menziesii* / *Spiraea betulifolia* Habitat Type (Pfister et al. 1977) B
- *Pseudotsuga menziesii* / *Spiraea betulifolia* Habitat Type (Steele et al. 1983) B
- *Pseudotsuga menziesii* / *Spiraea betulifolia* Habitat Type, *Calamagrostis rubescens* Phase (Steele et al. 1981) B
- *Pseudotsuga menziesii* / *Spiraea betulifolia* Habitat Type, *Spiraea betulifolia* Phase (Steele et al. 1981) B
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from one stand in Glacier National Park, east of the Continental Divide off of Swiftcurrent Trail. It is also known from three stands in Waterton Lakes National Park.

GLOBAL RANGE: This subalpine forest association is known from the central and northern Rocky Mountains from northwestern Wyoming, across Idaho and western Montana into Canada.

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT?, WY:S3

USFS ECOREGIONS: M331A:CC, M331D:CC, M331J:CC, M332A:C?, M332B:CC, M332C:CC, M332E:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton, Yellowstone); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.255, WATE.4086, WATE.4130, WATE.5044.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz, mod. G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Cooper et al. 1987, Driscoll et al. 1984, Johnson and Simon 1987, MTNHP 2002b, Pfister et al. 1977, Steele et al. 1981, Steele et al. 1983, Western Ecology Working Group n.d.

***Pinus contorta* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest**
LOGEPOLE PINE / DWARF BLUEBERRY / BRIDE'S BONNET FOREST

IDENTIFIER: C EGL005923

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b.)
Alliance	<i>Pinus contorta</i> Forest Alliance (A.118)
Alliance (English name)	Lodgepole Pine Forest Alliance
Association	<i>Pinus contorta</i> / <i>Vaccinium caespitosum</i> / <i>Clintonia uniflora</i> Forest
Association (English name)	Lodgepole Pine / Dwarf Blueberry / Bride's Bonnet Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Lodgepole Pine Forest (CES306.820)

ELEMENT CONCEPT

GLOBAL SUMMARY: This lodgepole pine forest association is a minor small- to large-patch type reported from northwestern Montana and southwestern Canadian Rockies, (it is not reported for northern Idaho), and is a minor type on the Colville and Okanogan national forests of northeastern and north-central Washington. In Montana its elevation range is documented to be 945 to 1650 m (3100-5400 feet); in northeastern Washington it occurs from 610 to 1525 m (2000-5000 feet). In Montana it is described from basins and river terraces and benchlands often having restricted drainages. In Washington it occurs predominantly on xero-riparian sites located in valley bottoms. The commonality of these environments is their potential to be frost pockets or at least areas where cold air ponds; daytime temperatures are contrastingly warm. Parent materials include volcanic ash deposited over glacial drift, coarse alluvium or fine alluvium over, or with, an appreciable gravel content, glacial till. Upper soil profiles are well- to excessively drained, but the compacted subsoils promote seasonally high water tables. The upper canopy generally has an open structure, dominated by *Pinus contorta* with well-scattered *Pseudotsuga menziesii* and *Larix occidentalis*. The subcanopy usually has low cover and is a mix of *Abies lasiocarpa*, *Picea engelmannii*, and occasionally *Abies grandis*. A tall-shrub component is conspicuously absent. The short-shrub component has a minor representation with *Vaccinium membranaceum*, *Spiraea betulifolia*, *Lonicera utahensis*, *Paxistima myrsinites*, *Amelanchier alnifolia*, *Shepherdia canadensis*, and *Juniperus communis* consistently present and the first-named often having cover in excess of 10%. The dwarf-shrub layer is the dominant component and, within it the appreciable cover (at least 3%) of *Vaccinium caespitosum*, is strongly indicative of a frosty microclimate and perhaps well-drained substrates. Other high-constancy (and variable cover) dwarf-shrubs include *Linnaea borealis*, *Arctostaphylos uva-ursi*, *Mahonia repens* (= *Berberis repens*), and *Chimaphila umbellata*. *Calamagrostis rubescens* and *Carex concinnoides* have very high constancy, and *Calamagrostis* cover is generally in excess of 10%, even capable of forming a sward that partially obscures the dwarf-shrub layer. The diverse forb component, in addition to the indicator *Clintonia uniflora*, regularly contains *Hieracium albiflorum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Cornus canadensis*, *Viola orbiculata*, *Maianthemum stellatum* (= *Smilacina stellata*), *Maianthemum racemosum* (= *Smilacina racemosa*), *Arnica latifolia*, and *Goodyera oblongifolia*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: They are found predominantly on benches and may extend to gentle slopes of low ridges. These mesic sites are usually situated on various types of glacial deposits between the elevations of 1110 and 1647 m (3640-5400 feet). The aspect varies for these sites, but they are rarely found on north-facing slopes. Soils tend to be well-drained sandy loams. The ground surface is mostly covered with litter and duff, and a moderate amount of wood is present. Less than one-half of sampled stands shows evidence of disturbance by either fire or beetle infestation.

GLOBAL ENVIRONMENT: This association is a minor small- to large-patch type that has a somewhat anomalous distribution, being reported as common throughout the upper Flathead River drainage and elsewhere in northwestern Montana, not reported for northern Idaho, and again comprising a minor type on the Colville and Okanogan national forests of northeastern and north-central Washington. In Montana its elevation range is documented to be 945 to 1650 m (3100-5400 feet); in northeastern Washington it occurs from 2000 to 5000 feet with most occurrences between 915 to 1220 m (3000-4000 feet). In Montana it is described from basins and river terraces and benchlands often having restricted drainages. In Washington it occurs predominantly on xero-riparian sites

located in valley bottoms. The commonality of these environments is their potential to be frost pockets or at least areas where cold air ponds; daytime temperatures are contrastingly warm. Parent materials include volcanic ash deposited over glacial drift, coarse alluvium or fine alluvium over, or with, an appreciable gravel content, glacial till (which may have been compacted). Thus upper soil profiles are well- to excessively drained, but the compacted subsoils promote seasonally high water tables.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This forest association is dominated by a pole to mature open canopy of *Pinus contorta* (31% average cover). *Pinus contorta* and *Abies lasiocarpa* are most abundant in the tree subcanopy. Tree seedlings established in the understory are *Pinus contorta*, *Abies lasiocarpa*, *Pseudotsuga menziesii*, and *Picea engelmannii*. *Amelanchier alnifolia*, *Sorbus scopulina*, and *Spiraea betulifolia* are found in the sparse tall- to short-shrub layer. The dwarf-shrub layer, at less than 1 m in height, is usually dominated by *Vaccinium caespitosum*, which is always present and ranges in cover from 1 to 43%; this species is considered to be a reliable indicator of frost-pocket conditions or areas where cold air ponds for considerable periods. Other common dwarf-shrubs are *Mahonia repens*, *Linnaea borealis*, and *Arctostaphylos uva-ursi*. The lush herbaceous layer is diverse with a mixture of graminoids and forbs. *Clintonia uniflora*, an indicator species, is always present, but has low average cover. Other common species are *Calamagrostis rubescens*, *Arnica cordifolia*, *Chimaphila umbellata*, and *Eurybia conspicua* (= *Aster conspicuus*). There is also minimal cover of nonvascular species.

GLOBAL VEGETATION: The upper canopy generally has an open structure, dominated by *Pinus contorta* with well-scattered *Pseudotsuga menziesii* and *Larix occidentalis*. The subcanopy usually has low cover and is a mix of *Abies lasiocarpa*, *Picea engelmannii*, and occasionally *Abies grandis*. A tall-shrub component is conspicuously absent. The short-shrub component usually exhibits low cover with *Vaccinium membranaceum*, *Spiraea betulifolia*, *Lonicera utahensis*, *Paxistima myrsinites*, *Amelanchier alnifolia*, *Shepherdia canadensis*, *Symphoricarpos albus*, and *Juniperus communis* consistently present and the first-named often having cover in excess of 10%. The dwarf-shrub layer is the dominant component and, within it the appreciable cover (at least 3%) of *Vaccinium caespitosum*, is strongly indicative of a frosty microclimate and perhaps well-drained substrates; in yet higher coverage, *Arctostaphylos uva-ursi* is also indicative of these conditions. Other high-constancy (and variable cover) dwarf-shrubs include *Linnaea borealis*, *Mahonia repens* (= *Berberis repens*), and *Chimaphila umbellata*. The graminoids *Calamagrostis rubescens* and *Carex concinnoides* have very high constancy, and *Calamagrostis* cover is generally in excess of 10%, even capable of forming a sward that partially obscures the dwarf-shrub layer. The diverse forb component, in addition to the indicators *Clintonia uniflora* and *Tiarella trifoliata*, regularly contains *Hieracium albiflorum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Cornus canadensis*, *Viola orbiculata*, *Maianthemum stellatum* (= *Smilacina stellata*), *Maianthemum racemosum* (= *Smilacina racemosa*), *Arnica cordifolia*, *Orthilia secunda* (= *Pyrola secunda*), and *Goodyera oblongifolia*. The Montana stands differ by the high constancy of *Xerophyllum tenax*; its cover frequently exceeds 40%.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium caespitosum</i>
Herb (field)	Forb	<i>Clintonia uniflora</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i> , <i>Symphoricarpos albus</i>
Herb (field)	Dwarf-shrub	<i>Arctostaphylos uva-ursi</i> , <i>Linnaea borealis</i> , <i>Vaccinium caespitosum</i>
Herb (field)	Forb	<i>Clintonia uniflora</i> , <i>Osmorhiza berteroi</i> , <i>Xerophyllum tenax</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Clintonia uniflora*, *Vaccinium caespitosum*

GLOBAL: *Arctostaphylos uva-ursi*, *Pinus contorta*, *Tiarella trifoliata*, *Vaccinium caespitosum*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Phleum pratense*, *Trifolium pratense*, *Trifolium repens*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4? (2-Mar-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: The type is in a very early successional stage.

GLOBAL COMMENTS: With the comparatively recent emphasis on developing descriptions of (and keys to) existing vegetation (Grossman et al. 1998), it has yet to be determined at what cover value forest vegetation types will be distinguished one from another when the canopy tree species are mostly, or exclusively seral in nature and have a broad environmental range (broad niche). Pfister et al. (1977) recognized *Pinus contorta* community types only when no other, more shade-tolerant tree species could be found on site. With *Pinus contorta*, which is exclusively seral except with respect to some subspecies on unusual substrates or atypical environments, researchers in Glacier National Park took the position that this very shade-intolerant, stand-replacing fire-adapted species should have several times the cover of the next most abundant canopy species for a *Pinus contorta* type to be recognized. What is really being indicated by this approach are areas having experienced stand-replacing fires (or similar catastrophic disturbance, e.g., clearcutting). Another approach could simply recognize the plurality of cover in assigning stands to particular associations treating existing vegetation. That this association in fact occurs in the states and USFS Sections listed derives from this writer's interpretation of constancy/cover tables of various authors/publications; where *Pinus contorta* is listed as a major seral species, the inference has been made that stands quite likely occur on the landscape where this species strongly dominates the upper canopy (often observed throughout northern Idaho and western Montana) (S. Cooper pers. comm.). If *Cornus canadensis* is accorded indicator status (of mesic environments) equivalent to *Clintonia uniflora* and *Tiarella trifoliata*, then this type may extend as far north as Banff National Park.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Forest (CEGL005912)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (CEGL005918)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium caespitosum* Forest (CEGL000340)
- *Pinus contorta* / *Arctostaphylos uva-ursi* Forest (CEGL000134)
- *Pinus contorta* / *Vaccinium caespitosum* Forest (CEGL000168)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Vaccinium caespitosum* Phase (Pfister et al. 1977) I
- *Abies lasiocarpa* / *Vaccinium caespitosum* Plant Association (Williams et al. 1995) I
- *Abies lasiocarpa* / *Vaccinium caespitosum* Plant Association (Kovalchik 1993) I
- *Pinus contorta* / *Arnica cordifolia* - *Spiraea betulifolia* Vegetation Type (Achuff et al. 2002a) I
- *Pinus contorta* / *Vaccinium caespitosum* Vegetation Type (Achuff and Corns 1982) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from nine stands throughout Glacier National Park, and from four stands in Waterton Lakes National Park.

GLOBAL RANGE: This association is known to occur from northwestern Montana and southwestern Canadian Rockies to the northeastern Washington and the east slope of the Cascade Range, with a conspicuous gap in northern Idaho that probably will be filled in with additional inventory in this region. If *Cornus canadensis* is accorded indicator status (of mesic environments) equivalent to *Clintonia uniflora* and *Tiarella trifoliata*, then this association may extend as far north as Banff National Park.

NATIONS: CA, US

STATES/PROVINCES: AB, ID?, MT:S4, WA

USFS ECOREGIONS: M242C:PP, M332B:CC, M332C:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes); USFS (Colville NF, Okanogan)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.1005, GLAC.129, GLAC.130, GLAC.2260, GLAC.2291, GLAC.2296, GLAC.52, GLAC.6, GLAC.7, WATE.4011, WATE.5018, WATE.5139, WATE.5042.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Achuff and Corns 1982, Achuff et al. 2002a, Cooper et al. 1987, Cooper pers. comm., Grossman et al. 1998, Kovalchik 1993, Lillybridge et al. 1995, Pfister et al. 1977, Western Ecology Working Group n.d., Williams and Lillybridge 1983, Williams et al. 1995

***Pinus contorta* / *Vaccinium caespitosum* Forest**
LOGEPOLE PINE / DWARF BLUEBERRY FOREST

IDENTIFIER: CEGL000168

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b.)
Alliance	<i>Pinus contorta</i> Forest Alliance (A.118)
Alliance (English name)	Lodgepole Pine Forest Alliance
Association	<i>Pinus contorta</i> / <i>Vaccinium caespitosum</i> Forest
Association (English name)	Lodgepole Pine / Dwarf Blueberry Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Lodgepole Pine Forest (CES306.820)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is found in the upper montane and subalpine zone of the Rocky Mountains from north-central Colorado to southern Alberta. It is more common near and east of the Continental Divide, but occurs in the Uinta Mountains of northern Utah and in Idaho. Elevations range from 2950-3120 m (9700-10,240 feet) in northern Colorado down to 950-1800 m (3100-5900 feet) in the northern Rocky Mountains. It typically occurs on cold, dry-mesic sites where cold air accumulates causing high diurnal temperature fluctuations often with frequent summer frosts and high daily maximum temperatures. Topography is flat to gently undulating or moderately sloping terrain typically occurring on valley bottoms, terraces, lower slopes, and benches with variable aspects, but also on steep canyon slopes and benches, plateau tops and adjacent upper slopes in the Uinta Mountains. Soils are typically well-drained, moderately deep, acidic, gravelly or non-gravelly sandy loam, loam, silt loam, silt or less frequently clay that are typically derived from a variety of noncalcareous parent materials. Ground cover is mostly litter, often with duff over 3 cm deep. The vegetation is characterized by a *Pinus contorta*-dominated tree canopy with *Vaccinium caespitosum* dominating or codominating the patchy to continuous dwarf-shrub layer. The tree canopy varies from moderately dense to nearly closed (40-90% cover) and is often composed solely of *Pinus contorta*. However, in some stands scattered *Abies lasiocarpa*, *Larix occidentalis*, *Picea engelmannii*, *Pinus albicaulis*, *Populus tremuloides*, or *Pseudotsuga menziesii* trees may be present, especially in the subcanopy. Some stands have tree saplings and scattered shrubs. *Vaccinium caespitosum* (indicator species) is usually dominates or codominates the dwarf-shrub layer. Other dwarf-shrubs may include low cover of *Arctostaphylos uva-ursi*, *Paxistima myrsinites*, *Ribes* spp., *Linnaea borealis* (on more mesic sites), or *Juniperus communis* and *Vaccinium scoparium* (drier sites). The herbaceous layer is sparse to moderately dense (to 30% cover) and is typically dominated or codominated by perennial graminoids such as *Calamagrostis rubescens*, *Danthonia intermedia*, *Deschampsia caespitosa*, *Carex geyeri*, *Carex rossii*, or *Festuca* spp. Forbs are generally have sparse cover but may be diverse. Mosses and lichens are common (5-20% cover) on some sites.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this forest association are found on all positions of moderate to flat slopes; other landforms include ridges, alluvial flats, and bench land to valley bottoms of glacial till and fluvial deposits. They occur predominately on westerly to southeasterly aspects between the elevations of 1090 and 1790 m (3580-5900 feet). Soils tend to be either well-drained loamy sand or clay with the exception of silty clay, which is poorly drained. Most stands have a high percentage of litter or duff on the ground surface, ranging from 20% to well over 90%. Mosses and lichens have high cover in some stands. Most of the stands sampled have been disturbed by fire, and one stand also has been significantly disturbed by beetle infestation.

GLOBAL ENVIRONMENT: This association is found in the upper montane and subalpine zone of the Rocky Mountains from north-central Colorado to southern Alberta. It is more common near and east of the Continental Divide, but occurs in the Uinta Mountains of northern Utah and in Idaho. Elevations range from 2950-3120 m (9700-10,240 feet) in northern Colorado down to 950-1800 m (3100-5900 feet) in the northern Rocky Mountains. It typically occurs on cold, dry-mesic sites where cold air accumulates causing high diurnal temperature fluctuations often with frequent summer frosts and high daily maximum temperatures. Topography

is flat to gently undulating or moderately sloping terrain typically occurring on valley bottoms, terraces, lower slopes, and benches with variable aspects, but also on steep canyon slopes and benches, plateau tops and adjacent upper slopes in the Uinta Mountains. Soils are typically well-drained, moderately deep, acidic, gravelly or non-gravelly sandy loam, loam, silt loam, silt or less frequently clay that are typically derived from a variety of noncalcareous parent materials such as glacial till, quartzite, granite, quartz monzonite, gneiss, schist, phyllite, sandstone and alluvium (Pfister et al. 1977, Steele et al. 1981, Mauk and Henderson 1984, Cooper et al. 1987). Ground cover is mostly litter, often with duff over 3 cm deep.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This forest association is dominated by a pole to mature tree canopy of *Pinus contorta* that is relatively open (<40% canopy cover). In mature stands the trees range from 10 to 35 m in height, but some stands are younger, with the *Pinus contorta* canopy being less than 5 m in height. Other conifers that may be present in occurrences include *Abies lasiocarpa*, *Picea engelmannii*, *Pseudotsuga menziesii*, and *Larix occidentalis*. The tall- and short-shrub layers are variable in cover. The dwarf-shrub layer has moderate cover (average 23% cover); species include *Vaccinium caespitosum*, the dominant shrub (100% constant, with 11% average cover), *Spiraea betulifolia*, *Linnaea borealis*, and *Arctostaphylos uva-ursi*. A moderate cover (54%) of diverse graminoids and forbs comprises the herbaceous layer. *Calamagrostis rubescens* is the most constant (100%) and dominates the herbaceous layer with an average of 39% cover. Other high-constancy species include *Arnica cordifolia* and *Carex concinnoides*.

GLOBAL VEGETATION: This forest association is characterized by a *Pinus contorta*-dominated tree canopy with *Vaccinium caespitosum* dominating or codominating the patchy to continuous dwarf-shrub layer. The tree canopy varies from moderately dense to nearly closed (40-90% cover) and is often composed solely of *Pinus contorta*. However, in some stands scattered *Abies lasiocarpa*, *Larix occidentalis*, *Picea engelmannii*, *Pinus albicaulis*, *Populus tremuloides*, or *Pseudotsuga menziesii* trees may be present, especially in the subcanopy. Some stands have tree saplings and scattered shrubs, *Amelanchier alnifolia*, *Spiraea betulifolia*, *Symphoricarpos albus*. *Vaccinium caespitosum* (indicator species) usually dominates or codominates the dwarf-shrub layer. Other dwarf-shrubs may include low cover of *Arctostaphylos uva-ursi*, *Paxistima myrsinites*, *Ribes* spp., *Linnaea borealis* (more mesic sites), or *Juniperus communis* and *Vaccinium scoparium* (drier sites). The herbaceous layer is sparse to moderately dense (to 30% cover) and is typically dominated or codominated by perennial graminoids such as *Calamagrostis rubescens*, *Danthonia intermedia*, *Deschampsia caespitosa*, *Carex geyeri*, *Carex rossii*, or *Festuca* spp. Forbs are generally sparse and may include *Antennaria* spp., *Arnica cordifolia*, *Chamerion angustifolium*, *Lupinus argenteus*, *Maianthemum stellatum*, *Polygonum bistortoides*, *Potentilla diversifolia*, *Penstemon procerus*, *Pseudocymopterus montanus*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Solidago simplex*, *Thalictrum occidentale*, and *Viola* spp. Mosses and lichens are common (5-20% cover) on some sites.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Herb (field)	Dwarf-shrub	<i>Linnaea borealis</i> , <i>Spiraea betulifolia</i> , <i>Vaccinium caespitosum</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium caespitosum</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Calamagrostis rubescens*, *Pinus contorta*

GLOBAL: *Pinus contorta*, *Vaccinium caespitosum*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Taraxacum officinale*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This type is recognized based on the diagnostic value attributed to *Vaccinium caespitosum* (Pfister et al. 1977); even with low coverage values it is thought to be indicative of frost-pocket conditions and well-drained soils. It is notable that early seral and frost-tolerant *Pinus contorta* is by far the best reproducing tree on these sites. Often the tree component is slow to fill in to create a canopy cover (>60%) associated with forested conditions.

GLOBAL COMMENTS: Many lower subalpine, spruce-fir and upper montane Douglas-fir forest and woodland stands include *Pinus contorta* trees in a mixed-conifer canopy. To clarify classification, only stands with tree canopies strongly dominated by *Pinus contorta* (usually >2/3 tree canopy) are considered to be *Pinus contorta* woodland and forest associations.

Abies lasiocarpa / *Vaccinium caespitosum* Habitat Type (Williams et al. 1990b) may include seral stands that would be classified as this association, which would significantly extend its range westward. Further research is needed to resolve this question. Steele et al. (1981) report this association occurring in the Little Rocky Mountains, but Roberts (1980) did not classify it in his study.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies grandis* / *Vaccinium caespitosum* Forest (CEGL000288)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium caespitosum* Forest (CEGL000340)
- *Larix occidentalis* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (CEGL005883)
- *Larix occidentalis* / *Vaccinium caespitosum* Forest (CEGL005882)
- *Picea engelmannii* / *Vaccinium caespitosum* Forest (CEGL005926)
- *Pinus contorta* / *Linnaea borealis* Forest (CEGL000153)
- *Pinus contorta* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (CEGL005923)
- *Pinus ponderosa* / *Vaccinium caespitosum* Woodland (CEGL005841)
- *Pseudotsuga menziesii* / *Vaccinium caespitosum* Forest (CEGL000465)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Vaccinium caespitosum* Habitat Type (Cooper et al. 1987) B
- *Abies lasiocarpa* / *Vaccinium caespitosum* Habitat Type (Mauk and Henderson 1984) B
- *Abies lasiocarpa* / *Vaccinium caespitosum* Habitat Type (Steele et al. 1981) B
- *Abies lasiocarpa* / *Vaccinium caespitosum* Habitat Type (Pfister et al. 1977) B
- *Picea* / *Vaccinium caespitosum* Habitat Type (Pfister et al. 1977) B
- *Pinus contorta* / *Vaccinium caespitosum* Community Type (Mauk and Henderson 1984) =
- *Pinus contorta* / *Vaccinium caespitosum* Habitat Type (Pfister et al. 1977) =
- *Pinus contorta* / *Vaccinium caespitosum* Habitat Type (Steele et al. 1981) =
- *Pinus contorta* / *Vaccinium caespitosum* Habitat Type (Cooper et al. 1987) =
- *Pinus contorta* / *Vaccinium caespitosum* Plant Association (Johnston 1987) =
- *Pinus contorta* / *Vaccinium caespitosum* (Bourgeron and Engelking 1994) =
- *Pseudotsuga menziesii* / *Vaccinium caespitosum* Habitat Type (Steele et al. 1981) B
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from both Waterton Lakes National Park and from a number stands in Glacier National Park both east and west of the Continental Divide. The stands in Glacier National Park are mostly located on benches near meadows at lower elevations.

GLOBAL RANGE: This association occurs in the upper montane and subalpine zone of the Rocky Mountains from north-central Colorado to southern Alberta. It is more common near and east of the Continental Divide, but also is found in the Uinta Mountains of northern Utah and in Idaho.

NATIONS: CA, US

STATES/PROVINCES: AB, CO, ID:S4?, MT:S5, OR:S3, UT

USFS ECOREGIONS: M331A:CC, M331B:C?, M331I:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier, Rocky Mountain); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.1006, GLAC.2227, GLAC.2240, GLAC.2274, GLAC.2604, GLAC.2606, GLAC.2645, GLAC.2661, WATE.5088, WATE.5089.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Cooper 1975, Cooper et al. 1987, Driscoll et al. 1984, Johnston 1987, MTNHP 2002b, Mauk and Henderson 1984, Pfister et al. 1977, Roberts 1980, Steele et al. 1981, Steele et al. 1983, Western Ecology Working Group n.d., Williams et al. 1990b

***Pinus contorta* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest
LODGEPOLE PINE / SQUARE-TWIG BLUEBERRY / BEAR-GRASS FOREST**

IDENTIFIER: C EGL005913

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b.)
Alliance	<i>Pinus contorta</i> Forest Alliance (A.118)
Alliance (English name)	Lodgepole Pine Forest Alliance
Association	<i>Pinus contorta</i> / <i>Vaccinium membranaceum</i> / <i>Xerophyllum tenax</i> Forest
Association (English name)	Lodgepole Pine / Square-twig Blueberry / Bear-grass Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Lodgepole Pine Forest (CES306.820)

ELEMENT CONCEPT

GLOBAL SUMMARY: This large-patch to matrix type is manifested as a seral type from central Idaho northward to northern Idaho, eastern Washington, western Montana and southwestern Alberta. This association is most prominent in west-central and central Montana forests. This association's elevation range is rather broad, from 1030 to 2015 m (3100-6600 feet). It occupies primarily south-through west-facing, moderate to steep slopes and is usually found on midslope to slope shoulder positions. It also occurs on benches associated with broad ridges. Soils are well-drained and derived from a broad spectrum of parent materials including glacial till and drift, both calcareous and noncalcareous sedimentary types, intrusive and extrusive igneous rock and metamorphic types, particularly quartzite. In one study soil texture ranged from gravelly sandy loams to silts. Ground surfaces have little or no bare soil or rock exposed. The canopy structure ranges from moderately open to closed (>60% cover) with *Pinus contorta* being strongly dominant in this layer, with lesser amounts of *Larix occidentalis* and *Pseudotsuga menziesii*. At mid to upper elevation limits of the type, *Abies grandis*, *Abies lasiocarpa* and *Picea engelmannii* may be minor components of the overstory and major components of the subcanopy. A tall-shrub layer is absent and even scattered individuals are rare. A short-shrub layer dominates the undergrowth with *Vaccinium membranaceum* being dominant, often exceeding 50% canopy cover; *Spiraea betulifolia*, *Lonicera utahensis*, *Paxistima myrsinites*, *Amelanchier alnifolia*, and *Rosa gymnocarpa* are the other high-constancy species of this layer. Dwarf-shrub layer species that occur with consistency include only *Vaccinium scoparium* and *Mahonia repens* (= *Berberis repens*). The herbaceous layer is generally relatively depauperate with the diagnostic species *Xerophyllum tenax* being strongly dominant (average cover reported by various studies ranging from 25 to 61%). Only two graminoids occur consistently and are well-represented in cover, *Calamagrostis rubescens* and *Carex geyeri*. Other forbs with moderate to high constancy include *Arnica cordifolia*, *Arnica latifolia*, *Chimaphila umbellata*, *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, and *Viola orbiculata*; not all of these forbs have high constancy throughout the range of the type.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this forest association are found predominately on middle to low positions of steep to gentle south-facing slopes. These sites are usually situated on glacial or colluvial deposits between the elevations of 1563 and 1970 m (5125-6459 feet). Soils tend to be well-drained sandy loams with a moderate to low percentage of gravel and rock. The ground surface is mostly covered with litter and duff, and a low percentage of wood.

GLOBAL ENVIRONMENT: This large-patch to matrix type is manifested as a seral type from central Idaho northward to northern Idaho, eastern Washington, western Montana and southwestern Alberta, and it very probably will be identified for British Columbia. This association is most prominent in west-central and central Montana forests. This association's elevation range is rather broad, from 1030 to 2015 m (3100-6600 feet). Virtually the whole of this appreciable elevation range can be realized in a given geographic area. It occupies primarily south-through west-facing, moderate to steep slopes and is usually found on midslope to slope shoulder positions. It also occurs on benches associated with broad ridges. Soils are well-drained and derived from a broad spectrum of parent materials including glacial till and drift, both calcareous and noncalcareous sedimentary types, intrusive and extrusive igneous rock and

metamorphic types, particularly quartzite. In one study soil texture ranged from gravelly sandy loams to silts, and a yet greater range in texture can be expected across the type's distribution. Ground surfaces have little or no bare soil or rock exposed.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This forest association is dominated by a pole to mature open canopy of *Pinus contorta* (34% average cover). The tree subcanopy layer, when present, includes *Abies lasiocarpa* and *Pinus contorta*. Tree seedlings established in the understory are *Pinus contorta*, *Abies lasiocarpa*, and *Picea engelmannii*. The tall-shrub layer is sparse. Shrubs at 1 m or less in height include *Vaccinium membranaceum*, which is almost always present and ranges in cover from 30 to 60%, and *Spiraea betulifolia*, which is always present and ranges in cover from 1 to 35%. Other shrub species contribute insignificant cover and constancy. The herbaceous layer is lush with a mixture of graminoids and forbs, and it is dominated by *Xerophyllum tenax* (13% average cover). Other common species are *Arnica cordifolia*, *Carex geyeri*, *Calamagrostis rubescens*, and *Chimaphila umbellata*.

GLOBAL VEGETATION: The canopy structure ranges from moderately open to closed (>60% cover) with *Pinus contorta* being strongly dominant in this layer though often joined by lesser amounts of *Larix occidentalis* and *Pseudotsuga menziesii* (sites beyond the cold limits of *Pinus ponderosa* for the most part). At mid to upper elevation limits of the type, *Abies grandis*, *Abies lasiocarpa*, and *Picea engelmannii* may be minor components of the overstory and major components of the subcanopy. A tall-shrub layer is absent and even scattered individuals are rare. The short-shrub layer dominates the undergrowth with *Vaccinium membranaceum* being dominant, often exceeding 50% canopy cover; *Spiraea betulifolia*, *Lonicera utahensis*, *Paxistima myrsinites*, *Amelanchier alnifolia*, and *Rosa gymnocarpa* are the other high-constancy species of this layer. Dwarf-shrub layer species that occur with consistency include only *Vaccinium scoparium*, *Vaccinium myrtillus* and *Mahonia repens* (= *Berberis repens*); if the cover of either of these *Vaccinium* species exceeds approximately 5%, then a different association is indicated. The herbaceous layer is generally relatively depauperate with the diagnostic species *Xerophyllum tenax* being strongly dominant (average cover reported by various studies ranging from 25 to 61%). Only two graminoids occur consistently and are well-represented in cover, *Calamagrostis rubescens* and *Carex geyeri*. Other forbs with moderate to high constancy include *Arnica cordifolia*, *Arnica latifolia*, *Chimaphila umbellata*, *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, and *Viola orbiculata*; not all of these forbs have high constancy throughout the range of the type.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium myrtillus</i>
Herb (field)	Forb	<i>Xerophyllum tenax</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Pinus contorta</i> , <i>Pseudotsuga menziesii</i>
Tree subcanopy	Needle-leaved tree	<i>Abies grandis</i> , <i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i> , <i>Vaccinium membranaceum</i>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Paxistima myrsinites</i>
Herb (field)	Dwarf-shrub	<i>Mahonia repens</i> , <i>Vaccinium myrtillus</i> , <i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Arnica latifolia</i> , <i>Thalictrum occidentale</i> , <i>Xerophyllum tenax</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i> , <i>Carex geyeri</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Pinus contorta*, *Xerophyllum tenax*

GLOBAL: *Pinus contorta*, *Vaccinium membranaceum*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4G5 (2-Mar-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This forest association is a seral stage of *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium membranaceum* Phase of Pfister et al. (1977).

GLOBAL COMMENTS: With the comparatively recent emphasis on developing descriptions of (and keys to) existing vegetation (Grossman et al. 1998), it has yet to be determined at what cover values forest vegetation types will be distinguished one from another when the canopy tree species are mostly seral in nature and have a broad environmental range (broad niche). Pfister et al. (1977) recognized *Pinus contorta* community types only when no other, more shade-tolerant tree species could be found on site. With *Pinus contorta*, which is exclusively seral except with respect to some subspecies on unusual substrates or atypical environments, researchers in Glacier National Park took the position that this very shade-intolerant, stand-replacing fire-adapted species should have several times the cover of the next most abundant canopy species for a *Pinus contorta* type to be recognized. What is really being indicated by this approach are areas having experienced stand-replacing fires (or similar catastrophic disturbance, e.g., clearcutting). Another approach could simply recognize the plurality of tree cover in assigning stands to particular associations treating existing vegetation. The stands representing this type are climax in a number of different tree series including *Abies lasiocarpa*, *Abies grandis*, *Tsuga mertensiana*, and *Pseudotsuga menziesii*. That this association in fact occurs in the states and USFS Sections listed derives from this writer's interpretation of constancy/cover tables of various authors/publications; where *Pinus contorta* is listed as a major seral species the inference has been made that stands quite likely occur on the landscape where this species strongly dominates the upper canopy (often observed throughout northern Idaho and western Montana) (S. Cooper pers. comm.).

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies grandis* / *Xerophyllum tenax* Forest (CEGL000293)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest (CEGL005917)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium membranaceum* Rocky Mountain Forest (CEGL000341)
- *Abies lasiocarpa* / *Xerophyllum tenax* Forest (CEGL000346)
- *Pseudotsuga menziesii* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest (CEGL005852)
- *Pseudotsuga menziesii* / *Vaccinium membranaceum* Forest (CEGL000466)
- *Tsuga mertensiana* / *Xerophyllum tenax* Forest (CEGL000516)

GLOBAL RELATED CONCEPTS:

- *Abies grandis* / *Xerophyllum tenax* Habitat Type (Steele et al. 1981) I
- *Abies grandis* / *Xerophyllum tenax* Habitat Type (Pfister et al. 1977) I
- *Abies grandis* / *Xerophyllum tenax* Habitat Type, *Vaccinium membranaceum* Phase (Cooper et al. 1987) I
- *Abies lasiocarpa* - (*Pinus contorta*) / *Xerophyllum tenax* Vegetation Type (Achuff et al. 2002a) I
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium globulare* (= *Vaccinium membranaceum*) Phase (Cooper et al. 1987) I
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium globulare* (= *Vaccinium membranaceum*) Phase (Pfister et al. 1977) I
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium globulare* (= *Vaccinium membranaceum*) Phase (Steele et al. 1981) I
- *Abies lasiocarpa* / *Xerophyllum tenax* Plant Association (Williams et al. 1995) I
- *Pseudotsuga menziesii* / *Vaccinium membranaceum* Habitat Type, *Xerophyllum tenax* Phase (Pfister et al. 1977) I
- *Tsuga mertensiana* / *Xerophyllum tenax* Habitat Type (Pfister et al. 1977) I
- *Tsuga mertensiana* / *Xerophyllum tenax* Habitat Type, *Vaccinium membranaceum* Phase (Cooper et al. 1987) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from five stands throughout Glacier National Park, and from two stands in Waterton Lakes National Park.

GLOBAL RANGE: This large-patch to matrix type is found from central Idaho north to northern Idaho, to eastern Washington, western Montana and southwestern Alberta, and it very probably will be identified for British Columbia with additional crosswalking.

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT:S4, OR?, WA

USFS ECOREGIONS: M242C:??, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.196, GLAC.69, GLAC.8, GLAC.2638, GLAC.2650, WATE.4058, WATE.5013.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Achuff et al. 2002a, Cooper et al. 1987, Cooper pers. comm., Daubenmire and Daubenmire 1968, Grossman et al. 1998, Johnson and Simon 1987, Lillybridge et al. 1995, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d., Williams et al. 1995

***Pinus contorta* / *Vaccinium scoparium* / *Calamagrostis rubescens* Forest
LODGEPOLE PINE / GROUSEBERRY / PINEGRASS FOREST**

IDENTIFIER: C EGL000174

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b.)
Alliance	<i>Pinus contorta</i> Forest Alliance (A.118)
Alliance (English name)	Lodgepole Pine Forest Alliance
Association	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> / <i>Calamagrostis rubescens</i> Forest
Association (English name)	Lodgepole Pine / Grouseberry / Pinegrass Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Lodgepole Pine Forest (CES306.820)
North Pacific Interior Lodgepole Pine-Douglas-fir Woodland and Forest [Provisional]
(CES207.153)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association can be recognized by *Pinus contorta* / *Vaccinium scoparium* with relatively high cover of *Calamagrostis rubescens* as well as the presence of other warmer site sub-shrubs and thus constitutes a relatively distinct environment. This association occurs in the Canadian, northern and middle Rocky Mountains from lower to mid-elevations of the subalpine zone, apparently not associated with positions of any particular slope or aspect; it also occurs on flats and basins. In Montana, it occurs predominantly east of the Continental Divide at elevations from 1370 to 2165 m (4500-7100 feet). It does occur west of the Continental Divide in Montana, however well to the south; as noted by Daubenmire and Daubenmire (1968) this type is inversely associated with areas where the Inland Pacific Maritime climatic regime is strongest, thus it is scarce in northern Idaho and eastern Washington as well. In central and eastern Idaho and Wyoming, it is found from 1740 to 2410 m (5700-7900 feet) elevation. *Pinus contorta* is the canopy dominant, not sharing this condition with any other tree species, though obviously these are seral stands as noted by the complement of *Pseudotsuga menziesii*, *Abies lasiocarpa*, and *Picea engelmannii* in the subcanopy or reproductive layers. The shrub layer is represented almost exclusively by dwarf-shrubs, including the diagnostic *Vaccinium scoparium* (and/or *Vaccinium myrtillus*) and *Mahonia repens*, *Arctostaphylos uva-ursi*, and *Spiraea betulifolia*; potentially mid-sized shrubs, including *Vaccinium membranaceum*, *Paxistima myrsinites*, *Shepherdia canadensis*, *Lonicera utahensis*, and *Juniperus communis*, occur here in minor amounts (<5% cover), environmentally constrained to dwarf-shrub size and evidencing constancy differences by region. *Vaccinium scoparium*, almost always the dominant shrub, varies highly in cover from about 5% (relatively closed-canopy stands) to what appears a continuous sward, especially when the cover of *Calamagrostis rubescens* or *Carex geyeri* fills what canopy gaps that may exist. *Carex rossii* is the only other graminoid that occurs with even moderate constancy and always low cover. Forbs constitute an insignificant component with only two species, *Arnica cordifolia* and *Orthilia secunda* (= *Pyrola secunda*), evidencing high constancy across the type's range, though only *Arnica* is capable of exhibiting relatively high cover (exceeding 5%) as well. Other forbs exhibiting high constancy on a regional basis include *Thalictrum occidentale*, *Lupinus argenteus*, *Osmorhiza berteroi*, *Fragaria virginiana*, *Geranium viscosissimum*, and *Viola adunca*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: The sole representative of this type, documented by Accuracy Assessment sampling on the eastern periphery of Glacier National Park, occurs at 1375.5 m (4510 feet) elevation on a gentle valley bottom slope mantled with coarse-textured glacial drift. It is at locations such as this within the IPP that this association can be expected to occur because it is here that the Inland Maritime climatic regime would be most attenuated (Daubenmire and Daubenmire 1968).

GLOBAL ENVIRONMENT: This association occurs in the Canadian, northern and middle Rocky Mountains from lower to mid-elevations of the subalpine zone, apparently not associated with positions of any particular slope or aspect; it also occurs on flats and basins. In Montana, it occurs predominantly east of the Continental Divide at elevations from 1370 to 2165 m (4500-7100 feet). It does occur west of the Continental Divide in Montana, however well to the south; as noted by Daubenmire and Daubenmire (1968) this type is inversely associated with areas where the Inland Pacific Maritime climatic regime is strongest, thus it is scarce in northern Idaho and eastern Washington as well. In central and eastern Idaho and Wyoming, it is found from 1740 to 2410 m (5700-7900 feet) elevation.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The Accuracy Assessment plot conforms well with the global summary by having *Pinus contorta* as the lone canopy dominant (40% cover) and the understory has shade-tolerant tree species present alluding to their eventual dominance. *Vaccinium scoparium* cover is in excess of 40% and, with the relative abundance of *Spiraea betulifolia* and *Calamagrostis rubescens* in the herbaceous layer, a nearly continuous sward of low undergrowth exists. *Xerophyllum tenax* in slightly greater than trace amounts may be testimony to a highly attenuated Inland Maritime climatic regime.

GLOBAL VEGETATION: *Pinus contorta* is the canopy dominant, not sharing this condition with any other tree species, though obviously these are seral stands as noted by the complement of *Pseudotsuga menziesii*, *Abies lasiocarpa*, and *Picea engelmannii* in the subcanopy or reproductive layers. The shrub layer is represented almost exclusively by dwarf-shrubs, including the diagnostic *Vaccinium scoparium* (and/or *Vaccinium myrtillus*) and *Mahonia repens*, *Arctostaphylos uva-ursi*, and *Spiraea betulifolia*; potentially mid-sized shrubs, including *Vaccinium membranaceum*, *Paxistima myrsinites*, *Shepherdia canadensis*, *Lonicera utahensis*, and *Juniperus communis*, occur here in minor amounts (<5% cover), environmentally constrained to dwarf-shrub size and evidencing constancy differences by region. *Vaccinium scoparium*, almost always the dominant shrub, varies highly in cover from about 5% (relatively closed-canopy stands) to what appears a continuous sward, especially when the cover of *Calamagrostis rubescens* or *Carex geyeri* fills what canopy gaps that may exist. *Carex rossii* is the only other graminoid that occurs with even moderate constancy and always low cover. Forbs constitute an insignificant component with only two species, *Arnica cordifolia* and *Orthilia secunda* (= *Pyrola secunda*), evidencing high constancy across the type's range, though only *Arnica* is capable of exhibiting relatively high cover (exceeding 5%) as well. Other forbs exhibiting high constancy on a regional basis include *Thalictrum occidentale*, *Lupinus argenteus*, *Osmorhiza berteroi*, *Fragaria virginiana*, *Geranium viscosissimum*, and *Viola adunca*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium myrtillus</i> , <i>Vaccinium scoparium</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Calamagrostis rubescens*, *Pinus contorta*, *Vaccinium myrtillus*, *Vaccinium scoparium*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3Q (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Compare this association with *Pinus contorta* / *Vaccinium scoparium* Forest (CEGL000172).

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Calamagrostis rubescens* Forest (CEGL000301)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium caespitosum* Forest (CEGL000340)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium myrtillus* Forest (CEGL000343)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* / *Xerophyllum tenax* Forest (CEGL005914)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* Forest (CEGL000344)--subsumes *Abies lasiocarpa* / *Vaccinium scoparium* Habitat Type, *Calamagrostis rubescens* Phase (Pfister et al. 1977, Steele et al. 1981, 1983).
- *Pinus contorta* / *Vaccinium scoparium* Forest (CEGL000172)
- *Pinus contorta* var. *latifolia* / *Vaccinium scoparium* / *Carex inops* ssp. *inops* Forest (CEGL000173)

GLOBAL RELATED CONCEPTS:

- *Pinus contorta*/ *Vaccinium scoparium*/*Calamagrostis rubescens* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This type was sampled during the accuracy assessment at one location in Glacier National Park, near the Elk Meadow Golf Course.

GLOBAL RANGE: This association occurs in the Canadian, northern and middle Rocky Mountains of British Columbia, Washington, Oregon, Montana and Wyoming.

NATIONS: CA, US

STATES/PROVINCES: BC, MT, OR:S3, WA, WY

USFS ECOREGIONS: M242C:CC, M331A:CC, M332G:CC, M333A:CC, M333B:CC

FEDERAL LANDS: NPS (Glacier, Yellowstone); USFS (Bridger-Teton, Caribou-Targhee, Flathead, Gallatin, Helena, Lewis and Clark, Lolo, Shoshone, Wallowa-Whitman)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.B99.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Bourgeron and Engelking 1994, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Driscoll et al. 1984, Hall 1973, Johnson 1981a, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Kagan et al. 2000, Pfister et al. 1977, Steele et al. 1981, Steele et al. 1983, Volland 1976, Western Ecology Working Group n.d.

***Pinus contorta* / *Vaccinium scoparium* / *Xerophyllum tenax* Forest LODGEPOLE PINE / GROUSEBERRY / BEAR-GRASS FOREST**

IDENTIFIER: CEGL005924

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b.)
Alliance	<i>Pinus contorta</i> Forest Alliance (A.118)
Alliance (English name)	Lodgepole Pine Forest Alliance
Association	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> / <i>Xerophyllum tenax</i> Forest
Association (English name)	Lodgepole Pine / Grouseberry / Bear-grass Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Lodgepole Pine Forest (CES306.820)**ELEMENT CONCEPT**

GLOBAL SUMMARY: This large-patch to matrix lodgepole pine forest occurs in upper subalpine habitats from central Idaho to northern Idaho and west as far as the eastern slope of the Cascade Range in Washington and east to just beyond the Continental Divide in central Montana and southwestern Alberta. In the northern Rockies of Idaho and Montana, this association ranges from 1585 to 2530 m (5200-8300 feet); just east of the Cascades its elevation range is considerably depressed, from 1310 to 1730 m (4300-5680 feet). Sites are generally cool to cold and have deep snow accumulations. It is found on gentle to moderate slopes of all aspects, mostly associated with shedding terrain, such as backslopes and slope shoulders; it also occurs on well-drained benches associated with ridgetops. Parent materials include volcanics, metamorphic rock, and sedimentary. Soils are uniformly well- to excessively drained with textures predominantly sandy loams and loams. Gravel content is usually at least 10% for the upper profile and increases markedly with depth, averaging about twice that of the surface soil. Soils are also very to moderately acidic. The tree canopy is highly variable with regard to structure, ranging from closed at 60-80% canopy cover in many of the northern Idaho stands to extremely to moderately open (25-50% canopy cover) along the Continental Divide in Montana. Compositionally the canopy is strongly dominated by *Pinus contorta*; usually *Abies lasiocarpa*, *Tsuga mertensiana*, or *Picea engelmannii* are present. A greater diversity of tree species occur on Washington's examples of this association. The undergrowth may be quite dense with a layer of *Vaccinium scoparium* (or *Vaccinium myrtillus*) surrounding tussocks of *Xerophyllum tenax* over which a sparse cover of *Vaccinium membranaceum* is superimposed. Tall shrubs, if present, could be characterized as accidentals. *Spiraea betulifolia* and *Lonicera utahensis* are consistently scattered in the short-shrub layer. *Carex geyeri* and *Calamagrostis rubescens* are the only graminoids regularly present and their cover seldom exceeds 10%. Other than the abundance of the diagnostic *Xerophyllum tenax*, the forb layer has low cover and is comparatively depauperate with only *Arnica latifolia*, *Anemone piperi*, *Goodyera oblongifolia*, *Orthilia secunda* (= *Pyrola secunda*), and *Viola orbiculata* having a consistent presence.

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this forest association are found at an average elevation of 1692 m (5547 feet) on middle positions of steep to moderate southwest-facing slopes, or on gentle northeast-facing interfluvies. Sites are usually situated on sedimentary or glacial till deposits. Soils tend to be well-drained sandy clay loams, and the ground surface is mostly covered with litter and duff.

GLOBAL ENVIRONMENT: This large-patch to matrix type occurs in upper subalpine habitats from central Idaho to northern Idaho and west as far as the eastern slope of the Cascade Range in Washington and east to just beyond the Continental Divide in central Montana and southwestern Alberta. In central Idaho this association ranges from 1980 to 2530 m (6500-8300 feet); at increasing latitudes and with less Inland Maritime climatic influence (in west-central Montana) the range is 1830 to 2285 m (6000-7500 feet); within Inland Maritime-influenced northern Idaho the type exhibits a range of 1585 to 2105 m (5200-6900 feet); just east of the Cascades its elevation range is considerably depressed, from 1310 to 1730 m (4300-5680 feet). For the stated regional elevation ranges the majority of the type occurs in the upper one-half to one-third of the distribution. Sites are generally cool to cold and have deep snow accumulations. It is found on gentle to moderate slopes of all aspects, mostly associated with shedding terrain, such as backslopes and slope shoulders; it also occurs on well-drained benches associated with ridgetops. It is infrequently associated with what ostensibly are frost-pocket conditions (at lower elevations within a region). Parent materials include volcanics (andesites, basalts, rhyolite, granite, granodiorite), metamorphic rock (schist, mica schist, quartzite, argillite) and sedimentary (siltstone, sandstone). Soils are uniformly well- to excessively drained with textures ranging widely, but they are mostly coarser, predominantly sandy loams and loams. Gravel content is usually at least 10% for the upper profile (ranging to 40%) and increases markedly with depth, averaging about twice that of the surface soil. Soils are also very to moderately acidic, mean pH values from various studies ranging from 4.5 to 5.2.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This forest association is dominated by a pole to mature open tree canopy of *Pinus contorta* (29% average cover). In 67% of stands *Abies lasiocarpa* is present in the tree subcanopy layer. Tree seedlings established are *Pinus contorta*, *Abies lasiocarpa*, *Picea engelmannii*, and *Pseudotsuga menziesii*. The short-shrub layer, including *Spiraea betulifolia*, *Sorbus scopulina*, and *Vaccinium membranaceum*, has moderate to low cover. The dwarf-shrub layer is dominated by *Vaccinium scoparium*, which is always present and has 44% average cover, and *Vaccinium myrtillus* also occurs. The herbaceous layer has numerous forbs and a few graminoids present, but none have significant cover. *Xerophyllum tenax* is the most abundant species and ranges in cover from 5 to 37%. Other common species are *Arnica cordifolia*, *Goodyera oblongifolia*, *Calamagrostis rubescens*, and *Viola orbiculata*. Each has less than 5% average cover. There is also 10% total cover of nonvascular species.

GLOBAL VEGETATION: The tree canopy is highly variable with regard to structure, ranging from closed at 60-80% canopy cover in many of the northern Idaho stands to extremely to moderately open (25-50% canopy cover) along the Continental Divide in Montana (other Montana areas report 60-70% average cover). Compositionally the canopy is strongly dominated by *Pinus contorta*; it

has several times the cover of the next most abundant species, which is usually *Abies lasiocarpa*, *Tsuga mertensiana*, or *Picea engelmannii*. These sites are generally at the cold limits of *Pseudotsuga menziesii* (which can be frost-stunted) and at the cold limits or largely beyond the range limits of *Larix occidentalis* (as it occurs in Montana and Idaho). A greater diversity of tree species occur on Washington's examples of this association. The undergrowth may be quite dense with a layer of *Vaccinium scoparium* (or *Vaccinium myrtillus*) surrounding tussocks of *Xerophyllum tenax* over which a sparse cover of *Vaccinium membranaceum* is superimposed. Tall shrubs, if present, could be characterized as accidentals. *Spiraea betulifolia* and *Lonicera utahensis* are consistently scattered in the short-shrub layer. *Carex geyeri* and *Calamagrostis rubescens* are the only graminoids regularly present and their cover seldom exceeds 10%. Other than the abundance of the diagnostic *Xerophyllum tenax*, the forb layer has low cover and is comparatively depauperate with only *Arnica latifolia*, *Anemone piperi*, *Goodyera oblongifolia*, *Orthilia secunda* (= *Pyrola secunda*), and *Viola orbiculata* having a consistent presence. In terms of potential vegetation this association is transitional throughout much of its range between *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest (CEGL005917) of lower elevations and warmer exposures and *Abies lasiocarpa* - *Picea engelmannii* / *Xerophyllum tenax* - *Luzula glabrata* var. *hitchcockii* Woodland (CEGL005898) that characterizes some of the highest and snowiest subalpine sites.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Xerophyllum tenax</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium myrtillus</i> , <i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Arnica latifolia</i> , <i>Orthilia secunda</i> , <i>Viola orbiculata</i> , <i>Xerophyllum tenax</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i> , <i>Carex geyeri</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Pinus contorta*, *Vaccinium scoparium*, *Xerophyllum tenax*

GLOBAL: *Pinus contorta*, *Vaccinium membranaceum*, *Vaccinium scoparium*, *Xerophyllum tenax*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4 (3-Mar-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: With the comparatively recent emphasis on developing descriptions of (and keys to) existing vegetation (Grossman et al. 1998), it has yet to be determined at what cover values forest vegetation types will be distinguished one from another when the canopy tree species are mostly seral in nature and have a broad environmental range (broad niche). This contrasts with the approach of Pfister et al. (1977) who recognize *Pinus contorta* community types only when virtually no representation of other, more shade-tolerant tree species could be found on site. With *Pinus contorta*, which is exclusively seral except with respect to some subspecies on unusual substrates or atypical environments, researchers in Glacier National Park have taken the position that this very shade-intolerant, stand-replacing fire-adapted species should have several times the cover of the next most abundant canopy species for a *Pinus contorta* type to be recognized. What is really being indicated by this approach are areas having experienced stand-replacing fires (or similar catastrophic disturbance, e.g., clearcutting). Another approach would be to simply recognize the tree species with the plurality of canopy cover in assigning stands to particular associations treating existing vegetation. The stands representing this type are climax in two different tree series, *Abies lasiocarpa* and *Tsuga mertensiana*. That this association in fact occurs in the

states and USFS Sections listed derives from this writer's interpretation of constancy/cover tables of various authors/publications; where *Pinus contorta* is listed as a major seral species, the inference has been made that stands quite likely occur on the landscape where this species strongly dominates the upper canopy (often observed throughout northern Idaho and western Montana) (S. Cooper pers. comm.).

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* / *Xerophyllum tenax* Forest (CEGL005914)
- *Pinus albicaulis* - *Abies lasiocarpa* / *Vaccinium scoparium* / *Xerophyllum tenax* Woodland (CEGL005838)
- *Pinus contorta* / *Vaccinium scoparium* Forest (CEGL000172)
- *Pinus contorta* / *Xerophyllum tenax* Forest (CEGL000175)
- *Tsuga mertensiana* / *Vaccinium scoparium* Forest (CEGL000126)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type (Daubenmire and Daubenmire 1968) I
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium membranaceum* Phase (Pfister et al. 1977) I
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium membranaceum* Phase (Steele et al. 1981) I
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium scoparium* Phase (Cooper et al. 1987) I
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium scoparium* Phase (Steele et al. 1981) I
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium scoparium* Phase (Pfister et al. 1977) I
- *Abies lasiocarpa* / *Xerophyllum tenax* Plant Association (Williams et al. 1995) I
- *Picea engelmannii* - *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type (Ogilvie 1962) B
- *Tsuga mertensiana* / *Xerophyllum tenax* - *Vaccinium myrtillus* Plant Association (Lillybridge et al. 1995) I
- *Tsuga mertensiana* / *Xerophyllum tenax* Habitat Type, *Vaccinium scoparium* Phase (Cooper et al. 1987) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from three stands in Glacier National Park, east of the Continental Divide.

GLOBAL RANGE: This association is found from the northern portion of the middle Rocky Mountains of Idaho to the northern Rocky Mountains and documented well into the southeastern portion of the Canadian Rockies; it may extend as far west as the west slope of the Cascade Range in Washington, where possibly it is a seral community of *Tsuga mertensiana* / *Vaccinium scoparium* Forest (CEGL000126) and north to Jasper and Banff national parks of Canada (*Xerophyllum tenax* is apparently scarce in this region).

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT:S3, WA, WY?

USFS ECOREGIONS: M332A:CC, M332B:CC, M332C:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); PC (Banff, Jasper); USFS (Colville NF, Wenatchee)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.12, GLAC.13, GLAC.75.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Achuff et al. 2002a, Cooper et al. 1987, Cooper pers. comm., Daubenmire and Daubenmire 1968, Grossman et al. 1998, Lillybridge et al. 1995, Lotan and Perry 1983, Ogilvie 1962, Ogilvie 1969, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d., Williams et al. 1995

***Pinus contorta* / *Vaccinium scoparium* Forest**

LOGPOLE PINE / GROUSEBERRY FOREST

IDENTIFIER: CEGL000172

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)

Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b.)
Alliance	<i>Pinus contorta</i> Forest Alliance (A.118)
Alliance (English name)	Lodgepole Pine Forest Alliance
Association	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Forest
Association (English name)	Lodgepole Pine / Grouseberry Forest
ECOLOGICAL SYSTEM(S):	Rocky Mountain Lodgepole Pine Forest (CES306.820) Rocky Mountain Poor-Site Lodgepole Pine Forest (CES306.960)

ELEMENT CONCEPT

GLOBAL SUMMARY: This widespread forest association is found in the upper montane and subalpine zones of the Rocky Mountains from central Colorado to Montana, east to the Black Hills and west to the mountains of Utah, Oregon and Washington. Elevation is variable depending on latitude and ranges from 3250 m (10,660 feet) in Colorado to 1555 m (5100 feet) in central Oregon. Stands occur on relatively cold, dry sites. Topography ranges from gentle to steep (10-100%) middle to upper slopes and ridgetops. Aspects are variable. Substrates are typically poorly developed, well-drained, gravelly, loamy sand or sandy loam soils that are too shallow or rocky for more mesic communities. Parent materials are variable. Ground cover is variable, with some stands having high cover of gravel and rock, and other stands having high cover of litter and duff. Vegetation is characterized by a *Pinus contorta*-dominated tree canopy with understory dominated by a patchy to continuous dwarf-shrub layer of *Vaccinium scoparium*. The tree canopy varies from moderately dense to nearly closed (40-90% cover) and is often composed solely of *Pinus contorta*. However, in some stands scattered *Abies lasiocarpa*, *Picea engelmannii*, *Pinus albicaulis* (northern stands), *Pinus flexilis*, *Populus tremuloides*, or *Pseudotsuga menziesii* trees may be present, especially in the subcanopy. Some stands have tree saplings and scattered shrubs, but not enough to form a tall- or short-shrub layer. The open to moderately dense dwarf-shrub layer is dominated by *Vaccinium scoparium* (indicator species) usually with 15-70% cover. Low cover of other dwarf-shrubs may be present such as scattered *Paxistima myrsinites*, *Rosa* spp., *Vaccinium caespitosum*, or *Juniperus communis*. The herbaceous layer if present is usually sparse but may be moderately dense and is typically dominated or codominated by perennial graminoids such as *Carex geyeri*, *Carex rossii* (= *Carex brevipes*), *Festuca brachyphylla*, *Poa nemoralis* ssp. *interior* (= *Poa interior*), *Poa nervosa*, or *Trisetum spicatum*. Forbs are generally sparse and may include *Antennaria* spp., *Arnica cordifolia*, *Chamerion angustifolium*, *Lupinus argenteus*, *Senecio* spp., and *Solidago* spp.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: As noted by Daubenmire and Daubenmire (1968), this type is inversely associated with the strength of the Inland Pacific Maritime climatic regime, and thus in the IPP, its presence has been confirmed by only one Accuracy Assessment plot from just east of the Continental Divide within the upper subalpine zone at 1770 m (5800 feet) elevation on a moderately steep, south-facing slope mantled with morainal materials.

GLOBAL ENVIRONMENT: This widespread forest association is found in the upper montane and subalpine zones of the Rocky Mountains from central Colorado to Montana, east to the Black Hills and west to the mountains of Utah, Oregon and Washington. Elevations range from 2745 to 3150 m (9000-10,660 feet) in Colorado and 2590 to 3050 m (8500-10,000 feet) in the Uinta Mountains down to 1770 to 2135 m (5800-7000 feet) in Montana and 1555 to 1950 m (5100-6400 feet) in central Oregon. Stands occur on relatively cold, dry sites. Topography ranges from gentle to steep (10-100%), middle to upper slopes and ridgetops. Aspects are variable. Substrates are typically poorly developed, well-drained, gravelly, loamy sand or sandy loam soils that are too shallow or rocky for more mesic communities. Parent materials are variable and include noncalcareous sedimentary, metamorphic or igneous rock, including argillite, quartzite, gneiss and schist, basalt, andecite, granite, quartz monzonite, rhyolite, and volcanic ash. Ground cover is variable. Cover of gravel and rock is often high (>50% cover), but other stands have high cover of litter and duff (40-80%). Mosses and lichens are common on some sites.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The lone plot supporting the occurrence of this type in the IPP is decidedly not modal; though *Pinus contorta* is appropriately dominant in the canopy, *Larix occidentalis* and *Pseudotsuga menziesii* are the only other tree species; neither is characteristic of the upper subalpine, and *Larix occidentalis* is an eastside rarity. The undergrowth is quite open with the cover of shrubs, including *Vaccinium scoparium* and *Juniperus communis*, not much exceeding 10%. The non-trivial canopy cover of *Festuca idahoensis* contrasts with that of *Veratrum viride* and *Xerophyllum tenax* causing a speculation as to the possibility of an environmental mosaic (or possibly ongoing disturbance).

GLOBAL VEGETATION: This forest association is characterized by a *Pinus contorta*-dominated tree canopy with understory dominated by a patchy to continuous dwarf-shrub layer of *Vaccinium scoparium*. The tree canopy varies from moderately dense to nearly closed (40-90% cover) and is often composed solely of *Pinus contorta*. However, in some stands scattered *Abies lasiocarpa*, *Picea engelmannii*, *Pinus albicaulis* (northern stands), *Pinus flexilis*, *Populus tremuloides*, or *Pseudotsuga menziesii* trees may be present, especially in the subcanopy. Some stands have tree saplings and scattered shrubs, but not enough to form a tall- or short-shrub

layer. The open to moderately dense dwarf-shrub layer is dominated by *Vaccinium scoparium* (indicator species) usually with 15-70% cover. Other dwarf-shrubs may be present and include low cover of *Arctostaphylos uva-ursi*, *Mahonia repens*, *Paxistima myrsinites*, *Rosa* spp., *Vaccinium caespitosum*, or *Juniperus communis*. The herbaceous layer if present is usually sparse but may be moderately dense and is typically dominated or codominated by perennial graminoids such as *Carex geyeri*, *Carex rossii* (= *Carex brevipes*), *Festuca brachyphylla*, *Poa nemoralis* ssp. *interior* (= *Poa interior*), *Poa nervosa*, or *Trisetum spicatum*. Forbs are generally sparse and may include *Antennaria* spp., *Arnica cordifolia*, *Chamerion angustifolium*, *Lupinus argenteus*, *Packera neomexicana* (= *Senecio neomexicanus*), *Solidago multiradiata*, and several others.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Vaccinium scoparium</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Vaccinium scoparium</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Pinus contorta*, *Vaccinium scoparium*

GLOBAL: *Pinus contorta*, *Vaccinium scoparium*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Larix occidentalis*

GLOBAL: *Poa pratensis*

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: Although *Vaccinium scoparium* and *Vaccinium myrtilloides* are used as equivalent indicators (in the IPP vegetation key and elsewhere), it is not at all clear that this is the case.

GLOBAL COMMENTS: Many lower subalpine, spruce-fir and upper montane Douglas-fir forest and woodland stands include *Pinus contorta* trees in a mixed-conifer canopy. To clarify classification, only stands with tree canopies strongly dominated by *Pinus contorta* (usually >2/3 tree canopy) are considered to be *Pinus contorta* woodland and forest associations.

Many stands in this association are considered early- to mid-successional, which developed following fires and are considered seral to *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* Forest (CEGL000344), less often *Picea engelmannii* / *Vaccinium scoparium* Forest (CEGL000381), and in extreme cold sites with *Pseudotsuga menziesii* / *Vaccinium* spp. Forest (CEGL000464) (Cooper 1975, Pfister et al. 1977, Steele et al. 1981, 1983, Mauk and Henderson 1984, Cooper et al. 1987), while other stands have a canopy that is dominated by persistent *Pinus contorta* that is successfully regenerating, especially on more extreme sites with only scattered *Abies lasiocarpa*, *Picea engelmannii*, *Picea glauca*, or *Pseudotsuga menziesii*.

Compare this association to *Pinus contorta* / *Vaccinium scoparium* / *Calamagrostis rubescens* Forest (CEGL000174). Regional analysis suggests that they are synonymous.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* / *Xerophyllum tenax* Forest (CEGL005914)
- *Pinus contorta* / *Vaccinium scoparium* / *Calamagrostis rubescens* Forest (CEGL000174)
- *Pinus contorta* / *Vaccinium scoparium* / *Xerophyllum tenax* Forest (CEGL005924)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Vaccinium scoparium* Habitat Type (Hoffman and Alexander 1987) B
- *Abies lasiocarpa* / *Vaccinium scoparium* Habitat Type (Hoffman and Alexander 1980) B
- *Pinus contorta* - *Vaccinium scoparium* Plant Community (Hall 1973) =

- *Pinus contorta* / *Vaccinium scoparium* Community Type (Hess 1981) =
- *Pinus contorta* / *Vaccinium scoparium* Community Type (Hess and Alexander 1986) =
- *Pinus contorta* / *Vaccinium scoparium* Community Type (Cooper et al. 1987) =
- *Pinus contorta* / *Vaccinium scoparium* Community Type (Pfister et al. 1977) =
- *Pinus contorta* / *Vaccinium scoparium* Community Type (Steele et al. 1983) =
- *Pinus contorta* / *Vaccinium scoparium* Community Type (Wasser and Hess 1982) =
- *Pinus contorta* / *Vaccinium scoparium* Community Type (Mauk and Henderson 1984) =
- *Pinus contorta* / *Vaccinium scoparium* Community Type (Steele et al. 1981) =
- *Pinus contorta* / *Vaccinium scoparium* Habitat Type (Komarkova et al. 1988b) =
- *Pinus contorta* / *Vaccinium scoparium* Habitat Type (Alexander et al. 1986) =
- *Pinus contorta* / *Vaccinium scoparium* Habitat Type (Hoffman and Alexander 1976) =
- *Pinus contorta* / *Vaccinium scoparium* Plant Association (Johnston 1987) =
- *Pinus contorta* / *Vaccinium scoparium* Plant Association (Baker 1984a) =
- *Pinus contorta*/ *Vaccinium scoparium* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B
- Lodgepole Pine / Grouse Huckleberry (Volland 1976) =
- Lodgepole Pine / Grouse Whortleberry Plant Community (Horton 1971) =

OTHER COMMENTS

OTHER COMMENTS: Given that much of the IPP is influenced by an Inland Maritime climatic regime it is not surprising that this community occurs with relative rarity.

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is recorded only east of the Continental Divide within the IPP.

GLOBAL RANGE: This association is common in the Rocky Mountains and mountains in the northwestern U.S. and is reported from Washington, Oregon, Idaho, Montana, Wyoming, Colorado, Utah, and possibly California.

NATIONS: US

STATES/PROVINCES: CA?, CO:S4, ID:S5, MT:S5, OR:S3, UT:S4S5, WA:S4, WY:S5

USFS ECOREGIONS: M242C:CC, M261D:CC, M331A:CC, M331B:CC, M331D:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton, Rockefeller, Rocky Mountain); USFS (Bighorn, Bridger-Teton, Caribou-Targhee, Custer, Gallatin, Helena, Lewis and Clark, Medicine Bow, Shoshone)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.147.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Alexander et al. 1986, Baker 1984a, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Cooper 1975, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Driscoll et al. 1984, Hall 1973, Harrington 1978, Hess 1981, Hess and Alexander 1986, Hoffman and Alexander 1976, Hoffman and Alexander 1980, Hoffman and Alexander 1987, Horton 1971, Johnson 1981a, Johnston 1987, Jones 1999, Jones and Fertig 1999d, Jones and Ogle 2000, Kagan et al. 2004, Komarkova et al. 1988b, MTNHP 2002b, Marr et al. 1973b, Mauk and Henderson 1984, Oswald 1966, Pfister et al. 1977, Rolston 1961, Steele et al. 1981, Steele et al. 1983, Steen and Dix 1974, Terwilliger et al. 1979a, Ueckert 1968, Volland 1976, Wasser and Hess 1982, Western Ecology Working Group n.d.

***Pinus ponderosa* Forest Alliance**

***Pinus ponderosa* / *Symphoricarpos albus* Forest PONDEROSA PINE / COMMON SNOWBERRY FOREST**

PONDEROSA PINE / SNOWBERRY FOREST

IDENTIFIER: C EGL000203

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b.)
Alliance	<i>Pinus ponderosa</i> Forest Alliance (A.124)
Alliance (English name)	Ponderosa Pine Forest Alliance
Association	<i>Pinus ponderosa</i> / <i>Symphoricarpos albus</i> Forest
Association (English name)	Ponderosa Pine / Common Snowberry Forest
Association (Common name)	Ponderosa Pine / Snowberry Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030)

ELEMENT CONCEPT

GLOBAL SUMMARY: This ponderosa pine community type occurs in the mountains of the northwestern United States, from the eastern Cascades and northern Sierra Nevada to the Rocky Mountains and Black Hills. It is found on moderate, undulating slopes with loamy soils. Most stands are on slopes with more northerly aspects. The overstory of this community is dominated by *Pinus ponderosa*. There are lesser amounts of *Populus tremuloides*, *Betula papyrifera*, *Quercus macrocarpa*, *Juniperus scopulorum*, *Picea glauca*, *Pinus flexilis*, and *Pseudotsuga menziesii* successfully reproducing. The shrub layer is prominent and approximately 0.5-1.0 m tall. The most prevalent shrubs are *Amelanchier alnifolia*, *Symphoricarpos albus*, *Shepherdia canadensis*, *Mahonia repens*, *Spiraea betulifolia*, *Juniperus communis*, and *Prunus virginiana*. The herbaceous layer is also well-developed. Typical species found in this layer are *Achillea millefolium*, *Campanula rotundifolia*, *Balsamorhiza sagittata*, *Galium* spp., and *Euthamia occidentalis* (= *Solidago occidentalis*). Ground fires are a regular occurrence but regeneration after these events is rapid.

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is documented only from west of the Continental Divide and probably only exists as a potentially long-persisting seral stage of *Pseudotsuga menziesii* / *Symphoricarpos albus* Forest (CEGL000459). The lone example was found at lower elevation (1085 m [3560 feet]), on a steep, south-facing, glacial drift-mantled slope shoulder, potentially the most xeric position in the westside landscape.

GLOBAL ENVIRONMENT: This community is found on moderate slopes with non-calcareous soils (Johnston 1987). The soils are usually loams with a high water-holding capacity, but they can be stony or sandy. If they are the latter, they tend to occur on north-facing slopes with more mesic microclimates (Daubenmire 1952).

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: By a slight margin over *Pinus ponderosa*, *Pinus contorta* is the dominant tree in the upper canopy with no indication of successional direction due to lack of seedlings/saplings. The shrub layer is dominated by *Symphoricarpos albus* with *Amelanchier alnifolia*, *Rosa woodsii*, *Shepherdia canadensis*, *Spiraea betulifolia*, and *Salix scouleriana* also conspicuous, but the total shrub cover does not exceed 30%. The herbaceous layer is codominated by graminoids, with *Calamagrostis rubescens* and *Carex geyeri* forming a prominent, albeit discontinuous, layer; *Chamerion angustifolium* and *Fragaria virginiana* are the only forbs occurring in greater than trace amounts.

GLOBAL VEGETATION: The overstory of this community is dominated by successfully reproducing *Pinus ponderosa*. There are lesser amounts of *Populus tremuloides*, *Betula papyrifera*, *Quercus macrocarpa*, *Juniperus scopulorum*, *Picea glauca*, *Pinus flexilis*, and *Pseudotsuga menziesii*. Hoffman and Alexander (1987) sampled 12 stands of this type that averaged 35.8 m²/ha basal area. The shrub layer is prominent, with cover approaching 100% in some stands (Daubenmire 1952). The common shrubs in this community are *Amelanchier alnifolia*, *Symphoricarpos albus*, *Shepherdia canadensis*, *Mahonia repens*, *Spiraea betulifolia*, *Juniperus communis*, and *Prunus virginiana*. The herbaceous layer is also well-developed. Typical species found in this layer are *Achillea millefolium*, *Campanula rotundifolia*, *Galium* spp., and *Euthamia occidentalis* (= *Solidago occidentalis*). Periodic ground fires move through the lower strata of this community. Regeneration after these events is rapid. Within a few years the signs of a fire may be difficult to detect (Daubenmire 1952).

MOST ABUNDANT SPECIES**WATERTON-GLACIER INTERNATIONAL PEACE PARK**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i> , <i>Pinus ponderosa</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i> , <i>Symphoricarpos albus</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

Global

Stratum

Tree canopy
 Tree subcanopy
 Tree subcanopy
 Short shrub/sapling
 Short shrub/sapling
 Herb (field)

Lifeform

Needle-leaved tree
 Needle-leaved tree
 Broad-leaved deciduous tree
 Broad-leaved deciduous tree
 Broad-leaved deciduous shrub
 Forb

Species

Pinus ponderosa
Pinus ponderosa
Betula papyrifera, *Populus tremuloides*, *Quercus macrocarpa*
Amelanchier alnifolia
Spiraea betulifolia, *Symphoricarpos occidentalis*
Achillea millefolium, *Balsamorhiza sagittata*, *Campanula rotundifolia*

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Pinus ponderosa*, *Symphoricarpos albus*

GLOBAL: *Balsamorhiza sagittata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4? (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: As defined (in part) by the importance of *Pinus ponderosa* in the uppermost layer of the tree canopy, this community is certainly not in accord with previously defined concepts of the type in Montana (Pfister et al. 1977) which emphasized *Pinus ponderosa* as the sole tree dominant because it is the only tree (with the possible exception of *Pinus flexilis*) capable of occurring on such xeric sites. As this type occurs in IPP, it is almost certainly seral to *Pseudotsuga menziesii* / *Symphoricarpos albus* Forest (CEGL000459) or *Pseudotsuga menziesii* / *Calamagrostis rubescens* Woodland (CEGL000429) because *Calamagrostis rubescens* and *Carex geyeri* are dominant in the undergrowth (this never occurs in *Pinus ponderosa* / *Symphoricarpos albus* Habitat Type) and *Pinus contorta* is capable of prominence as a member of the tree component (again, never occurring in *Pinus ponderosa* / *Symphoricarpos albus* Habitat Type). The lack of *Pseudotsuga menziesii* in some stands, such as document this association within IPP, can be attributed to stochastic events and fire history.

GLOBAL COMMENTS: Hoffman and Alexander (1987) described two phases of this type, *Oryzopsis asperifolia* phase which is now (at least tentatively) identified as *Pinus ponderosa* / *Oryzopsis asperifolia* Woodland (CEGL002123) and the *Balsamorhiza sagittata* phase which remains part of this type (see Marriott and Faber-Langendoen 2000). Additionally, there is some ambiguity between this type as a forest or woodland; in increasingly dense stands, this type has >60% canopy closure. Johnston (1987) reports that this community is also in Nebraska, but its presence there seems doubtful.

GLOBAL SIMILAR ASSOCIATIONS:

- *Pinus ponderosa* / *Mahonia repens* Forest (CEGL000187)
- *Pinus ponderosa* / *Oryzopsis asperifolia* Woodland (CEGL002123)
- *Pinus ponderosa* / *Quercus macrocarpa* Woodland (CEGL000873)
- *Pinus ponderosa* / *Spiraea betulifolia* Forest (CEGL000202)
- *Pinus ponderosa* / *Symphoricarpos occidentalis* Forest (CEGL000204)

GLOBAL RELATED CONCEPTS:

- *Pinus ponderosa* / *Shepherdia canadensis* / *Symphoricarpos albus* / *Arctostaphylos uva-ursi* Habitat Unit (Thilenius 1972) F
- *Pinus ponderosa* / *Symphoricarpos albus* - floodplain (Kovalchik 1987) ?
- *Pinus ponderosa* / *Symphoricarpos albus* / *Arctostaphylos uva-ursi* Habitat Unit (Thilenius 1972) F
- *Pinus ponderosa* / *Symphoricarpos albus* Association (Crowe et al. 2004) =
- *Pinus ponderosa* / *Symphoricarpos albus* Habitat Type (Hoffman and Alexander 1987) =
- *Pinus ponderosa* / *Symphoricarpos albus* Plant Association (Johnston 1987) =
- *Pinus ponderosa* / *Symphoricarpos rivularis* Association (Daubenmire 1952) =
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This community is restricted to the westside and occurs only on the most xeric sites.

GLOBAL RANGE: This ponderosa pine community type occurs from the mountains of the northwestern United States (eastern cascades and northern Sierras) to the Rocky Mountains and Black Hills, extending from eastern Washington south to northern California, east to South Dakota and north to Montana.

NATIONS: US

STATES/PROVINCES: CA:S2, ID:S3, MT:S4, OR:S1, SD:S4, WA:S3, WY:S2?

USFS ECOREGIONS: 331A:CC, 331D:CC, M242C:CC, M261G:CC, M331B:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332G:CC, M333A:CC, M333B:CC, M333D:CC, M334A:CC

FEDERAL LANDS: NPS (Glacier, Jewel Cave); USFS (Wallowa-Whitman)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.D884.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: J. Drake

REFERENCES: Clausnitzer and Zamora 1987, Cooper et al. 1987, Crowe and Clausnitzer 1997, Crowe et al. 2004, Daubenmire 1952, Daubenmire and Daubenmire 1968, Driscoll et al. 1984, Ganskopp 1979, Hall 1973, Hoffman and Alexander 1987, Johnson and Simon 1987, Johnston 1987, Kagan et al. 2000, Kovalchik 1987, Lynn et al. n.d., MTNHP 2002b, McAdams et al. unpubl. data 1998, McLean 1970, Midwestern Ecology Working Group n.d., Pfister et al. 1977, Steele et al. 1981, Terwilliger et al. 1979a, Thilenius 1972, Tisdale and McLean 1957, WNHP unpubl. data, Zamora 1983

I.A.8.N.c. Conical-crowned temperate or subpolar needle-leaved evergreen forest

Picea engelmannii Forest Alliance

Picea engelmannii / *Juniperus communis* Forest

ENGELMANN SPRUCE / COMMON JUNIPER FOREST

IDENTIFIER: CEGL005925

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Picea engelmannii</i> Forest Alliance (A.164)
Alliance (English name)	Engelmann Spruce Forest Alliance
Association	<i>Picea engelmannii</i> / <i>Juniperus communis</i> Forest
Association (English name)	Engelmann Spruce / Common Juniper Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)

ELEMENT CONCEPT

GLOBAL SUMMARY: This late-seral subalpine conifer association is found in the mountains of northwestern Wyoming, eastern Idaho and northwestern or north-central Montana. Elevation ranges from 2000 to 3140 m. Stands usually occur on cooler northern and eastern aspects on a variety of terrain on dry, rocky substrates derived from calcareous, volcanic, or granitic parent materials. In Montana, stands occurred on steep, south-facing talus slopes, with rocky, poorly developed soils. Otherwise, the soil surface typically has high cover of litter with low cover of bare soil and rock. This association has an open to moderately dense to dense (30% to over 60%) canopy of conifer trees over 30 m tall that is dominated by *Picea engelmannii* or *Picea engelmannii* X *glauca* hybrids. Other trees in the canopy may include *Pseudotsuga menziesii*, *Pinus flexilis*, or *Pinus contorta* depending on substrate. *Pinus albicaulis* is sometimes present in the northerly stands in Montana. *Abies lasiocarpa* is absent from the tree canopy and regeneration layer. The

understory is composed of large, dense, short-shrub patches of *Juniperus communis* with *Shepherdia canadensis* common in seral stands. The sparse herbaceous layer is composed of the forbs *Arnica cordifolia*, *Astragalus miser*, *Solidago multiradiata*, *Chamerion angustifolium* (= *Epilobium angustifolium*), *Frasera speciosa*, and the graminoids *Carex rossii* and *Poa nervosa*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs on moderately steep, xeric, south-facing, high talus slopes at elevations above 2100 m (7000 feet). Soil texture is a sandy loam that is rapidly drained due to 35-50% gravel content. Loose rock, sand, and bare soil comprise over 50% of the ground cover. It is speculated that this community developed on an old landslide.

GLOBAL ENVIRONMENT: This late-seral, subalpine forest association is found in the mountains of northwestern Wyoming, eastern Idaho and northwestern Montana. Elevation ranges from 2255 to 3140 m (7400-10300 feet), in northern stands extending down to 2100 m (6880 feet). Stands usually occur on cooler northern and eastern aspects on a variety of terrain on dry, rocky substrates. Soils are gravelly (25% mean gravel content) and are derived from various parent materials such as limestone, sandstone, andesite, basalt, rhyolite, or granite. The soil surface has high cover of litter (>4 cm mean depth) with low cover of bare soil and rock. In Glacier National Park and north-central Montana, this association occurs on moderately steep, xeric, south- or west-facing, talus slopes at elevations above 2000 m (6560 feet). Soil texture is a sandy loam that is rapidly drained due to 35-50% gravel content. Loose rock, sand, and bare soil comprise over 50% of the ground cover.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This association is a subalpine coniferous woodland dominated by *Picea engelmannii*. Cover of *Picea engelmannii* is 20% with heights averaging only 2-5 m, since most trees occur as shrubby krummholz. *Picea engelmannii* seedlings are also common, while *Pinus albicaulis* saplings and *Abies lasiocarpa* seedlings are present but have low cover. The shrub layer is 0.5-1 m high and dominated by *Juniperus communis* with 5% cover. Herbaceous cover is 10% with a number of species contributing minimal cover. Stand age for the one area that was sampled is 75 years.

GLOBAL VEGETATION: This association has an open to moderately dense to dense (30% to over 60%) canopy of conifer trees over 30 m tall that is dominated by *Picea engelmannii* or *Picea engelmannii* X *glauca* hybrids. Other trees in the canopy may include *Pseudotsuga menziesii*, *Pinus flexilis*, and *Pinus contorta* depending on substrate, but there is typically little *Pinus albicaulis* except in the northern part of its range. *Abies lasiocarpa* is absent from the tree canopy and regeneration layer. The understory is composed of large, dense, short-shrub patches of *Juniperus communis* with *Shepherdia canadensis* common in seral stands. The sparse herbaceous layer is composed of the forbs *Arnica cordifolia*, *Astragalus miser*, *Chamerion angustifolium* (= *Epilobium angustifolium*), *Solidago multiradiata*, *Frasera speciosa*, and the graminoids *Carex rossii* and *Poa nervosa*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree subcanopy	Needle-leaved tree	<i>Picea engelmannii</i> , <i>Pinus albicaulis</i>
Short shrub/sapling	Needle-leaved shrub	<i>Juniperus communis</i>
Herb (field)	Other herbaceous	<i>Picea engelmannii</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Picea engelmannii</i> , <i>Pinus contorta</i> , <i>Pinus flexilis</i> , <i>Pseudotsuga menziesii</i>
Short shrub/sapling	Needle-leaved shrub	<i>Juniperus communis</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Chamerion angustifolium</i>
Herb (field)	Graminoid	<i>Carex rossii</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Juniperus communis*, *Picea engelmannii*

GLOBAL: *Picea engelmannii*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Arnica angustifolia*, *Astragalus vexilliflexus*, *Hedysarum sulphureum*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3 (22-Dec-1999). This late-seral, montane forest association is restricted to cool, northern and eastern aspects in mountains of western Wyoming and eastern Idaho. Although over 100 occurrences are estimated, there has been historic decline of this association because of logging. Logging still threatens these forests, especially stands growing on calcareous substrates which appear to not regenerate well. More information is needed on condition and extent of these forests, especially in Idaho.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Some stands in the *Picea engelmannii* / *Senecio streptanthifolius* Habitat Type described by Pfister et al. (1977) may be similar to this association (Steele et al. 1983). This association now includes the former *Picea (engelmannii X glauca, engelmannii) / Juniperus communis* Forest (CEGL000410), originally identified by Roberts (1980) from central Montana. Both Roberts' (1980) stands and those identified in Glacier National Park occur on talus and scree slopes, and tend towards a more woodland physiognomy, with the trees also stunted by wind-swept conditions. While environmental setting is somewhat different from the Wyoming and Idaho expressions, the species composition is much the same. *Picea engelmannii* and/or *Picea engelmannii X glauca* (hybrids) are the diagnostic overstory species in this plant association. Stands can include pure *Picea engelmannii* and *Picea engelmannii X glauca* hybrid, or both. Hansen et al. (1995) explained that the frequent absence of mature cones, similar morphology, and ecological amplitudes led them to lump *Picea engelmannii* and *Picea glauca* (hybrids) into a single type.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Juniperus communis* Woodland (CEGL000919)
- *Pinus albicaulis* / *Juniperus communis* Woodland (CEGL000756)
- *Pinus contorta* / *Juniperus communis* Woodland (CEGL000764)
- *Pinus flexilis* / *Juniperus communis* Woodland (CEGL000807)
- *Pseudotsuga menziesii* / *Juniperus communis* Forest (CEGL000439)

GLOBAL RELATED CONCEPTS:

- *Picea* / *Juniperus communis* site type (Roberts 1980) =
- *Picea engelmannii* / *Juniperus communis* Habitat Type (Steele et al. 1983) =
- *Picea engelmannii* / *Juniperus communis* Plant Association (Johnston 1987) =
- *Picea engelmannii*/*Juniperus communis* (Bourgeron and Engelking 1994) =
- *Picea* spp./*Juniperus communis* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is very uncommon and has only been documented once at high elevations on the easternmost portion of Glacier National Park in the Otatso Creek drainage.

GLOBAL RANGE: This forest association is found in the central Rocky Mountains of eastern Idaho and western Wyoming, and central and northwestern Montana, including southern portions of the Absaroka Range, Owl Creek Mountains, and the eastern portions of the Wind River Range.

NATIONS: US

STATES/PROVINCES: ID:S2, MT:S2, WY:S3

USFS ECOREGIONS: 331D:CC, 342A:CC, M331A:CC, M331B:CC, M331D:CC, M331J:CC, M332C:CC, M332E:CC

FEDERAL LANDS: NPS (Glacier); USFS (Shoshone)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.239.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Hansen et al. 1995, Johnston 1987, Jones and Ogle 2000, Pfister et al. 1977, Roberts 1980, Steele et al. 1983, Western Ecology Working Group n.d.

***Picea engelmannii* / *Vaccinium caespitosum* Forest**
ENGELMANN SPRUCE / DWARF BLUEBERRY FOREST

IDENTIFIER: C EGL005926

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Picea engelmannii</i> Forest Alliance (A.164)
Alliance (English name)	Engelmann Spruce Forest Alliance
Association	<i>Picea engelmannii</i> / <i>Vaccinium caespitosum</i> Forest
Association (English name)	Engelmann Spruce / Dwarf Blueberry Forest

ECOLOGICAL SYSTEM(S):

ELEMENT CONCEPT

GLOBAL SUMMARY: This forest association occurs in the subalpine zone in the central and northern Rocky Mountains. Sites are relatively cold, moist benches, basins, ridge slopes and high plateaus often in areas where cold air accumulates (frost pockets). Substrates are typically well-drained, sandy loam to gravelly clay-textured soils derived from argillite, quartzite sandstone or glacial till. Litter dominates the ground surface (about 3 cm deep) with low cover of bare soil and rock (<10%). This conifer association is characterized by a *Picea engelmannii*-codominated tree canopy with 5% or more cover of *Vaccinium caespitosum* in the understory. The evergreen needle-leaved tree canopy is open to moderately dense (30-65% cover). The upper tree canopy is typically codominated by *Picea engelmannii* or *Picea engelmannii* X *glauca* hybrids, and mature seral tree species with *Picea engelmannii* dominating the subcanopy and regeneration layers. *Abies lasiocarpa* is typically absent from the tree canopy and regeneration layer or is restricted to drier microsites. Important seral species in the tree canopy are *Pseudotsuga menziesii*, *Larix occidentalis*, *Pinus contorta*, and sometimes *Populus tremuloides*. Undergrowth is variable depending on elevation and may be diverse, but is typically an open to dense dwarf-shrub layer with 5% or more cover of *Vaccinium caespitosum*. Other relatively consistent shrubs and dwarf-shrubs include *Amelanchier alnifolia*, *Arctostaphylos uva-ursi*, *Linnaea borealis*, *Mahonia repens*, *Ribes montigenum*, *Shepherdia canadensis*, *Spiraea betulifolia*, *Symphoricarpos albus*, and *Vaccinium scoparium*, which may codominate. The herbaceous layer is often dominated by *Calamagrostis rubescens*. Other relatively constant species are *Arnica cordifolia*, *Arnica latifolia*, *Carex rossii*, *Galium* spp., and *Thalictrum occidentale*. Higher elevation stands have herbaceous layers that are often dominated by alpine forbs and graminoids.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands occur on flat benches in valley bottoms at elevations near 1120 m (3670 feet). Soil is derived from alluvium and is typically a sandy clay loam and moderately well-drained. Litter, moss, and lichens cover 80% of the ground surface. Lodgepole pine mortality due to mountain pine beetle was noted in the one plot that was sampled. Most of the dead trees have blown down.

GLOBAL ENVIRONMENT: This forest association occurs in the subalpine zone in the central and northern Rocky Mountains. Elevations range from 2925-3385 m (9600-11,100 feet) on the Uinta Mountains of northern Utah and down to 945-1980 m (3100-4200 feet) in northwestern Montana. Sites are relatively cold, moist benches, basins, ridge slopes and high plateaus often in areas where cold air accumulates (frost pockets). Substrates are typically well-drained, sandy loam to gravelly clay-textured soils derived from argillite, quartzite or glacial till. Litter dominates the ground surface and is over 3 cm deep with low cover of bare soil and rock.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This montane, mesic, mixed evergreen forest is very heterogeneous in both undergrowth and canopy cover with low overall species diversity. Tree cover is 50% and is codominated by *Picea engelmannii* with 20% cover, *Pinus contorta* with 17% cover, and *Pseudotsuga menziesii* with 10% cover. Tree height is 20-35 m. Subcanopy tree cover is 5% and dominated primarily by *Pseudotsuga menziesii* with heights of 2-5 m. *Symphoricarpos albus* clearly dominates the shrub layer with 17% cover, comprising most of the 20% overall shrub cover. *Rosa woodsii*, *Amelanchier alnifolia*, *Cornus sericea*, and *Lonicera involucrata* are also common shrubs. *Vaccinium caespitosum* and *Mahonia repens* are common dwarf-shrubs, each with 3% cover. Overall herbaceous cover is only 10%, dominated by *Calamagrostis rubescens*. *Abies lasiocarpa* and *Picea engelmannii* seedlings are also common in this layer.

GLOBAL VEGETATION: This conifer association is characterized by a *Picea engelmannii*-codominated tree canopy with 5% or more cover of *Vaccinium caespitosum* in the understory. The evergreen needle-leaved tree canopy is open to moderately dense (30-65% cover). The upper tree canopy is typically codominated by *Picea engelmannii* or *Picea engelmannii X glauca* hybrids, and mature seral tree species with *Picea engelmannii* dominating the subcanopy and regeneration layers. *Abies lasiocarpa* is typically absent from the tree canopy and regeneration layer or restricted to drier microsites. Important seral species in the tree canopy are *Pseudotsuga menziesii*, *Larix occidentalis*, *Pinus contorta*, and sometimes *Populus tremuloides*. Undergrowth is variable depending on elevation and may be diverse, but is typically an open to dense dwarf-shrub layer with 5% or more cover of *Vaccinium caespitosum*. Other relatively constant shrubs and dwarf-shrubs include *Amelanchier alnifolia*, *Arctostaphylos uva-ursi*, *Linnaea borealis*, *Mahonia repens*, *Ribes montigenum*, *Shepherdia canadensis*, *Spiraea betulifolia*, *Symphoricarpos albus*, and *Vaccinium scoparium*, which may codominate. The herbaceous layer is often dominated by *Calamagrostis rubescens*. Other relatively constant species are *Arnica cordifolia*, *Arnica latifolia*, *Carex rossii*, *Galium* spp., and *Thalictrum occidentale*. Higher elevation stands have herbaceous layers that are often dominated by alpine forbs and graminoids such as *Lewisia pygmaea*, *Polygonum bistortoides*, *Sibbaldia procumbens*, *Trifolium* spp., *Deschampsia caespitosa*, *Festuca brachyphylla*, *Poa alpina*, and *Trisetum spicatum*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Picea engelmannii</i> , <i>Pinus contorta</i> , <i>Pseudotsuga menziesii</i>
Tree subcanopy	Needle-leaved tree	<i>Picea engelmannii</i> , <i>Pseudotsuga menziesii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Symphoricarpos albus</i>
Herb (field)	Dwarf-shrub	<i>Mahonia repens</i> , <i>Vaccinium caespitosum</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>
Herb (field)	Other herbaceous	<i>Abies lasiocarpa</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Picea engelmannii</i> , <i>Pinus contorta</i> , <i>Pseudotsuga menziesii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Symphoricarpos albus</i>
Herb (field)	Dwarf-shrub	<i>Mahonia repens</i> , <i>Vaccinium caespitosum</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Picea engelmannii*, *Pseudotsuga menziesii*, *Symphoricarpos albus*, *Vaccinium caespitosum*

GLOBAL: *Picea engelmannii*, *Pseudotsuga menziesii*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4G5 (23-Feb-1994).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This community is recognized based on the demonstrated indicator value of *Vaccinium caespitosum*, which even in minor amounts (<5%) is diagnostic of sites where cold air ponds for appreciable periods (Pfister et al. 1977), influencing the reproductive success of tree species and vegetation in general.

GLOBAL COMMENTS: This association now includes the former *Picea (engelmannii X glauca, engelmannii) / Vaccinium caespitosum* Forest (CEGL000416), originally identified by Pfister et al. (1977) from throughout western Montana. *Picea engelmannii* and/or *Picea engelmannii X glauca* (hybrids) are the diagnostic overstory species in this plant association. Stands can include pure *Picea engelmannii* and *Picea engelmannii X glauca* hybrid, or both. Hansen et al. (1995) explained that the frequent absence of mature cones, similar morphology, and ecological amplitudes led them to lump *Picea engelmannii* and *Picea glauca* (hybrids) into a single type, as did Pfister et al. (1977).

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Calamagrostis rubescens* Forest (CEGL000301)

- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (CEGL005918)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium caespitosum* Forest (CEGL000340)
- *Larix occidentalis* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (CEGL005883)
- *Larix occidentalis* / *Vaccinium caespitosum* Forest (CEGL005882)
- *Pinus contorta* / *Vaccinium caespitosum* Forest (CEGL000168)
- *Pseudotsuga menziesii* / *Vaccinium caespitosum* Forest (CEGL000465)

GLOBAL RELATED CONCEPTS:

- *Picea* / *Vaccinium caespitosum* Habitat Type (Pfister et al. 1977) B
- *Picea engelmannii* / *Vaccinium cespitosum* Habitat Type (Mauk and Henderson 1984) =
- *Picea engelmannii*/ *Vaccinium cespitosum* (Bourgeron and Engelking 1994) =
- *Picea* spp./ *Vaccinium cespitosum* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association occurs on the west side of Glacier National Park but is uncommon. It occurs on low-elevation benches in the North Fork subdistrict of Glacier National Park in an area north of Big Prairie.

GLOBAL RANGE: This subalpine forest association is found in the mountains of northeastern Utah and western Montana. It is highly likely to also occur in Wyoming.

NATIONS: US

STATES/PROVINCES: MT:S4, UT:S4S5, WY?

USFS ECOREGIONS: M331D:CC, M331E:CC, M332C:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2269.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Hansen et al. 1995, Mauk and Henderson 1984, Pfister et al. 1977, Western Ecology Working Group n.d.

***Pseudotsuga menziesii* Forest Alliance**

***Pseudotsuga menziesii* / *Acer glabrum* Forest
DOUGLAS-FIR / ROCKY MOUNTAIN MAPLE FOREST**

IDENTIFIER: CEGL000418

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Pseudotsuga menziesii</i> Forest Alliance (A.157)
Alliance (English name)	Douglas-fir Forest Alliance
Association	<i>Pseudotsuga menziesii</i> / <i>Acer glabrum</i> Forest
Association (English name)	Douglas-fir / Rocky Mountain Maple Forest
ECOLOGICAL SYSTEM(S):	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (CES306.825)

ELEMENT CONCEPT

GLOBAL SUMMARY: This montane forest association occurs in the montane zone in the southern, central and northern Rocky Mountains. Elevations vary from 1465 to 2654 m (4800-8700 feet). Sites are cool and moist, generally occurring on northern or eastern aspects, on steep, mid to lower slopes, and ravines or stream bottoms where cold-air drainage is a factor. Substrates are variable and may be gravelly or not, with soil texture ranging from sandy loam to clay derived from colluvium. The vegetation is characterized by a *Pseudotsuga menziesii*-dominated tree canopy with *Acer glabrum* dominating or codominating the understory. The evergreen needle-leaved tree canopy is generally moderately dense to dense (50-80% cover). Mature seral tree species such as *Pinus contorta*, *Pinus flexilis*, *Pinus ponderosa*, *Larix occidentalis*, *Populus angustifolia*, or *Populus tremuloides* may be present to codominant. *Abies concolor* is typically absent. The tall-shrub layer is open (patchy) to moderately dense and dominated or codominated by *Acer glabrum* with other tall shrubs such as *Amelanchier alnifolia*, *Cornus sericea*, *Quercus gambelii*, *Prunus virginiana*, *Sorbus scopulina*, *Spiraea betulifolia*, or *Salix scouleriana*. An open to moderately dense short-shrub layer is usually present and often dominated by *Physocarpus malvaceus* with other species such as *Lonicera utahensis*, *Mahonia repens*, *Paxistima myrsinites*, *Rosa* spp., *Ribes cereum*, *Symphoricarpos albus*, or *Symphoricarpos oreophilus*. The vine *Clematis columbiana* may also be present in small amounts. In some stands the tall- and short-shrub layers are not distinct. Herbaceous layer generally has low cover and is composed of diverse forbs with graminoids present to codominant.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association was sampled at 1670 m (5475 feet) elevation on a steep midslope with an eastern aspect. It was found on colluvial deposits with well-drained Orthic Regosols soil and a mesic moisture regime.

GLOBAL ENVIRONMENT: This montane forest association occurs in the montane zone in the southern, central and northern Rocky Mountains. Elevations vary from 1465 to 2654 m (4800-8700 feet). Sites are cool and moist, generally occurring on northern or eastern aspects, on steep, mid to lower slopes, and ravines or stream bottoms where cold-air drainage is a factor. Substrates are variable and may be gravelly or not, with soil texture ranging from sandy loam to clay derived from colluvium. Parent materials include loess, basalt, diorite, dolomite, limestone, granite, quartz monzonite or sandstone. Ground surface has high cover of litter 3-7 cm deep, sometimes with significant cover of rock, and low cover of bare soil.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: A partially closed canopy of 10- to 15-m tall *Pseudotsuga menziesii* (with 55% cover), over an open short-shrub and forb understory, characterized the one stand sampled. The shrub layer was dominated by *Acer glabrum* (with 25% cover) and *Spiraea betulifolia* (with 10% cover), both 1 m or less in height. Three other shrubs were present, but each had only trace cover. Seedling *Abies lasiocarpa* were present in the stand with trace cover. The diverse herbaceous understory was dominated by taller forbs, especially *Thalictrum occidentale*, *Eurybia conspicua* (= *Aster conspicuus*), *Eucephalus engelmannii*, and *Maianthemum racemosum* ssp. *amplexicaule*, each with 10 to 15% cover. *Angelica dawsonii* and *Clematis occidentalis* were also present, but with lower cover (3 to 5%). *Arnica cordifolia* (with 10% cover), along with *Viola* spp., and several other low-forb species, formed an open ground layer. All other forbs had trace cover, as did *Calamagrostis rubescens*, the only graminoid present. The ground cover was primarily litter and duff, with 5% cover of downed wood and trace amounts of small rocks and mosses.

GLOBAL VEGETATION: This minor Rocky Mountain conifer association is characterized by a *Pseudotsuga menziesii*-dominated tree canopy with *Acer glabrum* dominating or codominating the understory. The evergreen needle-leaved tree canopy is generally moderately dense to dense (50-80% cover), although occasionally the cover will be as low as 15%. Mature seral tree species like *Pinus contorta*, *Pinus flexilis*, *Pinus ponderosa*, *Larix occidentalis*, *Populus angustifolia*, or *Populus tremuloides* may be present to codominant. *Abies concolor* is typically absent. The tall-shrub layer is open (patchy) to moderately dense and dominated or codominated by *Acer glabrum* with other tall shrubs such as *Amelanchier alnifolia*, *Cornus sericea*, *Quercus gambelii*, *Prunus virginiana*, *Sorbus scopulina*, *Spiraea betulifolia*, or *Salix scouleriana*. An open to moderately dense short-shrub layer is usually present and often dominated by *Physocarpus malvaceus* with other species such as *Holodiscus dumosus*, *Lonicera utahensis*, *Mahonia repens*, *Paxistima myrsinites*, *Prunus virginiana*, *Rosa* spp., *Ribes cereum*, *Ribes inerme*, *Sambucus racemosa*, *Symphoricarpos albus*, or *Symphoricarpos oreophilus*. The vine *Clematis columbiana* may also be present in small amounts. In some stands the tall- and short-shrub layers are not distinct. Herbaceous layer generally has low cover and is composed of diverse forbs with graminoids present to codominant. Species may include *Agrostis scabra*, *Arnica cordifolia*, *Calamagrostis rubescens*, *Carex geyeri*, *Cystopteris fragilis*, *Elymus glaucus*, *Erigeron speciosus*, *Heracleum maximum* (= *Heracleum lanatum*), *Eurybia conspicua*, *Fragaria vesca*, *Galium triflorum*, *Mitella stauropetala*, *Moehringia macrophylla* (= *Arenaria macrophylla*), *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Penstemon wilcoxii*, *Poa nervosa*, *Maianthemum racemosum* ssp. *amplexicaule*, *Thalictrum fendleri*, or *Thalictrum occidentale*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

Stratum

Tree canopy
Short shrub/sapling
Herb (field)

Lifeform

Needle-leaved tree
Broad-leaved deciduous shrub
Forb

Species

Pseudotsuga menziesii
Acer glabrum, *Spiraea betulifolia*
Arnica cordifolia, *Eucephalus engelmannii*, *Eurybia conspicua*,
Maianthemum racemosum ssp. *amplexicaule*, *Thalictrum*
occidentale

Global

Stratum

Tree canopy
Tall shrub/sapling

Lifeform

Needle-leaved tree
Broad-leaved deciduous tree

Species

Pseudotsuga menziesii
Acer glabrum

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Acer glabrum*, *Angelica dawsonii*, *Arnica cordifolia*, *Clematis occidentalis*, *Eucephalus engelmannii*, *Eurybia conspicua*, *Maianthemum racemosum* ssp. *amplexicaule*, *Pseudotsuga menziesii*

GLOBAL: *Acer glabrum*, *Arnica cordifolia*, *Calamagrostis rubescens*, *Carex geyeri*, *Maianthemum racemosum*, *Osmorhiza berteroi*, *Pseudotsuga menziesii*, *Thalictrum fendleri*, *Thalictrum occidentale*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4? (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: Further sampling will provide data necessary for better characterizing the vegetation and environmental conditions of this association.

GLOBAL COMMENTS: All phases of the *Pseudotsuga menziesii* / *Acer glabrum* Habitat Type are included in the concept of this association (Steele et al. 1981, 1983, Mauk and Henderson 1984).

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies concolor* - *Pseudotsuga menziesii* / *Acer glabrum* Forest (CEGL000240)
- *Abies lasiocarpa* - *Picea engelmannii* / *Acer glabrum* Forest (CEGL000294)
- *Picea engelmannii* / *Acer glabrum* Forest (CEGL000354)
- *Populus tremuloides* / *Acer glabrum* Forest (CEGL000563)
- *Pseudotsuga menziesii* / *Acer negundo* Woodland (CEGL002754)

GLOBAL RELATED CONCEPTS:

- *Pseudotsuga menziesii* / *Acer glabrum* / *Physocarpus malvaceus* plant association (Johnson and Simon 1987) =
- *Pseudotsuga menziesii* / *Acer glabrum* Habitat Type (Henderson et al. 1976) =
- *Pseudotsuga menziesii* / *Acer glabrum* Habitat Type (Steele et al. 1981) B
- *Pseudotsuga menziesii* / *Acer glabrum* Habitat Type (Mauk and Henderson 1984) B
- *Pseudotsuga menziesii* / *Acer glabrum* Habitat Type, *Pachistima myrsinites* Phase (Steele et al. 1983) B
- *Pseudotsuga menziesii* / *Acer glabrum* plant association (Johnston 1987) =
- *Pseudotsuga menziesii* / *Acer glabrum* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is known from one medium-elevation stand at 1670 m (5475 feet) in Waterton Lakes National Park.

GLOBAL RANGE: This forest association occurs in the montane zone in the southern, central and northern Rocky Mountains from northern Colorado, through Utah, Wyoming, and Idaho, extending into Oregon and Alberta, and possibly Montana.

NATIONS: CA, US

STATES/PROVINCES: AB, CO:S1, ID:S3, MT?, OR:S2, UT:S4?, WY:S3?

USFS ECOREGIONS: 341B:CC, 342B:CC, 342E:CC, M331A:CC, M331D:CC, M331G:CC, M331H:CP, M332A:CC, M332B:CP, M332C:CP, M332D:CP, M332E:CP, M332F:CC, M332G:CC, M333:P

FEDERAL LANDS: NPS (Capitol Reef, Curecanti, Grand Teton); PC (Waterton Lakes); USFS (Bridger-Teton, Shoshone, Wallowa-Whitman)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.5064.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz, mod. G. Kittel and J. Coles

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Driscoll et al. 1984, Henderson et al. 1976, Johnson and Simon 1987, Johnston 1987, Jones and Ogle 2000, Kagan et al. 2000, Mauk and Henderson 1984, Steele et al. 1981, Steele et al. 1983, Titus et al. 1998, Western Ecology Working Group n.d.

Pseudotsuga menziesii / *Arctostaphylos uva-ursi* Forest DOUGLAS-FIR / BEARBERRY OR KINIKINNICK FOREST

IDENTIFIER: Cegl000424

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Pseudotsuga menziesii</i> Forest Alliance (A.157)
Alliance (English name)	Douglas-fir Forest Alliance
Association	<i>Pseudotsuga menziesii</i> / <i>Arctostaphylos uva-ursi</i> Forest
Association (English name)	Douglas-fir / Bearberry or Kinikinnick Forest

ECOLOGICAL SYSTEM(S): Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)

ELEMENT CONCEPT

GLOBAL SUMMARY: This minor forest association occupies mid to upper montane elevation in the northern and southern Rocky Mountains occurring in Alberta, Montana, Colorado and New Mexico. Elevation ranges from 1400-1785 m (4600-5855 feet) in the north to 2440-3020 m (8000-9900 feet) in the southern range. Sites are warm and dry, often occurring on southerly aspects or ridgetops. Substrates are typically rocky, coarse-textured soils derived from a variety of parent materials, including calcareous and noncalcareous rock. *Pseudotsuga menziesii* is the dominant tree species in the overstory and often in the understory as well. *Pinus ponderosa*, *Pinus flexilis*, *Juniperus scopulorum*, or *Pinus strobiformis* (in New Mexico) may be present to codominant. The low-shrub layer is dominated by large patches of *Arctostaphylos uva-ursi* and *Juniperus communis*. Other shrubs may include scattered *Spiraea betulifolia*, *Shepherdia canadensis*, or *Symphoricarpos* spp. The herbaceous cover is generally low and dominated by graminoids. Forb species typically provide low cover but may be diverse.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This forest association occurs on dry, somewhat steep and well-drained slopes at elevations ranging from 1385-1785 m (4540-5855 feet). The association can occur at all aspects and sometimes occupies shallow soil that has developed on cliff bedrock. Geologic parent material is typically sedimentary, consisting of limestone, dolomites and argillites. Soils are undeveloped (lacking horizonation), predominantly sandy loams with abundant gravel and small rock. Most of the ground cover is litter, although bedrock can account for a significant portion in some stands.

GLOBAL ENVIRONMENT: This minor forest association occupies mid to upper montane elevations in the northern and southern Rocky Mountains. Elevations range from 1785 m (4600-5855 feet) in the north to 2440-3020 m (8000-9900 feet) in the southern

range. Sites are warm and dry, often occurring on southerly aspects or ridgetops. Substrates are typically rocky, coarse-textured soils derived from a variety of parent materials, including both calcareous and noncalcareous rock.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This forest association typically has an open canopy, with *Pseudotsuga menziesii* contributing most of the canopy cover in a layer 5-15 m tall. *Pinus contorta* and *Pinus flexilis* may also be present. Dwarf- and short shrubs dominate the shrub layer; dwarf-shrubs *Arctostaphylos uva-ursi* and *Juniperus communis* are present in all plots sampled as were the short shrubs *Shepherdia canadensis* and *Spiraea betulifolia*. *Juniperus communis* was stunted (<0.5 m tall) because of harsh site conditions. Other shrubs, sometimes abundant, include *Amelanchier alnifolia* and *Prunus virginiana*. Herbaceous cover is sparse (10%) in some stands and dense (100%) in others, with *Anemone multifida*, *Galium boreale*, and *Allium cernuum* occurring in at least trace amounts in almost all plots. Other forbs include *Hedysarum sulphurescens*, *Lupinus sericeus*, *Sedum lanceolatum*, and *Solidago multiradiata*. *Festuca campestris* was abundant in several stands. The open forest canopy contributes to high diversity of primarily xeric-site forbs and grasses. This association may occur in patches across the landscape, alternating with forests dominated by *Abies lasiocarpa* and shrublands dominated by a variety of species, such as *Alnus viridis ssp. sinuata* and *Rubus parviflorus*.

GLOBAL VEGETATION: This forest association is dominated by *Pseudotsuga menziesii* in the overstory tree canopy and often in the understory as well. *Pinus ponderosa*, *Pinus flexilis*, *Juniperus scopulorum*, or *Pinus strobiformis* (in New Mexico) may be present to codominant. The low-shrub layer is dominated by large patches of *Arctostaphylos uva-ursi* and *Juniperus communis*. Other shrubs may include scattered *Spiraea betulifolia*, *Shepherdia canadensis*, or *Symphoricarpos* spp. The herbaceous cover is generally low and dominated by graminoids such as *Bromus ciliatus*, *Carex* spp., *Festuca idahoensis*, *Festuca campestris* (= *Festuca scabrella*), and *Pseudoroegneria spicata*. Forb species typically provide low cover but may be diverse and include *Achillea millefolium*, *Allium cernuum*, *Arnica cordifolia*, *Balsamorhiza sagittata*, *Lupinus* spp., and *Galium* spp.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i> , <i>Pseudotsuga menziesii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Shepherdia canadensis</i> , <i>Spiraea betulifolia</i>
Herb (field)	Dwarf-shrub	<i>Arctostaphylos uva-ursi</i> , <i>Juniperus communis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus flexilis</i> , <i>Pinus ponderosa</i> , <i>Pseudotsuga menziesii</i>
Herb (field)	Dwarf-shrub	<i>Arctostaphylos uva-ursi</i> , <i>Juniperus communis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Arctostaphylos uva-ursi*, *Juniperus communis*

GLOBAL: *Pseudotsuga menziesii*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Sites may be too warm and dry for *Pseudotsuga menziesii* throughout its range, which may help explain the disjunct occurrences in southern and northern Rocky Mountains. There also may be confusion with *Pseudotsuga menziesii* / *Juniperus communis* Forest (CEGL000439). This association tends towards having an open-tree canopy and may better fit in the *Pseudotsuga menziesii* Woodland Alliance (A.552).

GLOBAL SIMILAR ASSOCIATIONS:

- *Picea pungens* / *Arctostaphylos uva-ursi* Forest (CEGL000385)

- *Pinus contorta* / *Arctostaphylos uva-ursi* Forest (CEGL000134)
- *Pinus flexilis* / *Arctostaphylos uva-ursi* Woodland (CEGL000802)
- *Pinus ponderosa* / *Arctostaphylos uva-ursi* Woodland (CEGL000844)
- *Pseudotsuga menziesii* / *Arctostaphylos uva-ursi* - *Purshia tridentata* Forest (CEGL000426)
- *Pseudotsuga menziesii* / *Arctostaphylos uva-ursi* Cascadian Forest (CEGL000425)
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Woodland (CEGL000429)
- *Pseudotsuga menziesii* / *Juniperus communis* Forest (CEGL000439)

GLOBAL RELATED CONCEPTS:

- *Pseudotsuga menziesii* / *Arctostaphylos uva-ursi* Habitat Type (Fitzhugh et al. 1987) B
- *Pseudotsuga menziesii* / *Arctostaphylos uva-ursi* Habitat Type (Pfister et al. 1977) B
- *Pseudotsuga menziesii*/*Arctostaphylos uva-ursi* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B
- O25: *Pseudotsuga menziesii* - *Pinus flexilis* - *Pinus contorta* / *Arctostaphylos uva-ursi* - *Juniperus communis* Vegetation Type (Achuff et al. 2002a) I
- O26: *Pseudotsuga menziesii* - *Pinus contorta* / *Arctostaphylos uva-ursi* - *Festuca scabrella* Vegetation Type (Achuff et al. 2002a) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is common on sidewall slopes of narrow valleys in Glacier National Park and Waterton Lakes National Park. Specifically, in Glacier National Park the association is documented in the Cut Bank drainage and the upper reaches of the Waterton Valley.

GLOBAL RANGE: This minor forest association occupies mid to upper montane elevations in the northern and southern Rocky Mountains, occurring in Alberta, Montana, Colorado and New Mexico.

NATIONS: CA, US

STATES/PROVINCES: AB, CO:S3, MT:S4, NM:S4

USFS ECOREGIONS: 331D:CC, M331A:CC, M331G:CC, M331I:CC, M332B:CC, M332C:CC, M332D:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.122, GLAC.185, GLAC.78, WATE.4026, WATE.4027, WATE.4032, WATE.4053, WATE.5001.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Achuff et al. 2002a, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, DeVelice et al. 1986, Driscoll et al. 1984, Fitzhugh et al. 1987, Johnston and Hendzel 1985, Larson 1974, MTNHP 2002b, Peet 1975, Pfister et al. 1977, Shepherd 1975, Western Ecology Working Group n.d.

***Pseudotsuga menziesii* / *Arnica cordifolia* Forest
DOUGLAS-FIR / HEARTLEAF LEOPARDBANE FOREST**

IDENTIFIER: CEGL000427

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Pseudotsuga menziesii</i> Forest Alliance (A.157)
Alliance (English name)	Douglas-fir Forest Alliance
Association	<i>Pseudotsuga menziesii</i> / <i>Arnica cordifolia</i> Forest

Association (English name) Douglas-fir / Heartleaf Leopardbane Forest

ECOLOGICAL SYSTEM(S): Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)

ELEMENT CONCEPT

GLOBAL SUMMARY: This forest association occurs in the central and northern Rocky Mountains from the lower to mid montane zone. Elevations range from 1430 to 2900 m (4690-9500 feet). Sites are variable but generally on dry aspects. Substrates are variable and may be very gravelly or not, with soil textures ranging from sandy loam to silt. Ground surface has high cover of litter, often 4-7 cm deep, relatively low cover of surface rock (<10%), and low cover of bare soil. The vegetation is characterized by a relatively dense (60-90% cover), evergreen needle-leaved tree canopy strongly dominated by *Pseudotsuga menziesii* with *Arnica cordifolia* or *Astragalus miser* dominating or codominating the sparse to moderately dense understory. Other mature seral tree species present include *Pinus contorta*, *Pinus flexilis*, or *Juniperus scopulorum*. The dense canopy limits understory development so only scattered shrubs may be present, not enough to form a shrub layer. The herbaceous layer, whether depauperate or moderately dense, dominates the forest floor and is dominated or codominated by *Arnica cordifolia* and *Astragalus miser*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This forest association occupies cool, north-facing terraces and slopes in an early- to mid-seral stage. Light penetration to the undergrowth is very limited because of dense tree cover dominated by *Pseudotsuga menziesii*. The association occurs at elevations ranging from 1430-1465 m (4690-4805 feet) on parent material derived from glacial till. Soil is a well-drained sandy loam and is not well-developed, with much angular argillite present. Ground surfaces are primarily covered with deep duff (7-8 cm) from shed needles. The environmental parameters of this type are far from being detailed, based as they are for the most part on one plot and anecdotal observations. These stands are initiated by intense fire. Evidence of relatively recent fire may be present in the form of burned stumps and charcoal.

GLOBAL ENVIRONMENT: This forest association occurs in the central and northern Rocky Mountains from the lower to mid montane zone. Elevations range from 1800-2900 m (5900-9500 feet) in the central and 1430-2620 m (4690-8600 feet) in the northern Rocky Mountains. Sites are variable and tend to occur on dry aspects. Substrates are variable and may be very gravelly or not, with soil textures ranging from sandy loam to silt. Parent materials include loess, various calcareous and noncalcareous sedimentary rock, andesite, argillite, dacite, gneiss, granite, limestone, quartzite, quartz monzonite, rhyolite, sandstone or schist. Ground surface has high cover of litter 4-7 cm deep, relatively low cover of surface rock (<10%), and low cover of bare soil.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The forest canopy, dominated by *Pseudotsuga menziesii*, is made up of a dense, uniform layer of trees 10-15 m tall, limiting the light available for undergrowth development. Consequently, the shrub and herbaceous layers are very sparse (<10% cover). The trees are closely spaced and small, with only a few *Pinus contorta* present. *Abies lasiocarpa* is also present, but colonizing very slowly. Shrubs make up only a trace of the canopy cover. Forbs grow in small patches of light filtering through the canopy, with *Arnica cordifolia*, *Thalictrum occidentale*, and *Osmorhiza berteroi* (= *Osmorhiza chilensis*) among the handful present.

GLOBAL VEGETATION: This Rocky Mountain conifer association is characterized by a relatively dense (60-90% cover) evergreen needle-leaved tree canopy strongly dominated by *Pseudotsuga menziesii* with *Arnica cordifolia* or *Astragalus miser* dominating or codominating the sparse to moderate dense understory. Other mature seral tree species present include *Pinus contorta*, *Pinus flexilis*, or *Juniperus scopulorum*. The dense canopy limits understory development so only scattered shrubs may be present, not enough to form a shrub layer. Shrub species may include *Artemisia tridentata*, *Cercocarpus ledifolius*, *Ribes cereum*, *Shepherdia canadensis*, *Symphoricarpos oreophilus*, and occasional clumps of *Juniperus communis*. The herbaceous layer, whether depauperate or moderately dense, dominates the forest floor. *Arnica cordifolia* or *Astragalus miser* dominate or codominate this patchy herbaceous layer often with low cover of other herbaceous species such as *Antennaria microphylla*, *Balsamorhiza sagittata*, *Packera streptanthifolia* (= *Senecio streptanthifolius*), *Carex rossii*, *Festuca idahoensis*, *Leucopoa kingii* (= *Festuca kingii*), *Festuca campestris* (= *Festuca scabrella*), *Poa nervosa*, or *Pseudoroegneria spicata*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i> , <i>Pseudotsuga menziesii</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Osmorhiza berteroi</i> , <i>Thalictrum occidentale</i>

Global

Stratum

Tree canopy
Herb (field)

Lifeform

Needle-leaved tree
Forb

Species

Pinus contorta, *Pseudotsuga menziesii*
Arnica cordifolia, *Astragalus miser*

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Pseudotsuga menziesii*

GLOBAL: *Arnica cordifolia*, *Astragalus miser*, *Pseudotsuga menziesii*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: The one sampled stand represents a seral stage of a type potentially dominated by *Abies lasiocarpa* and a suite of forbs. It may represent a very limited condition (at least on relatively xeric, eastside slope) of closed-canopy structure that has inhibited the development of all but the most shade-tolerant of forbs.

GLOBAL COMMENTS: All phases of the *Pseudotsuga menziesii* / *Arnica cordifolia* Habitat Type are included in the concept of this associations (Steele et al. 1981, 1983).

GLOBAL SIMILAR ASSOCIATIONS:

- *Pinus contorta* / *Arnica cordifolia* Forest (CEGL000135)
- *Pseudotsuga menziesii* / *Paxistima myrsinites* Forest (CEGL000446)

GLOBAL RELATED CONCEPTS:

- *Pseudotsuga menziesii* / *Arnica cordifolia* Habitat Type (Steele et al. 1981) B
- *Pseudotsuga menziesii* / *Arnica cordifolia* Habitat Type (Pfister et al. 1977) B
- *Pseudotsuga menziesii* / *Arnica cordifolia* Habitat Type (Steele et al. 1983) B
- *Pseudotsuga menziesii* / *Arnica cordifolia* Plant Association (Johnston 1987) =
- *Pseudotsuga menziesii*/ *Arnica cordifolia* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is not common in Glacier National Park, and may be absent in Waterton Lakes National Park. Only one plot, in the St. Mary's Valley of Glacier National Park, was surveyed to document the association. However, project ecologists believe it exists in other areas not surveyed by field crews. It likely occupies cool, north-facing slopes recently affected by fire, within broad valleys east of the Continental Divide, such as the St. Mary's and Two Medicine valleys.

GLOBAL RANGE: This forest association occurs in the central and northern Rocky Mountains from the lower to mid montane zone.

NATIONS: US

STATES/PROVINCES: ID:S3, MT:S4, WY:S3S4

USFS ECOREGIONS: M331A:CC, M331B:CC, M331D:CC, M331J:CC, M332C:CC, M332E:CC, M332F:CC

FEDERAL LANDS: NPS (Glacier); USFS (Bighorn, Shoshone)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.199.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Johnston 1987, Jones and Ogle 2000, MTNHP 2002b, Pfister et al. 1977, Steele et al. 1981, Steele et al. 1983, Western Ecology Working Group n.d.

Pseudotsuga menziesii / *Carex geyeri* Forest DOUGLAS-FIR / GEYER'S SEDGE FOREST

IDENTIFIER: C EGL000430

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Pseudotsuga menziesii</i> Forest Alliance (A.157)
Alliance (English name)	Douglas-fir Forest Alliance
Association	<i>Pseudotsuga menziesii</i> / <i>Carex geyeri</i> Forest
Association (English name)	Douglas-fir / Geyer's Sedge Forest

ECOLOGICAL SYSTEM(S): Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association has been found in the montane zone of the Rocky Mountains of Colorado, Idaho, Montana, Oregon and Washington. Stands occur at lower montane elevations of these mountainous regions, on sites typically drier than most other *Pseudotsuga menziesii* associations. Site slope and aspect vary greatly. Slopes where this association is found in Colorado are reported to be steep to very steep (45-80%). Parent materials include granitics, conglomerates, sandstones, basalts, and shales. Exposed bare ground is low (less than 30%), and litter/duff is relatively thin, usually less than 5 cm deep. Vegetation is characterized by the dominance of *Pseudotsuga menziesii*, with a relatively closed canopy, as well as stands that are more open or have a mixed conifer tree canopy. *Pseudotsuga* is self-regenerating in this association. Several other conifers may be present to codominant, including *Pinus ponderosa* or *Juniperus scopulorum* in southern Rocky Mountain stands, and *Abies lasiocarpa*, *Pinus albicaulis*, *Pinus contorta*, or *Populus tremuloides* in stands farther north. These species are typically present only in early-seral stands of this association. There is no shrub layer, although several shrub species are typically present with low cover. These include the evergreen needle-leaved *Juniperus communis* and the broad-leaved cold-deciduous *Amelanchier alnifolia*, *Lonicera utahensis*, *Mahonia repens*, *Paxistima myrsinites*, *Purshia tridentata*, *Spiraea betulifolia*, *Vaccinium membranaceum*, *Vaccinium scoparium*, and *Symphoricarpos occidentalis* or *Symphoricarpos oreophilus*. The herbaceous layer is dominated by the perennial sedge *Carex geyeri* (averaging 35% cover). No other herbaceous species are well-represented, but many different forbs can occur in low amounts.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: The information describing this forest association comes from a single plot located in St. Mary's Valley. The association occupies warm, upland slopes with a moderate to steep grade and southerly exposure. Elevations range from 1480-1500 m (4854-4920 feet). Parent material is sedimentary siltstone and soil is loamy sand with up to 20-30% argillite gravel. Ground surfaces are predominantly covered with litter, with large to small rocks also common in amounts ranging from 1-10%.

GLOBAL ENVIRONMENT: This association has been found throughout much of the Rocky Mountains. Stands occur at lower montane elevations of these mountainous regions, on sites typically drier than most other *Pseudotsuga menziesii* associations. Elevations range from 1480-1500 m (4854-4920 feet) in Alberta, to 1860-2315 m (6100-7600 feet) in southern Montana, 2315-2800 m (7600-9200 feet) in central Colorado, and from 1125-2650 m (3700-8700 feet) in Idaho. Slope and aspect of sites vary greatly. Slopes vary from gentle to very steep (3-80%) but are generally moderate to steep (20-45%). Parent materials include granitics, conglomerates, sandstone, siltstone, rhyolite, basalt, and shale. Soils are rapidly drained loamy sand to silty clay loams. Exposed bare ground is low (less than 30%), and litter/duff is relatively thin, usually less than 5 cm deep.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The total tree canopy and subcanopy cover is typically around 40% in this forest association, giving these stands an open, often woodland-like form. These two canopy layers are dominated by *Pseudotsuga menziesii*, ranging in height from 5-15 m. *Pseudotsuga menziesii* is successfully reproducing, evidenced by

the presence of seedlings and pole-sized trees. *Abies lasiocarpa* and *Pinus flexilis* may also be present in the canopy and subcanopy, at levels ranging from 1-20%. Tall shrubs and saplings are common, with approximately 25% canopy cover coming from species such as *Amelanchier alnifolia* and *Prunus virginiana*. *Dasiphora fruticosa* ssp. *floribunda* is usually present as well. The most dominant species in the herbaceous layer is *Carex geyeri*, which is interspersed with bunchgrass species over much of the ground. *Calamagrostis rubescens*, if present, has a canopy cover of less than 5%. Forb diversity is high, with a wide variety of grassland species, such as *Eriogonum umbellatum* and *Lupinus sericeus*, occupying this sunny, dry forest habitat.

GLOBAL VEGETATION: This is an association dominated by the evergreen needle-leaved tree *Pseudotsuga menziesii*, with a relatively closed canopy. *Pseudotsuga* is self-regenerating in this association. Several other canopy trees may be present, including *Pinus ponderosa*, *Juniperus scopulorum*, and *Populus tremuloides*, with *Pinus albicaulis*, *Pinus contorta*, *Pinus flexilis*, or *Abies lasiocarpa* more typical in stands further north. These species are typically present only in early-seral stands of this association (Steele et al. 1981). It is reported that in some Idaho stands the canopy may be more open, with larger, more widely spaced trees in late-seral stands. There is no shrub layer, although several shrub or dwarf-shrub species are typically present with low cover. These include the evergreen needle-leaved *Juniperus communis* and the broad-leaved, cold-deciduous *Amelanchier* spp., *Dasiphora fruticosa* ssp. *floribunda*, *Lonicera utahensis*, *Mahonia repens*, *Paxistima myrsinites*, *Prunus virginiana*, *Purshia tridentata*, *Spiraea betulifolia*, *Symphoricarpos occidentalis*, or *Symphoricarpos oreophilus* depending on geographic region. The herbaceous layer is dominated by the perennial sedge *Carex geyeri*. Typically no other herbaceous species are well-represented, but many different forbs can occur in low amounts, including *Fragaria* spp., *Arnica cordifolia*, *Achillea millefolium*, *Antennaria parvifolia*, *Osmorhiza* spp., and *Astragalus* spp. Other graminoids can include *Poa* spp., *Bromus porteri*, *Carex siccata* (= *Carex foenea*), and *Calamagrostis rubescens*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus flexilis</i> , <i>Pseudotsuga menziesii</i>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Prunus virginiana</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i> , <i>Dasiphora fruticosa</i> ssp. <i>floribunda</i>
Herb (field)	Forb	<i>Eriogonum umbellatum</i> , <i>Lupinus sericeus</i>
Herb (field)	Graminoid	<i>Carex geyeri</i> , <i>Festuca idahoensis</i> , <i>Pseudoroegneria spicata</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Herb (field)	Graminoid	<i>Carex geyeri</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Pseudotsuga menziesii*

GLOBAL: *Carex geyeri*, *Pseudotsuga menziesii*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4? (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Some stands had an open tree canopy (40% cover) that could be classified as a woodland, but were included in this forest association until review of this association is completed rangewide. Stands included in this association from Colorado may be different from stands in the northwestern United States and northern Rocky Mountains and need to be re-analyzed.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Carex geyeri* Forest (CEGL000304)
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Woodland (CEGL000429)
- *Pseudotsuga menziesii* / *Mahonia repens* Forest (CEGL000442)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Carex geyeri* Habitat Type, *Pseudotsuga menziesii* Phase (Steele et al. 1983) B
- *Abies lasiocarpa* / *Carex geyeri* Habitat Type, *Pseudotsuga menziesii* Phase (Pfister et al. 1977) B
- *Abies lasiocarpa* / *Carex geyeri* Habitat Type, *Pseudotsuga menziesii* Phase (Steele et al. 1981) B
- *Pseudotsuga menziesii* / *Carex geyeri* (Topik et al. 1988) B
- *Pseudotsuga menziesii* / *Carex geyeri* Habitat Type (Pfister et al. 1977) B
- *Pseudotsuga menziesii* / *Carex geyeri* Habitat Type (Steele et al. 1981) B
- *Pseudotsuga menziesii* / *Carex geyeri* Habitat Type (Komarkova et al. 1988a) B
- *Pseudotsuga menziesii* / *Carex geyeri* Habitat Type (Hess 1981) B
- *Pseudotsuga menziesii* / *Carex geyeri* Habitat Type (Cooper et al. 1987) B
- *Pseudotsuga menziesii* / *Carex geyeri* Habitat Type (Williams and Smith 1990) B
- *Pseudotsuga menziesii* / *Carex geyeri* Habitat Type (Hess and Alexander 1986) B
- *Pseudotsuga menziesii* / *Carex geyeri* Plant Association (Johnston 1987) B
- *Pseudotsuga menziesii*/*Carex geyeri* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association has been documented on dry, south-facing slopes in St. Mary's Valley of Glacier National Park, and probably occurs in other eastside drainages with similar topographical and environmental characteristics.

GLOBAL RANGE: This association has been found in the montane zone throughout much of the Rocky Mountains from Colorado to Montana, and west into Oregon and Washington.

NATIONS: US

STATES/PROVINCES: CO:S3, ID:S4?, MT:S4, OR:S3, WA:S1, WY

USFS ECOREGIONS: 342C:CC, M331A:CC, M331D:CC, M331H:C?, M331I:C?, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332G:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Curecanti, Glacier, Grand Teton, Rocky Mountain); USFS (Arapaho-Roosevelt, Gunnison, Medicine Bow, Mount Hood, Shoshone, Wenatchee, White River NF)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.207.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Boyce 1977, CONHP unpubl. data 2003, Clausnitzer and Zamora 1987, Cooper et al. 1987, Driscoll et al. 1984, Giese 1975, Hess 1981, Hess and Alexander 1986, Johnson and Clausnitzer 1992, Johnston 1987, Jones and Ogle 2000, Kagan et al. 2000, Komarkova et al. 1988a, MTNHP 2002b, Pfister et al. 1977, Steele et al. 1981, Steele et al. 1983, Topik et al. 1988, Western Ecology Working Group n.d., Williams and Smith 1990

Pseudotsuga menziesii / *Clintonia uniflora* - *Xerophyllum tenax* Forest

DOUGLAS-FIR / BRIDE'S BONNET - BEAR-GRASS FOREST

IDENTIFIER: C EGL005854

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Pseudotsuga menziesii</i> Forest Alliance (A.157)
Alliance (English name)	Douglas-fir Forest Alliance
Association	<i>Pseudotsuga menziesii</i> / <i>Clintonia uniflora</i> - <i>Xerophyllum tenax</i> Forest
Association (English name)	Douglas-fir / Bride's Bonnet - Bear-grass Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)**ELEMENT CONCEPT**

GLOBAL SUMMARY: This is a seral, mesic, large-patch to matrix type found in the foothills and montane to lower and even mid-subalpine, relatively cold and dry environments throughout the northern Rocky Mountains and may extend as far west as the Cascade Crest. The associations' possible elevation range is from 915 to 1800 m (3000-5900 feet), and regardless of the climax series in which it is found, it consistently occurs on south- through west-facing exposures. The range of parent materials is, with the exception of highly unusual substrates like serpentine, literally as great as possible types occurring in the northern Rocky Mountains and northernmost middle Rocky Mountains and may include some ultramafics east of the Cascade Crest. It is difficult to characterize the soils as well, but they are uniformly well-drained and have a low coarse-fragment content, except those sites within the lower to mid-subalpine zone. The overstory is dominated by *Pseudotsuga menziesii* with a whole host of tree species capable of playing a subordinate role; on warmer sites these include *Thuja plicata*, *Tsuga heterophylla*, *Abies grandis*, and on colder or higher elevation sites are found *Abies lasiocarpa*, *Tsuga mertensiana*, and *Picea engelmannii*. However, the most frequent canopy codominants or associates are the seral species *Larix occidentalis*, *Pinus contorta*, and in a restricted portion of the type's range, *Pinus monticola*. The tall-shrub component is relatively unimportant, only *Alnus viridis ssp. sinuata* and *Amelanchier alnifolia* approach 50% constancy (and have low cover values). The short-shrub layer exhibits greater cover and diversity than the other shrub components with *Vaccinium membranaceum*, *Paxistima myrsinites*, *Rosa gymnocarpa*, *Rubus parviflorus*, and *Spiraea betulifolia* being consistently present. *Linnaea borealis* and *Chimaphila umbellata* have high constancy in the dwarf-shrub layer. *Bromus vulgaris* (or *Bromus ciliatus*) are the only graminoids of note. The diagnostic forbs *Clintonia uniflora*, *Xerophyllum tenax*, and *Tiarella trifoliata* naturally have high constancy and/or cover, however, a number of other forbs also exhibit high constancy, including *Arnica latifolia*, *Aralia nudicaulis*, *Adenocaulon bicolor*, *Coptis occidentalis*, *Cornus canadensis*, *Galium triflorum*, *Goodyera oblongifolia*, *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Pedicularis racemosa*, *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, *Trillium ovatum*, and *Viola orbiculata*.

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is known from 975 to 1609 m (3198-5274 feet) elevation on moderately steep slopes. Stands occur on basin floor and toeslope positions, as well as on midslopes and higher slopes, most often on southerly aspects. The association is known from alluvial deposits on a lakeplain, but more typically is found on soils originating from glacial-fluvial deposits, colluvium, bedrock, or glacial till. The association is restricted to well-drained, very gravelly soils. Soils range from rocky and poorly developed sand and sandy-loams, to gravelly clay-loams with a deep duff layer.

GLOBAL ENVIRONMENT: This seral, large-patch to matrix type occupies the relatively cold and dry environments across a number of climax tree series and associated geographic regions; the species defining these series include, but are not limited to, *Thuja plicata*, *Tsuga heterophylla*, *Tsuga mertensiana*, *Abies grandis*, *Abies lasiocarpa*, and *Picea engelmannii*. Thus this mesic type is found throughout the northern Rocky Mountains and may extend as far west as the Cascade Crest on environments characterized as foothills and montane to lower and even mid-subalpine. The associations possible elevation range is from 915 to 1800 m (3000-5900 feet), and regardless of the climax series in which it is found, it consistently occurs on south- through west-facing exposures. These are generally more shedding than collecting positions, occurring in any ridge or hillslope system from midslope up to ridge crest, including level terrain of ridge summits. The range of parent materials is, with the exception of highly unusual substrates like serpentine, literally as great as possible types occurring in the northern Rocky Mountains and northernmost middle Rocky Mountains and may include some ultramafics east of the Cascade Crest. It is difficult to characterize the soils as well, but they are uniformly well-drained and have a low coarse-fragment content, except those sites within the lower to mid-subalpine zone.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Widely spaced, mature *Pseudotsuga menziesii* trees (between 70 and 225 years old and 15-35 m tall) form an open tree canopy with up to 63% cover in the tree canopy and up to 10% cover in the tree subcanopy. *Abies lasiocarpa*, which is present in most stands, has up to 10% cover in the tree canopy but low cover in the younger tree layers. Both species are regenerating. Several early to mid-seral conifer species (e.g., *Larix occidentalis* and *Pinus contorta*) can be present in the overstory, while several shade-tolerant conifers (e.g., *Tsuga heterophylla*) occur as seedlings; all have low cover and constancy.

There is usually a sparse tall-shrub layer composed of *Acer glabrum*, *Amelanchier alnifolia*, and/or other species, but none have more than 10% cover or 50% constancy. *Vaccinium membranaceum* usually dominates the open short-shrub canopy (less than 2 m tall), occurring in at least 67% of the stands with up to 30% cover. Other important shrubs, such as *Lonicera utahensis*, *Rubus parviflorus*, and *Spiraea betulifolia*, each occur in the majority of stands but never have more than 20% cover. *Symphoricarpos albus* has higher average cover (15%), but it is only found in 33% of the stands. The dwarf-shrub *Paxistima myrsinites* is found in all stands with only trace cover.

Xerophyllum tenax (with 22% average cover) and *Clintonia uniflora* (with 5% average cover) characterize the diverse forb-dominated understory in all stands and, while not dominant, are the indicator herbaceous species for this association. *Arnica cordifolia*, which is found in 67% of the stands, can dominate the ground layer with up to 70% cover. *Thalictrum occidentale* is also an important forb species, found in 87% of the stands with up to 33% cover. *Aralia nudicaulis* can be noticeable in the ground layer, but it has low constancy. Graminoids have low constancy and low cover in this association, with *Carex geyeri* and *Bromus* spp. being the most important. Ground cover is primarily litter and duff, with an average moss cover of 15% and sparse downed wood.

GLOBAL VEGETATION: The overstory is dominated by *Pseudotsuga menziesii* with a whole host of tree species capable of playing a subordinate role; on warmer sites these include *Thuja plicata*, *Tsuga heterophylla*, *Abies grandis*, and on colder or higher elevation sites are found *Abies lasiocarpa*, *Tsuga mertensiana*, and *Picea engelmannii*. However, the most frequent canopy codominants or associates are the seral species *Larix occidentalis*, *Pinus contorta*, and in a restricted portion of the type's range, *Pinus monticola*. The tall-shrub component is relatively unimportant, only *Alnus viridis* ssp. *sinuata* and *Amelanchier alnifolia* approach 50% constancy (and have low cover values). The short-shrub layer exhibits greater cover and diversity than the other shrub components with *Vaccinium membranaceum*, *Paxistima myrsinites*, *Rosa gymnocarpa*, *Rubus parviflorus*, and *Spiraea betulifolia* being consistently present. *Linnaea borealis* and *Chimaphila umbellata* have high constancy in the dwarf-shrub layer. *Bromus vulgaris* (or *Bromus ciliatus*) are the only graminoids of note. The diagnostic forbs *Clintonia uniflora*, *Xerophyllum tenax*, and *Tiarella trifoliata* naturally have high constancy and/or cover, however, a number of other forbs also exhibit high constancy including *Arnica latifolia*, *Aralia nudicaulis*, *Adenocaulon bicolor*, *Coptis occidentalis*, *Cornus canadensis*, *Galium triflorum*, *Goodyera oblongifolia*, *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Pedicularis racemosa*, *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, *Trillium ovatum*, and *Viola orbiculata*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus parviflorus</i> , <i>Symphoricarpos albus</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Forb	<i>Aralia nudicaulis</i> , <i>Arnica cordifolia</i> , <i>Clintonia uniflora</i> , <i>Thalictrum occidentale</i> , <i>Xerophyllum tenax</i>
Herb (field)	Graminoid	<i>Carex geyeri</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Pinus contorta</i> , <i>Pseudotsuga menziesii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus parviflorus</i> , <i>Symphoricarpos albus</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Arnica latifolia</i> , <i>Clintonia uniflora</i> , <i>Coptis occidentalis</i> , <i>Maianthemum stellatum</i> , <i>Thalictrum occidentale</i> , <i>Viola orbiculata</i> , <i>Xerophyllum tenax</i>
Herb (field)	Graminoid	<i>Bromus ciliatus</i> , <i>Bromus vulgaris</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Arnica cordifolia*, *Goodyera oblongifolia*, *Paxistima myrsinites*, *Spiraea betulifolia*, *Thalictrum occidentale*, *Vaccinium membranaceum*, *Viola orbiculata*

GLOBAL: *Clintonia uniflora*, *Pseudotsuga menziesii*, *Tiarella trifoliata*, *Vaccinium membranaceum*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4G5 (11-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This association is very similar to the *Xerophyllum tenax* Phase of the *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type (Pfister et al. 1977, Cooper et al. 1987), but has *Pseudotsuga menziesii* as the dominant overstory tree species. The association is related to *Pseudotsuga menziesii* / *Clintonia uniflora* Forest (CEGL005850).

GLOBAL COMMENTS: This association defines an extremely broad environmental range due to the approach of defining as unique associations those communities that would formerly have been subsumed within a number of different climax or potential vegetation types; in the case of this association it is a successional stage in environments as mild and wet (defining a Pacific maritime climatic influence) as those supporting *Thuja plicata* or *Tsuga heterophylla* / *Clintonia uniflora* associations (and permutations) to those of the lower subalpine zone characterized by *Abies lasiocarpa*, *Abies grandis*, *Tsuga mertensiana*, and even *Picea engelmannii* / *Clintonia uniflora* forest associations. That this association in fact occurs in the states and USFS sections listed derives from this writer's interpretation of constancy/cover tables of various authors/publications; where *Pseudotsuga* is listed as a major seral species, the inference has been made that stands quite likely occur on the landscape where this species strongly dominates the upper canopy (often observed by this author throughout northern Idaho and western Montana). It should also be noted that this type is probably less common in zones where *Thuja plicata* and *Tsuga heterophylla* are the climax dominants because, following disturbance in these zones, the climax trees are quick to reclaim the site, i.e., they comprise a significant cover of the earliest forested successional stages. The crosswalking for this type is incomplete, and it may well occur west of the Cascade Crest in Oregon and Washington.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies grandis* / *Clintonia uniflora* Forest (CEGL000272)
- *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Forest (CEGL005912)
- *Picea (engelmannii X glauca, engelmannii)* / *Clintonia uniflora* Forest (CEGL000406)
- *Pseudotsuga menziesii* / *Clintonia uniflora* Forest (CEGL005850)
- *Thuja plicata* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005930)
- *Thuja plicata* / *Clintonia uniflora* Forest (CEGL000474)
- *Tsuga heterophylla* / *Clintonia uniflora* Forest (CEGL000493)
- *Tsuga mertensiana* / *Clintonia uniflora* Forest (CEGL000504)

GLOBAL RELATED CONCEPTS:

- *Abies grandis* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987) I
- *Abies grandis* / *Vaccinium membranaceum* / *Clintonia uniflora* Plant Association (Williams et al. 1995) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Pfister et al. 1977) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987) I
- *Thuja plicata* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987) I
- *Tsuga heterophylla* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987) I
- *Tsuga mertensiana* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987) I
- *Tsuga mertensiana* / *Vaccinium membranaceum* Plant Association (Lillybridge et al. 1995) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is known from both sides of the Continental Divide in Glacier National Park. It is found in the Camas Creek, Lake McDonald, and Middle Fork Flathead River drainages on the west side of Glacier National Park, and the St. Mary Lake and Waterton Lake basins on the east side.

GLOBAL RANGE: This association occurs from the Blue and Wallowa mountains of northeastern Oregon and southern portion of the Idaho Batholith of central Idaho northward to the Colville National Forest of northeastern Washington, across northern Idaho and into western Montana, predominantly west of the Continental Divide, and as far east as southwestern Alberta. Given opportunity for more complete crosswalking, this type could well be documented from British Columbia and the east slope of the Cascades (the fact that a different subspecies of *Pseudotsuga menziesii* is distributed west of the Cascades argues for considering those communities as different).

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT, OR, WA

USFS ECOREGIONS: M242C:CC, M332A:CC, M332B:CC, M332C:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes); USFS (Colville NF, Wallowa-Whitman, Wenatchee)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2005, GLAC.2018, GLAC.228, GLAC.90, GLAC.2613, GLAC.2052.

LOCAL DESCRIPTION AUTHORS: C. Murphy**GLOBAL DESCRIPTION AUTHORS:** Western Ecology Group**REFERENCES:** Achuff et al. 2002a, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Johnson and Simon 1987, Lillybridge et al. 1995, Pfister et al. 1977, Western Ecology Working Group n.d., Williams et al. 1995***Pseudotsuga menziesii* / *Clintonia uniflora* Forest
DOUGLAS-FIR / BRIDE'S BONNET FOREST****IDENTIFIER:** C EGL005850**NVC Classification**

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Pseudotsuga menziesii</i> Forest Alliance (A.157)
Alliance (English name)	Douglas-fir Forest Alliance
Association	<i>Pseudotsuga menziesii</i> / <i>Clintonia uniflora</i> Forest
Association (English name)	Douglas-fir / Bride's Bonnet Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)**ELEMENT CONCEPT**

GLOBAL SUMMARY: Broadly distributed throughout the northern Rocky Mountains and adjacent terrain, this large-patch to matrix seral community occupies relatively moist (mesic) and warm to cool sites having free air drainage and lacking frost-pocket conditions. It occurs on slopes of all degrees of steepness and aspect orientation, though it is more likely to occur from toeslope through midslope positions (predominantly collecting positions). At the dry extreme of its distribution it is more strongly associated with protected positions such as concave slopes, moist depressions in gently sloping plateau areas, stringers along perennial stream bottoms, toeslopes and northeastern aspects. In the north it ranges from 760 to 1585 m, whereas to the south it ranges from 1060 to 1710 m (3500-5600 feet). A wide variety of parent materials are represented, including those as disparate as granite and limestone, including all manner of glacial-fluvial material. In northern Idaho and northwestern Montana it is routinely found on ash caps, ranging from 3 to 60 cm in depth. The soil textures are predominantly loams and silt loams; soils typically have less than 15% coarse-fragment content and are well-drained. This mesic seral association is characterized by *Pseudotsuga menziesii* dominating the upper canopy, though other tree species occur with lesser cover, including *Larix occidentalis*, *Pinus contorta*, and *Pinus monticola* and including those from warmer environments, *Pinus ponderosa*, *Thuja plicata*, and *Tsuga heterophylla*, and those of colder environments, *Abies lasiocarpa*, *Abies grandis*, and *Picea engelmannii*. The shrub layer may be highly diverse with tall shrubs (e.g., *Acer glabrum*, *Taxus brevifolia*, *Amelanchier alnifolia*), short shrubs (e.g., *Symphoricarpos albus*, *Paxistima myrsinites*, *Rubus parviflorus*, *Spiraea betulifolia*), and dwarf-shrubs (e.g., *Chimaphila umbellata*, *Linnaea borealis*, *Mahonia repens*) abundantly represented. The graminoid component is inconspicuous with no one species exhibiting high constancy, though *Bromus vulgaris*, *Bromus ciliatus*, and *Calamagrostis rubescens* are more consistently present and with greater cover than other graminoids. The cover of the diagnostic forbs *Clintonia uniflora* and *Tiarella trifoliata* is greatest when this type occurs in the zones potentially dominated by *Thuja plicata* and *Tsuga heterophylla*, up to 30% canopy cover (can even be a dominant forb), whereas in the colder environments characterized by *Abies lasiocarpa*, *Abies grandis*, and *Picea engelmannii*, potential dominance cover of these diagnostics and all forbs is generally less. Other forbs of high constancy, at least in some portion of this association's considerable range, are *Aralia nudicaulis*, *Adenocaulon bicolor*, *Coptis occidentalis*, *Cornus canadensis*, *Galium triflorum*, *Goodyera oblongifolia*, *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, *Trillium ovatum*, *Viola glabella* (or *Viola canadensis*), and *Viola orbiculata*.

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this forest association are found predominately on lower slope positions of somewhat steep to moderate slopes of various aspects. They are also found on ridges, benches, and basins. Sites are usually situated on glacial or colluvial deposits between the elevations of 653 and 1540 m (2140-5049 feet). Soils tend to be well-drained loams, and the ground surface is mostly covered with litter and duff. There is also minimal cover of moss and lichen.

GLOBAL ENVIRONMENT: This broadly distributed, large-patch to matrix seral community occupies relatively moist (mesic) and relative warm to cool sites having free air drainage and lacking frost-pocket conditions. It occurs on slopes of all degrees of steepness and aspect orientation, though it is more likely to occur from toeslope through midslope positions (predominantly collecting positions). At the dry extreme of its distribution it is more strongly associated with protected positions such as concave slopes, moist depressions in gently sloping plateau areas, stringers along perennial stream bottoms, toeslopes and northeastern aspects. In the north it ranges from 760 to 1585 m (450-5200 feet) (extreme outliers at 1710 m (5600 feet)), whereas to the south it ranges from 1060 to 1710 m (3500-5600 feet). A wide variety of parent materials are represented, including those as disparate as granite and limestone, including all manner of glacial-fluvial material. In northern Idaho and northwestern Montana it is routinely found on ash caps, ranging from 3 to 60 cm in depth. The soil textures are predominantly loams and silt loams (reflecting in part the volcanic ash); soils typically have less than 15% coarse-fragment content and are well-drained.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This forest association is dominated by a pole to mature open tree canopy of *Pseudotsuga menziesii* (38% average cover). Other species in this layer with 50% or less constancy include *Picea engelmannii*, *Larix occidentalis*, and *Pinus contorta*. Tree seedlings established in the understory are *Pseudotsuga menziesii*, *Abies lasiocarpa*, and *Picea engelmannii*. The tall- to short-shrub layer is diverse and includes *Acer glabrum*, *Amelanchier alnifolia*, *Symphoricarpos albus*, *Spiraea betulifolia*, and *Rubus parviflorus*. These shrubs are almost always present and range in cover from 1 to 53%. *Mahonia repens*, *Paxistima myrsinites*, and *Linnaea borealis* occur consistently in the dwarf-shrub layer. The herbaceous layer consists of a variety of graminoids and forbs. The indicator species *Clintonia uniflora* is always present and ranges in cover from 1% to 10%. Other common species that occur in 50% or more of the stands include *Thalictrum occidentale*, *Arnica cordifolia*, *Calamagrostis rubescens*, and *Eurybia conspicua* (= *Aster conspicuus*). The majority of herbaceous species contribute less than 5% average cover.

GLOBAL VEGETATION: This mesic seral association is characterized by *Pseudotsuga menziesii* dominating the upper canopy, though other tree species occur with lesser cover, including both other species considered almost exclusively seral *Larix occidentalis*, *Pinus contorta*, and *Pinus monticola*, and those capable of functioning as both seral and climax species, including those from warmer environments, *Pinus ponderosa*, *Thuja plicata*, and *Tsuga heterophylla*, and those of colder environments, *Abies lasiocarpa*, *Abies grandis*, and *Picea engelmannii*. The shrub layer may be highly diverse with tall shrubs (e.g., *Acer glabrum*, *Taxus brevifolia*, *Amelanchier alnifolia*), short shrubs (e.g., *Symphoricarpos albus*, *Paxistima myrsinites*, *Rubus parviflorus*, *Spiraea betulifolia*), and dwarf-shrubs (e.g., *Chimaphila umbellata*, *Linnaea borealis*, *Mahonia repens*) abundantly represented. The graminoid component is inconspicuous with no one species exhibiting high constancy, though *Bromus vulgaris*, *Bromus ciliatus*, and *Calamagrostis rubescens* are more consistently present and with greater cover than other graminoids. The cover of the diagnostic forbs *Clintonia uniflora* and *Tiarella trifoliata* is greatest when this type occurs in the zones potentially dominated by *Thuja plicata* and *Tsuga heterophylla*, up to 30% canopy cover (can even be a dominant forb), whereas in the colder environments characterized by *Abies lasiocarpa*, *Abies grandis*, and *Picea engelmannii*, potential dominance cover of these diagnostics and all forbs is generally less. Other forbs of high constancy, at least in some portion of this association's considerable range, are *Aralia nudicaulis*, *Adenocaulon bicolor*, *Coptis occidentalis*, *Cornus canadensis*, *Galium triflorum*, *Goodyera oblongifolia*, *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, *Trillium ovatum*, and *Viola orbiculata*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Acer glabrum</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i> , <i>Symphoricarpos albus</i>
Herb (field)	Forb	<i>Clintonia uniflora</i> , <i>Thalictrum occidentale</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Pseudotsuga menziesii</i>
Tree subcanopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Pseudotsuga menziesii</i> , <i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Acer glabrum</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rosa gymnocarpa</i> , <i>Spiraea betulifolia</i> , <i>Symphoricarpos albus</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Dwarf-shrub	<i>Chimaphila umbellata</i> , <i>Linnaea borealis</i> , <i>Mahonia repens</i>
Herb (field)	Forb	<i>Adenocaulon bicolor</i> , <i>Clintonia uniflora</i> , <i>Coptis occidentalis</i> , <i>Maianthemum stellatum</i> , <i>Thalictrum occidentale</i> , <i>Tiarella trifoliata</i> , <i>Viola orbiculata</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Clintonia uniflora*

GLOBAL: *Clintonia uniflora*, *Tiarella trifoliata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Phleum pratense*, *Poa pratensis*, *Taraxacum officinale*, *Veronica officinalis*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4G5 (11-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: The stands comprising this community would have been classed as *Abies lasiocarpa* / *Clintonia uniflora* (Pfister et al. 1977) in terms of their potential vegetation.

GLOBAL COMMENTS: This association defines an extremely broad environmental range due to the relatively recent approach of defining as unique associations those communities that would formerly have been subsumed within a number of different climax or potential vegetation types; in the case of this association it is a successional stage in environments as mild and wet (defining a Pacific maritime climatic influence) as those supporting *Thuja plicata* or *Tsuga heterophylla* / *Clintonia uniflora* associations (and permutations) to those of the lower subalpine zone characterized by *Abies lasiocarpa*, *Abies grandis*, *Tsuga mertensiana*, and even *Picea engelmannii* / *Clintonia uniflora* forest associations. That this association in fact occurs in the states and USFS sections listed derives from interpretation (S. Cooper pers. comm.) of constancy/cover tables of various authors/publications; where *Pseudotsuga* is listed as a major seral species, the inference has been made that stands quite likely occur on the landscape where this species strongly dominates the upper canopy (often observed by S. Cooper (pers. comm.) throughout northern Idaho and western Montana). It should also be noted that this type is probably less common in zones where *Thuja plicata* and *Tsuga heterophylla* are the climax dominants because, following disturbance in these zones, the climax trees are quick to reclaim the site, i.e., they comprise a significant cover of the earliest forested successional stages. The crosswalking for this type is incomplete, and it may well occur west of the Cascade Crest in Oregon and Washington.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies grandis* / *Clintonia uniflora* Forest (CEGL000272)
- *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Forest (CEGL005912)
- *Larix occidentalis* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005881)
- *Pinus contorta* / *Clintonia uniflora* - *Xerophyllum tenax* Woodland (CEGL005921)
- *Pinus contorta* / *Clintonia uniflora* Forest (CEGL005916)
- *Pinus contorta* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005922)
- *Pseudotsuga menziesii* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005854)
- *Pseudotsuga menziesii* / *Heracleum maximum* Forest (CEGL005853)
- *Pseudotsuga menziesii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005851)
- *Thuja plicata* / *Clintonia uniflora* Forest (CEGL000474)
- *Tsuga heterophylla* / *Clintonia uniflora* Forest (CEGL000493)
- *Tsuga mertensiana* / *Clintonia uniflora* Forest (CEGL000504)

GLOBAL RELATED CONCEPTS:

- *Abies grandis* / *Acer circinatum* / *Clintonia uniflora* Plant Association (Lillybridge et al. 1995) I
- *Abies grandis* / *Acer glabrum* / *Clintonia uniflora* Plant Association (Williams et al. 1995) I
- *Abies grandis* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Pfister et al. 1977) I
- *Abies grandis* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Cooper et al. 1987) I
- *Abies grandis* / *Clintonia uniflora* Plant Association (Johnson and Simon 1987) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Cooper et al. 1987) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Pfister et al. 1977) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Steele et al. 1981) I
- *Abies lasiocarpa* / *Clintonia uniflora* Plant Association (Williams et al. 1995) I
- *Abies lasiocarpa* / *Clintonia uniflora* Plant Association (Johnson and Simon 1987) I
- *Thuja plicata* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Pfister et al. 1977) I

- *Thuja plicata* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Cooper et al. 1987) I
- *Tsuga heterophylla* / *Acer circinatum* / *Clintonia uniflora* Plant Association (Lillybridge et al. 1995) I
- *Tsuga heterophylla* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Cooper et al. 1987) I
- *Tsuga heterophylla* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Pfister et al. 1977) I
- *Tsuga heterophylla* / *Pachistima myrsinites* / *Clintonia uniflora* Plant Association (Lillybridge et al. 1995) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from 17 stands throughout Glacier National Park. Stands are predominately west of the Continental Divide. It is also known from four stands in Waterton Lakes National Park.

GLOBAL RANGE: This association occurs from the Blue and Wallowa mountains of northeastern Oregon and southern portion of the Idaho Batholith of central Idaho northward to the Colville National Forest of northeastern Washington, across northern Idaho and into western Montana, predominantly west of the Continental Divide, and southwestern Alberta. Given the opportunity for more complete crosswalking, this type could well be documented from British Columbia and the east slope of the Cascades (the fact that a different subspecies of *Pseudotsuga menziesii* is distributed west of the Cascades argues for considering those communities as different).

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT, OR, WA

USFS ECOREGIONS: M242C:CC, M332A:CC, M332B:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes); USFS (Colville NF, Wallowa-Whitman, Wenatchee)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2069, GLAC.2078, GLAC.213, GLAC.2256, GLAC.35, GLAC.36, GLAC.42, GLAC.2639, GLAC.2664, GLAC.163, GLAC.2206, GLAC.2213, GLAC.2223, GLAC.2257, GLAC.2267, GLAC.2516, GLAC.2614, WATE.4010, WATE.5048, WATE.5058, WATE.5087.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Achuff et al. 2002a, Cooper et al. 1987, Cooper pers. comm., Daubenmire and Daubenmire 1968, Johnson and Simon 1987, Lillybridge et al. 1995, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d., Williams et al. 1995

Pseudotsuga menziesii / *Heracleum maximum* Forest DOUGLAS-FIR / COW-PARSNIP FOREST

IDENTIFIER: CEG005853

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Pseudotsuga menziesii</i> Forest Alliance (A.157)
Alliance (English name)	Douglas-fir Forest Alliance
Association	<i>Pseudotsuga menziesii</i> / <i>Heracleum maximum</i> Forest
Association (English name)	Douglas-fir / Cow-parnsnip Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)

ELEMENT CONCEPT

GLOBAL SUMMARY: This seral association has been identified only from Glacier-Waterton International Peace Park of the northern Rocky Mountains but has a high probability of occurring throughout this region. It has been described from montane to lower subalpine and even extending to mid subalpine habitats, from 1070 to 1585 m (3500-5200 feet). It encompasses relatively mesic to subhygric sites occurring on moderate to steep slopes with north- to east-facing aspects, as well as on toeslopes and footslopes where

subsurface input may be a mitigating factor. Soils are mostly well-drained, fine-textured and derived from glacial drift or alluvium; because the type has been described from such a small geographic area, the only substrates sampled have been sedimentary siltstone and metamorphic (argillite). The canopy and subcanopy are *Pseudotsuga menziesii*-dominated with a combined cover in excess of 60%. *Abies lasiocarpa* and *Picea engelmannii* are represented in the seedling/sapling component, and *Pinus contorta* may have relatively high cover as a seral component. The shrub component is various but mostly dominated by a short-shrub layer in which *Rubus parviflorus*, *Spiraea betulifolia*, and *Symphoricarpos albus* have high constancy and share dominance. Any of the following forbs having >3% canopy cover, singly or in any combination, is diagnostic for the type: *Streptopus amplexifolius*, *Galium triflorum*, *Actaea rubra*, *Senecio triangularis*, *Angelica arguta*, *Angelica dawsonii*, and/or *Heracleum maximum*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is found at 1122 to 1581 m (3680-5184 feet) elevation on flat terraces to steep midslopes of moraines, with north to east aspects. Stands occur on well-drained clay loam or sandy clay loam soil derived from glacial or alluvial deposits, as well as siltstone. Argillite gravel and rock are occasionally present. The soil moisture regime is mesic.

GLOBAL ENVIRONMENT: This seral association [see Dynamics section] has been identified only from Glacier-Waterton International Peace Park of the northern Rocky Mountains but has a high probability for occurring throughout this region. It has been described from montane to lower subalpine and even extending to mid subalpine habitats, from 1070 to 1585 m (3500-5200 feet). It encompasses relatively mesic to subhygric sites occurring on moderate to steep slopes with north- to east-facing aspects, as well as on toeslopes and footslopes where subsurface input may be a mitigating factor. Soils are mostly well-drained, fine-textured and derived from glacial drift or alluvium; because the type has been described from such a small geographic area, the only substrates sampled have been sedimentary siltstone and metamorphic (argillite).

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This association is dominated by mixed-age *Pseudotsuga menziesii* up to 35 m tall, which has up to 45% cover in the tree canopy. Younger *Pseudotsuga menziesii*, with up to 40% cover, dominates the tree subcanopy. In at least 67% of the stands, *Picea engelmannii* had up to 10% cover in both the tree canopy and the tree subcanopy. *Pinus contorta* has low constancy but high cover in the tree canopy, with 43% cover in one-third of the stands. *Spiraea betulifolia* and *Symphoricarpos albus* codominate the relatively sparse short-shrub layer, each with an average cover of 4 to 5%. Variable-height *Rubus parviflorus* has high constancy, with up to 10% cover. The dwarf-shrub *Mahonia repens* is found in all stands with an average cover of 7%. The diagnostic forb for this association, *Angelica arguta*, is present in only one of the three stands sampled. *Thalictrum occidentale* has high constancy and up to 20% cover, clearly dominating the herbaceous understory, while *Erythronium grandiflorum* (= *Aster conspicuus*)-the only other forb found in all three stands-has only trace cover. *Maianthemum racemosum* ssp. *amplexicaule* and ground layer forbs *Viola canadensis* and *Arnica cordifolia* are each found in 67% of the stands with an average cover of 4 to 5%. *Erythronium grandiflorum* has 10% cover in the ground layer of one stand. Many forbs have high constancy but trace cover in this diverse forb undergrowth. Graminoids have low constancy and low total cover, with *Carex* species the most common. Ground cover is up to 50% litter and duff, often with moderate cover of downed wood. Nonvascular cover ranges from 0 to 40%.

GLOBAL VEGETATION: The canopy and subcanopy are *Pseudotsuga menziesii*-dominated with a combined cover in excess of 60%. *Abies lasiocarpa* and *Picea engelmannii* are represented in the seedling/sapling component, and *Pinus contorta* may have relatively high cover as a seral component. The shrub component is various but mostly dominated by a short-shrub layer in which *Rubus parviflorus*, *Spiraea betulifolia*, and *Symphoricarpos albus* have high constancy and share dominance. Any of the following forbs having >3% canopy cover, singly or in any combination, is diagnostic for the type: *Streptopus amplexifolius*, *Galium triflorum*, *Actaea rubra*, *Senecio triangularis*, *Angelica arguta*, *Angelica dawsonii*, and/or *Heracleum maximum*. The forb component is often dominated by *Thalictrum occidentale*, *Arnica cordifolia*, *Eucephalus engelmannii* (= *Aster engelmannii*), or in early spring *Erythronium grandiflorum*. Graminoids have negligible cover and constancy and nonvascular (bryoid) cover varies from zero to 40%.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i> , <i>Pseudotsuga menziesii</i>
Tree subcanopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus parviflorus</i> , <i>Spiraea betulifolia</i> , <i>Symphoricarpos albus</i>
Herb (field)	Dwarf-shrub	<i>Mahonia repens</i>
Herb (field)	Forb	<i>Erythronium grandiflorum</i> , <i>Thalictrum occidentale</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i> , <i>Pseudotsuga menziesii</i>
Tree subcanopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Pseudotsuga menziesii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus parviflorus</i> , <i>Spiraea betulifolia</i> , <i>Symphoricarpos albus</i>
Herb (field)	Dwarf-shrub	<i>Mahonia repens</i>
Herb (field)	Forb	<i>Erythronium grandiflorum</i> , <i>Thalictrum occidentale</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Angelica arguta*, *Arnica cordifolia*, *Eurybia conspicua*, *Maianthemum racemosum* ssp. *amplexicaule*, *Picea engelmannii*, *Rubus parviflorus*, *Spiraea betulifolia*, *Symphoricarpos albus*, *Thalictrum occidentale*, *Viola canadensis*

GLOBAL: *Actaea rubra*, *Angelica arguta*, *Angelica dawsonii*, *Galium triflorum*, *Heracleum maximum*, *Senecio triangularis*, *Streptopus amplexifolius*, *Viola canadensis*, *Viola glabella*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Poa palustris*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2? (10-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This association is similar to *Pinus contorta* / *Angelica* spp. Woodland (CEGL005915). Both are mesic to subhygric, and both are species-rich. Until recently, this association was called *Pseudotsuga menziesii* / *Galium triflorum* by the IPP analysis group, but the name was changed because the species composition was most similar to *Pinus contorta* / *Angelica* spp. Woodland (CEGL005915). *Angelica arguta* was present in only one stand sampled within IPP, however.

GLOBAL COMMENTS: This type is very similar to *Pseudotsuga menziesii* / *Clintonia uniflora* Forest (CEGL005850) but occurs on sites where *Clintonia uniflora* and *Tiarella trifoliata*, for whatever reason(s), are lacking. This type is more apt to be found east of the Continental Divide because the distribution of neither of the forenamed forbs penetrates much beyond this divide (into the drier downslope rainshadow). However, it is more aptly characterized as a long-lived seral representation of *Abies lasiocarpa* - *Picea engelmannii* / *Galium triflorum* Forest (CEGL000311) or *Abies lasiocarpa* - *Picea engelmannii* / *Actaea rubra* Forest (CEGL000295), or even *Picea (engelmannii X glauca, engelmannii)* / *Galium triflorum* Forest (CEGL000409); in some of these stands the climax species *Abies lasiocarpa* and *Picea engelmannii* are slow to re-establish for undetermined reasons (one hypothesis is that the litter layer is thick and inimical to germination of conifer seeds), and these stands can remain *Pseudotsuga*-dominated for hundreds of years.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies concolor* - *Pseudotsuga menziesii* / *Vaccinium myrtillus* Forest (CEGL000265)
- *Abies lasiocarpa* - *Picea engelmannii* / *Actaea rubra* Forest (CEGL000295)
- *Abies lasiocarpa* - *Picea engelmannii* / *Galium triflorum* Forest (CEGL000311)
- *Picea engelmannii* / *Galium triflorum* Forest (CEGL002174)
- *Pinus contorta* / *Heracleum maximum* Woodland (CEGL005915)
- *Pseudotsuga menziesii* / *Clintonia uniflora* Forest (CEGL005850)
- *Pseudotsuga menziesii* / *Cornus canadensis* Forest (CEGL000432)
- *Pseudotsuga menziesii* / *Linnaea borealis* Forest (CEGL000441)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Actaea rubra* Habitat Type (Hansen et al. 1995) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Pfister et al. 1977) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Cooper et al. 1987) I
- *Abies lasiocarpa* / *Clintonia uniflora* Plant Association (Williams et al. 1995) I
- *Abies lasiocarpa* / *Cornus canadensis* Plant Association (Williams et al. 1995) I
- *Abies lasiocarpa* / *Galium triflorum* Habitat Type (Hansen et al. 1995) I
- *Pseudotsuga menziesii* / *Cornus canadensis* Habitat Type (Roberts et al. 1979b) ?

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: In Glacier National Park, this association is known from both sides of the Continental Divide. On the east side, it is found near Lower Two Medicine Lake, and near Round Meadow on the west side. This association is also known from one location in Waterton Lakes National Park.

GLOBAL RANGE: This association is essentially found throughout the northern Rocky Mountains, but most abundantly east of the Continental Divide and could range to the middle Rocky Mountains and southward.

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT, WY

USFS ECOREGIONS: M331A:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2529, GLAC.166, WATE.4040.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Cooper et al. 1987, Hansen et al. 1995, Pfister et al. 1977, Roberts et al. 1979b, Western Ecology Working Group n.d., Williams et al. 1995

***Pseudotsuga menziesii* / *Juniperus communis* Forest
DOUGLAS-FIR / COMMON JUNIPER FOREST**

IDENTIFIER: CEGLO00439

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Pseudotsuga menziesii</i> Forest Alliance (A.157)
Alliance (English name)	Douglas-fir Forest Alliance
Association	<i>Pseudotsuga menziesii</i> / <i>Juniperus communis</i> Forest
Association (English name)	Douglas-fir / Common Juniper Forest

ECOLOGICAL SYSTEM(S): Middle Rocky Mountain Montane Douglas-fir Forest and Woodland (CES306.959)

ELEMENT CONCEPT

GLOBAL SUMMARY: This Rocky Mountain forest association occurs from northwestern Montana south into central and eastern Idaho, western Wyoming and north-central Colorado. These forests occupy gentle to steep slopes (11-100%), on dry, exposed rocky slopes and ridgetops, at lower to mid elevations of the forested zone, from 1430 to 2930 m (4690-9620 feet) in elevation. Sites are relatively dry and occur on all aspects. Substrates are typically coarse-textured soils derived from a variety of parent materials. This association includes stands dominated by the evergreen needle-leaved tree *Pseudotsuga menziesii* or a mixed montane conifer tree canopy. *Pseudotsuga menziesii* is the dominant tree species in the overstory and often in the understory as well. *Pinus ponderosa*, *Pinus flexilis*, *Pinus contorta*, or *Pinus albicaulis* are occasionally present to codominant on drier sites, *Populus tremuloides* on moister sites. The low-shrub layer is dominated by near-continuous to large patches of *Juniperus communis*. Other shrubs include *Arctostaphylos uva-ursi*, *Jamesia americana*, *Juniperus horizontalis*, *Mahonia repens*, *Purshia tridentata*, *Ribes cereum*, *Symphoricarpos oreophilus*, or *Shepherdia canadensis*. The herbaceous cover is generally depauperate in the southern and central Rockies, with less than 10% cover of grasses or forbs. Forb species typically provide less than 5% cover and include *Achillea millefolium*, *Arnica cordifolia*, *Astragalus miser*, and *Packeria streptanthifolia* (= *Senecio streptanthifolius*). Grass species also contribute less than 5% herbaceous canopy cover and include *Muhlenbergia montana*, *Danthonia parryi*, *Bouteloua gracilis*, or *Festuca arizonica*. However, occurrences in the northern Rockies may have relatively high herbaceous cover (30-60%), and individual stands can be diverse. Common grasses include *Pseudoroegneria spicata* and *Festuca campestris*. A number of forbs contribute to the

overall diversity, although the cover for any one species is not high. *Antennaria rosea*, *Penstemon confertus*, and *Allium cernuum* have high constancy, and *Selaginella densa* var. *scopulorum* may be abundant on some sites, particularly those where rock outcrops are present.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This woodland association occupies dry, exposed valley slopes with a somewhat steep grade. Aspects are highly variable. Elevations range from 1430-1500 m (4690-4920 feet). Parent material is highly variable, originating from glacial moraine deposits in some locations and sedimentary siltstone in others. Soil is a sandy loam and not well-developed. The association may also occupy a thin layer of poorly developed soil over bedrock. Ground cover is primarily litter with exposed rock accounting for 1-25% cover.

GLOBAL ENVIRONMENT: These Douglas-fir forests occupy dry, exposed rocky slopes, benches and ridgetops throughout the Rocky Mountains of Montana, Wyoming and Colorado. Slopes are gentle to steep (11-100%), at the lower to mid elevations of the forested zone, from 1430 to 2930 m (4690-9620 feet) in elevation. Sites are relatively dry and occur on all aspects. Soils are typically coarse-textured, rocky, and extremely well-drained. They may be derived from a variety of parent materials, including granite, sandstone, siltstone and glacial till. The ground surface is often rocky and mostly covered by litter and duff. Bare rock can be as much as 40% of the cover, often encrusted with lichens; litter depth is usually less than 6 cm.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The tree canopy is characteristically open in this woodland-like association, dominated by *Pseudotsuga menziesii* with a canopy cover of 10-20% in the canopy layer and 5-10% in the subcanopy layer. The average height for these trees is 10 m in the canopy layer and 1.5 m in the subcanopy layer. Seral tree species, such as *Pinus contorta*, may be present in small amounts. Tall- and dwarf-shrub cover is sparse, although the dwarf-shrub *Arctostaphylos uva-ursi* is characteristically present with 1-10% cover. In some areas the tall shrub *Shepherdia canadensis* may contribute significant (10-15%) canopy cover. Low-shrub cover, dominated by *Juniperus communis*, is typically around 20%. *Dasiphora fruticosa* ssp. *floribunda* is usually present in small amounts. Herbaceous diversity and cover are typically high, with cover ranging from 30 to 60%. Common grasses include *Pseudoroegneria spicata* and *Festuca campestris*. A wide variety of forbs contribute to the overall diversity, although the cover for any one particular species is not high. *Antennaria rosea*, *Penstemon confertus*, and *Allium cernuum* were documented in all plots. *Selaginella densa* var. *scopulorum* may be abundant on some sites, particularly those where rock outcrops are present.

GLOBAL VEGETATION: This association includes stands dominated by the evergreen needle-leaved tree *Pseudotsuga menziesii* or a mixed montane conifer tree canopy. Although total canopy cover may vary from sparse to dense, *Pseudotsuga menziesii* is the dominant tree species in the overstory and often in the subcanopy as well. *Populus tremuloides*, *Picea pungens*, *Pinus ponderosa*, *Pinus flexilis*, *Pinus contorta*, or *Pinus albicaulis* are occasionally present to codominant on drier sites, *Populus tremuloides* on moister sites. Total cover of the shrub and herbaceous layers tends to be negatively correlated with canopy closure. Scattered tall shrubs such as *Prunus virginiana* may be present, but they do not form a layer. The low-shrub layer is dominated by patches of *Juniperus communis*, which may vary in cover from 1% to more than 75%. Other shrubs may include *Arctostaphylos uva-ursi*, *Dasiphora fruticosa* ssp. *floribunda*, *Jamesia americana*, *Juniperus horizontalis*, *Mahonia repens*, *Purshia tridentata*, *Ribes cereum*, *Symphoricarpos oreophilus*, and *Shepherdia canadensis*. The herbaceous cover is generally depauperate in the southern and central Rockies, with less than 10% cover of grasses or forbs. Forb species typically provide less than 5% cover and include *Achillea millefolium* var. *occidentalis* (= *Achillea lanulosa*), *Antennaria* spp., *Arnica cordifolia*, *Artemisia ludoviciana*, *Astragalus miser*, *Geranium caespitosum*, *Packera streptanthifolia* (= *Senecio streptanthifolius*), and *Penstemon* spp. Grass species also contribute less than 5% herbaceous canopy cover and include *Muhlenbergia montana*, *Danthonia parryi*, *Bouteloua gracilis*, or *Festuca arizonica*. However, occurrences in the northern Rockies may have relatively high herbaceous cover (30-60%), and individual stands can be diverse. Common grasses include *Pseudoroegneria spicata* and *Festuca campestris*. A number of forbs contribute to the overall diversity, although the cover for any one species is not high. *Antennaria rosea*, *Penstemon confertus*, and *Allium cernuum* have high constancy, and *Selaginella densa* var. *scopulorum* may be abundant on some sites, particularly those where rock outcrops are present.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Shepherdia canadensis</i>
Short shrub/sapling	Needle-leaved shrub	<i>Juniperus communis</i>
Herb (field)	Graminoid	<i>Festuca campestris</i> , <i>Pseudoroegneria spicata</i>
Herb (field)	Fern or fern ally	<i>Selaginella densa</i> var. <i>scopulorum</i>

Global

Stratum

Tree canopy
Short shrub/sapling

Lifeform

Needle-leaved tree
Needle-leaved shrub

Species

Pseudotsuga menziesii
Juniperus communis

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Antennaria rosea*, *Juniperus communis*, *Penstemon confertus*, *Pseudotsuga menziesii*

GLOBAL: *Juniperus communis*, *Pseudotsuga menziesii*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Picea engelmannii* / *Juniperus communis* Forest (CEGL005925)
- *Picea pungens* / *Juniperus communis* Forest (CEGL000392)
- *Pinus albicaulis* / *Juniperus communis* Woodland (CEGL000756)
- *Pinus contorta* / *Juniperus communis* Woodland (CEGL000764)
- *Pinus flexilis* / *Juniperus communis* Woodland (CEGL000807)
- *Pseudotsuga menziesii* / *Arctostaphylos uva-ursi* Forest (CEGL000424)
- *Pseudotsuga menziesii* / *Mahonia repens* Forest (CEGL000442)

GLOBAL RELATED CONCEPTS:

- *Pseudotsuga menziesii* / *Juniperus communis* Habitat Type (Pfister et al. 1977) B
- *Pseudotsuga menziesii* / *Juniperus communis* Habitat Type (Steele et al. 1983) B
- *Pseudotsuga menziesii* / *Juniperus communis* Habitat Type (Steele et al. 1981) B
- *Pseudotsuga menziesii* / *Juniperus communis* Plant Association (Johnston 1987) =
- *Pseudotsuga menziesii* / *Juniperus communis* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association occurs east of the Continental Divide on dry slopes along broad valleys in Glacier National Park. Specifically, it was documented on lower slopes in St. Mary's Valley. It is likely present in the Two Medicine and Cut Bank drainages as well.

GLOBAL RANGE: This forested association occurs from northwestern Montana south into central and eastern Idaho, western Wyoming and northern Colorado.

NATIONS: US

STATES/PROVINCES: CO:S1S2, ID:S3, MT:S4, WY:S3S4

USFS ECOREGIONS: M331A:CC, M331D:CC, M331E:CC, M331H:CC, M331I:CC, M331J:C?, M332C:CC, M332E:CC, M332F:CC

FEDERAL LANDS: NPS (Dinosaur, Florissant Fossil Beds, Glacier, Rocky Mountain); USFS (Bighorn, Medicine Bow, Shoshone)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.205, GLAC.93.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: G. Kittel, mod. K.A. Schulz and J. Coles

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Driscoll et al. 1984, Giese 1975, Johnston 1987, Jones and Ogle 2000, MTNHP 2002b, Murphy 1982, Pfister et al. 1977, Steele et al. 1981, Steele et al. 1983, Vories 1974, Western Ecology Working Group n.d.

***Pseudotsuga menziesii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest**

DOUGLAS-FIR / FOOL'S-HUCKLEBERRY / BRIDE'S BONNET FOREST

IDENTIFIER: Cegl005851

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Pseudotsuga menziesii</i> Forest Alliance (A.157)
Alliance (English name)	Douglas-fir Forest Alliance
Association	<i>Pseudotsuga menziesii</i> / <i>Menziesia ferruginea</i> / <i>Clintonia uniflora</i> Forest
Association (English name)	Douglas-fir / Fool's-huckleberry / Bride's Bonnet Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)

ELEMENT CONCEPT

GLOBAL SUMMARY: This seral, large-patch to matrix type occupies relatively cold and moist environments across a number of climax tree series and associated geographic regions of the northern Rockies. Thus this cold, mesic type is found throughout the northern Rocky Mountains and may extend as far west as the Cascade Crest on environments characterized as montane to lower and even mid subalpine. The association's possible elevation range is from 915 to 1800 m (4000-5700 feet), and regardless of the climax series in which it is found, it consistently occurs on cool northwest- through east-facing slopes with moderate to extreme degrees of slope. It has been recorded as low as 910 m (3000 feet) on benches and swales where cold air ponds. The range of parent materials is, with the exception of highly unusual substrates like serpentine, literally as great as possible types occurring in the northern Rocky Mountains and northernmost middle Rocky Mountains and may include some ultramafics east of the Cascade Crest. It is difficult to simply characterize the soils as well, but they are uniformly moderately well-drained to well-drained and have a highly variable coarse-fragment content, but are mostly moderately gravelly throughout. Soil reactions vary from acidic to very acidic. Ground surfaces have virtually no exposed rock or bare soil and duff accumulations vary from moderate to deep. The overstory is dominated by *Pseudotsuga menziesii*, but its cover is often less than 30%, and canopy cover of the upper stratum often does not much exceed 60%. A whole host of tree species are capable of playing a subordinate role; on warmer sites these include *Thuja plicata*, *Tsuga heterophylla*, *Abies grandis*, and on colder or higher elevation sites are found *Abies lasiocarpa*, *Tsuga mertensiana*, and *Picea engelmannii*. However, the most frequent canopy codominants or associates are the seral species *Larix occidentalis*, *Pinus contorta*, and in a restricted portion of the type's range, *Pinus monticola*. *Menziesia ferruginea* conspicuously dominates the tall-shrub layer. *Alnus viridis* ssp. *sinuata* and *Taxus brevifolia* (predominantly in Idaho and western Montana) are the only other tall shrubs consistently present. The short-shrub layer exhibits greater diversity than the other shrub components with *Vaccinium membranaceum*, *Paxistima myrsinifera*, *Rosa gymnocarpa*, *Rubus parviflorus*, and *Spiraea betulifolia* being consistently present, along with *Linnaea borealis*, *Chimaphila umbellata*, and *Vaccinium scoparium* in the dwarf-shrub layer. *Bromus vulgaris* (or *Bromus ciliatus*) are the only graminoids of note. The diagnostic forbs *Clintonia uniflora* and *Tiarella trifoliata* have high constancy (both approaching 100%) and/or cover, however, a number of other forbs also exhibit high constancy across this type's range, including *Arnica latifolia*, (*Arnica cordifolia* at lower elevations), *Coptis occidentalis* (peculiar to central and northern Idaho), *Cornus canadensis*, *Galium triflorum*, *Goodyera oblongifolia*, *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, *Trillium ovatum*, *Viola orbiculata*, and *Xerophyllum tenax*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: A stand of this forest association is found at 1360 m (4460 feet) on a steep north-facing ridge. The ridge slope is straight with a few tip-up hummocks. The site is situated on colluvial-argillite deposits. The soils tend to be moderately well-drained silt loams, and the ground surface is mostly covered with litter and duff. There is a low percentage of moss present.

GLOBAL ENVIRONMENT: This seral, large-patch to matrix type occupies the relatively cold and moist environments across a number of climax tree series and associated geographic regions; the species defining these series include, but are not limited to, *Thuja plicata*, *Tsuga heterophylla*, *Tsuga mertensiana*, *Abies grandis*, *Abies lasiocarpa*, and *Picea engelmannii*. Thus, this cold, mesic type is found throughout the northern Rocky Mountains and may extend as far west as the Cascade Crest on environments characterized as montane to lower and even mid subalpine. The associations possible elevation range is from 915 to 1800 m (4000-5700 feet) with extremes to 910 and 1815 m (3000-5950 feet), and regardless of the climax series in which it is found, it consistently occurs on cool northwest- through east-facing slopes with moderate to extreme degrees of slope. Its low elevation extremes are associated with benches and swales where cold air ponds. The range of parent materials is, with the exception of highly unusual substrates like serpentine, literally as great as possible types occurring in the northern Rocky Mountains and northernmost middle Rocky Mountains and may include some ultramafics east of the Cascade Crest. It is difficult to characterize the soils as well, but they are uniformly moderately well-drained to well-drained and have a highly variable coarse-fragment content, but are mostly moderately gravelly throughout (when the type occurs in the subalpine zone). Soil reactions vary from acidic to very acidic. Ground surfaces have virtually no exposed rock or bare soil and duff accumulations vary from moderate to deep.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This forest association is dominated by a mature open tree canopy of *Pseudotsuga menziesii* (30% average cover). *Larix occidentalis* and *Picea engelmannii* are also present within this canopy layer. Tree seedlings established in the understory are *Picea engelmannii*, *Larix occidentalis*, and *Pseudotsuga menziesii*, and each has insignificant cover. The stand is very homogenous in tree canopy and regeneration growth. *Menziesia ferruginea* (23% average cover) occurs in patches with *Vaccinium myrtillus*, which dominates the dwarf-shrub layer. Other shrubs at 1 m or less in height are *Paxistima myrsinites*, *Rubus parviflorus*, and *Linnaea borealis*. The herbaceous layer consists mostly of forbs that include *Clintonia uniflora*, *Goodyera oblongifolia*, and *Orthilia secunda*. Each has less than 5% average cover. *Arnica cordifolia* is the only species within this layer that has greater than 5% average cover.

GLOBAL VEGETATION: The overstory is dominated by *Pseudotsuga menziesii*, but its cover is often less than 30%, and canopy cover of the upper stratum often does not much exceed 60%. A whole host of tree species are capable of playing a subordinate role; on warmer sites these include *Thuja plicata*, *Tsuga heterophylla*, *Abies amabilis*, and *Abies grandis*, and on colder or higher elevation sites are found *Abies lasiocarpa*, *Tsuga mertensiana*, and *Picea engelmannii*. However, the most frequent canopy codominants or associates are the seral species *Larix occidentalis*, *Pinus contorta*, and in a restricted portion of the type's range, *Pinus monticola*. *Menziesia ferruginea* conspicuously dominates the tall-shrub layer, however, its height is quite dependent on environment, exceeding 3.5 m (10 feet) on montane slopes and actually classed as a short shrub within much of its subalpine range (sites potentially dominated by *Abies lasiocarpa*, *Picea engelmannii*, and *Tsuga mertensiana*); *Alnus viridis* ssp. *sinuata* and *Taxus brevifolia* (predominantly in Idaho and western Montana) are the only other tall shrubs consistently present. The short-shrub layer exhibits greater diversity than the other shrub components with *Vaccinium membranaceum*, *Lonicera utahensis*, *Paxistima myrsinites*, *Rosa gymnocarpa*, *Rubus parviflorus*, and *Spiraea betulifolia* being consistently present. In the montane environments *Linnaea borealis* and *Chimaphila umbellata* have high constancy in the dwarf-shrub layer, whereas in the subalpine they are considerably reduced, and *Vaccinium scoparium* is consistently present with up to 50% cover. *Bromus vulgaris* (or *Bromus ciliatus*) are the only graminoids of note. The diagnostic forbs *Clintonia uniflora* and *Tiarella trifoliata* have high constancy (both approaching 100%) and/or cover, however, a number of other forbs also exhibit high constancy across this type's range, including *Arnica latifolia*, (*Arnica cordifolia* at lower elevations), *Coptis occidentalis* (peculiar to central and northern Idaho), *Cornus canadensis*, *Galium triflorum*, *Goodyera oblongifolia*, *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, *Trillium ovatum*, *Viola orbiculata*, and *Xerophyllum tenax*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Menziesia ferruginea</i>
Herb (field)	Dwarf-shrub	<i>Paxistima myrsinites</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Clintonia uniflora</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Pinus contorta</i> , <i>Pseudotsuga menziesii</i>
Tall shrub/sapling	Needle-leaved shrub	<i>Taxus brevifolia</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Alnus viridis</i> ssp. <i>sinuata</i> , <i>Menziesia ferruginea</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus parviflorus</i> , <i>Vaccinium membranaceum</i>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Paxistima myrsinites</i>
Herb (field)	Dwarf-shrub	<i>Chimaphila umbellata</i> , <i>Linnaea borealis</i> , <i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Clintonia uniflora</i> , <i>Thalictrum occidentale</i> , <i>Xerophyllum tenax</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Menziesia ferruginea*, *Pseudotsuga menziesii*

GLOBAL: *Alnus viridis* ssp. *sinuata*, *Menziesia ferruginea*, *Pseudotsuga menziesii*, *Tiarella trifoliata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3? (11-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This forest association represents a seral stage of the *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Menziesia ferruginea* Phase (Pfister et al. 1977, Cooper et al. 1987).

GLOBAL COMMENTS: This association defines an extremely broad environmental range due to the relatively recent approach of defining as unique associations those communities that would formerly have been subsumed within a number of different climax or potential vegetation types; in the case of this association it is a successional stage in environments as mild and wet (defining a Pacific maritime climatic influence) as those supporting *Thuja plicata* or *Tsuga heterophylla* / *Clintonia uniflora* associations (and permutations) to those of the lower subalpine zone characterized by *Abies lasiocarpa*, *Abies amabilis*, *Abies grandis*, *Tsuga mertensiana*, and even *Picea engelmannii* / *Clintonia uniflora* forest associations. That this association in fact occurs in the states and USFS sections listed derives from this writer's interpretation of constancy/cover tables of various authors/publications; where *Pseudotsuga* is listed as a major seral species, the inference has been made that stands quite likely occur on the landscape where this species strongly dominates the upper canopy (often observed by this author throughout northern Idaho and western Montana). It should also be noted that this type is probably less common in zones where *Thuja plicata*, *Tsuga heterophylla*, and *Abies amabilis* are the climax dominants because, following disturbance in these zones, the climax trees are quick to reclaim the site, i.e., they comprise a significant cover on the earliest forested successional stages (*Pseudotsuga menziesii* may seldom be a major seral component on these sites and thus the association is rare as well). Note that this association is always seral; there are no habitats supporting *Clintonia uniflora* or *Tiarella trifoliata* that do not support more shade-tolerant and competitive species than *Pseudotsuga*.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies grandis* / *Clintonia uniflora* Forest (CEGL000272)
- *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Forest (CEGL005912)
- *Picea (engelmannii X glauca, engelmannii)* / *Clintonia uniflora* Forest (CEGL000406)
- *Pinus contorta* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005922)
- *Pseudotsuga menziesii* / *Clintonia uniflora* Forest (CEGL005850)
- *Thuja plicata* / *Clintonia uniflora* Forest (CEGL000474)
- *Tsuga heterophylla* / *Clintonia uniflora* Forest (CEGL000493)
- *Tsuga mertensiana* / *Clintonia uniflora* Forest (CEGL000504)

GLOBAL RELATED CONCEPTS:

- *Abies grandis* / *Clintonia uniflora* Habitat Type, *Menziesia ferruginea* Phase (Cooper et al. 1987) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Menziesia ferruginea* Phase (Pfister et al. 1977) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Menziesia ferruginea* Phase (Cooper et al. 1987) I
- *Abies lasiocarpa* / *Rhododendron albiflorum* / *Xerophyllum tenax* Plant Association (Williams et al. 1995) I
- *Abies lasiocarpa* / *Rhododendron albiflorum* Plant Association (Williams et al. 1995) I
- *Thuja plicata* / *Clintonia uniflora* Habitat Type, *Menziesia ferruginea* Phase (Cooper et al. 1987) I
- *Tsuga heterophylla* / *Clintonia uniflora* Habitat Type, *Menziesia ferruginea* Phase (Cooper et al. 1987) I
- *Tsuga mertensiana* / *Clintonia uniflora* Habitat Type, *Menziesia ferruginea* Phase (Cooper et al. 1987) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from one stand in Glacier National Park, west of the Continental Divide, near Bowman Lake.

GLOBAL RANGE: This association occurs from the southern portion of the Idaho Batholith of central Idaho northward to the eastern fringes of the Colville National Forest of northeastern Washington and across northern Idaho and into western Montana, predominantly west of the Continental Divide, and as far eastward as southwestern Alberta. Given opportunity for more complete

crosswalking, this type could well be documented from British Columbia and the east slope of the Cascades (the fact that a different subspecies of *Pseudotsuga menziesii* is distributed west of the Cascades argues for considering those communities as different).

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT, OR?, WA?

USFS ECOREGIONS: M242C:CC, M332A:CC, M332B:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); USFS (Colville NF)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2242.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Achuff et al. 2002a, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Johnson and Simon 1987, Lillybridge et al. 1995, Pfister et al. 1977, Western Ecology Working Group n.d., Williams et al. 1995

Pseudotsuga menziesii / *Spiraea betulifolia* Forest DOUGLAS-FIR / SHINYLEAF MEADOWSWEET FOREST

IDENTIFIER: CEGLO00457

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Pseudotsuga menziesii</i> Forest Alliance (A.157)
Alliance (English name)	Douglas-fir Forest Alliance
Association	<i>Pseudotsuga menziesii</i> / <i>Spiraea betulifolia</i> Forest
Association (English name)	Douglas-fir / Shinyleaf Meadowsweet Forest

ECOLOGICAL SYSTEM(S): Middle Rocky Mountain Montane Douglas-fir Forest and Woodland (CES306.959)

ELEMENT CONCEPT

GLOBAL SUMMARY: This montane to lower subalpine forest association is known from the central and northern Rocky Mountains from northwestern Wyoming, to eastern Oregon, Idaho and western Montana, and extending into Canada. Elevations range from 1010 to 2470 m (3300-8100 feet). Stands occur on a variety of sites from steep colluvial slopes to gentle rolling terrain on relatively warm, dry sites. Sites at lower elevation and latitude are typically restricted to northerly aspects or limestone substrate. Higher elevation sites occur on a variety of aspects with the most northerly stands restricted to dry southern aspects. Parent materials are various. Soils tend to be coarser-textured, gravelly loam or sandy loam. Tree litter, often 4-6 cm deep, dominates the ground cover. Vegetation is characterized by an overstory tree canopy dominated by *Pseudotsuga menziesii* with *Spiraea betulifolia* prominent in the understory. *Pinus ponderosa* may be codominant in the overstory tree canopy, and *Pinus contorta* or *Populus tremuloides* may be present in the subcanopy. *Spiraea betulifolia* is a major component in the short-shrub layer with *Amelanchier alnifolia*, *Mahonia repens*, or *Paxistima myrsinifolia* sometimes abundant. Other common shrubs include *Acer glabrum*, *Lonicera utahensis*, *Prunus virginiana*, *Salix scouleriana*, *Shepherdia canadensis*, *Sorbus scopulina*, *Symphoricarpos oreophilus*, or *Symphoricarpos albus*. The sparse to moderately dense herbaceous layer may be dominated by graminoids *Calamagrostis rubescens*, *Carex geyeri*, *Festuca idahoensis*, or *Pseudoroegneria spicata*, with a variety of forbs.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This forest association occupies moist, moderate to steep, high slopes in a mid-seral stage. It occurs at various aspects, at elevations ranging from 1430-1800 m (4685-5904 feet). Parent material is derived from a mixture of siltstone, limestone and argillite; exposed limestone and argillite bedrock may be present. Soil is a well-drained to rapidly drained silt loam or sandy loam. Ground surfaces are primarily covered with litter. Stands that

have recently experienced fire may have a large percentage of exposed bare soil. Wood and rock of various sizes may also be present covering 1-30% of the ground surface. Evidence of relatively recent fire may be present in the form of burned stumps and charcoal.

GLOBAL ENVIRONMENT: This montane to lower subalpine forest association is known from the central and northern Rocky Mountains. Elevations range from 1000 to 2500 m (3300-8100 feet). Stands occur on a variety of sites from steep colluvial slopes to gentle rolling terrain on relatively warm, dry sites. Sites at lower elevation and latitude are typically restricted to northerly aspects or limestone substrate. Higher elevation sites occur on a variety of aspects with the most northerly stands restricted to dry southern aspects. Parent materials are various, typically comprised of colluvium or residuum derived from andesite, basalt, granites, gneiss, quartzite, schist phyllite, or limestone. Soils tend to be coarser-textured, gravelly loam or sandy loam. Tree litter, often 4-6 cm deep, dominates ground cover.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The tree canopy may appear open and woodland-like, with a canopy cover of around 20%, or may be dense, approaching 60-70%. In either case it is dominated by *Pseudotsuga menziesii* 5-15 m tall. *Abies lasiocarpa* and *Picea engelmannii* are generally present in the understory. The short-shrub layer has 10-40% cover and is codominated by *Spiraea betulifolia* with *Shepherdia canadensis*, *Symphoricarpos albus*, *Rosa woodsii*, or *Ribes lacustre*. Herbaceous cover varies from 30-80%. In the plots sampled *Arnica cordifolia*, *Thalictrum occidentale*, *Melica subulata*, and *Eurybia conspicua* (= *Aster conspicuus*) contributed significant ground cover when present, although they were only present in half of the sampled plots. Forb species present in low densities in every plot include *Fragaria virginiana*, *Galium boreale*, and *Heuchera cylindrica*.

GLOBAL VEGETATION: This forest association is characterized by an overstory tree canopy dominated by *Pseudotsuga menziesii* with *Spiraea betulifolia* prominent in the understory. *Pinus ponderosa* may be codominant in the overstory tree canopy, and *Pinus contorta* or *Populus tremuloides* may be present in the subcanopy. *Spiraea betulifolia* is a major component in the short-shrub layer with *Amelanchier alnifolia*, *Mahonia repens*, or *Paxistima myrsinites* sometimes abundant. Other common shrubs include *Acer glabrum*, *Lonicera utahensis*, *Prunus virginiana*, *Salix scouleriana*, *Shepherdia canadensis*, *Sorbus scopulina*, *Symphoricarpos oreophilus*, or *Symphoricarpos albus*. The sparse to moderately dense herbaceous layer is typically dominated by graminoids *Calamagrostis rubescens*, *Carex geyeri*, *Festuca idahoensis*, or *Pseudoroegneria spicata*, with a variety of forbs. The most common species are *Arnica cordifolia*, *Astragalus miser*, *Balsamorhiza sagittata*, *Eurybia conspicua*, *Fragaria virginiana*, *Fragaria vesca*, *Goodyera oblongifolia*, *Maianthemum racemosum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Orthilia secunda* (= *Pyrola secunda*), and *Thalictrum occidentale*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Shepherdia canadensis</i> , <i>Spiraea betulifolia</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Eurybia conspicua</i> , <i>Thalictrum occidentale</i>
Nonvascular	Moss	<i>Timmia austriaca</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Fragaria virginiana*, *Galium boreale*, *Pseudotsuga menziesii*

GLOBAL: *Arnica cordifolia*, *Pseudotsuga menziesii*, *Spiraea betulifolia*, *Thalictrum occidentale*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Pinus contorta* / *Spiraea betulifolia* Forest (CEGL000164)
- *Populus tremuloides* - Conifer / *Spiraea betulifolia* - *Symphoricarpos albus* Forest (CEGL005911)
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Woodland (CEGL000429)--distinguished by having a less abundant shrub component, but otherwise is very similar.
- *Pseudotsuga menziesii* / *Symphoricarpos albus* Forest (CEGL000459)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Spiraea betulifolia* Habitat Type (Steele et al. 1983) B
- *Pseudotsuga menziesii* / *Spiraea betulifolia* Habitat Type (Pfister et al. 1977) B
- *Pseudotsuga menziesii* / *Spiraea betulifolia* Habitat Type (Steele et al. 1983) B
- *Pseudotsuga menziesii* / *Spiraea betulifolia* Habitat Type (Cooper et al. 1987) B
- *Pseudotsuga menziesii* / *Spiraea betulifolia* Habitat Type (Youngblood and Mueggler 1981) B
- *Pseudotsuga menziesii* / *Spiraea betulifolia* Plant Association (Johnson and Simon 1987) =
- *Pseudotsuga menziesii* / *Spiraea betulifolia* Plant Association (Johnston 1987) =
- *Pseudotsuga menziesii* / *Spiraea betulifolia* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association occupies steep, moist mountain slopes bordering narrow, sheltered valleys in both Glacier National Park and Waterton Lakes National Park. Specifically, the association was documented in a narrow portion of the Middle Fork Flathead Drainage, near Scalplock Lookout.

GLOBAL RANGE: This subalpine forest association is known from the central and northern Rocky Mountains from northwestern Wyoming, to eastern Oregon, Idaho and western Montana, and extending into Canada.

NATIONS: CA, US

STATES/PROVINCES: AB, ID:S3S4, MT:S4, OR:S4, WY:S2S3

USFS ECOREGIONS: 342C:CC, M331A:CC, M331D:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton); PC (Waterton Lakes); USFS (Bighorn, Bridger-Teton, Caribou-Targhee, Shoshone, Wallowa-Whitman)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2282, GLAC.39, WATE.4047.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz, mod. G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Cooper et al. 1987, Driscoll et al. 1984, Head 1959, Horton 1971, Johnson and Simon 1987, Johnston 1987, Jones and Ogle 2000, Kagan et al. 2000, MTNHP 2002b, Oswald 1966, Pfister et al. 1977, Steele et al. 1981, Steele et al. 1983, Western Ecology Working Group n.d., Youngblood and Mueggler 1981

Pseudotsuga menziesii / *Symphoricarpos albus* Forest

DOUGLAS-FIR / COMMON SNWBERRY FOREST

IDENTIFIER: CEGL000459

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)

Alliance	<i>Pseudotsuga menziesii</i> Forest Alliance (A.157)
Alliance (English name)	Douglas-fir Forest Alliance
Association	<i>Pseudotsuga menziesii</i> / <i>Symphoricarpos albus</i> Forest
Association (English name)	Douglas-fir / Common Snowberry Forest

ECOLOGICAL SYSTEM(S): Middle Rocky Mountain Montane Douglas-fir Forest and Woodland (CES306.959)

ELEMENT CONCEPT

GLOBAL SUMMARY: This widespread forest association occurs in the central and northern Rocky Mountains from the mid montane zone down to upper foothill zone on cool aspects. Sites are warm and relatively dry to moist, gentle to steep, mid to lower slopes, benches, and terraces. Stands are found on southerly or easterly aspects throughout much of its range, but may occur on any aspect. Substrates are variable and may be very gravelly or not, with soil textures ranging from sandy loam to silt derived from alluvium, glacial till and outwash. Ground surface has high cover of litter, sometimes significant cover of rock, and low cover of bare soil. The vegetation is characterized by a moderately dense to dense (40-90% cover) evergreen needle-leaved tree canopy, dominated or codominated by *Pseudotsuga menziesii* with the short shrub *Symphoricarpos albus* dominating or codominating the understory. Mature *Pinus ponderosa* often codominates the tree canopy, but does not regenerate. Other mature seral tree species present to codominant may include *Pinus contorta*, *Pinus flexilis*, *Larix occidentalis*, *Juniperus* spp., or *Populus tremuloides*. Understory trees are almost exclusively *Pseudotsuga menziesii*. The short-shrub layer is dominated or codominated by the rhizomatous *Symphoricarpos albus* and other short shrubs such as *Juniperus communis*, *Mahonia repens*, *Paxistima myrsinites*, *Ribes cereum*, *Rosa* spp., *Spiraea betulifolia*, and *Symphoricarpos oreophilus*. Scattered tall shrubs such as *Amelanchier alnifolia*, *Prunus virginiana*, or *Sorbus scopulina* may form an open tall-shrub layer. A low cover to moderately dense herbaceous layer is present and is composed of diverse forbs with the graminoids *Calamagrostis rubescens*, *Carex geyeri*, *Festuca idahoensis* or *Pseudoroegneria spicata* present to codominant.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this forest association are found predominately on middle to low positions of steep to moderate southeast-facing to west-facing slopes. Sites are usually situated on glacial or colluvial deposits between the elevations of 1057 and 1482 m (3464-4860 feet). Soils tend to be sandy loams, and the ground surface is mostly covered with litter and duff.

GLOBAL ENVIRONMENT: This widespread forest association occurs in the central and northern Rocky Mountains from the mid montane zone down to upper foothill zone on cool aspects. Elevations range 820-2260 m (2700-7400 feet) in the central and northern Rocky Mountains and down to 680-1700 m (2230-5575 feet) in eastern Oregon and Washington. Sites are warm and relatively dry to moist, gentle to steep, mid to lower slopes, benches, and terraces. Stands are found on southerly or easterly aspects throughout much of its range, but may occur on any aspect. Substrates are variable and may be very gravelly or not, with soil textures ranging from sandy loam to silty clay derived from alluvium, glacial till and outwash. Parent materials include loess, various calcareous and noncalcareous sedimentary rock, andesite, argillite, basalt, gneiss, granite, limestone, quartzite, quartz monzonite, rhyolite, sandstone or schist. Ground surface has high cover of litter 4-8 cm deep, sometimes significant cover of rock, and low cover of bare soil.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This forest association is dominated by a pole to mature open tree canopy of *Pseudotsuga menziesii* (36% average cover). Occasionally *Pinus contorta*, *Betula papyrifera*, and *Abies lasiocarpa* are present in the tree canopy. A tree subcanopy is not consistently occurring in slightly more than 50% of stands; species include *Pseudotsuga menziesii*, *Betula papyrifera*, and *Abies lasiocarpa*. *Pseudotsuga menziesii* seedlings are consistently present in the understory. The shrub layers are diverse. *Symphoricarpos albus* is always present and averages 60% cover. Other shrubs include *Amelanchier alnifolia*, *Acer glabrum*, *Rosa woodsii*, and *Spiraea betulifolia*. The variance in height of certain shrubs, such as *Amelanchier alnifolia* and *Acer glabrum*, is likely a result of heavy ungulate browsing. The herbaceous layer is lush and has moderate to low total cover (35% average). Common species include *Calamagrostis rubescens*, which is always present, *Carex geyeri*, *Eurybia conspicua* (= *Aster conspicuus*), and *Achillea millefolium*. Most species within this layer contribute less than 5% average cover.

GLOBAL VEGETATION: This Rocky Mountain conifer association is characterized by a moderately dense to dense (40-90% cover) evergreen needle-leaved tree canopy dominated or codominated by *Pseudotsuga menziesii* with the short shrub *Symphoricarpos albus* dominating or codominating the understory. Mature *Pinus ponderosa* often codominates tree canopy, but does not regenerate. Other mature seral tree species present to codominant may include *Pinus contorta*, *Pinus flexilis*, *Larix occidentalis*, *Juniperus scopulorum*, *Juniperus occidentalis* (eastern Oregon and Washington), or *Populus tremuloides*. Understory trees are almost exclusively *Pseudotsuga menziesii*. The short-shrub layer is open (patchy) to moderately dense (25-50% cover) and is dominated or codominated by the rhizomatous *Symphoricarpos albus* and other short shrubs such as *Juniperus communis*, *Mahonia repens*, *Paxistima myrsinites*, *Ribes cereum*, *Rosa* spp., *Spiraea betulifolia*, *Spiraea splendens*, *Shepherdia canadensis*, and *Symphoricarpos oreophilus*. Scattered tall shrubs such as *Amelanchier alnifolia*, *Prunus virginiana*, or *Sorbus scopulina* may form an open tall-shrub

layer, but it does not dominate the undergrowth. A low cover to moderately dense herbaceous layer is present and is composed of diverse forbs with the graminoids *Calamagrostis rubescens*, *Carex geyeri*, *Festuca idahoensis* or *Pseudoroegneria spicata* present to codominant. Forb species may include *Achillea millefolium*, *Moehringia macrophylla* (= *Arenaria macrophylla*), *Arnica cordifolia*, *Balsamorhiza sagittata*, *Fragaria* spp., *Hieracium* spp., *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Penstemon wilcoxii*, *Poa nervosa*, *Maianthemum racemosum* ssp. *amplexicaule*, and *Thalictrum occidentale*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Acer glabrum</i> , <i>Amelanchier alnifolia</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i> , <i>Symphoricarpos albus</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Symphoricarpos albus</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Pseudotsuga menziesii*

GLOBAL: *Calamagrostis rubescens*, *Pseudotsuga menziesii*, *Spiraea betulifolia*, *Symphoricarpos albus*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Phleum pratense*, *Poa compressa*, *Poa pratensis*, *Taraxacum officinale*, *Tragopogon dubius*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: All phases of *Pseudotsuga menziesii* / *Symphoricarpos albus* Habitat Type (Pfister et al. 1977, Steele et al. 1981) are included in the concept of this association.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Symphoricarpos albus* Forest (CEGL000337)
- *Pinus contorta* / *Symphoricarpos albus* Forest (CEGL000166)
- *Populus tremuloides* - Conifer / *Spiraea betulifolia* - *Symphoricarpos albus* Forest (CEGL005911)
- *Pseudotsuga menziesii* / *Amelanchier alnifolia* Forest (CEGL000420)
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Woodland (CEGL000429)
- *Pseudotsuga menziesii* / *Spiraea betulifolia* Forest (CEGL000457)
- *Pseudotsuga menziesii* / *Symphoricarpos albus* / *Hieracium cynoglossoides* Forest (CEGL000458)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Symphoricarpos albus* Habitat Type (Steele et al. 1983) B
- *Pseudotsuga menziesii* - *Pinus ponderosa* / *Symphoricarpos albus* Association (Brayshaw 1965) =
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Habitat Type (Ogilvie 1962) =
- *Pseudotsuga menziesii* / *Symphoricarpos albus* (Topik et al. 1988) B
- *Pseudotsuga menziesii* / *Symphoricarpos albus* Habitat Type (Daubenmire and Daubenmire 1968) =
- *Pseudotsuga menziesii* / *Symphoricarpos albus* Habitat Type (Cooper et al. 1987) =
- *Pseudotsuga menziesii* / *Symphoricarpos albus* Habitat Type (Ogilvie 1962) =
- *Pseudotsuga menziesii* / *Symphoricarpos albus* Habitat Type (Zamora 1983) B
- *Pseudotsuga menziesii* / *Symphoricarpos albus* Habitat Type (Steele et al. 1983) B
- *Pseudotsuga menziesii* / *Symphoricarpos albus* Habitat Type (Steele et al. 1981) B

- *Pseudotsuga menziesii* / *Symphoricarpos albus* Habitat Type (Pfister et al. 1977) B
- *Pseudotsuga menziesii* / *Symphoricarpos albus* Habitat Type (Johnson and Simon 1987) =
- *Pseudotsuga menziesii* / *Symphoricarpos albus* Plant Association (Williams et al. 1990b) =
- *Pseudotsuga menziesii* / *Symphoricarpos albus* Plant Association (Johnson and Clausnitzer 1992) =
- *Pseudotsuga menziesii* / *Symphoricarpos albus* Plant Association (Williams and Lillybridge 1985) =
- *Pseudotsuga menziesii* / *Symphoricarpos albus* Plant Association (Johnston 1987) =
- *Pseudotsuga menziesii* / *Symphoricarpos albus* Plant Association (Williams and Lillybridge 1983) =
- *Pseudotsuga menziesii* / *Symphoricarpos albus* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B
- Douglas fir/snowberry (McLean and Holland 1958) =
- ponderosa pine-Douglas-fir-snowberry-oceanspray community (Hall 1973) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from six stands throughout Glacier National Park and from one stand in Waterton Lakes National Park.

GLOBAL RANGE: This widespread montane forest association occurs in the central and northern Rocky Mountains from southeastern Idaho and northwestern Wyoming, Montana, Idaho and eastern Oregon and Washington, extending into southern Alberta and British Columbia.

NATIONS: CA, US

STATES/PROVINCES: AB, BC?, ID:S4, MT:S5, OR:S2, WA:S4, WY:S2

USFS ECOREGIONS: M242C:CC, M331A:CC, M331D:CC, M332A:CC, M332C:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CP, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton); PC (Waterton Lakes); USFS (Mount Hood, Shoshone, Wallowa-Whitman)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2055; GLAC.2523, GLAC.177, GLAC.2226, GLAC.32, GLAC.2534, WATE.5057.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz, mod. G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Brayshaw 1965, Cooper 1975, Cooper et al. 1987, Crowe and Clausnitzer 1997, Daubenmire and Daubenmire 1968, Driscoll et al. 1984, Hall 1973, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Johnston 1987, Jones and Ogle 2000, Kagan et al. 2000, MTNHP 2002b, McLean and Holland 1958, Ogilvie 1962, Pfister et al. 1977, Steele et al. 1981, Steele et al. 1983, Titus et al. 1998, Topik et al. 1988, WNHP unpubl. data, Western Ecology Working Group n.d., Williams and Lillybridge 1983, Williams and Lillybridge 1985, Williams et al. 1990b, Wooten and Morrison 1995, Zamora 1983

Pseudotsuga menziesii / *Vaccinium caespitosum* Forest DOUGLAS-FIR / DWARF BLUEBERRY FOREST

IDENTIFIER: CEGLO00465

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Pseudotsuga menziesii</i> Forest Alliance (A.157)
Alliance (English name)	Douglas-fir Forest Alliance
Association	<i>Pseudotsuga menziesii</i> / <i>Vaccinium caespitosum</i> Forest
Association (English name)	Douglas-fir / Dwarf Blueberry Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is found in the montane zone of the Rocky Mountains in north-central and northwestern Montana from east of the Continental Divide to northeastern Washington. Elevations range from 700-1370 m (2300-4500 feet) extending to 1950 m (6400 feet) east of the divide. This association often occurs in frost pocket conditions, where cold air accumulates causing high diurnal temperature fluctuations, typically with cold nights, high daily maximum temperatures, and frequent summer frosts. Topography is flat to gently undulating or moderately sloping terrain typically occurring on valley bottoms, terraces, lower slopes, and benches on all aspects. Soils are predominantly excessively well-drained, moderately deep, acidic, gravelly, sandy loam or loam. Ground cover is mostly tree litter, often with duff over 4 cm deep. The vegetation is characterized by an open to moderately dense tree canopy that is dominated or codominated by *Pseudotsuga menziesii* and *Pinus ponderosa*, *Pinus contorta*, or *Larix occidentalis*. In some stands scattered *Populus tremuloides* trees may be present. *Vaccinium caespitosum* and *Arctostaphylos uva-ursi* (indicator species) are common to dominant in the patchy to continuous dwarf-shrub layer. Other shrubs and dwarf-shrubs may include low cover of *Amelanchier alnifolia*, *Linnaea borealis* (on more mesic sites), *Mahonia repens*, *Paxistima myrsinites*, *Ribes* spp., *Spiraea betulifolia*, or *Symphoricarpos albus*. The herbaceous layer is sparse to moderately dense (to 30% cover) and is typically dominated or codominated by perennial graminoids in the openings such as *Calamagrostis rubescens*. Forbs generally have sparse cover but may be diverse.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This forest association occupies flat, upland benches and gentle slopes in a mid-seral stage. The association is typically a dry-site vegetation type, though swales and depressions with moist-site characteristics may be present. Elevations range from 1050-1100 m (3444-3608 feet). Parent material is derived from glacial till. Soil is a well-drained loam to silt loam and is not well-developed. The substrate is coarse-textured, with rock of various sizes abundant in the upper strata. Ground surfaces are mostly covered with litter. Large rock and moss may also contribute significant cover as well. Evidence of relatively recent, low-intensity fire may be present in the form of fire-scarred trees.

GLOBAL ENVIRONMENT: This association is found in the montane zone of the northern Rocky Mountains. Elevations range from 700-1370 m (2300-4500 feet) extending to 1950 (6400 feet) east of the Continental Divide. This association often occurs in frost pocket situations, where cold air accumulates causing high diurnal temperature fluctuations, typically with cold nights, high daily maximum temperatures, and frequent summer frosts. Topography is flat to gently undulating or moderately sloping terrain typically occurring on valley bottoms, terraces, lower slopes, and benches on all aspects. Soils are typically excessively well-drained, moderately deep, acidic, gravelly, sandy loam or loam, derived from a variety of noncalcareous parent materials, especially glacial till. Ground cover is mostly tree litter, often with duff over 4 cm deep.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The forest canopy cover in this association ranges from 30-40% and is dominated by *Pseudotsuga menziesii* and/or *Larix occidentalis*. In some stands *Pinus ponderosa* may be dominant in the upper canopy. Tree height is 20-50 m. *Pseudotsuga menziesii* is the most abundant tree in the regeneration layer. The cover of short shrubs is highly variable (5-60%), with *Symphoricarpos albus* tending to dominate in stands with the greatest shrub cover and *Spiraea betulifolia* being the most consistently present short shrub, with an average canopy cover of 10-15%. The dwarf-shrubs *Vaccinium caespitosum* and *Arctostaphylos uva-ursi* are typically abundant undergrowth species, with average covers of 25% and 11%, respectively. *Vaccinium caespitosum* is indicative of sites where cold-air ponding is presumed to be a critical environmental factor. Some stands may have a dense layer of the dwarf-shrub *Linnaea borealis*. Herbaceous cover varies from 40-90%, dominated by *Calamagrostis rubescens*. Low-growing forbs, such as *Fragaria virginiana* and *Galium boreale*, have high constancy but are sparsely distributed within the association.

GLOBAL VEGETATION: This association is characterized by an open to moderately dense tree canopy that is dominated or codominated by *Pseudotsuga menziesii* and *Pinus ponderosa*, *Pinus contorta*, or *Larix occidentalis*. In some stands scattered *Populus tremuloides* trees may be present. *Vaccinium caespitosum* and *Arctostaphylos uva-ursi* (indicator species) are common to dominant in the patchy to continuous dwarf-shrub layer. Other shrubs and dwarf-shrubs may include low cover of *Amelanchier alnifolia*, *Linnaea borealis* (on more mesic sites), *Mahonia repens*, *Paxistima myrsinites*, *Ribes* spp., *Spiraea betulifolia*, or *Symphoricarpos albus*. The herbaceous layer is sparse to moderately dense (to 30% cover) and is typically dominated or codominated by perennial graminoids in the openings such as *Calamagrostis rubescens*, *Carex geyeri*, or *Festuca* spp. Forbs generally have sparse cover but may be diverse and include *Arnica cordifolia*, *Balsamorhiza sagittata*, *Fragaria virginiana*, *Heuchera cylindrica*, *Maianthemum racemosum*, *Tiarella trifoliata*, and *Thalictrum occidentale*. *Xerophyllum tenax* is common in some stands.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Pseudotsuga menziesii</i>

Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i> , <i>Symphoricarpos albus</i>
Herb (field)	Dwarf-shrub	<i>Arctostaphylos uva-ursi</i> , <i>Linnaea borealis</i> , <i>Vaccinium caespitosum</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

Global

Stratum

Tree canopy
Herb (field)
Herb (field)

Lifeform

Needle-leaved tree
Dwarf-shrub
Forb

Species

Larix occidentalis, *Pinus ponderosa*, *Pseudotsuga menziesii*
Arctostaphylos uva-ursi, *Vaccinium caespitosum*
Calamagrostis rubescens

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Arctostaphylos uva-ursi*, *Larix occidentalis*, *Pseudotsuga menziesii*, *Vaccinium caespitosum*

GLOBAL: *Pseudotsuga menziesii*, *Vaccinium caespitosum*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Some stands had an open tree canopy (40% cover) that could be classified as a woodland, but were included in this forest association until review of this association is completed rangewide.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies grandis* / *Vaccinium caespitosum* Forest (CEGL000288)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (CEGL005918)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium caespitosum* Forest (CEGL000340)
- *Picea engelmannii* / *Vaccinium caespitosum* Forest (CEGL005926)
- *Pinus contorta* / *Vaccinium caespitosum* Forest (CEGL000168)
- *Pinus ponderosa* / *Vaccinium caespitosum* Woodland (CEGL005841)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Vaccinium cespitosum* Habitat Type (Pfister et al. 1977) B
- *Abies lasiocarpa* / *Vaccinium cespitosum* Habitat Type (Steele et al. 1981) B
- *Picea engelmannii* / *Vaccinium cespitosum* Habitat Type (Steele et al. 1981) B
- *Picea engelmannii* / *Vaccinium cespitosum* Habitat Type (Pfister et al. 1977) B
- *Pseudotsuga* / *Calamagrostis* Habitat Type (Ogilvie 1962) I
- *Pseudotsuga menziesii* / *Vaccinium cespitosum* Habitat Type (Cooper et al. 1987) B
- *Pseudotsuga menziesii* / *Vaccinium cespitosum* Habitat Type (Pfister et al. 1977) B
- *Pseudotsuga menziesii* / *Vaccinium cespitosum* Habitat Type (Steele et al. 1981) B
- *Pseudotsuga menziesii* / *Vaccinium cespitosum* plant association (Williams et al. 1995) =
- *Pseudotsuga menziesii*/ *Vaccinium cespitosum* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association occupies gentle slopes and benches in sub-drainages of the North Fork Flathead River Valley, on the west side of Glacier National Park. Specifically, the association was documented in the Logging and Quartz drainages. It is likely to occur in other drainages with similar topographical features promoting cold-air ponding.

GLOBAL RANGE: This association is found in the montane zone of the Rocky Mountains in north-central and northwestern Montana from east of the Continental Divide to northeastern Washington, and in Alberta, Canada.

NATIONS: CA, US

STATES/PROVINCES: AB, ID:S2, MT:S5, OR:S3, WA:S3

USFS ECOREGIONS: M332A:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2262, GLAC.2265.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Cooper et al. 1987, Driscoll et al. 1984, MTNHP 2002b, Ogilvie 1962, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d., Williams et al. 1990b, Williams et al. 1995

Pseudotsuga menziesii / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest DOUGLAS-FIR / SQUARE-TWIG BLUEBERRY / BEAR-GRASS FOREST

IDENTIFIER: CEGL005852

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Pseudotsuga menziesii</i> Forest Alliance (A.157)
Alliance (English name)	Douglas-fir Forest Alliance
Association	<i>Pseudotsuga menziesii</i> / <i>Vaccinium membranaceum</i> / <i>Xerophyllum tenax</i> Forest
Association (English name)	Douglas-fir / Square-twig Blueberry / Bear-grass Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)

ELEMENT CONCEPT

GLOBAL SUMMARY: This large-patch to matrix type is manifested as both a seral and climax type from central Idaho north to northern Idaho, eastern Washington, western Montana and southwestern Alberta, and it very probably will be identified for British Columbia. As a climax type this association is most prominent in west-central and central Montana forests. This association's elevation range is rather broad, ranging from 1030 to 2015 m (3100-6600 feet). Virtually the whole of this appreciable elevation range can be realized in a given geographic area due to the type's presence as both a seral and late-successional type. It occupies primarily south- through west-facing, moderate to steep slopes and is usually found on midslope to slope-shoulder positions. It also occurs on benches associated with broad ridges. Soils are well-drained and derived from a broad spectrum of parent materials, including glacial till and drift, both calcareous and noncalcareous sedimentary types, intrusive and extrusive igneous rock and metamorphic types, particularly quartzite. Ground surfaces have little or no bare soil or rock exposed. The canopy structure ranges from moderately open to closed (>60% cover) with *Pseudotsuga menziesii* being the dominant canopy tree, often joined by lesser amounts of *Larix occidentalis* and *Pinus contorta* (sites are beyond the cold limits of *Pinus ponderosa* for the most part). At its mid to upper elevation limits *Abies grandis*, *Abies lasiocarpa*, and *Picea engelmannii* may be minor components of the overstory and major components of the subcanopy. A tall-shrub layer is absent and even scattered individuals are rare. The short-shrub layer dominates the undergrowth with *Vaccinium membranaceum* being dominant, often exceeding 50% canopy cover. *Spiraea betulifolia*, *Lonicera utahensis*, *Paxistima myrsinites*, *Amelanchier alnifolia*, and *Rosa gymnocarpa* are the other high-constancy species of this layer. Dwarf-shrub layer species that occur with consistency include only *Vaccinium scoparium* and *Mahonia repens* (= *Berberis repens*). The herbaceous layer is generally relatively depauperate with the diagnostic species *Xerophyllum tenax* being strongly dominant (average cover reported by various studies ranging from 25 to 61%). Only two graminoids occur consistently and are well-represented in cover, *Calamagrostis rubescens* and *Carex geyeri*. Other forbs with moderate to high constancy include *Arnica cordifolia*, *Arnica latifolia*, *Chimaphila umbellata*, *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, and *Viola orbiculata*; not all of these forbs have high constancy throughout the range of the type.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this forest association are found midslope to upper slope on steep ridges of various aspects. Sites occupy glacial till deposits or limestone-argillite between the elevations of 958 and 1623 m (3140-5320 feet). Soils tend to be well-drained clay- or silt-loams, and the ground surface is mostly covered with litter and duff. A low percentage of moss and lichen is present.

GLOBAL ENVIRONMENT: This large-patch to matrix type is manifested as both a seral and climax type from central Idaho north to northern Idaho, eastern Washington, western Montana and southwestern Alberta, and it very probably will be identified for British Columbia. As a climax type this association is most prominent in west-central and central Montana forests. This association's elevation range is rather broad ranging from 1030 to 2015 m (3100-6600 feet). Virtually the whole of this appreciable elevation range can be realized in a given geographic area due to type's presence as both a seral and climax type (within the *Abies grandis* and *Abies lasiocarpa* - *Picea engelmannii* Series). It occupies primarily south- through west-facing, moderate to steep slopes, usually found on midslope to slope-shoulder positions. It also occurs on benches associated with broad ridges. Soils are well-drained and derived from a broad spectrum of parent materials, including glacial till and drift, both calcareous and noncalcareous sedimentary types, intrusive and extrusive igneous rock and metamorphic types, particularly quartzite. In one study soil texture ranged from gravelly sandy loams to silts, and a yet greater range in texture can be expected across the type's distribution. Ground surfaces have little or no bare soil or rock exposed.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This forest association is dominated by a pole to mature open tree canopy of *Pseudotsuga menziesii* (42% average cover). The seedling layer is comprised of *Picea engelmannii*, *Pseudotsuga menziesii*, and *Abies lasiocarpa*. Shrubs at 2 m or less in height include *Vaccinium membranaceum*, *Spiraea betulifolia*, and *Paxistima myrsinites*; all are always present and each exhibits less than 10% average cover. Shrubs with lower constancy include *Shepherdia canadensis*, *Rubus parviflorus*, and *Ribes viscosissimum*. As an indicator of the type, *Xerophyllum tenax* exhibits 100% constancy and 42% average cover, dominating the herbaceous layer. *Thalictrum occidentale* is also always present but has less than 5% average cover. All other herbaceous species contribute insignificant cover.

GLOBAL VEGETATION: The canopy structure ranges from moderately open to closed (>60% cover) with *Pseudotsuga menziesii* being the dominant canopy tree, often joined by lesser amounts of *Larix occidentalis* and *Pinus contorta* (sites beyond the cold limits of *Pinus ponderosa* for most part). At its mid to upper elevational limits *Abies grandis*, *Abies lasiocarpa*, *Tsuga mertensiana*, and *Picea engelmannii* may be minor components of the overstory and major components of the subcanopy. A tall-shrub layer is absent and even scattered individuals are rare. The short-shrub layer dominates the undergrowth with *Vaccinium membranaceum* being dominant, often exceeding 50% canopy cover; *Spiraea betulifolia*, *Lonicera utahensis*, *Paxistima myrsinites*, *Amelanchier alnifolia*, and *Rosa gymnocarpa* are the other high-constancy species of this layer. Dwarf-shrub layer species that occur with consistency include only *Vaccinium scoparium* and *Mahonia repens* (= *Berberis repens*). The herbaceous layer is generally relatively depauperate with the diagnostic species *Xerophyllum tenax* being strongly dominant (average cover reported by various studies ranging from 25 to 61%). Only two graminoids occur consistently and are well-represented, *Calamagrostis rubescens* and *Carex geyeri*. Other forbs with moderate to high constancy include *Arnica cordifolia*, *Arnica latifolia*, *Chimaphila umbellata*, *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, and *Viola orbiculata*; not all of these forbs have high constancy throughout the range of the type.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Vaccinium membranaceum</i>
Herb (field)	Dwarf-shrub	<i>Paxistima myrsinites</i> , <i>Spiraea betulifolia</i>
Herb (field)	Forb	<i>Thalictrum occidentale</i> , <i>Xerophyllum tenax</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Pinus contorta</i> , <i>Pseudotsuga menziesii</i>
Tree subcanopy	Needle-leaved tree	<i>Abies grandis</i> , <i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Paxistima myrsinites</i> , <i>Spiraea betulifolia</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Dwarf-shrub	<i>Mahonia repens</i> , <i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Arnica latifolia</i> , <i>Thalictrum occidentale</i> , <i>Xerophyllum tenax</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i> , <i>Carex geyeri</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Vaccinium membranaceum*, *Xerophyllum tenax*

GLOBAL: *Vaccinium membranaceum*, *Xerophyllum tenax*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4G5 (11-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This forest association is equivalent to *Pseudotsuga menziesii*/*Vaccinium membranaceum* Habitat Type, *Xerophyllum tenax* Phase of Pfister et al. (1977).

GLOBAL COMMENTS: This association is the result of elevating to plant association status the *Xerophyllum tenax* Phase of the *Pseudotsuga menziesii* / *Vaccinium membranaceum* Habitat Type (Pfister et al. 1977); and, by recognizing *Pseudotsuga menziesii* dominance in the canopy layer, many seral stands of existing potential-based classifications have been drawn into this syntaxon (including those of the *Tsuga mertensiana*, *Abies lasiocarpa*, and *Abies grandis* Series) and considerably broadened the environmental parameters for the type.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies grandis* / *Xerophyllum tenax* Forest (CEGL000293)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest (CEGL005917)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium membranaceum* Rocky Mountain Forest (CEGL000341)
- *Abies lasiocarpa* / *Xerophyllum tenax* Forest (CEGL000346)
- *Pinus contorta* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest (CEGL005913)
- *Pseudotsuga menziesii* / *Vaccinium membranaceum* Forest (CEGL000466)
- *Tsuga mertensiana* / *Xerophyllum tenax* Forest (CEGL000516)

GLOBAL RELATED CONCEPTS:

- *Abies grandis* / *Xerophyllum tenax* Habitat Type (Pfister et al. 1977) I
- *Abies grandis* / *Xerophyllum tenax* Habitat Type (Steele et al. 1981) I
- *Abies grandis* / *Xerophyllum tenax* Habitat Type, *Vaccinium membranaceum* Phase (Cooper et al. 1987) I
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium globulare* (= *Vaccinium membranaceum*) Phase (Pfister et al. 1977) I
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium globulare* (= *Vaccinium membranaceum*) Phase (Cooper et al. 1987) I
- *Abies lasiocarpa* / *Xerophyllum tenax* Plant Association (Williams et al. 1995) I
- *Abies lasiocarpa* - (*Pinus contorta*) / *Xerophyllum tenax* Vegetation Type (Achuff et al. 2002a) I
- *Pseudotsuga menziesii* / *Vaccinium membranaceum* Habitat Type, *Xerophyllum tenax* Phase (Pfister et al. 1977) =
- *Tsuga mertensiana* / *Xerophyllum tenax* - *Vaccinium membranaceum* Plant Association (Lillybridge et al. 1995) I
- *Tsuga mertensiana* / *Xerophyllum tenax* Habitat Type (Pfister et al. 1977) I
- *Tsuga mertensiana* / *Xerophyllum tenax* Habitat Type, *Vaccinium membranaceum* Phase (Cooper et al. 1987) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from two stands in Glacier National Park, west of the Continental Divide. One stand is in the vicinity of Bowman Lake and the other stand is near Scalplock Mountain.

GLOBAL RANGE: This large-patch to matrix type is found from central Idaho north to northern Idaho, eastern Washington, western Montana and southwestern Alberta, and it very probably will be identified for British Columbia with additional crosswalking.

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT, OR?, WA

USFS ECOREGIONS: M242C:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332G:C?, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2616, GLAC.2283.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Achuff et al. 2002a, Arno and Peterson 1983, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Johnson and Simon 1987, Lillybridge et al. 1995, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d., Williams et al. 1995

***Thuja plicata* Forest Alliance**

***Thuja plicata* / *Aralia nudicaulis* Forest**

WESTERN RED-CEDAR / WILD SARSAPARILLA FOREST

IDENTIFIER: CEG000471

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Thuja plicata</i> Forest Alliance (A.166)
Alliance (English name)	Western Red-cedar Forest Alliance
Association	<i>Thuja plicata</i> / <i>Aralia nudicaulis</i> Forest
Association (English name)	Western Red-cedar / Wild Sarsaparilla Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (CES306.802)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is a late-seral evergreen conifer forest found in the mid elevations in the Okanogan Highlands east of the Kettle Mountain crest in Washington and British Columbia, with outliers in Montana. It appears on stream terraces representing xero-riparian conditions and on lower slopes and benches, mostly below 1065 m (3500 feet) in Washington and 1220 m (4000 feet) in Montana. Its name reflects a potential vegetation. The existing vegetation is dominated by a closed canopy of *Picea engelmannii*, *Thuja plicata*, and *Pseudotsuga menziesii* trees. The undergrowth can contain scattered tall deciduous shrubs such as *Acer glabrum* and *Alnus viridis ssp. sinuata*. The short and dwarf-shrub layers have both greater diversity and cover than the tall-shrub layer, with *Linnaea borealis* and *Cornus canadensis* being the most constant and having appreciable coverages. The herbaceous component is characterized by a rich assortment of mesic site forbs, such as *Aralia nudicaulis*, *Clintonia uniflora*, *Galium triflorum*, *Maianthemum stellatum*, *Tiarella trifoliata*, and *Prosartes hookeri* (= *Disporum hookeri*); graminoids, with the exception of the highly constant *Bromus vulgaris* (or *Bromus ciliatus*), are a minor element.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs on gentle to flat terrain along moist basin floors or floodplains at elevations between 945 and 1010 m (3100-3300 feet). Soil texture is variable, ranging from silty clay loam to sandy clay loam to loam that can be somewhat poorly drained to well-drained. Soils are derived from glacio-fluvial deposits or till and tend to be very dark with thick duff layers and little gravel. Litter, comprising 30-80% cover, dominates the ground surface, although downed wood, moss, and lichen can also be common.

GLOBAL ENVIRONMENT: This is a late-seral evergreen conifer forest found in the mid elevations in the Okanogan Highlands east of the Kettle Mountain crest in Washington and British Columbia, with outliers in northwestern Montana as far east as the Continental Divide. It appears on stream terraces representing xero-riparian conditions and on lower slopes and benches, mostly below 1070 m (3500 feet) in Washington and 1220 m (4000 feet) in Montana. Sites are postulated to be relatively warm and moist. Soils

have fine-textured upper horizons, often with a high concentration of volcanic ash, overlying coarse-textured alluvium or glacial outwash and drift; thus soils are expected to be nutrient-rich and well-drained.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This mid-seral, montane, evergreen forest is species-rich in each stratum. This association has a mixed overstory codominated by *Thuja plicata*, *Pseudotsuga menziesii*, *Picea engelmannii*, and *Larix occidentalis*. Each tree species averages 10-20% cover, and average tree height is 20-35 m. *Tsuga heterophylla* and *Betula papyrifera* trees are also common but have low cover. *Picea engelmannii* saplings, measuring 1-5 m in height, are common in the subcanopy with 8% average cover. *Thuja plicata* saplings are less common but may have high cover in certain areas. Short and dwarf-shrubs are generally more common than tall shrubs, but are reduced in cover when herbaceous cover is high. Short shrubs range from 0-40% with *Spiraea betulifolia* and *Symphoricarpos albus* providing the most cover. Dwarf-shrub cover ranges from 5-40% due to the presence of *Mahonia repens* and high cover of *Linnaea borealis* in some areas. Tall-shrub cover ranges from 10-30% with this stratum dominated by *Acer glabrum*, *Amelanchier alnifolia*, and *Menziesia ferruginea* in some areas. Herbaceous cover ranges from 30-80% and is dominated by native forb species. The most dominant forb is *Aralia nudicaulis* with an average cover of 35%. Other high-constancy forbs with cover ranging from 1-7% include *Clintonia uniflora*, *Maianthemum stellatum*, *Prosartes hookeri* (= *Disporum hookeri*), *Osmorhiza berteroi*, *Adenocaulon bicolor*, *Veronica officinalis*, and *Thuja plicata* and *Picea engelmannii* seedlings. High-constancy species with low cover include *Thalictrum occidentale*, *Bromus vulgaris*, *Elymus glaucus*, *Fragaria vesca*, *Galium triflorum*, *Oryzopsis asperifolia*, and *Viola orbiculata*. *Arnica cordifolia*, *Pteridium aquilinum*, *Tiarella trifoliata*, *Cornus canadensis*, and *Xerophyllum tenax* may have moderate to very high cover in certain areas. Larger openings in the tree canopy result in even higher cover of *Pteridium aquilinum*, a native species that increases with disturbance. Stand age for one of the three sampled areas is 98 years.

GLOBAL VEGETATION: The existing vegetation is dominated by a relatively closed canopy of *Thuja plicata*, *Picea engelmannii*, and *Pseudotsuga menziesii*; throughout all but the easternmost extent of the type, *Abies grandis* often contributes the greatest canopy cover. The undergrowth can contain scattered tall deciduous shrubs, such as *Acer glabrum* and *Amelanchier alnifolia*. The short-shrub layer is often moderately dense, though not highly diverse with the most constant species being *Rubus parviflorus*, *Symphoricarpos albus*, *Spiraea betulifolia*, and *Rosa gymnocarpa*. In the dwarf-shrub layer *Chimaphila umbellata*, *Linnaea borealis*, and *Cornus canadensis* have the highest constancy and cover. A rich assortment of mesic-site forbs consistently includes *Aralia nudicaulis*, *Asarum caudatum*, *Clintonia uniflora*, *Prosartes hookeri* (= *Disporum hookeri*), *Galium triflorum*, *Gymnocarpium dryopteris*, *Maianthemum stellatum*, *Tiarella trifoliata*, *Trillium ovatum*, and *Viola orbiculata*. *Bromus vulgaris* is the only graminoid with greater than 50% constancy. Though some would include stands with relatively high cover of *Gymnocarpium dryopteris*, *Athyrium filix-femina*, *Asarum caudatum*, and *Cornus canadensis* in this type, from all indications these species would reflect other, more mesic environments (and types).

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Picea engelmannii</i> , <i>Pseudotsuga menziesii</i> , <i>Thuja plicata</i>
Tree subcanopy	Needle-leaved tree	<i>Picea engelmannii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Acer glabrum</i> , <i>Amelanchier alnifolia</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i> , <i>Symphoricarpos albus</i>
Herb (field)	Dwarf-shrub	<i>Linnaea borealis</i> , <i>Mahonia repens</i>
Herb (field)	Forb	<i>Aralia nudicaulis</i> , <i>Arnica cordifolia</i> , <i>Clintonia uniflora</i> , <i>Maianthemum stellatum</i> , <i>Tiarella trifoliata</i>
Herb (field)	Fern or fern ally	<i>Pteridium aquilinum</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies grandis</i> , <i>Larix occidentalis</i> , <i>Picea engelmannii</i> , <i>Pseudotsuga menziesii</i> , <i>Thuja plicata</i>
Tree subcanopy	Needle-leaved tree	<i>Picea engelmannii</i> , <i>Thuja plicata</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Acer glabrum</i> , <i>Amelanchier alnifolia</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rosa gymnocarpa</i> , <i>Rubus parviflorus</i> , <i>Spiraea betulifolia</i> , <i>Symphoricarpos albus</i>
Herb (field)	Dwarf-shrub	<i>Cornus canadensis</i> , <i>Linnaea borealis</i> , <i>Mahonia repens</i>
Herb (field)	Forb	<i>Adenocaulon bicolor</i> , <i>Aralia nudicaulis</i> , <i>Clintonia uniflora</i> , <i>Galium triflorum</i> , <i>Maianthemum stellatum</i> , <i>Osmorhiza berteroi</i> , <i>Tiarella trifoliata</i>
Herb (field)	Graminoid	<i>Bromus vulgaris</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Adenocaulon bicolor*, *Aralia nudicaulis*, *Bromus vulgaris*, *Clintonia uniflora*, *Larix occidentalis*, *Maianthemum stellatum*, *Osmorhiza berteroi*, *Picea engelmannii*, *Prosartes hookeri*, *Pseudotsuga menziesii*, *Thalictrum occidentale*, *Thuja plicata*

GLOBAL: *Aralia nudicaulis*, *Thuja plicata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Dactylis glomerata*, *Poa pratensis*, *Veronica officinalis*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2 (30-Nov-1998). This riparian community has a restricted natural range to portions of northeastern Washington, northwestern Montana, and most probably adjacent Idaho and British Columbia. This is a mid- to late-seral forest community that naturally depends upon a relatively narrow range of environmental conditions along streams and restrictive climatic conditions. Its area has been reduced by land-use conversions and repeated severe fires. There are fewer than 100 high-quality occurrences remaining. There are no occurrences known in protected areas, although it may receive de facto protection through riparian management activities.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Currently there are at least two conceptions of this type, one is that of a potential vegetation type identified by the mere presence and successful reproduction of *Thuja plicata* (Pfister et al. 1977, Williams et al. 1995); Williams et al. (1995) also recognize the type based on at least 10% cover of *Thuja* and less than 10% cover of *Tsuga heterophylla*. A modified cover type approach (as encouraged by the NVC) is reflected by the approach taken in Waterton-Glacier International Peace Park (IPP); *Thuja* must comprise at least 25% of the cover of the upper canopy and *Tsuga* less than 25% of this stratum. Under the potential-vegetation concept a considerable number of seral tree species are capable of dominating the site, whereas with the IPP concept, primarily mature to late-seral and climax stages are recognized. In Montana this association was formerly recognized as a phase of the *Thuja plicata* / *Clintonia uniflora* Habitat Type (Pfister et al. 1977), but with accumulating compelling information linking this phase with particular environmental parameters, it is appropriate to recognize it at the association level, as exemplified by Williams et al. (1995). However, following intensive field sampling in IPP, it is deemed prudent to recognize *Aralia nudicaulis* as an indicator only at 1% or greater canopy cover; this contrasts with Pfister et al. (1977) and Cooper et al. (1987) who recognize its mere presence not confined to microsites as indicative. In contrast Williams et al. (1995) stipulate that 5% be present to recognize the type. Pfister et al. (1977) and Williams et al. (1995) also use *Gymnocarpium dryopteris*, *Athyrium filix-femina*, *Asarum caudatum*, *Actaea rubra*, and *Cornus canadensis* as alternative indicators for this association. All of these species are also used as indicators of other plant associations (both with and without *Thuja* as overstory indicator), and the first three are clearly indicative of more mesic environments or at least a more maritime climatic regime than reflected by the presence of *Aralia nudicaulis*.

GLOBAL SIMILAR ASSOCIATIONS:

- *Thuja plicata* / *Gymnocarpium dryopteris* Forest (CEGL000476)
- *Tsuga heterophylla* / *Aralia nudicaulis* Forest (CEGL000488)

GLOBAL RELATED CONCEPTS:

- *Thuja plicata* / *Aralia nudicaulis* Plant Association (Williams et al. 1995) I
- *Thuja plicata* / *Clintonia uniflora* Habitat Type, *Aralia nudicaulis* Phase (Pfister et al. 1977) I
- *Thuja plicata* / *Aralia nudicaulis* (Bourgeron and Engelking 1994) =
- *Tsuga heterophylla* / *Clintonia uniflora* Habitat Type, *Aralia nudicaulis* Phase (Cooper et al. 1987) I
- *Tsuga heterophylla* / *Clintonia uniflora* Habitat Type, *Aralia nudicaulis* Phase (Pfister et al. 1977) I
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is relatively common in moist bottomlands and within floodplains in the Lake McDonald valley on the west side of Glacier National Park. Specific locations that have been documented include the West Glacier bike path area and terraces above Lake McDonald.

GLOBAL RANGE: This association is restricted to the eastern portion of the Okanogan Highlands and penetrates into northwestern Montana extending as far east as the Continental Divide (beyond which *Thuja plicata* does not extend); it has not been recognized for

northern Idaho, but this may be due to the omnipresence of *Tsuga heterophylla*, which was given precedence, even in trace amounts in the seedling layer, over *Thuja* in potential-based vegetation keys.

NATIONS: CA?, US

STATES/PROVINCES: BC?, ID?, MT, WA:S2

USFS ECOREGIONS: M333A:CC, M333B:CC, M333C:CC, M333D:CP

FEDERAL LANDS: NPS (Glacier); USFS (Colville NF, Flathead)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2051, GLAC.2053, GLAC.2547.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: R.C. Crawford, mod. S.V. Cooper

REFERENCES: Bourgeron and Engelking 1994, Cooper et al. 1987, Driscoll et al. 1984, Hansen et al. 1995, Kovalchik 1993, MTNHP 2002b, Pfister et al. 1977, WNHP unpubl. data, Western Ecology Working Group n.d., Williams and Lillybridge 1985, Williams et al. 1990b, Williams et al. 1995

Thuja plicata / *Carex disperma* Forest [Provisional] WESTERN RED-CEDAR / SOFTLEAF SEDGE FOREST

IDENTIFIER: CEGLO05931

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Thuja plicata</i> Forest Alliance (A.166)
Alliance (English name)	Western Red-cedar Forest Alliance
Association	<i>Thuja plicata</i> / <i>Carex disperma</i> Forest [Provisional]
Association (English name)	Western Red-cedar / Softleaf Sedge Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Conifer Swamp (CES306.803)

ELEMENT CONCEPT

GLOBAL SUMMARY: This forest association is tentative and presently known from the west side of Glacier National Park, Montana. It was found on very wet sites, growing on a flat basin floor over alluvial substrates. The site is very poorly drained; surface ponding is evident throughout the growing season. The ground surface is hummocky, the hummocks about 2-3 dm above the water surface. Soils are peat. Elevation of the one known occurrence was 980 m (3210 feet). This is a swampy, forested association, with near equal dominance of *Thuja plicata*, *Picea engelmannii*, and *Tsuga heterophylla*. Other trees present are *Pinus monticola* and *Betula papyrifera*. Subcanopy trees are *Thuja plicata* and *Tsuga heterophylla*. The tall-shrub layer is abundant with *Alnus incana*, *Menziesia ferruginea*, and *Cornus sericea*. Other shrubs present are *Rhamnus alnifolia*, *Rosa gymnocarpa*, and *Vaccinium membranaceum*. *Thuja plicata*, *Picea engelmannii*, and *Tsuga heterophylla* saplings also occupy the shrub layer with 2-10% cover. The herbaceous layer is lush and dominated by *Carex disperma* with 43% cover. *Streptopus amplexifolius*, *Cicuta douglasii*, *Petasites frigidus* var. *sagittatus* (= *Petasites sagittatus*), and *Pteridium aquilinum* were among the hygrophilous forbs. Several other herbaceous species are present, all indicators of moist to continually wet conditions. These include *Glyceria* sp., *Menyanthes trifoliata*, and *Athyrium filix-femina*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is very wet, growing on a flat basin floor over alluvial substrates. The site is very poorly drained; surface ponding is evident throughout the growing season. The ground surface is hummocky, the hummocks about 2-3 dm above the water surface. Soils are peat. Elevation of the one stand sampled is 980 m (3210 feet).

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This is a swampy, forested association, with near equal dominance of *Thuja plicata* (13% cover), *Picea engelmannii* (10% cover), and *Tsuga heterophylla* (10% cover). Other trees present are *Pinus monticola* (3%) and *Betula papyrifera* (4%). Subcanopy trees are *Thuja plicata* (13%) and *Tsuga heterophylla* (10%). The very wet nature of the stand and abundance of *Thuja plicata* is the indication of a *Thuja plicata* type. The tall-shrub layer is abundant with *Alnus incana* (33%), *Menziesia ferruginea* (10%), and *Cornus sericea* (1%). Other shrubs present are *Rhamnus alnifolia*, *Rosa gymnocarpa*, and *Vaccinium membranaceum*. *Thuja plicata*, *Picea engelmannii*, and *Tsuga heterophylla* saplings also occupy the shrub layer with 2-10% cover. The herbaceous layer is lush and dominated by *Carex disperma* (43%). *Streptopus amplexifolius* (13%), *Cicuta douglasii* (4%), *Petasites frigidus* var. *sagittatus* (= *Petasites sagittatus*) (4%), and *Pteridium aquilinum* (4%) were among the hygrophilous forbs. Several other herbaceous species are present, all indicators of moist to continually wet conditions. These include *Glyceria* sp., *Menyanthes trifoliata*, and *Athyrium filix-femina*.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Picea engelmannii</i> , <i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Shrub/sapling (tall & short)	Needle-leaved tree	<i>Thuja plicata</i>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Alnus incana</i>
Herb (field)	Forb	<i>Streptopus amplexifolius</i>
Herb (field)	Graminoid	<i>Carex disperma</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex disperma*, *Thuja plicata*, *Tsuga heterophylla*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2? (15-Apr-2004).

CLASSIFICATION

STATUS: Provisional

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Picea engelmannii* / *Carex disperma* Forest (CEGL000358)
- *Thuja plicata* / *Athyrium filix-femina* Forest (CEGL000473)

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: Only known from the Lake MacDonald watershed of Glacier National Park.

GLOBAL RANGE: This association is tentative and presently known from the west side of Glacier National Park, Montana.

NATIONS: US

STATES/PROVINCES: MT:S2?

USFS ECOREGIONS: M333C:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2219.

LOCAL DESCRIPTION AUTHORS: G. Kittel

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Western Ecology Working Group n.d.

***Thuja plicata* / *Clintonia uniflora* - *Xerophyllum tenax* Forest WESTERN RED-CEDAR / BRIDE'S BONNET - BEAR-GRASS FOREST**

IDENTIFIER: CEG005930

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Thuja plicata</i> Forest Alliance (A.166)
Alliance (English name)	Western Red-cedar Forest Alliance
Association	<i>Thuja plicata</i> / <i>Clintonia uniflora</i> - <i>Xerophyllum tenax</i> Forest
Association (English name)	Western Red-cedar / Bride's Bonnet - Bear-grass Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (CES306.802)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is a small- to large-patch forested community found in the northern Rocky Mountains of western Montana west into northeastern Washington. This type generally occupies the highest elevation *Thuja plicata* communities, representing relatively cold and dry environments. Its known elevational range is 790 to 1675 m (2600-5500 feet). This type is very heterogeneous, occurring across a broad range of habitat conditions; it occurs from toeslope positions to the tops of ridges and on all degrees of slope and all aspects. Parent materials are variable, with loess and ash caps deposited over glacial outwash and till in some areas. The upper soil horizons are well- to excessively drained and coarse-textured (in some areas sandy soils predominate). Glacial compression is invoked as the reason many of the soil profiles have a compacted subsoil, which results in shallow rooting and accounts in part for the more xeric nature of these sites. The canopy cover of this forest type is usually in excess of 60%, with *Thuja plicata* comprising at least 25% of the total. Because seral tree species occupy these sites readily following disturbance, *Pseudotsuga menziesii*, *Larix occidentalis*, *Pinus contorta*, and *Picea engelmannii* commonly occur across the range of this type, but in northern Idaho *Abies grandis* often shares dominance with *Thuja*. Sites transitional to subalpine occasionally have appreciable cover of *Abies lasiocarpa*. The understory, in which *Thuja* is 100% constant, gives every indication that these stands will be *Thuja*-dominated late in the sere. The tall-shrub component is mostly dispersed clumps, and no one species has high constancy, though *Acer glabrum*, *Alnus viridis* ssp. *sinuata*, *Amelanchier alnifolia*, and *Sorbus scopulina* may have 5-10 % cover, singly or in the aggregate. The short-shrub layer is dominant with the indicator *Vaccinium membranaceum* nearly 100% constant and generally exhibiting greater than 15% cover. Other regularly occurring short shrubs include *Paxistima myrsinites*, *Spiraea betulifolia*, *Rosa gymnocarpa*, *Rubus parviflorus*, and *Lonicera utahensis*. The dwarf-shrub *Linnaea borealis* is always present and its cover can approach 20%. *Bromus vulgaris* is often the only graminoid represented. In the forb layer *Clintonia uniflora* and *Tiarella trifoliata* are reflective of relative mesic conditions, whereas *Xerophyllum tenax* (considered an indicator when having 5% or greater cover) is indicative of *Thuja* at its cold, dry extremes, transitional to subalpine habitats. In the northwestern portion of this type's distribution, *Xerophyllum* appears to be sporadically distributed and *Vaccinium* is relied on as the alternative indicator.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This evergreen forest occurs on gentle slopes at 1024 m (3360 feet) elevation within the Lake MacDonald watershed. The one stand sampled occurs on the basin floor, on a glacier moraine. Soils are clay loam with a possible ash layer and are moderately well-drained.

GLOBAL ENVIRONMENT: This type generally occupies the highest elevations within the *Thuja plicata* series, representing relatively cold and dry environments. The extremes of its known elevation range are 790 to 1675 m (2600-5500 feet), but in most landscapes its expressed range is narrower, between 1000 to 1400 m (3300-4600 feet). This type is very heterogeneous, occurring across a broad range of habitat conditions; it occurs from toeslope positions to the tops of ridges and on all degrees of slope and all aspects. Parent materials are mostly granitics, quartzite, siltite, and sandstone with loess and ash caps deposited over glacial outwash and till extensive in some areas. The upper soil horizons are well- to excessively drained as a consequence of being primarily coarse-textured (in some areas sandy soils predominate). Glacial compression is invoked as the reason many of the soil profiles have a compacted subsoil, which results in shallow rooting and accounts in part for the more xeric nature of these sites. Soil reaction ranges between pH 5.5 and 6.6, and rooting depth (of forbs and shrubs) is mostly less than 50 cm (20 inches) and as shallow as 20 cm (8 inches).

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This is a heavily shaded forest with a mixed conifer canopy. The most abundant trees are *Pseudotsuga menziesii* with 47% cover, *Larix occidentalis* (12% cover), *Thuja plicata* (7% cover), and *Picea engelmannii* (3% cover). *Thuja plicata* and *Pseudotsuga menziesii* have 20% cover each in the subcanopy, and *Thuja plicata* seedlings account for 20% cover in the herbaceous layer. Shrubs are numerous but in low cover. *Alnus viridis ssp. sinuata*, *Rosa acicularis*, *Vaccinium membranaceum*, *Acer glabrum*, *Amelanchier alnifolia*, and *Menziesia ferruginea* all occurred in one stand with a total cover of 10%. The herbaceous layer had mostly seedlings of the overstory tree (*Pseudotsuga menziesii* with 10% and *Thuja plicata* with 20%). Abundant herbaceous species are *Xerophyllum tenax* (10%) and *Clintonia uniflora* (2%). Typical shaded-floor forbs present with <1% are *Chimaphila umbellata*, *Listera caurina*, *Orthilia secunda*, *Pyrola chlorantha*, and *Tiarella trifoliata*.

GLOBAL VEGETATION: The canopy cover of this forest type is usually in excess of 60%, with *Thuja plicata* comprising at least 25% of the total tree cover in the mature canopy. Because seral tree species occupy these sites readily following disturbance (to comprise a vast majority of the canopy), this community should be considered a later successional stage [see Global Classification Comments]. The understory, in which *Thuja* is 100% constant (occasionally constituting as much as 20% cover), gives every indication that these stands will be *Thuja*-dominated late in the sere. *Pseudotsuga menziesii*, *Larix occidentalis*, *Pinus contorta*, and *Picea engelmannii* are the primary seral trees across the range of this type, but in northern Idaho *Abies grandis* often shares dominance with *Thuja*. Indicating these sites are transitional to subalpine habitats is the occasionally appreciable cover of *Abies lasiocarpa* (to 25%). The tall-shrub component is mostly dispersed clumps, and no one species has high constancy, though *Acer glabrum*, *Alnus viridis ssp. sinuata*, *Amelanchier alnifolia*, and *Sorbus scopulina* may have 5-10% cover, singly or in the aggregate. The short-shrub layer is dominant with the indicator *Vaccinium membranaceum* nearly 100% constant and generally exhibiting greater than 15% cover. Other regularly occurring components of this layer are *Paxistima myrsinites*, *Spiraea betulifolia*, *Rosa gymnocarpa*, *Rubus parviflorus*, and *Lonicera utahensis*. Dwarf-shrubs are consistently represented by *Linnaea borealis* and *Chimaphila umbellata*; *Linnaea* cover can approach 20%. *Bromus vulgaris* is often the only graminoid represented, and it seldom occurs with greater than a trace of cover. In the forb layer *Clintonia uniflora* and *Tiarella trifoliata* are reflective of relative mesic conditions, whereas *Xerophyllum tenax* (considered an indicator when having 5% or greater cover) is indicative of *Thuja* at its cold, dry extremes, transitional to subalpine habitats. In the northwestern portion of this type's distribution, *Xerophyllum* appears to be sporadically distributed and *Vaccinium* is relied on as the alternative indicator. Other forbs with moderate to high constancy in at least a portion of this type's range include *Anemone piperi*, *Arnica latifolia*, *Coptis occidentalis*, *Goodyera oblongifolia*, *Pyrola asarifolia*, and *Viola orbiculata*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Pseudotsuga menziesii</i> , <i>Thuja plicata</i>
Tree subcanopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i> , <i>Thuja plicata</i>
Herb (field)	Forb	<i>Clintonia uniflora</i> , <i>Xerophyllum tenax</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies grandis</i> , <i>Picea engelmannii</i> , <i>Pseudotsuga menziesii</i> , <i>Thuja plicata</i>
Tree subcanopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Thuja plicata</i>
Tall shrub/sapling	Needle-leaved shrub	<i>Taxus brevifolia</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Acer glabrum</i> , <i>Alnus viridis ssp. sinuata</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rosa gymnocarpa</i> , <i>Rubus parviflorus</i>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Paxistima myrsinites</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Dwarf-shrub	<i>Linnaea borealis</i>
Herb (field)	Forb	<i>Clintonia uniflora</i> , <i>Coptis occidentalis</i> , <i>Maianthemum stellatum</i> , <i>Viola orbiculata</i> , <i>Xerophyllum tenax</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Clintonia uniflora*, *Thuja plicata*, *Xerophyllum tenax*

GLOBAL: *Clintonia uniflora*, *Thuja plicata*, *Tiarella trifoliata*, *Vaccinium membranaceum*, *Xerophyllum tenax*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4? (15-Apr-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association is the result of recognizing at the plant association level what was known as the *Thuja plicata* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987). There are clearly stands within the *Thuja plicata* / *Vaccinium membranaceum* Plant Association (Williams et al. 1995) and *Thuja plicata* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Pfister et al. 1977) that would also key to the type under consideration. These existing classifications have all treated *Thuja* as an indicator species, its mere presence and successful reproduction (Pfister et al. 1977, Cooper et al. 1987) or minor cover (10%) (Williams et al. 1995) conveying the notion that these sites would ultimately be dominated by *Thuja*; in other words, this was a potential vegetation type. With recent classification work related to vegetation mapping in Waterton Lakes-Glacier International Peace Park (IPP), many of the stands that would have been assigned to *Thuja plicata*, *Tsuga heterophylla* or *Abies lasiocarpa* associations were instead allocated to seral tree-dominated associations. A rather arbitrary decision was made regarding the IPP classification to recognize *Thuja* associations based on this species having 25% relative cover in the upper (mature) canopy. This cover value was deemed sufficient to indicate a *Thuja* type but begs the question: why not 50% or having greater cover than any other canopy species? Forthcoming debate on appropriate cover values for type recognition when multiple species occupy the canopy is a certainty. Recognizing *Clintonia uniflora* and *Tiarella trifoliata* as indicators when they are merely present and not confined to microsites is also a contentious point for some.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005892)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest (CEGL005917)
- *Larix occidentalis* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005881)
- *Pseudotsuga menziesii* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005854)
- *Thuja plicata* / *Clintonia uniflora* Forest (CEGL000474)
- *Thuja plicata* / *Vaccinium membranaceum* Forest (CEGL000487)
- *Tsuga heterophylla* / *Clintonia uniflora* Forest (CEGL000493)
- *Tsuga heterophylla* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest (CEGL000120)
- *Tsuga heterophylla* / *Xerophyllum tenax* Forest (CEGL000499)

GLOBAL RELATED CONCEPTS:

- *Thuja plicata* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Pfister et al. 1977) I
- *Thuja plicata* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987) I
- *Thuja plicata* / *Vaccinium membranaceum* Plant Association (Williams et al. 1995) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This evergreen forest occurs on gentle slopes at 1024 m (3360 feet) elevation within the Lake MacDonald watershed.

GLOBAL RANGE: This is a small- to large-patch forested community found eastward from the Kettle Mountain Crest of northeastern Washington, throughout northern Idaho, and northwestern Montana to just west of the Continental Divide.

NATIONS: US

STATES/PROVINCES: ID, MT, WA

USFS ECOREGIONS: M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); USFS (Colville NF, Flathead)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2001.

LOCAL DESCRIPTION AUTHORS: G. Kittel

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Clausnitzer and Zamora 1987, Cooper et al. 1987, Pfister et al. 1977, Western Ecology Working Group n.d., Williams et al. 1995

Thuja plicata / *Clintonia uniflora* Forest

WESTERN RED-CEDAR / BRIDE'S BONNET FOREST

IDENTIFIER: CEGL000474

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Thuja plicata</i> Forest Alliance (A.166)
Alliance (English name)	Western Red-cedar Forest Alliance
Association	<i>Thuja plicata</i> / <i>Clintonia uniflora</i> Forest
Association (English name)	Western Red-cedar / Bride's Bonnet Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (CES306.802)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association represents the warmest and driest *Thuja plicata*-dominated forests. Elevation range is 670 to 1530 m (2200-5000 feet). Stands occur on bottomlands, benches, and lower slopes with gentle to steep gradients, most often on gentle slopes. All aspects are represented. Soils are volcanic ash over glacial till or outwash with variable parent material. Soil textures are silt loams to mostly sandy loams, with high coarse fragments (16-63%). All soils are well- to moderately well-drained. *Thuja plicata* is dominant in the overstory and in the subcanopy as a reproducing tree. Undergrowth is characterized by scattered mesophytic herbs and shrubs of which *Clintonia uniflora* is the most diagnostic. *Thuja plicata* is dominant or codominant and the characteristic tree (average cover ranges between 35 and 60%). *Pseudotsuga menziesii*, *Larix occidentalis*, *Pinus contorta*, and *Abies grandis* are often abundant codominants (average cover ranging from 10-30%). The shrub layer is relatively sparse with 5-10% cover. Shrub species present include *Paxistima myrsinites*, *Linnaea borealis*, *Mahonia repens*, and *Lonicera utahensis*. The herbaceous layer is not abundant, with a high variance in the forb and grass species present. *Goodyera oblongifolia*, *Chimaphila umbellata*, *Clintonia uniflora*, *Tiarella trifoliata*, *Coptis occidentalis*, *Orthilia secunda*, and *Viola orbiculata* are the more commonly encountered species, but with very low abundance (1-3%), occasionally with as much as 5% cover. *Clintonia uniflora*, while not present in all stands, is the indicator species for this relatively depauperate type; other indicators include *Tiarella trifoliata*, *Coptis occidentalis*, and *Adenocaulon bicolor*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This forested association grows on steep, north- to northwest-facing slopes within the Lake MacDonald watershed. Elevation ranges from 995 to 1200 m (3270-3900 feet). It occurs primarily on mid to lower slopes. Soils are consistently sandy loams that are well- to moderately well-drained. Stand ages range between about 150-250 years old. All stands had fire scars and many downed trees presumably from wind throw, none appearing recent.

GLOBAL ENVIRONMENT: This association represents the warmest and driest *Thuja plicata*-dominated forests. It is the most widely distributed association within the *Thuja plicata* Forest Alliance (A.166) in Washington, Idaho and Montana, and reflects the driest sites that can support climax stands of *Thuja*. Elevation range is 670 to 1530 m (2200-5000 feet). Stands occur on bottomlands, benches, and lower slopes with gentle to steep gradients, most often on gentle slopes. It occurs on all aspects throughout its range, with a tendency to occupy northern aspects in the easternmost part of its range, and warmer aspects (southeast to northwest) in the western portion of the range. Soils are volcanic ash over glacial till or outwash with variable parent material. Some parent materials

are calcium-rich, others are granitic. Soil textures are silt loams to mostly sandy loams, with high coarse fragments (16-63%). All soils are well- to moderately well-drained.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Stands of this forested association have a mix of tree species in the upper canopy. *Thuja plicata* cover ranges from 20-60%; *Pseudotsuga menziesii* and *Larix occidentalis* (7-20%) were consistently present. *Tsuga heterophylla* had cover ranging from 10-20%; *Betula papyrifera*, *Pinus contorta*, *Pinus monticola*, and *Picea engelmannii* may be present with as much as 10% cover. The shrub layer is sparse, with *Lonicera involucrata*, *Taxus brevifolia*, *Acer glabrum*, *Amelanchier alnifolia*, and *Rubus parviflorus* ranging from 1 to 3% cover. Saplings of *Thuja plicata* and *Tsuga heterophylla* make up the bulk of the vegetation in this layer (1-5 m), with 1-30% cover. Shrub and herbaceous cover is abundant under tree canopy openings; areas directly under the dense tree layers often had very little herbaceous growth. Scattered short shrubs are occasionally present with *Vaccinium membranaceum*, *Spiraea betulifolia*, *Paxistima myrsinites*, *Linnaea borealis*, and *Mahonia repens* (1-3% cover). The herbaceous layer is relatively open, more abundant patches appear in openings in the trees. The most abundant species in this layer are seedlings of *Thuja plicata* (1-30%). *Goodyera oblongifolia*, *Chimaphila umbellata*, *Clintonia uniflora*, *Orthilia secunda*, and *Viola orbiculata* are the most consistently present species, but with very low abundance (1-3%). A wide variety of other herbaceous species may be present with <1% cover. These include *Xerophyllum tenax*, *Hieracium albiflorum*, *Tiarella trifoliata*, *Prosartes hookeri* (= *Disporum hookeri*), *Pyrola* spp., and *Calamagrostis rubescens*.

GLOBAL VEGETATION: *Thuja plicata* is dominant in the overstory and in the subcanopy as a reproducing tree. Undergrowth is characterized by scattered mesophytic herbs and subshrubs of which *Clintonia uniflora* is the most diagnostic. *Thuja plicata* is dominant or codominant and the characteristic tree (average cover ranges between 35 and 60%). *Pseudotsuga menziesii*, *Larix occidentalis*, *Pinus contorta*, and *Abies grandis* are often abundant codominants (average cover ranging from 10-30%). The shrub layer is relative sparse with 5-10% cover. Shrub species present include *Paxistima myrsinites*, *Linnaea borealis*, *Mahonia repens*, *Taxus brevifolia*, and *Lonicera utahensis*. The herbaceous layer is not abundant, with a high variance in the forb and grass species present. *Goodyera oblongifolia*, *Chimaphila umbellata*, *Clintonia uniflora*, *Tiarella trifoliata*, *Coptis occidentalis*, *Orthilia secunda*, and *Viola orbiculata* are the more commonly encountered species, but with very low abundance (1-3%), occasionally with as much as 5% cover. *Clintonia uniflora*, while not present in all stands, is the indicator species for this relatively depauperate type.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Pseudotsuga menziesii</i> , <i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Shrub/sapling (tall & short)	Needle-leaved tree	<i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Shrub/sapling (tall & short)	Needle-leaved shrub	<i>Taxus brevifolia</i>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Lonicera involucrata</i> var. <i>involucrata</i>
Herb (field)	Forb	<i>Chimaphila umbellata</i> , <i>Clintonia uniflora</i> , <i>Goodyera oblongifolia</i>
Herb (field)	Other herbaceous	<i>Thuja plicata</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Pseudotsuga menziesii</i> , <i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Shrub/sapling (tall & short)	Needle-leaved tree	<i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Shrub/sapling (tall & short)	Needle-leaved shrub	<i>Taxus brevifolia</i>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Lonicera involucrata</i> var. <i>involucrata</i>
Herb (field)	Forb	<i>Chimaphila umbellata</i> , <i>Clintonia uniflora</i> , <i>Goodyera oblongifolia</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Clintonia uniflora*, *Thuja plicata*

GLOBAL: *Clintonia uniflora*, *Pseudotsuga menziesii*, *Thuja plicata*, *Tsuga heterophylla*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies grandis* - *Thuja plicata* / *Achlys triphylla* Forest (CEGL002669)
- *Larix occidentalis* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005881)
- *Larix occidentalis* / *Clintonia uniflora* Forest (CEGL005880)
- *Pinus contorta* / *Clintonia uniflora* - *Xerophyllum tenax* Woodland (CEGL005921)
- *Pinus contorta* / *Clintonia uniflora* Forest (CEGL005916)
- *Pinus contorta* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005922)
- *Pseudotsuga menziesii* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005854)
- *Pseudotsuga menziesii* / *Clintonia uniflora* Forest (CEGL005850)
- *Pseudotsuga menziesii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005851)
- *Thuja plicata* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005930)
- *Thuja plicata* / *Gymnocarpium dryopteris* Forest (CEGL000476)
- *Thuja plicata* / *Linnaea borealis* Forest (CEGL000089)
- *Tsuga heterophylla* / *Clintonia uniflora* Forest (CEGL000493)

GLOBAL RELATED CONCEPTS:

- *Thuja plicata* / *Clintonia uniflora* Habitat Type (Daubenmire and Daubenmire 1968) B
- *Thuja plicata* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Cooper et al. 1987) =
- *Thuja plicata* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Pfister et al. 1977) =
- *Thuja plicata* / *Clintonia uniflora* Plant Association (Williams et al. 1995) =
- *Thuja plicata* / *Clintonia uniflora* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: Known only from the Lake MacDonald watershed.

GLOBAL RANGE: This association is known from northeastern Washington, northern Idaho, and northwestern Montana.

NATIONS: CA?, US

STATES/PROVINCES: BC?, ID:S4?, MT:S4, WA:S3

USFS ECOREGIONS: 331A:CC, M332A:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); USFS (Colville NF, Flathead)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2601, GLAC.2211, GLAC.2054, GLAC.2509, GLAC.2510.

LOCAL DESCRIPTION AUTHORS: G. Kittel

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Clausnitzer and Zamora 1987, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Driscoll et al. 1984, IDCDC 2005, MTNHP 2002b, Pfister et al. 1977, WNHP unpubl. data, Western Ecology Working Group n.d., Williams and Lillybridge 1985, Williams et al. 1990b, Williams et al. 1995, Zamora 1983

Thuja plicata / *Gymnocarpium dryopteris* Forest

WESTERN RED-CEDAR / NORTHERN OAK FERN FOREST

IDENTIFIER: CEGLO00476

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Thuja plicata</i> Forest Alliance (A.166)
Alliance (English name)	Western Red-cedar Forest Alliance
Association	<i>Thuja plicata</i> / <i>Gymnocarpium dryopteris</i> Forest
Association (English name)	Western Red-cedar / Northern Oak Fern Forest
ECOLOGICAL SYSTEM(S):	Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (CES306.802) Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland (CES306.804)

ELEMENT CONCEPT

GLOBAL SUMMARY: This *Thuja plicata* forest association is known from the northern Rocky Mountains of British Columbia, northern Idaho and northwestern Montana. It represents one of the driest *Thuja plicata* riparian communities, and the driest *Thuja* type to have a fern layer. It occurs at elevations ranging from 975 to 1370 m (3200-4500 feet). Typical locations include slopes or benches along major mountain streams. Slopes are moderate to steep, and stands are generally located on mid to lower slopes. Parent materials are usually quartzite, sandstone, or schist, often mixed or overlain with volcanic ash. Soils are gravelly loams to silty clay loam to silt. Stands are subirrigated yet well-drained. Duff layers average 8 cm in depth. Late seral stands have closed canopies and are dominated by *Thuja plicata*. Stands not in a late seral stage are more heterogeneous, with a mix of conifers in addition to *Thuja*. Seral species persisting in these stands include *Abies grandis* as the most abundant and common. Others include *Tsuga heterophylla*, *Picea engelmannii* (or *Picea engelmannii* X *glauca*), *Pinus monticola*, *Larix occidentalis*, and *Pseudotsuga menziesii*. The shrub layer is typically limited to 10-20% total cover. Highly constant species include *Acer glabrum*, *Lonicera utahensis*, *Linnaea borealis*, *Rubus parviflorus*, and *Taxus brevifolia*. The herbaceous layer has mostly ferns and forb species with few to no grasses. *Gymnocarpium dryopteris* is diagnostic for this type, with at least 1% cover, but is often much more abundant. *Athyrium filix-femina* or *Adiantum pedatum* are often present, but with low cover or only on moist microsites. Other highly constant mesic forbs include *Clintonia uniflora*, *Tiarella trifoliata*, *Coptis occidentalis*, *Osmorhiza berteroi*, *Prosartes hookeri* (= *Disporum hookeri*), *Aralia nudicaulis*, and *Maianthemum stellatum*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is located on a ridge with varying topography, i.e., slopes interrupted by benches. Above this ridge is a flat area with wetland, so the ground throughout the slope is subirrigated and very wet, but moderately well-drained due to the slope. The elevation is 1109 m (3640 feet). The slope faces north and the soils are fine silts. Unvegetated surface is 70% litter, 4% wood and 4% mosses.

GLOBAL ENVIRONMENT: This association is one of the driest *Thuja plicata* riparian communities, and the driest *Thuja* type to have a fern layer. It occurs at elevations ranging from 975 to 1370 m (3200-4500 feet). Typical locations include slopes or benches along major mountain streams. Slopes are moderate to steep, and stands are generally located on mid to lower slopes. Parent materials are usually quartzite, sandstone, or schist, often mixed or overlain with volcanic ash (Hansen et al. 1995). Soils are gravelly loams to silty clay loam to silt. Stands are subirrigated yet well-drained. Duff layers average 8 cm in depth.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This is a mixed forested association. The canopy is heterogeneous, with patches of *Betula papyrifera* and *Larix occidentalis* then patches of pure *Tsuga heterophylla* and *Thuja plicata*. *Thuja plicata* has the highest canopy cover (33%) and is represented throughout the stand in all ages. Other trees present are *Betula papyrifera* (20%), *Larix occidentalis* (17%), *Tsuga heterophylla* (4%), *Abies lasiocarpa* (3%), *Picea engelmannii* (3%), and *Pseudotsuga menziesii* (3%). The tall-shrub layer is dominated by sapling tree species *Thuja plicata* (23%), *Taxus brevifolia* (13%), *Tsuga heterophylla* (1%), and *Picea engelmannii* (4%). Other actual shrubs have low cover; *Oplopanax horridus* with (2%), and *Ribes* spp., *Acer glabrum*, *Cornus sericea*, *Lonicera* spp., and *Menziesia ferruginea* have less than 1% cover. The herbaceous layer is also depauperate, total cover is barely 10%. Most abundant species are *Tiarella trifoliata* (3%), *Aralia nudicaulis* (2%), and *Gymnocarpium dryopteris* (2%). Other hydrophilic ferns and fern allies present with <1% include *Athyrium filix-femina* and *Equisetum arvense*. Other mesic forbs include *Osmorhiza berteroi*, *Prosartes hookeri* (= *Disporum hookeri*), and *Clintonia uniflora*. There are no graminoids.

GLOBAL VEGETATION: Late-seral stands are dominated by *Thuja plicata* (3-90%). Stands are often not in a late-seral stage and can have several other conifer species. Seral species persisting in these stands include *Abies grandis* as the most abundant and common with 1-60% cover. Others include *Tsuga heterophylla*, *Picea engelmannii* (or *Picea engelmannii* X *glauca*), *Pinus monticola*, *Larix occidentalis*, and *Pseudotsuga menziesii*, usually present with 1-10% cover. This is the wettest of the closed-canopy *Thuja*

plicata forest types to have an appreciable shrub component (Cooper et al. 1987), with the exception of mature stands of *Thuja plicata* - *Tsuga heterophylla* / *Oplopanax horridus* Rocky Mountain Forest (CEGL000479). The shrub layer is typically limited to 10-20% total cover. Highly constant species include *Acer glabrum*, *Lonicera utahensis*, *Linnaea borealis*, *Rubus parviflorus*, and *Taxus brevifolia*. Others occasionally present include *Menziesia ferruginea*, *Vaccinium membranaceum*, *Cornus sericea*, and *Oplopanax horridus* (but with less than 5% cover). The herbaceous layer has mostly ferns and forb species with few to no grasses. *Gymnocarpium dryopteris* is diagnostic for this type, with at least 1% cover, but is often much more abundant. *Athyrium filix-femina* or *Adiantum pedatum* are often present, but with low cover or only on moist microsites. Other highly constant mesic forbs include *Clintonia uniflora*, *Tiarella trifoliata*, *Coptis occidentalis*, *Osmorhiza berteroi*, *Prosartes hookeri* (= *Disporum hookeri*), *Aralia nudicaulis*, and *Maianthemum stellatum*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree (canopy & subcanopy)	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Thuja plicata</i>
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	<i>Betula papyrifera</i>
Tall shrub/sapling	Needle-leaved tree	<i>Thuja plicata</i>
Tall shrub/sapling	Needle-leaved shrub	<i>Taxus brevifolia</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Oplopanax horridus</i>
Herb (field)	Forb	<i>Aralia nudicaulis</i> , <i>Tiarella trifoliata</i>
Herb (field)	Fern or fern ally	<i>Gymnocarpium dryopteris</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree (canopy & subcanopy)	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Thuja plicata</i>
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	<i>Betula papyrifera</i>
Tall shrub/sapling	Needle-leaved tree	<i>Thuja plicata</i>
Tall shrub/sapling	Needle-leaved shrub	<i>Taxus brevifolia</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Oplopanax horridus</i>
Herb (field)	Dwarf-shrub	<i>Linnaea borealis</i>
Herb (field)	Forb	<i>Clintonia uniflora</i> , <i>Tiarella trifoliata</i>
Herb (field)	Fern or fern ally	<i>Gymnocarpium dryopteris</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Gymnocarpium dryopteris*, *Larix occidentalis*, *Thuja plicata*

GLOBAL: *Aralia nudicaulis*, *Clintonia uniflora*, *Gymnocarpium dryopteris*, *Linnaea borealis*, *Thuja plicata*, *Tiarella trifoliata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This community, in regard to subcanopy and undergrowth composition, defining abiotic parameters and geographic distribution is virtually indistinguishable from *Tsuga heterophylla* / *Gymnocarpium dryopteris* Forest (CEGL000494). The difference between *Tsuga* and *Thuja* dominance of the upper canopy is quite probably related to historical accident, past disturbance events and subsequent successional patterns. Despite the very long fire-return intervals (200-500 years for stand-replacing fire), the longevity of both species, especially *Thuja*, argues for considering the dual designation (*Thuja plicata* - *Tsuga heterophylla*) as appropriate (i.e., combining these two associations into one); if one or the other species responds to disturbance by attaining canopy dominance, it is unlikely the non-dominant species will become dominant in the average fire-free interval. Others have recognized that quite probably a dominance continuum exists between these two species by naming at least 8 plant associations with the dual designation (*Tsuga heterophylla* - *Thuja plicata* / _).

Arguing against this approach is the approach being taken by the NVC placing emphasis on existing vegetation composition, and it is indisputable that either climax tree species can be strongly dominant with the other species only occurring in the reproductive layers, if at all. In northern Idaho, where these species are sympatric over an extensive range, there are drainages where one or the other species is present and its complement is not (Daubenmire and Daubenmire 1968); this phenomenon has never been satisfactorily explained and again argues for recognizing separate *Thuja plicata* and *Tsuga heterophylla* types.

GLOBAL SIMILAR ASSOCIATIONS:

- *Thuja plicata* / *Aralia nudicaulis* Forest (CEGL000471)
- *Thuja plicata* / *Asarum caudatum* Forest (CEGL000472)
- *Thuja plicata* / *Athyrium filix-femina* Forest (CEGL000473)
- *Thuja plicata* / *Clintonia uniflora* Forest (CEGL000474)
- *Tsuga heterophylla* / *Gymnocarpium dryopteris* Forest (CEGL000494)
- *Tsuga heterophylla* / *Tiarella trifoliata* - *Gymnocarpium dryopteris* Forest (CEGL000116)

GLOBAL RELATED CONCEPTS:

- *Thuja plicata* / *Asarum caudatum* Habitat Type, *Gymnocarpium dryopteris* Phase (Steele et al. 1976) I
- *Thuja plicata* / *Clintonia uniflora* Habitat Type, *Aralia nudicaulis* Phase (Pfister et al. 1977) I
- *Thuja plicata* / *Clintonia uniflora* Plant Association (Williams et al. 1995) I
- *Thuja plicata* / *Gymnocarpium dryopteris* Habitat Type (Cooper et al. 1987) B
- *Thuja plicata*/ *Gymnocarpium dryopteris* (Bourgeron and Engelking 1994) =
- *Tsuga heterophylla* / *Gymnocarpium dryopteris* Habitat Type (Cooper et al. 1987) B
- *Tsuga heterophylla* / *Gymnocarpium dryopteris* Plant Association (Williams et al. 1995) I
- *Tsuga heterophylla* / *Pachistima myrsinites* Habitat Type (Daubenmire and Daubenmire 1968) B
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is known only from the Lake MacDonald watershed on the west side of the park.

GLOBAL RANGE: This association is known from areas of inland maritime climate of the northern Rocky Mountains, in British Columbia, northern Idaho and northwestern Montana.

NATIONS: CA?, US

STATES/PROVINCES: BC?, ID:S2, MT:S3, WA

USFS ECOREGIONS: M332A:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); USFS (Colville NF, Flathead)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2230.

LOCAL DESCRIPTION AUTHORS: G. Kittel

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Driscoll et al. 1984, Hansen et al. 1991, Hansen et al. 1995, IDCDC 2005, MTNHP 2002b, Pfister et al. 1977, Steele et al. 1976, Western Ecology Working Group n.d., Williams et al. 1995

***Tsuga heterophylla* Forest Alliance**

***Tsuga heterophylla* / *Aralia nudicaulis* Forest**

WESTERN HEMLOCK / WILD SARSAPARILLA FOREST

IDENTIFIER: CEGL000488

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)

Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Tsuga heterophylla</i> Forest Alliance (A.145)
Alliance (English name)	Western Hemlock Forest Alliance
Association	<i>Tsuga heterophylla</i> / <i>Aralia nudicaulis</i> Forest
Association (English name)	Western Hemlock / Wild Sarsaparilla Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (CES306.802)

ELEMENT CONCEPT

GLOBAL SUMMARY: This forested association occurs on warm, moist locations, some of the warmest locations in the Interior Northwest for *Tsuga heterophylla* communities. It occurs primarily on gentle stream benches, lower valley sideslopes and toeslopes, alluvial terraces and valley bottoms, 640 to 1219 m (2100-4000 feet) in elevation. Soils are typically well-drained, fine-textured with an ash layer, loam to silty loam, moist but never boggy. Parent materials range from glacial till, coarse alluvium to colluvium. This association is heavily forested. Total tree canopy cover ranges from 70-95%. *Tsuga heterophylla* is always present with 20-75% cover. *Thuja plicata* is often present with 10-40% average cover. Other trees are always present, but not in any consistent combination. Other tree species include *Abies grandis*, *Betula papyrifera*, *Larix occidentalis*, *Pseudotsuga menziesii*, and *Pinus monticola*. The shrub layer is relatively sparse with less than 10% total cover. Typical species include *Paxistima myrsinites*, *Cornus sericea*, *Lonicera* spp., *Acer* spp., and *Linnaea borealis*. The herbaceous layer is relatively lush, with 10-80% cover and floristically rich, but only *Aralia nudicaulis*, *Clintonia uniflora*, and *Maianthemum stellatum* have more than 5% cover. *Aralia nudicaulis* is not present in every stand in the literature, but it is expressed as the forb with the highest constancy and highest cover value within all sampled stands.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This forested association occurs on steep to gentle south-, southeast- to east-facing high slopes of montane valley sides or lower slopes of alluvial terraces at 1005 m (3300 feet) in elevation. Soils are moist clay loams to silty clay loams, over parent material of glacial till or colluvium. Stands are well-drained to somewhat poorly drained. Nonvegetative ground cover, on average, is 70% litter and duff, 10% woody material, and 20% moss and lichens.

GLOBAL ENVIRONMENT: This forested association occurs on gentle slopes along valley bottoms in warm, moist locations, some of the warmest for *Tsuga heterophylla* communities. It occurs primarily on stream benches, lower valley sideslopes and toeslopes, alluvial terraces and valley bottoms at 640 to 1219 m (2100-4000 feet) in elevation. Soils are typically well-drained, occasionally somewhat poorly drained, fine-textured with an ash layer, loam to silty loam, moist but never boggy, and are relatively deep. Parent materials range from glacial till, coarse alluvium or colluvium.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This association represents old, dense growth of *Tsuga heterophylla*. Tree canopy is 70-80% cover, with *Tsuga heterophylla* (20-75%) and *Larix occidentalis* (3-13%) present in all stands. *Thuja plicata* and *Pseudotsuga menziesii* have 3-30% cover when present (in 2 of 3 stands). *Tsuga heterophylla* is reproducing in all stands. Shrub cover is low (5%), and a wide variety of species may be present, individually with very low cover (1-3%). Shrub species include *Acer glabrum*, *Cornus sericea*, *Amelanchier alnifolia*, *Symphoricarpos albus*, *Lonicera utahensis*, and several *Sorbus* species. The herbaceous layer is lush, ranging from 20-90% cover. Consistently present species with 1-10% cover are *Aralia nudicaulis*, *Clintonia uniflora*, *Adenocaulon bicolor*, *Maianthemum stellatum*, and *Prosartes hookeri* (= *Disporum hookeri*). *Aralia nudicaulis* is the indicator undergrowth species for this association. It represents shady, moist conditions. Additional species not present in all stands but which can have significant cover (up to 20%) include *Tiarella trifoliata*, *Dryopteris expansa*, and *Circaea alpina*. Many other forb and grass species are usually present.

GLOBAL VEGETATION: This association is heavily forested. Total tree canopy cover ranges from 70-95%. *Tsuga heterophylla* is always present with 20-75% cover. *Thuja plicata* is often present with 10-40% average cover. Other trees are always present, but not in any consistent combination. Other tree species include *Abies grandis*, *Betula papyrifera*, *Larix occidentalis*, *Pseudotsuga menziesii*, and *Pinus monticola*. Deciduous tree presence may be an indication of recent fires. The shrub layer is relatively sparse with less than 10% total cover. Typical species include *Paxistima myrsinites*, *Cornus sericea*, *Lonicera* spp., *Acer* spp., and *Linnaea borealis*. The herbaceous layer is relatively lush, with 10-80% cover and floristically rich, however, only *Aralia nudicaulis*, *Clintonia uniflora*, and *Maianthemum stellatum* have more than 5% cover. *Aralia nudicaulis* is not present in every stand in the literature, but it is expressed as the forb with the highest constancy and highest cover value within all sampled stands.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

Stratum

Tree canopy
Shrub/sapling (tall & short)
Short shrub/sapling
Herb (field)

Lifeform

Needle-leaved tree
Needle-leaved tree
Broad-leaved deciduous tree
Forb

Species

Larix occidentalis, *Thuja plicata*, *Tsuga heterophylla*
Thuja plicata, *Tsuga heterophylla*
Acer glabrum
Aralia nudicaulis, *Clintonia uniflora*

Global

Stratum

Tree canopy
Shrub/sapling (tall & short)
Herb (field)

Lifeform

Needle-leaved tree
Needle-leaved tree
Forb

Species

Thuja plicata, *Tsuga heterophylla*
Thuja plicata, *Tsuga heterophylla*
Aralia nudicaulis, *Clintonia uniflora*, *Maianthemum stellatum*

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Aralia nudicaulis*, *Larix occidentalis*, *Tsuga heterophylla*

GLOBAL: *Aralia nudicaulis*, *Clintonia uniflora*, *Tsuga heterophylla*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: In Idaho, occurrences now included in this association have previously been classified as *Tsuga heterophylla* / *Clintonia uniflora* Forest (CEGL000493); stands representing the *Aralia nudicaulis* phase of this type are now included here. The difference between *Tsuga* and *Thuja* dominance of the upper canopy in this association (and its analogue, *Thuja plicata* / *Aralia nudicaulis* Forest (CEGL000471)) is quite probably related to historical accident, past disturbance events and subsequent successional patterns. Despite the very long fire-return intervals (200-500 years for stand-replacing fire), the longevity of both species, especially *Thuja*, argues for considering the dual designation (*Thuja plicata* - *Tsuga heterophylla*) as appropriate (i.e., combining these two associations into one); if one or the other species responds to disturbance by attaining canopy dominance it is unlikely the non-dominant species will become dominant in the average fire-free interval. Others have recognized that quite probably a dominance continuum exists between these two species by naming at least 8 plant associations with the dual designation (*Tsuga heterophylla* - *Thuja plicata* / _).

Arguing against this approach is the approach being taken by the NVC placing emphasis on existing vegetation composition, and it is indisputable that either climax tree species can be strongly dominant with the other species occurring only in the reproductive layers, if at all. In northern Idaho, where these species are sympatric over an extensive range, there are drainages where one or the other species is present and its complement is not (Daubenmire and Daubenmire 1968); this phenomenon has never been satisfactorily explained and again argues for recognizing separate *Thuja plicata* and *Tsuga heterophylla* types.

GLOBAL SIMILAR ASSOCIATIONS:

- *Thuja plicata* / *Aralia nudicaulis* Forest (CEGL000471)
- *Tsuga heterophylla* / *Clintonia uniflora* Forest (CEGL000493)

GLOBAL RELATED CONCEPTS:

- *Tsuga heterophylla* / *Aralia nudicaulis* Plant Association (Williams et al. 1995) =
- *Tsuga heterophylla* / *Aralia nudicaulis* association (Kovalchik 1993) =
- *Tsuga heterophylla* / *Asarum caudatum* Habitat Type, *Aralia nudicaulis* Phase (Cooper et al. 1987) I
- *Tsuga heterophylla* / *Clintonia uniflora* Habitat Type, *Aralia nudicaulis* Phase (Pfister et al. 1977) =
- *Tsuga heterophylla* / *Clintonia uniflora* Habitat Type, *Aralia nudicaulis* Phase (Cooper et al. 1987) =
- *Tsuga heterophylla* / *Aralia nudicaulis* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association occurs only on the west side of Glacier National Park in the Lake MacDonald watershed.

GLOBAL RANGE: This association is known from central and northeastern Washington, northern Idaho, north of the Coeur d'Alene River, and in Montana on the west side of Glacier National Park.

NATIONS: CA?, US

STATES/PROVINCES: BC?, ID, MT, WA:S2S3

USFS ECOREGIONS: M333A:CC, M333B:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2500, GLAC.2501, GLAC.2617.

LOCAL DESCRIPTION AUTHORS: G. Kittel

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Driscoll et al. 1984, Kovalchik 1993, Pfister et al. 1977, WNHP unpubl. data, Western Ecology Working Group n.d., Williams et al. 1990b, Williams et al. 1995

***Tsuga heterophylla* / *Clintonia uniflora* Forest**
WESTERN HEMLOCK / BRIDE'S BONNET FOREST

IDENTIFIER: CEGL000493

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Tsuga heterophylla</i> Forest Alliance (A.145)
Alliance (English name)	Western Hemlock Forest Alliance
Association	<i>Tsuga heterophylla</i> / <i>Clintonia uniflora</i> Forest
Association (English name)	Western Hemlock / Bride's Bonnet Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (CES306.802)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is known from northeastern Washington, northern Idaho and northeastern Montana. This is the most widespread type of the interior *Tsuga heterophylla* forests and is considered one of the driest of the interior western hemlock communities. In the western part of its range, it typically occurs on uplands, generally the upper one-third of a slope. In northwestern Montana, at the easternmost extent of its range, it occurs on lower slopes, valley bottoms, and stream terraces. Elevations range from 550 to 1585 m (1800-5200 feet). Slopes range from gentle to steep (2-58%). Soils are silty clay loams, silt loams to sandy loams. Parent materials are generally quartzite, siltite, glacial till and outwash, sandstone and metasediments with an ash cap. Late-seral stages of this type are dense, shady stands dominated by *Tsuga heterophylla* and *Thuja plicata*. However, only about 10% of all stands sampled are older than 200 years, so most stands have a complex, variable mixed canopy. Most stands have *Pseudotsuga menziesii*, *Larix occidentalis*, *Abies grandis*, *Pinus contorta*, and/or *Pinus monticola*, but not all of these species are present in all stands. Note that *Tsuga heterophylla* and *Thuja plicata* are always present at least in the tree subcanopy, if not in the overstory canopy. Early-seral stages can be very similar to *Thuja plicata* types; however, these generally lack *Tsuga heterophylla* and have a lower conifer diversity. The shrub and herbaceous layers are species-rich. Most stands have *Lonicera utahensis*, *Paxistima myrsinites*, *Rosa* spp., and *Linnaea borealis*. *Clintonia uniflora*, *Tiarella trifoliata*, *Viola orbiculata*, *Prosartes hookeri* (= *Disporum hookeri*), and *Goodyera oblongifolia* are typical forbs. *Clintonia uniflora* is the most abundant (5%) and most highly constant species in an otherwise highly variable herbaceous layer. Total biomass can be sparse with dense canopies. Other herbaceous species that can be abundant are *Arnica latifolia*, *Calamagrostis rubescens*, and *Coptis occidentalis*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This is a moist, deeply shaded, forested association, mostly of old-growth *Tsuga heterophylla* stands. Stands occur on lower slopes and toeslopes of valley walls and alluvial terraces, on mostly gentle but occasionally steep grades, on all aspects, between 975 to 1200 m (3200-3900 feet) in elevation. Soils are well-drained to moderately well-drained clay loams, silt loams and sandy loams, usually dark colored with high rock content. Five of seven stands occur on parent material of glacial till, one on colluvium, and one on sedimentary rock.

GLOBAL ENVIRONMENT: This is the most widespread type of the interior *Tsuga heterophylla* forests described from northeastern Washington, northern Idaho, and northwest Montana. This type is considered one of the driest of the interior western hemlock communities. It occurs on a broad range of elevations, slopes, and aspects. In the western part of its range, it typically occurs on uplands, generally the upper one-third of a slope. In northwestern Montana, at the eastward most extent of its range, it occurs on lower slopes, valley bottoms, and stream terraces. It occurs at elevations from 555 to 1560 m (1800-5200 feet). Slopes range from gentle to steep (2-58%). Soils are silty clay loams, silt loams to sandy loams. Coarse fragment content ranges from 5 to 60%. Parent materials are generally quartzite, siltite, sandstone and metasediments with an ash cap. Other parent materials include glacial till and outwash.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This association is a tall dense forest with an upper tree canopy of 30-90% cover. *Tsuga heterophylla* is present and successfully reproducing (several age classes) in all stands with 1-80% cover. *Thuja plicata* and *Larix occidentalis* are also present in 50-70% of the stands, with 3-40% cover. Other trees, including *Betula papyrifera*, *Pseudotsuga menziesii*, *Pinus contorta*, *Pinus monticola*, and *Abies grandis*, may be present with up to 10% cover. Many of the upper canopy trees can also occupy the subcanopy. Shrubs are generally not abundant; however, one stand with considerable subirrigation had up to 40% shrub canopy of *Taxus brevifolia* and *Acer glabrum*. These species appear in many stands, although not as abundantly, usually with 1-3% cover. Other shrubs include *Amelanchier alnifolia*, *Lonicera utahensis*, *Vaccinium membranaceum*, and *Holodiscus discolor*. Dwarf-shrubs of note are *Linnaea borealis* with 1-13% cover and *Paxistima myrsinites* (1%). The herbaceous layer is not abundant; *Clintonia uniflora* is the most abundant and consistently present forb, with 1-7% cover. Other forbs include *Viola orbiculata*, *Chimaphila umbellata*, *Tiarella trifoliata*, and *Xerophyllum tenax*, these with up to 3-7% cover. Many other scattered moisture-loving forbs and grasses may be present.

GLOBAL VEGETATION: Late seral stages of this type are dense, shady stands dominated by *Tsuga heterophylla* (average cover 20-53%) and *Thuja plicata* (average cover 25-37%). However, only about 10% of all stands sampled are older than 200 years, so most stands have many other conifer species included in the complex canopy of this widespread type. Most stands have, on average, 10% cover of *Pseudotsuga menziesii*, *Larix occidentalis*, *Abies grandis*, *Pinus contorta*, and/or *Pinus monticola*. Not all of these species are present in all stands, in fact conifer composition is highly variable. The time since, and intensity of, past disturbance (fire) and seed source will determine the abundance of seral conifer species. Intense fires favor *Pinus contorta*, moderate fires favor *Larix occidentalis* or *Pinus monticola*. Note that *Tsuga heterophylla* and *Thuja plicata* are always present at least in the tree subcanopy, if not in the overstory canopy. Early seral stages can be very similar to *Thuja plicata* types; however, these generally lack *Tsuga heterophylla* and have a lower conifer diversity. The shrub and herbaceous layers are species-rich. Most stands have *Lonicera utahensis*, *Paxistima myrsinites*, *Rosa* spp., and *Linnaea borealis*. *Clintonia uniflora*, *Tiarella trifoliata*, *Viola orbiculata*, *Prosartes hookeri* (= *Disporum hookeri*), and *Goodyera oblongifolia* are typical forbs. *Clintonia uniflora* is the most abundant (5%) and most highly constant species in an otherwise highly variable herbaceous layer. Total biomass can be sparse with dense canopies. Other herbaceous species that can be abundant are *Arnica latifolia*, *Calamagrostis rubescens*, and *Coptis occidentalis*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Shrub/sapling (tall & short)	Needle-leaved tree	<i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Shrub/sapling (tall & short)	Needle-leaved shrub	<i>Taxus brevifolia</i>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Acer glabrum</i>
Herb (field)	Forb	<i>Clintonia uniflora</i> , <i>Tiarella trifoliata</i>
Herb (field)	Other herbaceous	<i>Tsuga heterophylla</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Pseudotsuga menziesii</i> , <i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Tall shrub/sapling	Needle-leaved tree	<i>Thuja plicata</i>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Linnaea borealis</i>

Herb (field)

Forb

Clintonia uniflora, *Tiarella trifoliata*, *Viola orbiculata*

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Clintonia uniflora*, *Tsuga heterophylla*

GLOBAL: *Clintonia uniflora*, *Linnaea borealis*, *Lonicera utahensis*, *Thuja plicata*, *Tiarella trifoliata*, *Tsuga heterophylla*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: *Aralia nudicaulis*, if present, is in very low abundance, lower than *Clintonia uniflora*. This association is differentiated by its depauperate herbaceous cover (1-20%), while similar *Tsuga heterophylla* / *Aralia nudicaulis* Forest (CEGL000488) has a richer, more abundant herbaceous layer (1-30% cover).

GLOBAL COMMENTS: *Aralia nudicaulis*, if present, is in very low abundance, lower than *Clintonia uniflora*. This association is differentiated by its depauperate herbaceous cover (1-20%), while similar *Tsuga heterophylla* / *Aralia nudicaulis* Forest (CEGL000488) has a richer, more abundant herbaceous layer (1-30% cover).

GLOBAL SIMILAR ASSOCIATIONS:

- *Larix occidentalis* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005881)
- *Larix occidentalis* / *Clintonia uniflora* Forest (CEGL005880)
- *Pinus contorta* / *Clintonia uniflora* - *Xerophyllum tenax* Woodland (CEGL005921)
- *Pinus contorta* / *Clintonia uniflora* Forest (CEGL005916)
- *Pinus contorta* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005922)
- *Pseudotsuga menziesii* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005854)
- *Pseudotsuga menziesii* / *Clintonia uniflora* Forest (CEGL005850)
- *Pseudotsuga menziesii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005851)
- *Thuja plicata* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005930)
- *Thuja plicata* / *Clintonia uniflora* Forest (CEGL000474)
- *Tsuga heterophylla* / *Aralia nudicaulis* Forest (CEGL000488)--has a richer, more abundant herbaceous component, with *Aralia* more abundant than *Clintonia*.

GLOBAL RELATED CONCEPTS:

- *Tsuga heterophylla* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Pfister et al. 1977) =
- *Tsuga heterophylla* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Cooper et al. 1987) =
- *Tsuga heterophylla* / *Clintonia uniflora* Plant Association (Williams and Smith 1990) =
- *Tsuga heterophylla* / *Clintonia uniflora* Plant Association (Williams et al. 1995) =
- *Tsuga heterophylla* / *Pachistima myrsinites* / *Clintonia uniflora* Plant Association (Lillybridge et al. 1995) =
- *Tsuga heterophylla* / *Pachistima myrsinites* Habitat Type (Daubenmire and Daubenmire 1968) I
- *Tsuga heterophylla* / *Clintonia uniflora* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is known only from the west side of Glacier National Park, within the MacDonald Lake watershed.

GLOBAL RANGE: This association is known from northeastern Washington, northern Idaho and northeastern Montana. Very similar forest types have been described from the south-central eastern Cascades of Washington.

NATIONS: US

STATES/PROVINCES: ID:S4, MT:S3, WA:S4

USFS ECOREGIONS: M332A:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); USFS (Colville NF, Wenatchee)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2065, GLAC.162, GLAC.2215, GLAC.2600, GLAC.2618, GLAC.2546, GLAC.2204.

LOCAL DESCRIPTION AUTHORS: G. Kittel

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Driscoll et al. 1984, Lillybridge et al. 1995, MTNHP 2002b, Pfister et al. 1977, WNHP unpubl. data, Western Ecology Working Group n.d., Williams and Smith 1990, Williams et al. 1990b, Williams et al. 1995, Zamora 1983

Tsuga heterophylla / *Gymnocarpium dryopteris* Forest WESTERN HEMLOCK / NORTHERN OAK FERN FOREST

IDENTIFIER: C EGL000494

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
Alliance	<i>Tsuga heterophylla</i> Forest Alliance (A.145)
Alliance (English name)	Western Hemlock Forest Alliance
Association	<i>Tsuga heterophylla</i> / <i>Gymnocarpium dryopteris</i> Forest
Association (English name)	Western Hemlock / Northern Oak Fern Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (CES306.802)
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland (CES306.804)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association occurs as small, usually linear patches from Coeur d'Alene National Forest northward to northeastern Washington and northwestern Montana, west of the Continental Divide. This association is generally restricted to conditions of moisture accumulation and low insolation, i.e., sheltered slopes and toeslopes, alluvial bottoms and benches forming part of the meso-riparian zone. It shows no affinity for particular aspects due to sheltered positions and is perhaps subirrigated, at least until early summer. The elevation range is from 555 to 1370 m (1820-4500 feet). In northeastern Washington and northern Idaho, soils generally have an ash component overlying a mixed alluvium or colluvium derived from metasediments and glacial till. In Montana soils are derived from a variety of parent materials, though alluvium from sedimentary rock is common. Textures are silt, silt loam, loams and sandy loams. This mesic forest type varies widely in degree of canopy closure from nearly 100% in younger stands to open (less than 60% canopy cover) in stands that have experienced wind-throw, root-rot or underburns. This type can include all successional stages. Early seral stands can be dominated by other than *Tsuga heterophylla* or *Thuja plicata*; however, in late seral to climax stands these two conifers invariably dominate the canopy with specimens approaching 50 m (160 feet) in height. Long-persisting seral tree species include *Abies grandis*, *Picea engelmannii*, *Pinus monticola* (particularly in northern Idaho), *Larix occidentalis*, *Pseudotsuga menziesii*, and *Betula papyrifera*. The shrub layer is often relatively species-rich but not abundant and clearly subordinate to the herbaceous cover. Tall and mid-shrubs with the highest constancy and cover include *Acer glabrum*, *Lonicera utahensis*, *Paxistima myrsinites*, *Rosa gymnocarpa*, *Rubus parviflorus*, *Taxus brevifolia*, and *Vaccinium membranaceum*. *Linnaea borealis* is the only subshrub of note. *Bromus vulgaris* is consistently present in trace amounts. In addition to being 100% constant the herbaceous indicator *Gymnocarpium dryopteris* ranges in cover from 10 to 90% and averages around 25%. Other forbs of high constancy (>60%) and indicative of mesic or moister moisture levels include *Adenocaulon bicolor*, *Asarum caudatum*, *Aralia nudicaulis*, *Clintonia uniflora*, *Tiarella trifoliata*, *Galium triflorum*, *Prosartes hookeri* (= *Disporum hookeri*), *Maianthemum stellatum*, *Trillium ovatum*, and *Viola orbiculata*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs on gentle to flat benches or alluvial terraces along toeslopes at elevations near 975 m (3200 feet). Soils are derived from alluvium or glacial till and

tend to be moderately well-drained despite being wet in certain areas due to subirrigation. Soil texture ranges from silty clay to clay loam with little rock content. Litter covers 60-75% of the ground surface with moss covering 10-20%.

GLOBAL ENVIRONMENT: This association occurs as small, usually linear patches extending from Coeur d'Alene National Forest northward to northeastern Washington and northwestern Montana, west of the Continental Divide. This association is generally restricted to conditions of moisture accumulation and low insolation, i.e., sheltered slopes and toeslopes, alluvial bottoms and benches forming part of the meso-riparian zone. Overall it shows no affinity for particular aspects due to sheltered positions and is perhaps subirrigated, at least until early summer; however, with certain drainages it is not found on southerly exposures. The documented elevation range is from 555 to 1370 m (1820-4500 feet). In general these are nutrient-rich soils with a relatively thick (3-6 in.) organic layer in older stands. In northeastern Washington and northern Idaho soils generally have an ash component overlying a mixed alluvium or colluvium derived from metasediments and glacial till; loams, silt loams and sandy loams predominate, with gravel content ranging from 30 to 50%. In Montana soils are derived from a variety of parent materials, though alluvium from sedimentary rock is often predominant, and textural range is similar to that of Idaho and Washington occurrences. There is no mottling or gleying to indicate other-than-seasonal saturation at most. Throughout much of its range this type grades to *Tsuga heterophylla* / *Clintonia uniflora* Forest (CEGL000493) or *Tsuga heterophylla* / *Asarum caudatum* Forest (CEGL000490) of drier sites and to *Tsuga heterophylla* / *Athyrium filix-femina* Forest (CEGL000491), *Thuja plicata* / *Athyrium filix-femina* Forest (CEGL000473), or *Thuja plicata* - *Tsuga heterophylla* / *Oplopanax horridus* Rocky Mountain Forest (CEGL000479) of marginally wetter, perennially subirrigated environments.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This mature, mixed-evergreen, small-patch forest tends to have a dense overstory, low midstory cover, and a high-cover, low-diversity herbaceous layer. Tree cover ranges from 75-90% and measures 20-50 m in height. It is dominated by *Tsuga heterophylla* that ranges from 40-60% cover. *Thuja plicata* and *Larix occidentalis* are also common, each with average cover of approximately 15%. In addition, *Pseudotsuga menziesii* is consistently present in the overstory. *Tsuga heterophylla* saplings, averaging 13% cover and measuring 1-2 m, dominate the tall-shrub layer. The other high-constancy shrub is *Linnaea borealis*, a dwarf-shrub with low cover. Herbaceous cover ranges from 30-90% with heights ranging from 0.5-2 m. Native ferns and forbs dominate this layer with *Gymnocarpium dryopteris* providing the highest average cover at 40%. Other high-constancy native forbs with cover ranging from 2-12% include *Clintonia uniflora*, *Aralia nudicaulis*, *Tiarella trifoliata*, and *Adenocaulon bicolor*. *Dryopteris filix-mas* and *Maianthemum stellatum* are also consistently present with low cover. *Viola glabella*, *Prosartes hookeri* (= *Disporum hookeri*), and *Athyrium filix-femina* may have high cover in certain areas. Stand ages for the two sampled plots were estimated to be 217 and 234 years.

GLOBAL VEGETATION: This small-patch (usually linear in form), mesic forest type varies widely in degree of canopy closure from nearly 100% in younger stands to open (less than 60% canopy cover) in stands that have experienced wind-throw, root-rot or underburns. This type, as defined here, can include early seral as well as late seral to climax stands, though the latter condition is by far the one that has been most thoroughly sampled (documented by plots). Early seral stands can be dominated by other than *Tsuga heterophylla* or *Thuja plicata*; however, these two conifers invariably dominate the canopy with specimens approaching 50 m (160 feet) in height in late seral to climax stands. Long-persisting seral tree species include *Abies grandis*, *Picea engelmannii*, *Pinus monticola* (particularly in northern Idaho), *Larix occidentalis*, *Pseudotsuga menziesii*, and *Betula papyrifera*. Though *Larix occidentalis* has been cited as an early seral dominant, the more usual condition is that the climax dominants (*Tsuga heterophylla* and *Thuja plicata*) are the early seral dominants on these especially mesic sites that do not require post-disturbance amelioration to make them habitable by climax species. The shrub layer is often relatively species-rich but not abundant and clearly subordinate to the herbaceous cover. Tall and mid-shrubs with the highest constancy and cover include *Acer glabrum*, *Lonicera utahensis*, *Paxistima myrsinites*, *Rosa gymnocarpa*, *Rubus parviflorus*, *Taxus brevifolia*, and *Vaccinium membranaceum*. *Linnaea borealis* is the only subshrub of note. *Bromus vulgaris* is consistently present in trace amounts. In addition to being 100% constant the herbaceous indicator *Gymnocarpium dryopteris* ranges in cover from 10 to 90% and averages around 25%. Other forbs of high constancy (>60%) and indicative moisture levels rated mesic and moister include *Adenocaulon bicolor*, *Asarum caudatum*, *Aralia nudicaulis*, *Clintonia uniflora*, *Tiarella trifoliata*, *Galium triflorum*, *Prosartes hookeri* (= *Disporum hookeri*), *Maianthemum stellatum*, *Trillium ovatum*, and *Viola orbiculata*. Among the forbs with at least sub-hydric affinities are *Athyrium filix-femina* (low cover and stature), *Circaea alpina*, *Streptopus amplexifolius*, *Trautvetteria caroliniensis*, and *Viola glabella*; the foregoing species have low to moderate constancy (20-50%).

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Tall shrub/sapling	Needle-leaved tree	<i>Tsuga heterophylla</i>
Herb (field)	Dwarf-shrub	<i>Linnaea borealis</i>
Herb (field)	Forb	<i>Aralia nudicaulis</i> , <i>Clintonia uniflora</i> , <i>Tiarella trifoliata</i> , <i>Viola glabella</i>
Herb (field)	Fern or fern ally	<i>Gymnocarpium dryopteris</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies grandis</i> , <i>Larix occidentalis</i> , <i>Picea engelmannii</i> , <i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Tree subcanopy	Needle-leaved tree	<i>Abies grandis</i> , <i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Tall shrub/sapling	Needle-leaved shrub	<i>Taxus brevifolia</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Acer glabrum</i> , <i>Rubus parviflorus</i> , <i>Vaccinium membranaceum</i>
Tall shrub/sapling	Broad-leaved evergreen shrub	<i>Menziesia ferruginea</i>
Herb (field)	Dwarf-shrub	<i>Linnaea borealis</i>
Herb (field)	Forb	<i>Aralia nudicaulis</i> , <i>Clintonia uniflora</i> , <i>Prosartes hookeri</i> , <i>Tiarella trifoliata</i> , <i>Viola glabella</i>
Herb (field)	Fern or fern ally	<i>Gymnocarpium dryopteris</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Adenocaulon bicolor*, *Aralia nudicaulis*, *Clintonia uniflora*, *Dryopteris filix-mas*, *Gymnocarpium dryopteris*, *Larix occidentalis*, *Linnaea borealis*, *Maianthemum stellatum*, *Pseudotsuga menziesii*, *Thuja plicata*, *Tiarella trifoliata*, *Tsuga heterophylla*

GLOBAL: *Gymnocarpium dryopteris*, *Tsuga heterophylla*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This community is somewhat more mesic than *Tsuga heterophylla* / *Clintonia uniflora* Forest (CEGL000493) and slightly drier than *Tsuga heterophylla* - (*Thuja plicata*) / *Oplopanax horridus* / *Polystichum munitum* Forest (CEGL000497) and *Tsuga heterophylla* / *Athyrium filix-femina* Forest (CEGL000491), but found in the same landscape positions as the latter community.

GLOBAL COMMENTS: Regarding subcanopy and undergrowth composition, the defining abiotic parameters and geographic distribution of this community is virtually indistinguishable from *Thuja plicata* / *Gymnocarpium dryopteris* Forest (CEGL000476). The difference between *Tsuga* and *Thuja* dominance of the upper canopy is quite probably related to historical accident, past disturbance events and subsequent successional patterns. Despite the very long fire-return intervals (200-500 years for stand-replacing fire), the longevity of both species, especially *Thuja*, argues for considering the dual designation (*Thuja plicata* - *Tsuga heterophylla*) as appropriate (i.e., combining these two associations into one); if one or the other species responds to disturbance by attaining canopy dominance, it is unlikely the non-dominant species will become dominant in the average fire-free interval. Others have recognized that quite probably a dominance continuum exists between these two species by naming at least 8 plant associations with the dual designation (*Tsuga heterophylla* - *Thuja plicata* / _).

Arguing against this approach is the approach being taken by the NVC placing emphasis on existing vegetation composition, and it is indisputable that either climax tree species can be strongly dominant with the other species only occurring in the reproductive layers, if at all. In northern Idaho, where these species are sympatric over an extensive range, there are drainages where one or the other species is present and its complement is not (Daubenmire and Daubenmire 1968); this phenomenon has never been satisfactorily explained and again argues for recognizing separate *Thuja plicata* and *Tsuga heterophylla* types.

GLOBAL SIMILAR ASSOCIATIONS:

- *Thuja plicata* / *Gymnocarpium dryopteris* Forest (CEGL000476)
- *Tsuga heterophylla* / *Athyrium filix-femina* Forest (CEGL000491)
- *Tsuga heterophylla* / *Tiarella trifoliata* - *Gymnocarpium dryopteris* Forest (CEGL000116)

GLOBAL RELATED CONCEPTS:

- *Tsuga heterophylla* / *Gymnocarpium dryopteris* Association (Kovalchik 1993) =
- *Tsuga heterophylla* / *Gymnocarpium dryopteris* Habitat Type (Cooper et al. 1987) =
- *Tsuga heterophylla* / *Gymnocarpium dryopteris* Habitat Type (Hansen et al. 1995) =

- *Tsuga heterophylla* / *Gymnocarpium dryopteris* Plant Association (Williams et al. 1995) I
- *Tsuga heterophylla*/ *Gymnocarpium dryopteris* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon within the Lake McDonald valley on the west side of Glacier National Park. It occurs on flat toeslopes and may represent an ecotone between drier *Tsuga heterophylla* / *Clintonia uniflora* Forest (CEGL000493) and *Tsuga heterophylla* - (*Thuja plicata*) / *Oplopanax horridus* / *Polystichum munitum* Forest (CEGL000497). Specific locations occur along Upper McDonald Creek.

GLOBAL RANGE: This association is strongly associated with an Inland Maritime climatic regime and is thus confined to that portion of eastern Washington, northern Idaho and western Montana receiving in excess of 30 inches annual precipitation and not experiencing severe Arctic cold fronts.

NATIONS: US

STATES/PROVINCES: ID:S3, MT:S2, WA:S3S4

USFS ECOREGIONS: M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); USFS (Clearwater, Colville NF, Flathead, Idaho Panhandle, Kootenai)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2217, GLAC.2628.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Bourgeron and Engelking 1994, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Driscoll et al. 1984, Hansen et al. 1991, Hansen et al. 1995, IDCDC 2005, Kovalchik 1993, MTNHP 2002b, WNHP unpubl. data, Western Ecology Working Group n.d., Williams and Lillybridge 1985, Williams et al. 1990b, Williams et al. 1995

I.A.8.N.d. Cylindrical-crowned temperate or subpolar needle-leaved evergreen forest

Abies lasiocarpa - *Picea engelmannii* Forest Alliance

Abies lasiocarpa - *Picea engelmannii* / *Acer glabrum* Forest

SUBALPINE FIR - ENGELMANN SPRUCE / ROCKY MOUNTAIN MAPLE FOREST

IDENTIFIER: CEGL000294

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.d.)
Alliance	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> Forest Alliance (A.168)
Alliance (English name)	Subalpine Fir - Engelmann Spruce Forest Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Acer glabrum</i> Forest
Association (English name)	Subalpine Fir - Engelmann Spruce / Rocky Mountain Maple Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)

ELEMENT CONCEPT

GLOBAL SUMMARY: This minor forest association occurs in the upper montane and subalpine zone in the southern, central and northern Rocky Mountains. Sites are cool, relatively moist slopes or riparian areas. Stands are typically found on moderate to very steep canyon and mountain slopes, as well as on nearly flat valley bottoms and on benches with moderate to gentle slopes. Aspects are typically northerly or shaded (in canyon). Lowland aspects are variable. Substrates may be gravelly or not, typically with loam- or

sandy loam-textured soil, although finer textured soils are reported. Litter dominates the ground cover often 3-8 cm deep with low cover of rock and bare ground. The vegetation is characterized by a tree canopy codominated by *Abies lasiocarpa* and *Picea engelmannii* with the tall shrub *Acer glabrum* dominating the understory. The evergreen needle-leaved tree canopy is open to moderately dense (30-80% cover) and typically dominated by *Abies lasiocarpa* with lesser amounts of *Picea engelmannii*. Scattered *Pinus contorta*, *Abies concolor*, *Pseudotsuga menziesii*, *Picea pungens*, and *Populus tremuloides* trees may be present. The tall-shrub layer is open (patchy) to moderately dense. *Acer glabrum* dominates or codominates with other tall shrubs such as *Amelanchier alnifolia* or *Sorbus scopulina*. An open to moderately dense short-shrub layer is often present with species such as *Lonicera utahensis*, *Mahonia repens*, *Paxistima myrsinites*, *Physocarpus malvaceus*, *Rosa* spp., *Rubus parviflorus*, *Ribes* spp., *Symphoricarpos* spp., *Vaccinium* spp. and the vine *Clematis columbiana*. The herbaceous layer is composed of diverse forbs with graminoids present to codominant. Species with high constancy include *Arnica cordifolia*, *Bromus* spp., *Calamagrostis rubescens*, *Carex geyeri*, *Carex rossii*, *Elymus glaucus*, *Erigeron eximius*, *Lathyrus lanszwertii*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Penstemon wilcoxii*, *Maianthemum stellatum*, and *Thalictrum* spp.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This forest association occupies lowslopes and toeslopes that border broad valleys. Slopes are typically moderately steep to steep and have been documented on southeasterly and northwesterly slopes. Snow slides are relatively common on steeper sites. Elevation ranges from 1375-1450 m (4510-4756 feet). Soils are primarily derived from noncalcareous sedimentary parent material. Siltstone, in the form of argillite, is present in surface soils. Sites are well-drained to rapidly drained, and the soil is a loamy sand with abundant gravel and small rock. Ground surfaces are primarily covered with litter, but wood, and small and large rock may each contribute nearly 10% ground cover.

GLOBAL ENVIRONMENT: This minor forest association occurs in the upper montane and subalpine zone in the southern, central and northern Rocky Mountains. Elevations range from 2955-3050 m (9700-10,000 feet) in southern latitudes (Sandia Mountains) to 1980-3020 m (6500-9900 feet) on the Wasatch Plateau and down to 1375-1980 m (4510-6500 feet) in the northern Rocky Mountains. Sites are cool, relatively moist slopes or riparian. Stands are typically found on moderate to very steep canyon and mountain slopes, as well as on nearly flat valley bottoms and on benches with moderate to gentle slopes. Aspects are typically northerly or shaded (in canyon). Lowland aspects are variable. Substrates may be gravelly or not, typically with loam- or sandy loam-textured soil, although finer textured soils are reported. Substrates are derived from various parent materials including sandstone, granite, andesite, rhyolite, quartz monzonite or limestone. Litter dominates ground cover often 3-8 cm deep with low cover of rock and bare ground.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The forest canopy, dominated by *Abies lasiocarpa*, is typically 15-20 m tall. This layer may be dense in some stands, approaching 70% canopy cover, or sparse and woodland-like, with 20-30% cover. The subcanopy is sparse, with 5-20% cover, and is also dominated by *Abies lasiocarpa*. Subcanopy height is usually 1-5 m. Shrubs are dense in this association, contributing up to 90% cover in a layer 1-2 m tall. *Acer glabrum* is the most dominant shrub species, with an average cover of 35%. *Rubus parviflorus*, *Amelanchier alnifolia*, *Symphoricarpos albus*, and *Ribes lacustre* are also common. The herbaceous layer is sparse. *Thalictrum occidentale* is the most common herbaceous species, with approximately 5% cover in sampled stands. A wide variety of moist-site forbs, such as *Aquilegia flavescens*, *Galium triflorum*, *Maianthemum racemosum* ssp. *amplexicaule*, and *Osmorhiza berteroi*, are typically present in amounts ranging from trace to 5%.

GLOBAL VEGETATION: This minor Rocky Mountain conifer association is characterized by a tree canopy codominated by *Abies lasiocarpa* and *Picea engelmannii* with tall shrub *Acer glabrum* dominating the understory. The evergreen needle-leaved tree canopy is open to moderately dense (30-80% cover) and is typically dominated by *Abies lasiocarpa* with lesser amounts of *Picea engelmannii*. Scattered *Pinus contorta*, *Abies concolor*, *Pseudotsuga menziesii*, *Picea pungens*, and *Populus tremuloides* trees may be present. The tall-shrub layer is open (patchy) to moderately dense. *Acer glabrum* dominates or codominates with other tall shrubs such as *Amelanchier alnifolia*, *Sorbus scopulina*, *Spiraea betulifolia*, or sometimes *Prunus virginiana* or *Salix scouleriana*. An open to moderately dense short-shrub layer is often present with species such as *Lonicera utahensis*, *Mahonia repens*, *Paxistima myrsinites*, *Physocarpus malvaceus*, *Rosa* spp., *Rubus parviflorus*, *Ribes lacustre*, *Symphoricarpos albus*, *Symphoricarpos oreophilus*, *Vaccinium caespitosum*, *Vaccinium membranaceum*, and the vine *Clematis columbiana*. Herbaceous layer is composed of diverse forbs with graminoids present to codominant. Species may include *Arnica cordifolia*, *Bromus carinatus*, *Bromus ciliatus*, *Calamagrostis rubescens*, *Carex geyeri*, *Carex rossii*, *Elymus glaucus*, *Erigeron eximius*, *Lathyrus lanszwertii*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Penstemon wilcoxii*, *Maianthemum stellatum*, *Thalictrum fendleri*, or *Thalictrum occidentale*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Acer glabrum</i> , <i>Rubus parviflorus</i>

Short shrub/sapling	Broad-leaved deciduous shrub	<i>Symphoricarpos albus</i>
Herb (field)	Forb	<i>Thalictrum occidentale</i>

**Global
Stratum**

Tree canopy
Tall shrub/sapling

Lifeform

Needle-leaved tree
Broad-leaved deciduous shrub

Species

Abies lasiocarpa, *Picea engelmannii*
Acer glabrum

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Galium triflorum*, *Thalictrum occidentale*

GLOBAL: *Abies lasiocarpa*, *Picea engelmannii*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: One plot was recently reported from Rocky Mountain National Park, otherwise it is not known from Colorado. Plots with *Acer glabrum*-dominated understories from similar associations (and habitat types) may be misclassified and need further review.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* / *Erigeron eximius* Forest (CEGL000310)
- *Picea engelmannii* / *Acer glabrum* Forest (CEGL000354)
- *Pseudotsuga menziesii* / *Acer glabrum* Forest (CEGL000418)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Acer glabrum* Habitat Type (Steele et al. 1981) B
- *Abies lasiocarpa* / *Acer glabrum* Habitat Type (Alexander et al. 1987) B
- *Abies lasiocarpa* / *Acer glabrum* Habitat Type (Henderson et al. 1976) B
- *Abies lasiocarpa* / *Acer glabrum* Habitat Type (Youngblood and Mauk 1985) B
- *Abies lasiocarpa* / *Acer glabrum* Habitat Type (Mauk and Henderson 1984) B
- *Abies lasiocarpa* / *Acer glabrum* Habitat Type, *Pachistima myrsinites* Phase (Steele et al. 1983) B
- *Abies lasiocarpa* / *Acer glabrum* Plant Association (Johnston 1987) =
- *Abies lasiocarpa* / *Erigeron eximius* Habitat Type (Larson and Moir 1987) I
- *Abies lasiocarpa* / *Acer glabrum* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon in Glacier National Park and has not been documented in Waterton Lakes National Park. It occurs east of the Continental Divide on both sides of the St. Mary valley, and probably occurs in similar habitats along other eastern valleys.

GLOBAL RANGE: This upper montane and subalpine association is widespread, occurring in the southern, central and northern Rocky Mountains from the Sandia Mountains to the Wasatch Plateau and Uinta Mountains, north to Glacier National Park.

NATIONS: US

STATES/PROVINCES: CO, ID:S3, MT, NM:S5, UT:S5, WY:S3

USFS ECOREGIONS: 331J:CC, 342B:CC, M313B:??, M331A:CC, M331D:CC, M331F:CC, M331G:CC, M331I:CC, M332A:CC, M332C:CC, M332E:CC, M332G:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton, Rocky Mountain); USFS (Bridger-Teton, Dixie, Fishlake, Payette, Salmon, Uinta, Wasatch-Cache)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.198, GLAC.203.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Alexander et al. 1987, Bourgeron and Engelking 1994, Driscoll et al. 1984, Henderson et al. 1976, Johnston 1987, Larson and Moir 1987, Mauk and Henderson 1984, Steele et al. 1981, Steele et al. 1983, Western Ecology Working Group n.d., Youngblood and Mauk 1985

***Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* - *Xerophyllum tenax* Forest
SUBALPINE FIR - ENGELMANN SPRUCE / BRIDE'S BONNET - BEAR-GRASS FOREST**

IDENTIFIER: CEGL005892

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.d.)
Alliance	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> Forest Alliance (A.168)
Alliance (English name)	Subalpine Fir - Engelmann Spruce Forest Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Clintonia uniflora</i> - <i>Xerophyllum tenax</i> Forest
Association (English name)	Subalpine Fir - Engelmann Spruce / Bride's Bonnet - Bear-grass Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association has been described only for the northern Rocky Mountains. It occupies most of what was considered the dry and cold portion of the former *Abies lasiocarpa* / *Clintonia uniflora* association. It is found predominantly on well-drained sites with south- or west-facing exposures and all degrees of slope steepness; it is seldom found on toeslope positions or steam terraces. Within a given landscape (Glacier-Waterton International Peace Park) it exhibited a wide elevational range, from 4400 to 5900 feet; this upper elevation is extreme and beyond the elevational limits of *Clintonia uniflora*, but within the distributional limits of *Tiarella trifoliata*. Parent materials are dominated by granitics, quartzites, mica schists, and partially metamorphosed sedimentary types, such as argillite. In northern Idaho and western Montana ash caps of varying thickness are common. In local landscapes it grades to *Abies grandis* / *Xerophyllum tenax* - *Clintonia uniflora* or *Thuja plicata* / *Clintonia uniflora* at lower elevations, and above, or on drier sites, to *Abies lasiocarpa* / *Xerophyllum tenax* (which may be dominated by seral tree species). The tree canopy is dominated by a variable combination of *Abies lasiocarpa* and *Picea engelmannii*; cover of the upper canopy generally ranges from 60 to 80%. Seral tree species (*Pinus contorta*, *Pseudotsuga menziesii*, *Larix occidentalis*) are relatively more successful in post-disturbance colonization than they are in other *Clintonia uniflora*-characterized sites (stands dominated by seral tree species comprise a separate set of associations). This response essentially reflects the warmer, more open sites that following disturbance do not so readily regenerate to shrub dominance. The undergrowth is dominated by a low- to mid-shrub, discontinuous layer of *Vaccinium membranaceum*; other high-constancy shrubs, which seldom exceed 15% cover, include *Lonicera utahensis*, *Spiraea betulifolia*, *Rubus parviflorus*, *Paxistima myrsinites*, *Acer glabrum*, and *Amelanchier alnifolia*. The graminoid component often comprises less than 1% cover, and there are none that appear with even moderate constancy. The forb layer is generally dominated by *Xerophyllum tenax*, whose cover ranges from barely greater than 1% to 60 or 70% in more open stands. The other diagnostic forbs, *Clintonia uniflora* and *Tiarella trifoliata*, seldom exceed 5% cover. Other forbs of high constancy and occasional layer dominance include *Thalictrum occidentale*, *Orthilia secunda*, *Viola orbiculata*, *Arnica latifolia* (or *Arnica cordifolia*), *Goodyera oblongifolia* and *Osmorhiza berteroi* (= *Osmorhiza chilensis*).

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This forested association occurs on cool, dry mountain slopes and ridges with gentle to steep grades. Stands that occupy gentle grades typically occur on broad benches positioned within more steeply sloped terrain. The association is most commonly found at low- to mid-slope and on southerly to westerly aspects. Elevations range from 1200-1800 m (3936-5904 feet). The association occurs on a thin layer of gravelly soil that overlies glacial till or

colluvial deposits. Parent material is derived from noncalcareous sedimentary and metamorphic material. Soils are typically characterized as sandy or silty loams and are moderately well-drained on low-grade slopes, and well-drained on steeper slopes. Ground cover is primarily litter, but may be up to 20% wood, in the form of coarse woody debris.

GLOBAL ENVIRONMENT: This association has been described only for the northern Rocky Mountains. It occupies most of what was considered the dry and cold portion of former *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Forest (CEGL000307). It is found predominantly on well-drained sites with south- or west-facing exposures and all degrees of slope steepness; it is seldom found on toeslope positions or steam terraces. Within a given landscape (Glacier-Waterton International Peace Park) it exhibits a wide elevational range, from 1340 to 1800 m (4400-5900 feet); this upper elevation is extreme and beyond the elevational limits of *Clintonia uniflora*. Parent materials are dominated by granitics, quartzites, mica schists, and partially metamorphosed sedimentary types, such as argillite. In northern Idaho and western Montana ash caps of varying thickness are common.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Forests in this association are in an early to mid-seral stage of succession with stand initiation occurring 30-50 years ago, most likely from stand-replacing fire. Consequently, both early seral (*Pinus contorta*, *Pseudotsuga menziesii*) and young climax (*Abies lasiocarpa*) tree species are typically well-represented in these stands. Tall-tree canopy cover is highly variable, ranging from 10-60%, with an average tree height of 20-35 m. Some stands have a moderately dense canopy and can be classified as a true forest. Other stands are very open with a woodland-like character. Less common are sites that may be considered shrublands with a very sparse layer of tall trees. Subcanopy character is equally variable ranging from 5-50% in a layer 5-15 m tall. Tree species most commonly occurring in the tall-tree layer are *Pinus contorta*, *Abies lasiocarpa*, and *Pseudotsuga menziesii*. The subcanopy is usually dominated by *Abies lasiocarpa*. Tall shrubs, when present, account for less than 15% canopy cover in a layer 2-5 m tall. Tall shrubs were only present in 3 of 8 sampled plots, and include *Salix scouleriana*, *Sorbus scopulina*, and *Acer glabrum*. Canopy cover for short (less than 2 m) shrubs ranges from 10-80% and is dominated by *Vaccinium membranaceum*. *Amelanchier alnifolia* and *Spiraea betulifolia* are also well-represented in most stands. Stands that have a very sparse tree layer and a shrubland physiognomy usually have much higher overall short-shrub diversity, with many species present in amounts less than 10%. Stands with a thicker tall-tree canopy typically have lower diversity of short shrubs. Dwarf-shrubs may be entirely absent in the association, or present with a cover of up to 80%. When present, the most common dwarf-shrubs occurring in this association are *Paxistima myrsinites* and *Vaccinium myrtillus*. Cover of herbaceous species ranges from 40-90%. *Xerophyllum tenax* was present in all sampled plots with average cover of 37%. *Thalictrum occidentale* was also present in all plots, but contributed much less cover (less than 5%). *Xerophyllum tenax* forms dense, hummocky carpets in areas where sun filters through the canopy. Stands with higher tree canopy cover typically have lower herbaceous species diversity, while more open stands support a wide variety of forbs and grasses. Common forb species include *Arnica cordifolia*, *Clintonia uniflora*, *Chamerion angustifolium*, and *Orthilia secunda*.

GLOBAL VEGETATION: The tree canopy is dominated by a variable combination of *Abies lasiocarpa* and *Picea engelmannii*; cover of the upper canopy generally ranges from 60 to 80%. Throughout Montana many of the *Picea* populations show clear hybridization between *Picea engelmannii* and *Picea glauca*; however, most populations exhibit the *Picea engelmannii* characteristics more strongly. It is notable that with a shift to more of an existing vegetation-based classification that this type constitutes much less of the landscape than it would have under the concept of potential vegetation types. This is because seral tree species (*Pinus contorta*, *Pseudotsuga menziesii*, *Larix occidentalis*) are relatively more successful in post-disturbance colonization than they are in other *Clintonia uniflora*-characterized sites (stands dominated by seral tree species comprise a separate set of associations). This response essentially reflects the warmer, more open sites that following disturbance do not so readily regenerate to shrub dominance. The undergrowth is dominated by a low- to mid-shrub, discontinuous layer of *Vaccinium membranaceum*; other high-constancy shrubs, which seldom exceed 15% cover, include *Lonicera utahensis*, *Spiraea betulifolia*, *Rubus parviflorus*, *Paxistima myrsinites*, *Acer glabrum*, and *Amelanchier alnifolia*. The graminoid component often comprises less than 1% cover, and there are none that appear with even moderate constancy. The forb layer is generally dominated by *Xerophyllum tenax*, whose cover ranges from barely greater than 1% to 60 or 70% in open stands. The other diagnostic forbs, *Clintonia uniflora* and *Tiarella trifoliata*, seldom exceed 5% cover. Other forbs of high constancy and occasional layer dominance include *Thalictrum occidentale*, *Orthilia secunda*, *Viola orbiculata*, *Arnica latifolia* (or *Arnica cordifolia*), *Goodyera oblongifolia*, and *Osmorhiza berteroi* (= *Osmorhiza chilensis*). There are regional distinctions within the forb layer with northern Idaho having several forbs of high constancy including *Anemone piperi*, *Trillium ovatum*, *Coptis occidentalis*, and *Mitella stauropetala*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Pinus contorta</i> , <i>Pseudotsuga menziesii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Forb	<i>Xerophyllum tenax</i>

Global

Stratum

Tree canopy

Tall shrub/sapling

Short shrub/sapling

Short shrub/sapling

Herb (field)

Lifeform

Needle-leaved tree

Broad-leaved deciduous shrub

Broad-leaved deciduous shrub

Broad-leaved evergreen shrub

Forb

Species

Abies lasiocarpa, *Picea engelmannii*, *Pinus contorta*, *Pseudotsuga menziesii*

Sorbus scopulina

Vaccinium membranaceum

Paxistima myrsinites

Arnica cordifolia, *Thalictrum occidentale*, *Viola orbiculata*,

Xerophyllum tenax

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Pinus contorta*, *Thalictrum occidentale*, *Xerophyllum tenax*

GLOBAL: *Abies lasiocarpa*, *Clintonia uniflora*, *Tiarella trifoliata*, *Xerophyllum tenax*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4G5 (10-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association is derived from the *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type (climax association), *Xerophyllum tenax* Phase, by elevating this phase to the association level; this phase (now association) has been abundantly documented (at least 40 plots). This association is actually a subset of the habitat type, including those stands where *Abies lasiocarpa* and/or *Picea engelmannii* are dominant. As noted above, seral tree species are well-represented in this type and, where stands are conspicuously dominated by them, unique and separate plant associations are recognized.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies grandis* / *Clintonia uniflora* Forest (CEGL000272)
- *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Forest (CEGL005912)
- *Picea engelmannii* / *Clintonia uniflora* Forest (CEGL000360)
- *Pinus contorta* / *Clintonia uniflora* - *Xerophyllum tenax* Woodland (CEGL005921)
- *Thuja plicata* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005930)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Clintonia uniflora* (Bourgeron and Engelking 1994) B
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Pfister et al. 1977) I
- *Abies lasiocarpa* / *Pachistima myrsinites* Habitat Type (Daubenmire and Daubenmire 1968) B
- *Abies lasiocarpa* / *Xerophyllum tenax* Plant Association (Williams et al. 1995) I
- *Picea engelmannii* - *Abies lasiocarpa* / *Menziesia ferruginea* / *Vaccinium membranaceum* - *Xerophyllum tenax* Vegetation Type (Achuff et al. 2002a) I
- *Picea engelmannii* - *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Pachistima myrsinites* variant (Ogilvie 1962) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is abundant on high valley slopes in both Glacier National Park and Waterton Lakes National Park. In Glacier National Park, the association occurs west of the Continental Divide on slopes above the North Fork Flathead River and near Scalplock Lookout in the Middle Fork Flathead River valley. East of the Divide, stands have been documented in the St. Mary and upper Waterton River drainages.

GLOBAL RANGE: This association has been described only for the northern Rocky Mountains of extreme northeastern Washington, northern Idaho and western Montana, extending north into southwestern Alberta; this type is to be expected in western British Columbia based on environmental parameters.

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT, OR?, WA

USFS ECOREGIONS: M332A:CC, M332B:CC, M332C:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2225, GLAC.2281, GLAC.229, GLAC.2519, GLAC.79, WATE.4062, WATE.9038, WATE.5118.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Achuff et al. 2002a, Bourgeron and Engelking 1994, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Ogilvie 1962, Pfister et al. 1977, Western Ecology Working Group n.d., Williams et al. 1995

***Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Forest SUBALPINE FIR - ENGELMANN SPRUCE / BRIDE'S BONNET FOREST**

IDENTIFIER: C EGL005912

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.d.)
Alliance	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> Forest Alliance (A.168)
Alliance (English name)	Subalpine Fir - Engelmann Spruce Forest Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Clintonia uniflora</i> Forest
Association (English name)	Subalpine Fir - Engelmann Spruce / Bride's Bonnet Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is broadly distributed across the inland northwest and northern Rocky Mountains, where it is associated with a maritime component of climate. It occurs as far east as the Continental Divide in northwestern Montana and Alberta, extending only a few air miles to the east of this strongest of topographic breaks. This community occupies relatively moist (mesic) and cool sites having free air drainage and lacking frost pocket conditions. Elevations range from 1066 to 1710 m (3500-5600 feet). It occurs on slopes of all degrees of steepness and aspect orientation, though it is more likely to occur from toeslope through midslope positions (predominantly collecting positions). At the dry extremes of its distribution it is more strongly associated with protected positions such as concave slopes, moist depressions in gently sloping plateaus, stringers along perennial stream bottoms, toeslopes and northeastern aspects. It occurs on a variety of parent materials, as varying as granite, limestone, glacial-fluvial material, and volcanic ash caps. *Abies lasiocarpa* and *Picea engelmannii* dominate the tree canopy. The most important seral species are *Pseudotsuga menziesii*, *Larix occidentalis*, and *Pinus contorta*, however, their cover seldom exceeds 10-15%. Total tree canopy cover is generally in excess of 55% ranging to 75%. *Abies lasiocarpa* dominates the tree regeneration layer, whereas *Picea engelmannii* reproduction is more sporadic. The shrub layer ranges from low diversity and cover to extremely diverse and high in cover; the shrubs present are judged largely seral. Those of highest constancy include *Acer glabrum*, *Ribes lacustre*, *Lonicera utahensis*, *Rubus parviflorus*, *Symphoricarpos albus*, and *Vaccinium membranaceum*. The low-shrub component is well-represented by *Linnaea borealis*, *Spiraea betulifolia*, *Paxistima myrsinites*, and, in the northern portion of the type's range, *Vaccinium myrtillus*. The only graminoids consistently present are *Bromus vulgaris* and *Calamagrostis rubescens*; the latter species may be relatively abundant on early seral stands but with an increase in tree canopy cover it is less abundant. The forb component is relatively species-rich and abundant; cover of the diagnostic species *Clintonia uniflora* or *Tiarella trifoliata* generally does not exceed 20%. There are many other forbs with high constancy and the potential to have appreciable cover, including *Maianthemum stellatum*, *Arnica cordifolia*, *Thalictrum occidentale*, and *Eucephalus engelmannii* (= *Aster engelmannii*); forbs merely with high constancy include *Orthilia secunda*, *Galium triflorum*, *Goodyera oblongifolia*, *Osmorhiza berteroi*, and *Viola orbiculata*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This forest association is abundant on the lower and middle portions of mountain slopes throughout the IPP. The association occurs less commonly on toeslopes and valley bottomlands, and is usually associated with relatively warm, moist conditions. Slope grades vary from steep to flat, and stands may occur at any aspect. Elevations range from 1020-1740 m (3345-5707 feet). Parent material may be calcareous and/or noncalcareous sedimentary, or metamorphic in origin. On mountain slopes the association most often overlies glacial till, glacial-fluvial deposits, or colluvial deposits. On toeslope and bottomland positions the association may overlie glacial outwash in the form of alluvium. Soils are most often described as sandy loam or clay loam and are moderately well-drained to rapidly drained on sloped sites. Stands that occupy lower level sites may have silt to silt loam soils with somewhat poor drainage. Ground cover is primarily litter, but small rock and/or wood may contribute up to 30% ground cover in some stands.

GLOBAL ENVIRONMENT: This community occupies relatively moist (mesic) and cool sites having free air drainage and lacking frost pocket conditions. It is speculated to have the most moderate temperature regimes within the *Abies lasiocarpa* - *Picea engelmannii* Forest Alliance (A.168). It occurs on slopes of all degrees of steepness and aspect orientation, though it is more likely to occur from toeslope through midslope positions (predominantly collecting positions). At the dry extreme of its distribution, it is more strongly associated with protected positions such as concave slopes, moist depressions in gently sloping plateau areas, stringers along perennial stream bottoms, toeslopes and northeastern aspects. In the north it ranges from 1066 to 1585 m (3500-5200 feet) (extreme outliers at 1710 m [5600 feet]), whereas to the south it ranges from 1555 to 1710 m (5100-5600 feet). A variety of parent materials are represented, including those as disparate as granite and limestone, including all manner of glacio-fluvial material. In northern Idaho and northwestern Montana it is routinely found on ash caps, ranging from 3 to 60 cm in depth. The soil textures are predominantly loams and silt loams (reflecting in part the volcanic ash); soils typically have less than 15% coarse fragment content and are well-drained.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The forest canopy in this association is very diverse, but is typically dominated by *Abies lasiocarpa* and *Picea engelmannii* in a mid-seral to climax stage of succession. *Pinus contorta*, *Larix occidentalis*, and *Pseudotsuga menziesii* may be well-represented in early- to mid-seral stands. Total canopy cover ranges from 20-60%. Scattered openings may be present, created by downfall. Tree height in the upper canopy is usually 15-30 m but may be as high as 50 m in stands with old-growth *Larix occidentalis*. The tree subcanopy is typically 5-10 m tall, dominated by *Abies lasiocarpa* and *Picea engelmannii*. Shrub cover is highly variable and diverse in this association. Tall-shrub cover ranges from 0-100% in a layer 1-5 m tall. Stands where tall shrubs are absent or sparse usually have a well-developed short- or dwarf-shrub component. Common tall shrubs include *Acer glabrum* and *Amelanchier alnifolia*. *Rubus parviflorus* is also prevalent in this association and may be considered a tall or short shrub. Other short shrubs present in most stands include *Spiraea betulifolia*, *Vaccinium membranaceum*, and *Symphoricarpos albus*. Dwarf-shrub cover is 20-40%. *Mahonia repens*, *Paxistima myrsinites*, and *Linnaea borealis* are characteristically found throughout this association in decreasing order of abundance. Diversity of the herbaceous layer among stands within this association is even more pronounced than that of the shrub and tree layers. Total cover for all herbaceous species usually ranges from 30-70%, but may be as low as 20% in stands approaching tree canopy closure, and as high as 90% in stands with an open canopy. The presence of *Clintonia uniflora* or *Tiarella trifoliata* defines the association. Neither species is abundant, rarely reaching 20% cover in most stands, however, one or the other is always present. Forbs with high constancy but usually low cover include *Orthilia secunda*, *Galium triflorum*, *Goodyera oblongifolia*, *Prosartes* spp. (= *Disporum* spp.), *Osmorhiza berteroi*, *Eurybia conspicua* (= *Aster conspicuus*), and *Viola orbiculata*. In some stands *Arnica cordifolia* cover may approach 25%, while the other species listed rarely reach 5% cover. Cover of mosses and lichens on the ground surface and on downed logs can be high in some stands, and averages 24%.

Ages of trees in these stands ranged from 60 years to well over 300. Achuff et al. (2002a) report stand ages in Waterton Lakes National Park ranged from 130 to 300 years, and that stands were mostly successional mature.

GLOBAL VEGETATION: A highly variable mix of *Abies lasiocarpa* and *Picea engelmannii* dominate the overstory, ostensibly at all stages of succession; tree canopy cover is generally in excess of 55% ranging to 75%. Certainly the regeneration layers are *Abies lasiocarpa*-dominated whereas *Picea engelmannii* reproduction is more sporadic, but its autecological characteristics provide for its presence throughout the sere. The most important seral species are *Pseudotsuga menziesii*, *Larix occidentalis*, and *Pinus contorta*, however, their cover seldom exceeds 10-15% [see Global Classification Comments]. The shrub layer ranges from virtually nonexistent to extremely diverse and high in cover; the shrubs present are judged largely seral in their response and not specific enough in indicator value to be useful in further subdividing this syntaxon. Those of highest constancy include *Acer glabrum*, *Ribes lacustre*, *Lonicera utahensis*, *Rubus parviflorus*, *Symphoricarpos albus*, and *Vaccinium membranaceum*. The low-shrub component is well-represented by *Linnaea borealis*, *Spiraea betulifolia*, *Paxistima myrsinites*, and, in the northern portion of the type's range, *Vaccinium myrtilloides*. The only graminoids consistently present are *Bromus vulgaris* and *Calamagrostis rubescens*; the latter species may be relatively abundant on early seral stands but with an increase in tree canopy cover it is less abundant. The forb component is relatively species-rich and abundant; cover of the diagnostic species *Clintonia uniflora* or *Tiarella trifoliata* generally does not exceed 20% [see Global Classification Comments]. A host of forbs with high constancy and the potential to have appreciable cover include *Maianthemum stellatum*, *Arnica cordifolia*, *Thalictrum occidentale*, and *Eucephalus engelmannii* (= *Aster engelmannii*); forbs merely

exhibiting high constancy include *Orthilia secunda*, *Galium triflorum*, *Goodyera oblongifolia*, *Osmorhiza berteroi*, and *Viola orbiculata*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i> , <i>Pseudotsuga menziesii</i>
Tree subcanopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Acer glabrum</i> , <i>Rubus parviflorus</i> , <i>Symphoricarpos albus</i>
Herb (field)	Dwarf-shrub	<i>Linnaea borealis</i> , <i>Paxistima myrsinites</i> , <i>Spiraea betulifolia</i> , <i>Vaccinium myrtillus</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Maianthemum stellatum</i> , <i>Thalictrum occidentale</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Larix occidentalis</i> , <i>Picea engelmannii</i> , <i>Pinus contorta</i> , <i>Pseudotsuga menziesii</i>
Tree subcanopy	Needle-leaved tree	<i>Picea engelmannii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Acer glabrum</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Lonicera utahensis</i> , <i>Ribes lacustre</i> , <i>Rubus parviflorus</i> , <i>Symphoricarpos albus</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Dwarf-shrub	<i>Linnaea borealis</i> , <i>Paxistima myrsinites</i> , <i>Spiraea betulifolia</i> , <i>Vaccinium myrtillus</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Eucephalus engelmannii</i> , <i>Maianthemum stellatum</i> , <i>Thalictrum occidentale</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Clintonia uniflora*, *Galium triflorum*, *Goodyera oblongifolia*, *Orthilia secunda*, *Osmorhiza berteroi*, *Picea engelmannii*

GLOBAL: *Abies lasiocarpa*, *Clintonia uniflora*, *Picea engelmannii*, *Tiarella trifoliata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association is essentially a renamed (including *Picea engelmannii*) subset of the *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Pfister et al. 1977, Cooper et al. 1987) or the similarly named climax plant association (Johnson and Simon 1987, Williams et al. 1995). It is a subset because previous authors have used *Abies lasiocarpa* as an indicator species (present and reproducing successfully or having some minimum amount of cover, e.g., 10% (Williams et al. 1995)) which creates a very broad category, capable of being dominated by any number of seral tree species. The type concept used here is that *Picea engelmannii* or *Abies lasiocarpa* must have a substantial presence (at least 10% canopy cover, one or both species) but need not be dominant. This interpretation then allows for recognition of stands dominated by seral tree species that occur within this moderate portion of the subalpine zone, as distinct plant associations. The undergrowth concept for the type was kept intact, recognizing the broadest interpretation of Cooper et al. (1991) that either *Clintonia uniflora* or *Tiarella trifoliata* need be present and not confined to microsites within the stand for type recognition. This approach essentially recognizes the *Clintonia uniflora* Phase of *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type (Pfister et al. 1977, Cooper et al. 1987), but with other phases split off (note one exception below) as associations unto themselves (e.g., *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005893)), it would be redundant to append another *Clintonia uniflora* to the name. The *Aralia nudicaulis* Phase was combined with the *Clintonia uniflora* Phase because after examining data from many stands a considerable overlap was found between the two phases and the unique habitat (rich benchlands) once claimed for the *Aralia nudicaulis* Phase was not substantiated.

Furthermore the *Aralia nudicaulis* Phase was absent from sites that appeared in all respects to be quintessential habitat, adding doubt to its consistency as an indicator. The existence of this type in the vicinity of the Cascade Crest needs exploration.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005892)
- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005893)
- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Streptopus amplexifolius* Woodland (CEGL005897)
- *Larix occidentalis* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005881)
- *Larix occidentalis* / *Clintonia uniflora* Forest (CEGL005880)
- *Larix occidentalis* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (CEGL005883)
- *Picea (engelmannii X glauca, engelmannii)* / *Clintonia uniflora* Forest (CEGL000406)
- *Picea engelmannii* / *Clintonia uniflora* Forest (CEGL000360)
- *Pinus contorta* / *Clintonia uniflora* - *Xerophyllum tenax* Woodland (CEGL005921)
- *Pinus contorta* / *Clintonia uniflora* Forest (CEGL005916)
- *Pinus contorta* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005922)
- *Pinus contorta* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (CEGL005923)
- *Pseudotsuga menziesii* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005854)
- *Pseudotsuga menziesii* / *Clintonia uniflora* Forest (CEGL005850)
- *Pseudotsuga menziesii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005851)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Pfister et al. 1977) B
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Cooper et al. 1987) B
- *Abies lasiocarpa* / *Clintonia uniflora* Plant Association (Williams et al. 1995) I
- *Abies lasiocarpa* / *Cornus canadensis* Plant Association (Williams et al. 1995) I
- *Abies lasiocarpa* / *Linnaea borealis* Plant Association (Williams et al. 1995) I
- *Abies lasiocarpa* / *Pachistima myrsinites* Habitat Type (Daubenmire and Daubenmire 1968) B
- *Abies lasiocarpa* / *Pachistima myrsinites* Habitat Type (Ogilvie 1962) =
- *Abies lasiocarpa* / *Clintonia uniflora* (Bourgeron and Engelking 1994) =
- C69: *Picea engelmannii* - *Abies lasiocarpa* - (*Pseudotsuga menziesii*) / *Arnica cordifolia* Vegetation Type (Achuff et al. 2002a) I
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is widely distributed on both slopes of the Continental Divide, throughout the IPP. It has been documented in almost every major drainage in Glacier National Park.

GLOBAL RANGE: This association is broadly distributed across the inland northwest and northern Rocky Mountains, associated with a maritime component of climate. It occurs as far east as the Continental Divide in northwestern Montana and Alberta, but extends only a few air miles to the east of this strongest of topographic breaks.

NATIONS: CA, US

STATES/PROVINCES: AB, ID:S4, MT:S5, OR:S4, WA:S3

USFS ECOREGIONS: M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes); USFS (Wallowa-Whitman)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.138, GLAC.176, GLAC.200, GLAC.2015, GLAC.2075, GLAC.215, GLAC.225, GLAC.2279, GLAC.3 GLAC.2234; GLAC.2246; GLAC.2268, GLAC.2264, GLAC.2513, GLAC.2235, WATE.4012, WATE.4019, WATE.4063, WATE.5049, WATE.5050, WATE.5116, WATE.5128, WATE.5130, WATE.9039.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Achuff et al. 2002a, Bourgeron and Engelking 1994, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Driscoll et al. 1984, Johnson and Simon 1987, Kagan et al. 2000, MTNHP 2002b, Ogilvie 1962, Pfister et al. 1977, Western Ecology Working Group n.d., Williams et al. 1990b, Williams et al. 1995

***Abies lasiocarpa* - *Picea engelmannii* / *Galium triflorum* Forest**

SUBALPINE FIR - ENGELMANN SPRUCE / SWEET-SCENT BEDSTRAW FOREST

IDENTIFIER: C EGL000311

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.d.)
Alliance	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> Forest Alliance (A.168)
Alliance (English name)	Subalpine Fir - Engelmann Spruce Forest Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Galium triflorum</i> Forest
Association (English name)	Subalpine Fir - Engelmann Spruce / Sweet-scent Bedstraw Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)

ELEMENT CONCEPT

GLOBAL SUMMARY: This forest association occurs in the upper montane and subalpine zone in the central and northern Rocky Mountains. Elevations range from 1060-2075 m (3477-6800 feet), but extend up to 2440 m in the southern and eastern part of its range. Sites are relatively warm with moist soil. Stands are typically found on northern slopes, valley bottoms and benches. In drier mountain ranges, stands are restricted to riparian zones. Upland aspects are typically northerly except where soil moisture is supplemented by seeps. Lowland aspects are variable. Substrates are typically finer textured soils such as silt loams or silts, but include loams and sandy loam. Soils are derived from a variety of parent materials. Litter dominates ground cover often 6 cm deep with low cover of rock and bare ground. Vegetation is characterized by *Abies lasiocarpa* and *Picea engelmannii* codominating the tree canopy with an understory that includes the presence of indicator species *Galium triflorum*, *Actaea rubra*, and *Streptopus amplexifolius*. The evergreen needle-leaved tree canopy is moderately dense to dense (over 55% cover) and is typically dominated by *Picea engelmannii* and mature seral tree species, with *Abies lasiocarpa* dominating the subcanopy and regeneration layers. Important seral species in the tree canopy are *Pseudotsuga menziesii*, *Larix occidentalis*, and *Pinus contorta*, however, their cover seldom exceeds 10-15%. Undergrowth is variable with shrub layers present or not, however, the characteristic herbaceous layer is typically lush and must have some of the above moist-site indicator species present in the stand. Other important understory moist-site indicator species are *Angelica arguta*, *Cornus sericea* (= *Cornus stolonifera*), *Moneses uniflora* (= *Pyrola uniflora*), *Saxifraga odontoloma* (= *Saxifraga arguta*), and *Senecio triangularis*. Other species with high constancy include *Amelanchier alnifolia*, *Arnica* spp., *Calamagrostis rubescens*, *Carex geyeri*, *Linnaea borealis*, *Mahonia repens*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Orthilia secunda* (= *Pyrola secunda*), *Ribes lacustre*, *Rubus parviflorus*, *Spiraea betulifolia*, *Symphoricarpos albus*, *Thalictrum occidentale*, *Vaccinium membranaceum*, and *Vaccinium scoparium*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Data from a single plot in Glacier National Park was used to describe this association. This forest association occurs on steep slopes with northwesterly aspects. Sites are relatively warm and moist, and usually lie on the lower portion of mountain slopes, just above valley floors. Elevation is approximately 1060 m (3477 feet). The association occupies a thin layer of rocky soil over glacial till or fluvial deposits. Soils are typically characterized as a sandy loam and are not well-developed. Ground cover is primarily litter, but may be up to 10% small rock, large rock and wood.

GLOBAL ENVIRONMENT: This forest association occurs in the mid-subalpine zone in the central and northern Rocky Mountains. Elevations range from 1060-2075 m (3477-6800 feet), but extends up to 2440 m (8000 feet) in the southern and eastern part of its range. Climate is continental. Sites are relatively warm with moist soil. Stands are typically found on northern slopes, valley bottoms and benches. In drier mountain ranges, stands are restricted to riparian zones. Upland aspects are typically northerly except where soil moisture is supplemented by seeps. Lowland aspects are variable. Substrates are typically finer textured soils such as silt loams or silts, but include loams and sandy loam. Soils are derived from a variety of parent materials including argillite, quartzite, gneiss, schist, basalt, andesite, rhyolite, granite and biotite granite, and calcareous and noncalcareous sedimentary rocks. Litter dominates ground cover often 6 cm deep with low cover of rock and bare ground.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The upper tree canopy in this forest association is typically composed of an open layer of seral tree species, such as *Pinus contorta* and *Larix occidentalis*, 10-15 m tall. The

subcanopy is dense, with canopy cover of approximately 80%, and is dominated by *Picea engelmannii*. *Abies lasiocarpa* is also present in the subcanopy. Subcanopy tree height ranges from 5-10 m. Tall and short shrubs contribute a total of 20% canopy cover. *Alnus viridis ssp. sinuata* and *Rubus parviflorus* are the dominant tall-shrub species, each with an average of 3% cover. *Spiraea betulifolia* is the most common short shrub, contributing 10-15% cover. Dwarf-shrubs are rare or absent in most stands. Total cover in the herbaceous layer is approximately 30% in this association. *Calamagrostis rubescens* is well-represented, with 10% cover. *Picea engelmannii*, *Abies lasiocarpa*, and *Betula papyrifera* seedlings were recorded as herbaceous species in sampled stands, with a combined cover of approximately 25%. Moist-site species, such as *Galium triflorum*, *Aralia nudicaulis* and *Cornus canadensis*, are typically present in trace amounts.

GLOBAL VEGETATION: This Rocky Mountain conifer association is characterized by *Abies lasiocarpa* and *Picea engelmannii* codominating the tree canopy with an understory that includes the presence of indicator species *Galium triflorum*, *Actaea rubra*, and *Streptopus amplexifolius*. The evergreen needle-leaved tree canopy is moderately dense to dense (over 55% cover) and is typically dominated by *Picea engelmannii* and mature seral tree species, with *Abies lasiocarpa* dominating the subcanopy and regeneration layers. Important seral species in the tree canopy are *Pseudotsuga menziesii*, *Larix occidentalis*, and *Pinus contorta*, however, their cover seldom exceeds 10-15%. Undergrowth is variable with shrub layers present or not, however, the characteristic herbaceous layer is typically lush and must have some of the above moist-site indicator species present in the stand. Other important understory moist-site indicator species are *Angelica arguta*, *Cornus sericea* (= *Cornus stolonifera*), *Moneses uniflora* (= *Pyrola uniflora*), *Saxifraga odontoloma* (= *Saxifraga arguta*), and *Senecio triangularis*. Other species with high constancy include *Amelanchier alnifolia*, *Arnica* spp., *Calamagrostis rubescens*, *Carex geyeri*, *Linnaea borealis*, *Mahonia repens*, *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Orthilia secunda* (= *Pyrola secunda*), *Ribes lacustre*, *Rubus parviflorus*, *Spiraea betulifolia*, *Symphoricarpos albus*, *Thalictrum occidentale*, *Vaccinium membranaceum*, and *Vaccinium scoparium*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Pinus contorta</i>
Tree subcanopy	Needle-leaved tree	<i>Picea engelmannii</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Betula papyrifera</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Picea engelmannii</i> , <i>Pinus contorta</i>
Tree subcanopy	Needle-leaved tree	<i>Abies lasiocarpa</i>
Herb (field)	Forb	<i>Thalictrum occidentale</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Actaea rubra*, *Galium triflorum*

GLOBAL: *Actaea rubra*, *Galium triflorum*, *Picea engelmannii*, *Streptopus amplexifolius*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association overlaps, not completely, *Abies lasiocarpa*/*Galium triflorum* Habitat Type of Pfister et al. (1977), and Hansen et al. (1995). Comparison to other moist-site *Abies lasiocarpa* forest associations is needed to clarify its concept and range. In particular, it is ecologically and compositionally nearly identical with *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Forest (CEGL000336). It has been recommended that these two associations be merged into one (S. Cooper pers. comm.).

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Actaea rubra* Forest (CEGL000295)
- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005893)--similar but limited to maritime climate-influenced uplands (Pfister et al. 1977).
- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Streptopus amplexifolius* Woodland (CEGL005897)
- *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Forest (CEGL000336)
- *Picea engelmannii* / *Galium triflorum* Forest (CEGL002174)
- *Pinus contorta* / *Heracleum maximum* Woodland (CEGL005915)
- *Pseudotsuga menziesii* / *Heracleum maximum* Forest (CEGL005853)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Galium triflorum* Habitat Type (Pfister et al. 1977) B
- *Abies lasiocarpa* / *Galium triflorum* Habitat Type (Hansen et al. 1995) B
- *Abies lasiocarpa*/ *Galium triflorum* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is rare in Glacier National Park and has not been documented in Waterton Lakes National Park. In Glacier National Park the association has been recorded on the lower slopes of Huckleberry Mountain, west of the Continental Divide.

GLOBAL RANGE: This forest association occurs in the subalpine zone in central and western Montana within the central and northern Rocky Mountains.

NATIONS: US

STATES/PROVINCES: MT:S4

USFS ECOREGIONS: M331A:CC, M331D:C?, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2011.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Cooper pers. comm., Driscoll et al. 1984, Hansen et al. 1995, MTNHP 2002b, Pfister et al. 1977, Western Ecology Working Group n.d.

***Abies lasiocarpa* - *Picea engelmannii* / *Linnaea borealis* Forest**

SUBALPINE FIR - ENGELMANN SPRUCE / AMERICAN TWINFLOWER FOREST

IDENTIFIER: CEGL000315

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.d.)
Alliance	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> Forest Alliance (A.168)
Alliance (English name)	Subalpine Fir - Engelmann Spruce Forest Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Linnaea borealis</i> Forest
Association (English name)	Subalpine Fir - Engelmann Spruce / American Twinflower Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)

ELEMENT CONCEPT

GLOBAL SUMMARY: This widespread forest association occurs in the subalpine zone in the central and northern Rocky Mountains. Elevations are 1145-2135 m (3750-7000 feet) throughout most of the range. Sites are relatively cool and moist, occurring on all aspects, but are typically found on northern slopes (especially mid to lowslopes), valley bottoms and benches. Soils are typically medium- to fine-textured and are derived from a variety of parent materials. Litter dominates ground surface often 3 cm deep with low cover of bare soil and rock (except boulders). The vegetation is characterized by *Abies lasiocarpa* and *Picea engelmannii* codominating the tree canopy with *Linnaea borealis* present to dominant in the dwarf-shrub layer and *Vaccinium scoparium* and *Xerophyllum tenax* with less than 5% cover. The evergreen needle-leaved tree canopy is moderately dense to dense (over 55% cover) and is typically dominated by *Picea engelmannii* and mature seral tree species, with *Abies lasiocarpa* dominating the subcanopy and regeneration layers. Important seral species in the tree canopy are *Pseudotsuga menziesii*, *Larix occidentalis*, and *Pinus contorta*. Undergrowth is variable; however, an open to dense dwarf-shrub layer is present and usually dominated or codominated by *Linnaea borealis*. Consistent shrubs and dwarf-shrubs include *Amelanchier alnifolia*, *Mahonia repens*, *Ribes lacustre*, *Rosa* spp., *Rubus parviflorus*, *Shepherdia canadensis*, *Spiraea betulifolia*, *Vaccinium membranaceum* and *Vaccinium scoparium*. The sparse to moderate herbaceous layer is a mixture of graminoids and forbs such as *Actaea rubra*, *Arnica* spp., *Calamagrostis rubescens*, *Carex geyeri*, *Carex rossii*, *Galium* spp., *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Orthilia secunda* (= *Pyrola secunda*), and *Thalictrum occidentale*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Data from only 2 plots were used to describe this forest association: one stand in Glacier National Park and one in Waterton Lakes National Park. The association lies on steep mountain slopes with northerly aspects and on flat valley floors. Elevation ranged from 1145-1710 m (3756-5609 feet). Stands on steep slopes develop over colluvial deposits, while those on valley floors typically overlie glacial till. Soils are well-drained to moderately well-drained loam. Ground cover is primarily litter. Wood may account for up to 30% surface cover in stands with heavy downfall.

GLOBAL ENVIRONMENT: This widespread forest association occurs in the subalpine zone in the central and northern Rocky Mountains. Elevations are 1145-2600 m (3750-7000 feet) throughout most of the range, but extend up to 2135-2600 m (7000-8500 feet) in the southern extent. Sites are relatively cool and moist, occurring on all aspects, but typically are found on northern slopes (especially mid to lowslopes), valley bottoms and benches. Soils are typically medium- to fine-textured. Soils are derived from a variety of parent materials such as mixed colluvium, glacial till argillite, quartzite, gneiss, schist, basalt, andesite, granite and biotite granite, and calcareous and noncalcareous sedimentary rocks (sandstone). Litter dominates ground surface often 3 cm deep with low cover of bare ground and rock (except boulders).

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The tree canopy of this forest association is variable, ranging from 40-70%. The most dominant tall tree species is *Picea engelmannii*, with an average of 35% canopy cover. *Pseudotsuga menziesii* is also present in most stands, with cover of less than 10%. The subcanopy is sparse (less than 5% cover) and is made up of a mixture of *Picea engelmannii*, *Pseudotsuga menziesii*, and *Abies lasiocarpa*. Shrub cover is also sparse in this association. The dwarf-shrub *Linnaea borealis* was present in all sampled stands, with cover ranging from 3-10%. *Amelanchier alnifolia*, *Spiraea betulifolia*, *Symphoricarpos albus*, and *Mahonia repens* may also be present. Total herbaceous cover is variable, from 10 to 90%. *Thalictrum occidentale* is the only herb with 100% constancy and greater than 5% average cover. Forbs with 100% constancy include *Maianthemum racemosum*, *Galium boreale*, *Eurybia conspicua* (= *Aster conspicuus*), and *Fragaria virginiana*. *Bromus vulgaris* was also documented in all sampled plots.

GLOBAL VEGETATION: This Rocky Mountain conifer association is characterized by *Abies lasiocarpa* and *Picea engelmannii* codominating the tree canopy with *Linnaea borealis* present to dominant in the dwarf-shrub layer and *Vaccinium scoparium* and *Xerophyllum tenax* with less than 5% cover. The evergreen needle-leaved tree canopy is moderately dense to dense (over 55% cover) and is typically dominated by *Picea engelmannii* and mature seral tree species, with *Abies lasiocarpa* dominating the subcanopy and regeneration layers. Important seral species in the tree canopy are *Pseudotsuga menziesii*, *Larix occidentalis*, and *Pinus contorta*. Undergrowth is variable; however, an open to dense dwarf-shrub layer is present and usually dominated or codominated by *Linnaea borealis*. Consistent shrubs and dwarf-shrubs include *Amelanchier alnifolia*, *Mahonia repens*, *Ribes lacustre*, *Rosa* spp., *Rubus parviflorus*, *Shepherdia canadensis*, *Spiraea betulifolia*, *Vaccinium membranaceum* and *Vaccinium scoparium*. The sparse to moderate herbaceous layer is a mixture of graminoids and forbs such as *Actaea rubra*, *Arnica* spp., *Calamagrostis rubescens*, *Carex geyeri*, *Carex rossii*, *Galium* spp., *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Orthilia secunda* (= *Pyrola secunda*), and *Thalictrum occidentale*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

Stratum

Tree canopy
Herb (field)
Herb (field)

Lifeform

Needle-leaved tree
Dwarf-shrub
Forb

Species

Picea engelmannii
Linnaea borealis
Thalictrum occidentale

Global

Stratum

Tree canopy
Herb (field)
Herb (field)

Lifeform

Needle-leaved tree
Dwarf-shrub
Forb

Species

Picea engelmannii
Linnaea borealis
Thalictrum occidentale

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Linnaea borealis*, *Maianthemum racemosum*, *Picea engelmannii*

GLOBAL: *Abies lasiocarpa*, *Linnaea borealis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Picea engelmannii* / *Linnaea borealis* Forest (CEGL002689)
- *Pinus contorta* / *Linnaea borealis* Forest (CEGL000153)
- *Pseudotsuga menziesii* / *Linnaea borealis* Forest (CEGL000441)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Linnaea borealis* Habitat Type (Johnston 1987) B
- *Abies lasiocarpa* / *Linnaea borealis* Habitat Type (Cooper 1975) B
- *Abies lasiocarpa* / *Linnaea borealis* Habitat Type, *Linnaea borealis* Phase (Steele et al. 1983) B
- *Abies lasiocarpa* / *Linnaea borealis* Habitat Type, *Linnaea borealis* Phase (Steele et al. 1981) B
- *Abies lasiocarpa* / *Linnaea borealis* Habitat Type, *Linnaea borealis* Phase (Pfister et al. 1977) B
- *Abies lasiocarpa* / *Linnaea borealis* Plant Association (Johnson and Clausnitzer 1992) =
- *Abies lasiocarpa* / *Linnaea borealis* Plant Association (Johnson and Simon 1987) =
- *Abies lasiocarpa* / *Linnaea borealis* var. *longiflora* Plant Association (Williams et al. 1990b) =
- *Abies lasiocarpa* / *Linnaea borealis* var. *longiflora* Plant Association (Williams and Lillybridge 1983) =
- *Abies lasiocarpa*/ *Linnaea borealis* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is relatively uncommon in the IPP. It has been documented near the valley floor in the North Fork Flathead River valley of Glacier National Park, and on a steep mountain slope in Waterton Lakes National Park.

GLOBAL RANGE: This is a widespread subalpine forest association that occurs in the central and northern Rocky Mountains from north-central Wyoming west to Oregon and north into Canada.

NATIONS: CA, US

STATES/PROVINCES: AB, ID:S5, MT:S5, OR:S4, UT?, WA:S4, WY:S4

USFS ECOREGIONS: M242C:CC, M331A:CC, M331D:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes); USFS (Shoshone, Wallowa-Whitman, Wenatchee)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2520, WATE.4055.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Cooper 1975, Driscoll et al. 1984, Henderson et al. 1985, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Johnston 1987, Jones and Ogle 2000, Kagan et al. 2000, MTNHP 2002b, Pfister et al. 1977, Steele et al. 1981, Steele et al. 1983, WNHP unpubl. data, Western Ecology Working Group n.d., Williams and Lillybridge 1983, Williams and Lillybridge 1985, Williams and Smith 1990, Williams et al. 1990b

***Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* - *Vaccinium scoparium* Forest SUBALPINE FIR - ENGELMANN SPRUCE / FOOL'S-HUCKLEBERRY - GROUSEBERRY FOREST**

IDENTIFIER: CEG005894

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.d.)
Alliance	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> Forest Alliance (A.168)
Alliance (English name)	Subalpine Fir - Engelmann Spruce Forest Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Menziesia ferruginea</i> - <i>Vaccinium scoparium</i> Forest
Association (English name)	Subalpine Fir - Engelmann Spruce / Fool's-huckleberry - Grouseberry Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is found from central Idaho (middle Rocky Mountains) and extreme northwestern Oregon's Blue Mountains northward to northern Idaho, northwestern Montana, British Columbia and southwestern Alberta (northern Rocky Mountains and Canadian Rockies). It is generally characterized as occurring at the highest elevations of mesic forests, which is roughly from 1830 to 2200 m (6000-7200 feet). Though sites are relatively mesic, located predominantly on moderate to steep north- to east-facing slopes that may receive greater amounts of moisture due to blow-over, they are also stressful due to the frequency of high winds and cold temperatures. It is hypothesized that these sites receive less snowload and/or experience a later melt-off date than those supporting *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Luzula glabrata* var. *hitchcockii* Woodland (CEGL005896) and occupy colder microenvironments than does *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Xerophyllum tenax* Forest (CEGL005895). Parent materials are various, comprised of colluvium (of sedimentary and intrusive igneous nature) and ash cap to Lithosols comprised of both calcareous and noncalcareous sedimentary rock. This open forest type is *Abies lasiocarpa*- and *Picea engelmannii*-dominated from the time of earliest post-shrub stage of succession. *Pinus contorta* and *Pinus albicaulis* are the only seral species of note. Tree height is usually less than 60 feet. The undergrowth is comparatively species-poor, but its cover, between the tall-shrub layer of *Menziesia ferruginea*, *Alnus viridis* ssp. *sinuata*, and *Sorbus scopulina*, and short/dwarf-shrub layer of *Vaccinium membranaceum*, *Vaccinium scoparium*, and *Vaccinium myrtillus*, is virtually continuous. The species-depauperate forb layer is almost invariably dominated by *Xerophyllum tenax* with *Arnica cordifolia*, *Arnica latifolia*, *Goodyera oblongifolia*, and various *Pedicularis* species having the highest constancy.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: The data used to define this association are based on a single plot located in Waterton Lakes National Park. The association occurs high on steep, northwest-facing slopes at approximately 2140 m (7019 feet) elevation. Parent material is derived from calcareous or noncalcareous sedimentary formations. Soil

is a well-drained loam and is shallow with a significant amount of small rock and gravel. Ground cover is primarily litter. Wood and small rock each contribute 5-10% surface cover.

GLOBAL ENVIRONMENT: This association is found from central Idaho (middle Rocky Mountains) and extreme northwestern Oregon's Blue Mountains northward to northern Idaho, northwestern Montana, British Columbia and southwestern Alberta (northern Rocky Mountains and Canadian Rockies). It has been reliably documented as far north as Banff and Jasper national parks, Alberta (Ogilvie 1962, Holland and Coen 1982), and Glacier and Mount Revelstoke national parks, British Columbia (Achuff et al. 1984b). This association is generally characterized as occurring at the highest elevations of mesic forests, which is roughly from 1830 to 2260 m (6000-7400 feet). Site moisture regimes are predominantly mesic ranging to subhygric reflecting their locations on predominantly moderate to steep north- to east-facing slopes that may receive greater amounts of moisture due to blow-over; sites are stressed due to the frequency of high winds on these upper slopes and slope shoulders. It is hypothesized these sites receive less snowload and/or experience a later melt-off date than those supporting *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Luzula glabrata* var. *hitchcockii* Woodland (CEGL005896) and occupy colder microenvironments than does *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Xerophyllum tenax* Forest (CEGL005895). In the more northern portion of its distribution, the higher elevations therein, it may even occur on west-facing slopes. Parent materials are various, from primarily composed of colluvium and ash caps to Lithosols comprised of both calcareous and noncalcareous sedimentary rock. In the Canadian portion of its distribution it is found on strongly podzolized soils of glacial till and drift.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Tree canopy cover is characteristically open in this forest association, with 40% cover in a layer 10-15 m tall. *Abies lasiocarpa* and *Picea engelmannii* are the dominant tree species in both the upper and subcanopies. Cover for each species is typically 15%. *Pinus albicaulis* may also be present in small amounts. Tall and short shrubs are scarce, with an overall cover of only 5%, dominated by *Menziesia ferruginea*. The dwarf-shrub *Vaccinium myrtillus* is the most abundant shrub species, with approximately 35% cover. *Vaccinium scoparium* may also be present with relatively high cover. Herbaceous cover is quite high (approximately 80%) and is not diverse with less than 20 herbaceous species present. The most abundant species include *Arnica latifolia*, *Valeriana sitchensis*, *Pedicularis bracteosa*, and, to a less extent, *Erigeron peregrinus*.

GLOBAL VEGETATION: This open forest type is *Abies lasiocarpa*- and *Picea engelmannii*-dominated following an early shrub-dominated stage of succession. *Pinus contorta* and *Pinus albicaulis* are the only seral species of note. Potential tree height is usually in the 60- to 80-foot range. The undergrowth is comparatively species-poor, but its cover, between the tall-shrub layer of *Menziesia ferruginea*, *Alnus viridis* ssp. *sinuata*, and *Sorbus scopulina*, and short/dwarf-shrub layer of *Vaccinium membranaceum*, *Vaccinium scoparium*, and *Vaccinium myrtillus*, can be virtually continuous; note that while the potential height of the above-named tall species is greater than 6 feet (tall shrubs) in this somewhat extreme environment they often do not attain that height. The species-depauperate forb layer is almost invariably dominated by *Xerophyllum tenax* with *Arnica cordifolia*, *Arnica latifolia*, *Goodyera oblongifolia*, and various *Pedicularis* species having the highest constancy. Local distinctions in the forb layer produce high constancy for *Moehringia macrophylla* (= *Arenaria macrophylla*), *Anemone piperi*, *Orthilia secunda* (= *Pyrola secunda*), and *Viola orbiculata*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Menziesia ferruginea</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium myrtillus</i> , <i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Arnica latifolia</i> , <i>Valeriana sitchensis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Alnus viridis</i> ssp. <i>sinuata</i> , <i>Menziesia ferruginea</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Lonicera utahensis</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium myrtillus</i> , <i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Arnica latifolia</i> , <i>Xerophyllum tenax</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Alnus viridis* ssp. *sinuata*, *Menziesia ferruginea*, *Picea engelmannii*, *Vaccinium myrtillus*

GLOBAL: *Abies lasiocarpa*, *Alnus viridis* ssp. *sinuata*, *Menziesia ferruginea*, *Picea engelmannii*, *Vaccinium myrtillus*, *Vaccinium scoparium*

OTHER NOTEWORTHY SPECIES**WATERTON-GLACIER INTERNATIONAL PEACE PARK:****GLOBAL:****CONSERVATION STATUS RANK****GLOBAL RANK & REASONS:** G2G4 (10-Feb-2004).**CLASSIFICATION****STATUS:** Standard**CLASSIFICATION CONFIDENCE:** 2 - Moderate**WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:**

GLOBAL COMMENTS: This association was previously known as, and included most of the stands (excluding a couple where *Pinus contorta* dominated) assigned to, the *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type, *Vaccinium scoparium* Phase of Cooper et al.'s (1987) classification for northern Idaho. It represents the coldest environments where *Menziesia ferruginea* is capable of dominating the tall-shrub layer; environments somewhat more moderate lack or have *Vaccinium scoparium* and *Vaccinium myrtillus* with highly reduced cover and environments with greater and/or longer persisting snowpack have appreciable amounts of *Luzula glabrata*. To the northwest, approaching the Colville National Forest of Washington, this type grades to the *Abies lasiocarpa* / *Rhododendron albiflorum* Association of Williams et al. (1995); northwestern Montana and northern Idaho have sporadic representations of *Rhododendron albiflorum* often associated with the plant association under discussion. This type is also very close to the *Abies lasiocarpa* / *Rhododendron albiflorum* Association of the east slope of Washington's Cascade Range (Lillybridge et al. 1995), which has no *Menziesia* present. If one accepts that *Menziesia glabella* has been unequivocally synonymized with *Menziesia ferruginea* (or is at least an ecological analogue), then this type would extend northward at least as far as Banff and Jasper national parks in Alberta (as *Picea engelmannii* - *Pinus albicaulis* / *Menziesia ferruginea* [= *M. glabella*] (Holland and Coen 1982); *Picea engelmannii* - *Picea* hybrid - *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type (Ogilvie 1962)). It should be noted that the northernmost extent of the type includes some floristic differences, such as *Lycopodium annotinum*, *Cornus canadensis*, and *Rhododendron albiflorum*.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* Forest (CEGL000319)
- *Abies lasiocarpa* / *Rhododendron albiflorum* Woodland (CEGL000330)
- *Tsuga mertensiana* / *Menziesia ferruginea* Forest (CEGL000506)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type (Pfister et al. 1977) I
- *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type (Steele et al. 1981) I
- *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type, *Vaccinium scoparium* Phase (Cooper et al. 1987) I
- *Abies lasiocarpa* / *Rhododendron albiflorum* Plant Association (Williams et al. 1995) I
- *Picea engelmannii* - *Abies lasiocarpa* / *Menziesia ferruginea* / *Vaccinium membranaceum* - *Xerophyllum tenax* Vegetation Type (Achuff et al. 2002a) I
- *Picea engelmannii* - *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type (Ogilvie 1962) I
- *Picea engelmannii* - *Abies lasiocarpa* / *Menziesia glabella* (= *M. ferruginea*) / *Vaccinium scoparium* Vegetation Type (Achuff et al. 1984a) I
- *Picea engelmannii* - *Abies lasiocarpa* / *Menziesia glabella* (= *M. ferruginea*) / *Vaccinium scoparium* Vegetation Type (Achuff et al. 1984b) I
- *Picea engelmannii* - *Pinus albicaulis* / *Menziesia glabella* Vegetation Type (Holland and Coen 1982) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is not known from Glacier National Park and is uncommon in Waterton Lakes National Park. It is known from only one location, in Waterton Lakes National Park.

GLOBAL RANGE: This association is sporadically distributed in central Idaho and southwestern to west-central Alberta with the core of its range apparently being northern Idaho and western Montana.

NATIONS: CA, US**STATES/PROVINCES:** AB, BC, ID, MT, OR?, WA?**USFS ECOREGIONS:** M242C:??, M332A:CC, M332B:CC, M332G:C?, M333A:CC, M333B:CC, M333C:CC, M333D:CC**FEDERAL LANDS:** NPS (Glacier?); PC (Banff, Jasper, Mount Revelstoke, Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.5053.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Achuff et al. 1984a, Achuff et al. 1984b, Achuff et al. 2002a, Bourgeron and Engelking 1994, Cooper et al. 1987, Holland and Coen 1982, Lillybridge et al. 1995, Ogilvie 1962, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d., Williams et al. 1995

***Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest
SUBALPINE FIR - ENGELMANN SPRUCE / FOOL'S-HUCKLEBERRY / BRIDE'S BONNET
FOREST**

IDENTIFIER: CEGL005893

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.d.)
Alliance	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> Forest Alliance (A.168)
Alliance (English name)	Subalpine Fir - Engelmann Spruce Forest Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Menziesia ferruginea</i> / <i>Clintonia uniflora</i> Forest
Association (English name)	Subalpine Fir - Engelmann Spruce / Fool's-huckleberry / Bride's Bonnet Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is a broadly distributed association strongly associated with Pacific maritime climatic regime which penetrates with ever diminishing influence just east of the Continental Divide in the northern Rocky Mountains. It is well-documented from north-central Idaho and western Montana northwards into neighboring provinces of Alberta and British Columbia. This is a type of lower to mid-elevation subalpine environments with a relatively narrow elevation range in any given locality and an overall range of 1280 to 1770 m. It is characteristic of cool, moist exposures, typically occupying moderate to steep slopes with north- and east-facing slope aspects. Soils are derived from a variety of noncalcareous and calcareous sedimentary rock, as well as metamorphic types (including quartzites, mica schists), volcanics (both intrusive and extrusive, including granitics and basalts), and glacial till and drift. Surface horizon soil textures are predominantly silt loams and loams. In northern Idaho and western Montana an ash cap of variable depth (1-24 inches) increases the moisture-holding capacity and nutrient content of these soils. The overstory is dominated by a variable combination of *Abies lasiocarpa* and *Picea engelmannii*; total tree canopy cover is generally in the range of 50 to 80%. This association represents predominantly mature to old-growth conditions, but seral species can be present, in declining order of importance, *Pinus contorta*, *Pseudotsuga menziesii*, *Larix occidentalis*, *Pinus monticola*, and *Pinus albicaulis*. The undergrowth generally has a lush aspect with a tall to mid-sized shrub layer dominated by *Menziesia ferruginea*, *Vaccinium membranaceum*, *Alnus viridis* ssp. *sinuata*, *Sorbus* spp., *Lonicera utahensis*, and *Ribes lacustre*. *Vaccinium scoparium* (or *Vaccinium myrtillus*) and *Linnaea borealis* are the predominant dwarf-shrubs. Graminoids are scarce with only *Bromus vulgaris* and *Bromus ciliatus* being present with any constancy at all. The forb component is virtually always dominated by one, or a combination of, the following three species: *Xerophyllum tenax*, *Arnica latifolia* (or *Arnica cordifolia*), or *Thalictrum occidentale*. However, the type is recognized by the presence of either *Clintonia uniflora* or *Tiarella trifoliata*, which have much more restricted environmental ranges (mesic to hygric moisture regimes) than the above-named forb dominants; their cover seldom exceeds 10%. Other forbs consistently present with low coverages include *Veratrum viride*, *Heracleum maximum*, *Galium triflorum*, and *Senecio triangularis*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Slopes supporting this forest association are cool and moist with a moderate to somewhat steep grade. The association occurs most often at mid to low slope, and occasionally occupies gentle toeslopes, stream terraces and flat, valley bottomlands. Aspect is highly variable, and elevation ranges from 1270-1920 m (4165-6303 feet). Soils are derived from noncalcareous and calcareous sedimentary material. Evidence of sedimentary

siltstone, limestone and dolomite has been found in soils that support these stands. The association may also develop on glacial deposits, in the form of till, fluvial or lacustrine deposits. Soils vary from silt loam to clay loam and are moderately well-drained to well-drained. Some stands have been documented on loamy sand. Soil depth may be shallow in areas where there is little soil development. Other sites may have deep, well-developed soil with a significant amount of organic material. Ground cover is usually at least 75% litter and up to 20% wood. Small rock and moss each typically contribute around 5% cover.

GLOBAL ENVIRONMENT: This is a broadly distributed association strongly associated with Pacific maritime influences which penetrate with ever diminishing influence as far east as just east of the Continental Divide in Glacier-Waterton International Peace Park and the Lewis and Clark National Forest to the south. This is a type of lower to mid-elevation subalpine environments cited from a relatively narrow elevation range, 1555 to 1675 m (5100-5500 feet) in central Idaho (Steele et al. 1981), 1400 to 1800 m (4600-5900 feet) in northern Idaho (Cooper et al. 1987), and 1370 to 1740 m (4500-5700 feet) in western Montana (Pfister et al. 1977). A more intensive inventory of Glacier-Waterton International Peace Park has demonstrated a slightly broader elevation range, 1280 to 1920 m (4200-5800 (6300) feet). It is characteristic of cool, moist exposures, typically occupying moderate to steep slopes with northerly and easterly aspects. It is associated with collecting positions, from midslopes downward to toeslopes and even benches where cold air ponds. Again, an intensive sampling of Glacier-Waterton shows it to occur across a broader environmental spectrum than hitherto had been appreciated. Factor compensation is nicely exemplified in the Glacier-Waterton data with stands occurring on southerly exposures but only at the highest elevations of the type. Soils are derived from a variety of noncalcareous and calcareous sedimentary, metamorphic (including quartzites, mica schists), volcanics (including granitics and basalts), and glacial till and drift. In Montana in the vicinity of the Continental Divide, it has been demonstrated that the type occurs about 90 to 150 m (300-500 feet) higher on calcareous substrates in contrast to all varieties of noncalcareous substrates. Surface horizon soil textures are predominantly silt loams and loams. In northern Idaho and western Montana an ash cap of variable depth (1-24 inches) increases the moisture-holding capacity and nutrient content of these soils.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Vegetation structure and composition are highly variable within this association. Stands may have a dense upper tree canopy, approaching 80% cover, or an open, woodland-like canopy, with cover under 10%. These two examples are at the extreme ends of a broad range of well-represented gradations. Average tree height of the upper canopy typically falls between 10-35 m with canopy cover of 30-60%. *Abies lasiocarpa* and *Picea engelmannii* usually dominate this layer, but seral species such as *Pinus contorta* and *Larix occidentalis* may be well-represented (10-20% cover). Total tree subcanopy cover ranges from 5-40% and is also dominated by *Abies lasiocarpa* and *Picea engelmannii* in a layer less than 20 m high. Total shrub cover is relatively inconsistent between stands in this association. Tall-shrub cover may be as low as 10% in some stands and approach 90% in others. The tall-shrub layer is 1-5 m tall, dominated by *Menziesia ferruginea*. Other well-represented species include *Sorbus scopulina*, *Rubus parviflorus*, and *Alnus viridis ssp. sinuata*. Short shrubs (0.5-1 m tall) typically contribute 30-70% canopy cover. The most common species, *Vaccinium membranaceum*, had 100% constancy in sampled stands, with an average cover of approximately 60%. Dwarf-shrubs are usually absent in this association, but are occasionally present with up to 30% canopy cover. When present, common dwarf-shrub species include *Vaccinium myrtilus*, *Vaccinium scoparium*, and *Paxistima myrsinites*. Herbaceous cover is also extremely variable. Most sampled stands reported herbaceous cover of 30-100%. Lower herbaceous cover was not uncommon. Species with high constancy (at least 84%) included *Xerophyllum tenax*, *Arnica cordifolia*, *Tiarella trifoliata*, and *Clintonia uniflora*. Of these four species only *Xerophyllum tenax* and *Arnica cordifolia* were well-represented, with average cover of 16% and 32%, respectively. *Orthilia secunda*, *Thalictrum occidentale*, *Viola orbiculata*, and *Chimaphila umbellata* are also common in this association, though cover of each of these species is usually less than 5%.

GLOBAL VEGETATION: The overstory is dominated by a variable combination of *Abies lasiocarpa* and *Picea engelmannii*, though in exceptional cases either may be wanting; total tree canopy cover is generally in the range of 50 to 80%. Most of the plots from which this type has been defined represent mature to old-growth conditions; though younger stands will key here, they are not well-represented on the landscape due to the fact that this type is distinctive in that both *Abies lasiocarpa* and *Picea engelmannii* establish readily only shortly after disturbance events. Other seral tree species are, in declining order of importance, *Pinus contorta*, *Pseudotsuga menziesii*, *Larix occidentalis*, *Pinus monticola*, and *Pinus albicaulis*. Sites are apparently beyond the cold limits of *Pinus ponderosa*. The undergrowth generally has a lush aspect with a tall to mid-sized shrub layer dominated by *Menziesia ferruginea*, *Vaccinium membranaceum*, *Alnus viridis ssp. sinuata*, *Sorbus* spp., *Lonicera utahensis*, and *Ribes lacustre*. *Vaccinium scoparium* (or *Vaccinium myrtilus*) and *Linnaea borealis* are the only dwarf-shrubs present with greater than 20% constancy. *Menziesia ferruginea* has by far the greatest cover with some stands in the very moderate environments of northern Idaho having cover approaching 100% and heights over 8 feet; this condition contrasts with this type at its cold dry limits on the east slope of the Rocky Mountains where *Menziesia ferruginea* height potential is in the 3- to 4-foot range and cover is often not much greater than 10%. Graminoids are scarce with only *Bromus vulgaris* and *Bromus ciliatus* being present with any constancy at all. The forb component is virtually always dominated by one or a combination of the following three: *Xerophyllum tenax*, *Arnica latifolia* (or *Arnica cordifolia*), or *Thalictrum occidentale*, which are at least 80% constant and have coverages often exceeding 20%. However the type is recognized by the presence of either *Clintonia uniflora* or *Tiarella trifoliata*, which have much more restricted environmental ranges (mesic to hygic moisture regimes) than the above-named forb dominants; their cover seldom exceeds 10%. The consistent presence of other forbs affirms the type's mesic to hygic nature and includes *Veratrum viride*, *Heracleum maximum*, *Galium triflorum*, and *Senecio*

triangularis; were they plentiful a yet wetter community would be recognized. In more localized landscapes the following forbs are highly constant, *Anemone piperi*, *Orthilia secunda* (= *Pyrola secunda*), *Viola orbiculata*, *Goodyera oblongifolia*, and *Trillium ovatum*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Menziesia ferruginea</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Vaccinium membranaceum</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Xerophyllum tenax</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Alnus viridis</i> ssp. <i>sinuata</i> , <i>Menziesia ferruginea</i> , <i>Sorbus scopulina</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Ribes lacustre</i> , <i>Rubus parviflorus</i> , <i>Vaccinium membranaceum</i>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Paxistima myrsinites</i>
Herb (field)	Dwarf-shrub	<i>Linnaea borealis</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Goodyera oblongifolia</i> , <i>Thalictrum occidentale</i> , <i>Viola orbiculata</i> , <i>Xerophyllum tenax</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Alnus viridis* ssp. *sinuata*, *Clintonia uniflora*, *Menziesia ferruginea*, *Tiarella trifoliata*

GLOBAL: *Abies lasiocarpa*, *Clintonia uniflora*, *Menziesia ferruginea*, *Picea engelmannii*, *Tiarella trifoliata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4G5 (10-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: The presence of a tall-shrub layer dominated by *Menziesia ferruginea* makes this association quite recognizable, and easily distinguished from the similar and landscape-coupled *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Forest (CEGL005912) and *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005892). This type is the result of elevating to association status what was a well-documented phase within the habitat type system (*Abies lasiocarpa* / *Clintonia uniflora* - *Menziesia ferruginea*). There is abundant documentation that it defines a unique environment and has a characteristic composition. The name was slightly modified to reflect the composition of the tree canopy, which in fact, on average, has greater cover of *Picea engelmannii* than *Abies lasiocarpa*. This association is expected to occur in Washington and Oregon because *Abies lasiocarpa* / *Clintonia uniflora* and *Abies lasiocarpa* / *Menziesia ferruginea* associations are listed for both states; where these indicator species co-occur there is usually a distributional overlap, thus defining a unique environment.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Alnus viridis* ssp. *sinuata* Forest (CEGL000297)
- *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Forest (CEGL005912)
- *Abies lasiocarpa* - *Picea engelmannii* / *Galium triflorum* Forest (CEGL000311)
- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* Forest (CEGL000319)
- *Pinus contorta* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005922)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Menziesia ferruginea* Phase (Pfister et al. 1977) =
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Menziesia ferruginea* Phase (Cooper et al. 1987) =

- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Menziesia ferruginea* Phase (Steele et al. 1981) =
- *Picea engelmannii* - *Abies lasiocarpa* - (*Pinus contorta*) / *Menziesia ferruginea* / *Arnica cordifolia* - *Rubus parviflorus* Vegetation Type (Achuff et al. 2002a) I
- *Picea engelmannii* - *Abies lasiocarpa* / *Menziesia ferruginea* - *Tiarella unifoliata* Habitat Type (Ogilvie 1962) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is common throughout the IPP on cool, moist slopes. In Glacier National Park it has been documented west of the Continental Divide in the Trout Lake and Quartz Lake areas. East of the Divide, stands were sampled in the Waterton, Two Medicine and Many Glacier drainages.

GLOBAL RANGE: This is a broadly distributed association strongly associated with Pacific maritime influences in the northern Rocky Mountains of northern Idaho, western Montana, and southwestern Alberta with a minor presence southward into the ranges of central Idaho. This association is expected to occur in British Columbia, Washington, and Oregon based on the existence of appropriate habitat and distributional range of the defining species.

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT, OR?, WA?

USFS ECOREGIONS: M332A:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes); USFS (Lewis and Clark)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.18, GLAC.2040, GLAC.226, GLAC.256, GLAC.275, GLAC.294, GLAC.323, GLAC.84, GLAC.2612, GLAC.2615, WATE.4020, WATE.4064, WATE.4088, WATE.4107, WATE.4108, WATE.5046, WATE.5117, WATE.5121, WATE.5127.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Achuff et al. 2002a, Cooper et al. 1987, Ogilvie 1962, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d., Williams et al. 1995

***Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Xerophyllum tenax* Forest SUBALPINE FIR - ENGELMANN SPRUCE / FOOL'S-HUCKLEBERRY / BEAR-GRASS FOREST**

IDENTIFIER: C EGL005895

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.d.)
Alliance	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> Forest Alliance (A.168)
Alliance (English name)	Subalpine Fir - Engelmann Spruce Forest Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Menziesia ferruginea</i> / <i>Xerophyllum tenax</i> Forest
Association (English name)	Subalpine Fir - Engelmann Spruce / Fool's-huckleberry / Bear-grass Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association occurs throughout the middle to northern Rocky Mountains and on into the Canadian Rockies as a small- to large-patch type from mid to upper subalpine habitats. In the southerly portions of its distribution, the Wallowa and Seven Devils mountains and Idaho Batholith, it faithfully occupies moderate to steep slopes of northerly aspects at elevations ranging from 5600 to 7500 feet, but dropping to 4500 feet where frost pocket conditions obtain. Further to the north it also occurs predominantly on northerly exposures, but at higher elevations in wetter climates, it may be found on southerly exposures. It can occur on a given slope from the toe, up the backslope to the slope shoulder, and in wetter climates is found on ridgetops as well. It is perhaps most widely distributed in western Montana where individual stands may comprise hundreds to thousands of acres. It exhibits no

particular substrate preferences being found on granitics, fine-grained sedimentaries (including argillite and limestone), metasediments, and mica-schist; volcanic ash caps of varying depths (to 50 cm thickness) are very prevalent in the southern and western portions. The predominant soil texture is silt loam, and soils are uniformly well-drained. Rock content of surface horizons ranges from about 15% to over 50%. This is a closed forest type for the most part with total upper canopy cover ranging upward from 60%. A variable mix of *Abies lasiocarpa* and *Picea engelmannii* dominates the canopy as well as the regeneration layers. Seral tree species do poorly on these sites; *Pinus contorta*, *Pseudotsuga menziesii*, and *Larix occidentalis* are the only tree species consistently present and seldom is their canopy cover as great as 20%. The modal condition for the undergrowth varies with geographic region. *Menziesia ferruginea* consistently dominates the tall-shrub layer, which may also have *Alnus viridis ssp. sinuata* as a conspicuous component. In all parts of the type's range *Vaccinium membranaceum* is the mid (short) shrub dominant with coverages generally upwards of 30%; it is usually accompanied by low cover of *Ribes lacustre* and the somewhat shorter dwarf-shrub *Vaccinium scoparium* (or its ecological analogue *Vaccinium myrtillus*). The only graminoid consistently present, *Luzula glabrata*, occurs in slightly greater than trace amounts in stands at higher elevations and experiencing deeper snowpack. The herb layer, depauperate in comparison to that of *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005893), is strongly dominated by *Xerophyllum tenax*; *Arnica cordifolia*, *Arnica latifolia*, *Goodyera oblongifolia*, *Viola orbiculata*, and *Orthilia secunda* are the only forbs approaching or exceeding 50% constancy.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This forest association occupies moderately steep to steep slopes. Its position on the slope may be high, middle or low. Aspect of the slope is variable, and while not documented on west-facing slopes, it is suspected to occur there. Elevation ranges from 1645-2050 m (5396-6724 feet). Soils are moderately well-drained to well-drained and are derived from a variety of calcareous and noncalcareous sedimentary material. Some stands occupy slopes with underlying limestone and dolomite. Others are positioned on siltstone colluvial deposits. Still other stands may develop on glacial till and aeolian deposits. Soil texture is also variable. Stands have been sampled on soils described as silt loam, sandy loam and clay loam. Ground cover is primarily litter and wood, with the former contributing most (60-95%) surface area.

GLOBAL ENVIRONMENT: This association occurs throughout the middle to northern Rocky Mountains and on into the Canadian Rockies of southwestern and west-central Alberta as a small- to large-patch type from mid to upper subalpine habitats. In the southerly portions of its distribution, the Wallowa and Seven Devils mountains and Idaho Batholith (somewhat disjunct in Teton Range of Wyoming), it faithfully occupies moderate to steep slopes of northerly aspects at elevations ranging from 1700 to 2195 m (5600-7200 feet), but dropping to 4500 feet where frost pocket conditions obtain. Further to the north it also occurs predominantly on northerly exposures, but at higher elevations in wetter climates, it may be found on western and even southern exposures; it can occur on a given slope from the toe, up the backslope to the slope shoulder, and in wetter climates is found on ridgetops as well. It is perhaps most widely distributed in western Montana where individual stands may comprise hundreds to thousands of acres. In a circumscribed area, such as Glacier National Park, it may have a fairly consistent 1000- to 1200-m elevation range (5400-6600 feet). It exhibits no particular substrate preferences being found on granitics, fine-grained sedimentaries (including argillite and limestone), metasediments, and mica-schist; volcanic ash caps of varying depths (to 50 cm thickness) are very prevalent in the southern and western portions. The predominant soil texture is silt loam, and soils, at least those occurring in the U.S., are uniformly well-drained; in the Canadian Rockies soils are cited to be strongly developed podzols developed on morainal and colluvium (Ogilvie 1962, Achuff et al. 2002a) and Brunisols (Achuff et al. 2002a). Rock content of surface horizons ranges from about 15% to over 50%.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The upper tree canopy cover is usually 30-60% in this association, although cover may be as low as 10%. Tree height is typically 10-20 m with *Abies lasiocarpa* and *Picea engelmannii* the most dominant species. Seral species, such as *Pinus contorta* and *Larix occidentalis*, may also contribute significant cover in younger stands. *Abies lasiocarpa* dominates the tree subcanopy. Total subcanopy cover ranges from 5-30% in a layer 5-10 m tall. The most dominant shrub species in the understory of this association are *Menziesia ferruginea* and *Vaccinium membranaceum* with average covers of approximately 45% and 20%, respectively. The height of these two species varies from 0.5-2 m, resulting in their classification as short shrubs in some stands and tall shrubs in others. Total shrub cover in this layer ranges from 30-90%. A taller shrub layer (2-5 m) is also present but somewhat sparse, with cover ranging from 5-10%. *Sorbus scopulina* and *Sorbus sitchensis* are often found in this stratum. Dwarf-shrubs are uncommon in these stands. Species such as *Vaccinium myrtillus* and *Vaccinium scoparium* may be present with cover of less than 20%. The herbaceous stratum is variable between sites and relatively diverse in most stands, with total cover of all herbaceous species ranging from 20-100%. *Xerophyllum tenax* is the most common and abundant species, with average cover of almost 30%. *Arnica cordifolia* is also common in this association, though its cover is usually less than 15%. Forbs with relatively high constancy (50% or greater) and low cover include *Orthilia secunda* and *Viola orbiculata*.

GLOBAL VEGETATION: This is a closed forest type for the most part with total upper canopy cover ranging upward from 60%. A variable mix of *Abies lasiocarpa* and *Picea engelmannii* dominate the canopy as well as the regeneration layers. Seral tree species do poorly on these sites; *Pinus contorta*, *Pseudotsuga menziesii*, and *Larix occidentalis* are the only tree species consistently present and seldom is their canopy cover as great as 20%. The modal condition for the undergrowth varies with geographic region; in northern

Idaho and eastern Washington *Menziesia ferruginea*, joined by *Rhododendron albiflorum* in over half the stands inventoried, forms a lush and mostly continuous, tall (to 6 feet or more) shrub layer. This is contrasted with the physiognomy of stands on the east side of the Continental Divide where the tall-shrub canopy can be decidedly discontinuous and seldom exceeds 3-4 feet in height and lacks *Rhododendron albiflorum*, though *Alnus viridis* ssp. *sinuata* (= *Alnus sinuata*) and *Sorbus scopulina* are consistently present. In all parts of the type's range *Vaccinium membranaceum* is the mid (short) shrub dominant with coverages generally upwards of 30%; it is usually accompanied by low cover of *Ribes lacustre* and the somewhat shorter *Vaccinium scoparium* (or its ecological analogue *Vaccinium myrtillus*). The only graminoid consistently present, *Luzula glabrata*, occurs in slightly greater than trace amounts in stands at higher elevations and experiencing deeper snowpack. The herb layer, depauperate in comparison to that of *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005893), is strongly dominated by *Xerophyllum tenax*; *Arnica cordifolia*, *Arnica latifolia*, *Goodyera oblongifolia*, *Viola orbiculata*, and *Orthilia secunda* are the only forbs approaching or exceeding 50% constancy.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Menziesia ferruginea</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Forb	<i>Arnica latifolia</i> , <i>Xerophyllum tenax</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Alnus viridis</i> ssp. <i>sinuata</i> , <i>Menziesia ferruginea</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Lonicera utahensis</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium myrtillus</i> , <i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Arnica latifolia</i> , <i>Xerophyllum tenax</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Menziesia ferruginea*, *Picea engelmannii*, *Vaccinium membranaceum*

GLOBAL: *Abies lasiocarpa*, *Alnus viridis* ssp. *sinuata*, *Menziesia ferruginea*, *Picea engelmannii*, *Xerophyllum tenax*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4G5 (10-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This very extensive and abundant association is slightly changed in name and concept from several pre-existing syntaxa. This association bears the dual designation for the tree canopy because this in fact describes over 95% of existing stand conditions with dominance shared by either or both species (*Abies lasiocarpa* or *Picea engelmannii*). When either or both of these species comprise less than 25% of the uppermost tree canopy cover, then another association is indicated. This association is very similar to or identical with *Abies lasiocarpa* / *Rhododendron albiflorum* / *Xerophyllum tenax* (Williams et al. 1995); only *Rhododendron albiflorum* needs to be added as a co-diagnostic species of the tall-shrub layer (with *Menziesia ferruginea*). In a few cases *Rhododendron albiflorum* is the sole dominant of this shrub layer, but this fact does not perceptibly change the environmental parameters defining this type. The addition of *Rhododendron albiflorum* to the key would create an overarching type extending from Banff and Jasper south to central Idaho. Archiving *Abies lasiocarpa* / *Rhododendron albiflorum* Woodland (CEGL000330) is tentatively recommended. It is suggested that individual indicator shrub species or their combined cover need to be 5% or greater to recognize the type described here. *Xerophyllum tenax* must also exhibit at least 5% cover; it has been added to the type name so as to distinguish this association from others characterized by *Menziesia ferruginea* and *Rhododendron albiflorum* dominance. These other associations represent yet more extreme environments.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Alnus viridis* ssp. *sinuata* Forest (CEGL000297)
- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* Forest (CEGL000319)
- *Abies lasiocarpa* / *Rhododendron albiflorum* Woodland (CEGL000330)
- *Pinus albicaulis* - *Abies lasiocarpa* / *Menziesia ferruginea* / *Xerophyllum tenax* Woodland (CEGL005836)
- *Tsuga mertensiana* / *Menziesia ferruginea* Forest (CEGL000506)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type (Steele et al. 1983) B
- *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type (Steele et al. 1981) B
- *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type (Daubenmire and Daubenmire 1968) B
- *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type (Pfister et al. 1977) B
- *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987) I
- *Abies lasiocarpa* / *Menziesia ferruginea* Plant Association (Johnson and Simon 1987) B
- *Abies lasiocarpa* / *Rhododendron albiflorum* / *Xerophyllum tenax* Plant Association (Williams et al. 1995) I
- *Picea engelmannii* - *Abies lasiocarpa* / *Menziesia ferruginea* / *Vaccinium membranaceum* - *Xerophyllum tenax* Vegetation Type (Achuff et al. 2002a) I
- *Picea engelmannii* - *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type (Ogilvie 1962) I
- *Picea engelmannii* - *Pinus albicaulis* / *Menziesia glabella* (= *M. ferruginea*) Vegetation Type (Holland and Coen 1982) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is relatively common in the IPP. It is known from several locations on mountain slopes in Waterton Lakes National Park, including Boundary Creek valley. In Glacier National Park the association has been documented both east and west of the Continental Divide. East of the Divide the association occurs in the Two Medicine and Slide Lake drainages, and probably occupies similar sites in other drainages. West of the Divide the association has been documented in the Middle Fork Flathead River drainage, near Granite Park and along the Huckleberry Lookout Trail.

GLOBAL RANGE: This association occurs from the northernmost middle Rocky Mountains, throughout the northern Rocky Mountains and on into the Canadian Rockies at least to the latitude of Jasper National Park (Canada) as a small- to large-patch type from mid to upper subalpine habitats.

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT, OR, WA

USFS ECOREGIONS: M332A:CC, M332B:CC, M332C:CC, M332G:CP, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); PC (Jasper?, Waterton Lakes); USFS (Wallowa-Whitman)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2039, GLAC.241, GLAC.305, GLAC.2634, GLAC.1003, WATE.4091, WATE.4092, WATE.4098, WATE.4104, WATE.4118, WATE.4124, WATE.5078, WATE.5079, WATE.5101, WATE.5126, WATE.9037.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Achuff et al. 2002a, Bourgeron and Engelking 1994, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Holland and Coen 1982, Johnson and Simon 1987, Ogilvie 1962, Pfister et al. 1977, Steele et al. 1981, Steele et al. 1983, Western Ecology Working Group n.d., Williams et al. 1995

***Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest SUBALPINE FIR - ENGELMANN SPRUCE / DWARF BLUEBERRY / BRIDE'S BONNET FOREST**

IDENTIFIER: CEGL005918

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)

Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.d.)
Alliance	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> Forest Alliance (A.168)
Alliance (English name)	Subalpine Fir - Engelmann Spruce Forest Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Vaccinium caespitosum</i> / <i>Clintonia uniflora</i> Forest
Association (English name)	Subalpine Fir - Engelmann Spruce / Dwarf Blueberry / Bride's Bonnet Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)

ELEMENT CONCEPT

GLOBAL SUMMARY: This forest association occurs in the lower subalpine zone in the northern Rocky Mountains. Sites are cool, relatively moist benches and may be frost pockets. Elevations range from 945-1250 m (3100-4100 feet). Substrates are typically well-drained, gravelly, sandy loam- to silt-textured soils derived from argillite, quartzite or glacial till. Litter dominates ground surface over 3 cm deep with low cover of bare soil and rock. The vegetation of this conifer association is characterized by *Abies lasiocarpa* and *Picea engelmannii* codominating the tree canopy with 5% cover or more of *Vaccinium caespitosum* and/or *Arctostaphylos uva-ursi*. *Clintonia uniflora* or *Tiarella trifoliata* are always present in stands and not confined to mesic microsites. The evergreen needle-leaved tree canopy is open to moderately dense (30-65% cover). The upper tree canopy is typically codominated by *Picea engelmannii* and mature seral tree species, with *Abies lasiocarpa* dominating the subcanopy and regeneration layers. Important seral species in the tree canopy are *Pseudotsuga menziesii*, *Larix occidentalis*, *Pinus ponderosa*, and *Pinus contorta*. Undergrowth is variable; however, an open to dense dwarf-shrub layer is present and is codominated by *Arctostaphylos uva-ursi*, *Linnaea borealis*, and *Vaccinium caespitosum*. The herbaceous layer is often dominated by *Xerophyllum tenax* or *Calamagrostis rubescens*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This open forest association occupies moist benchlands and gentle slopes with variable aspects. Stands may develop on sites with frost pockets. Elevation is typically 1125-1185 m (3690-3887 feet). The association typically develops over morainal deposits of glacial till. Soils are moderately well-drained to well-drained and have a sandy loam or silt loam texture. Gravel content within the soil is high. Litter contributes the majority of ground cover in most stands. Wood may account for up to 10% ground cover in stands with heavy downfall.

GLOBAL ENVIRONMENT: This forest association occurs in the lower subalpine zone in the northern Rocky Mountains. Elevations are 945-1250 m (3100-4100 feet) mostly in the upper Flathead Valley. Sites are cool, relatively moist benches and may be frost pockets. Substrates are typically well-drained, gravelly, sandy loam- to silt-textured soils derived from argillite, quartzite or glacial till. Litter dominates ground surface over 3 cm deep with low cover of bare soil and rock.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The upper forest canopy is typically 15-35 m tall in this open forest association, with cover ranging from 5-20%. The tree subcanopy is also open, with 5-30% cover in a layer 5-15 m tall. *Abies lasiocarpa* and *Picea engelmannii* are well-represented in both of these strata. *Pinus contorta* may be common in the upper canopy of seral stands. Tall shrubs (1-2 m) are sparse and may be absent in many sites. Common tall-shrub species, when present, include *Cornus sericea* and *Prunus virginiana*. The short-shrub layer (0.5-1 m) is also sparse, but diversity is high. Short-shrub species with 100% constancy and low cover (less than 10%) include *Amelanchier alnifolia*, *Shepherdia canadensis*, *Vaccinium membranaceum*, and *Lonicera utahensis*. Dwarf-shrub cover is high, ranging from 50-70% in most stands, although cover may occasionally be as low as 20%. Dwarf-shrubs with 100% constancy and high cover include *Vaccinium caespitosum*, *Spiraea betulifolia*, and *Linnaea borealis*. Herbaceous cover ranges from 50-60% and is dominated by *Calamagrostis rubescens*. This species had 100% constancy in sampled stands. Other herbaceous species with 100% constancy include *Clintonia uniflora*, *Lupinus argenteus*, and *Oryzopsis asperifolia*, although cover for these species is typically less than 5%.

GLOBAL VEGETATION: This conifer association is characterized by *Abies lasiocarpa* and *Picea engelmannii* codominating the tree canopy with *Clintonia uniflora* or *Tiarella trifoliata* present in stands and not confined to mesic microsites, and with 5% or more cover of *Vaccinium caespitosum* and/or *Arctostaphylos uva-ursi*. The evergreen needle-leaved tree canopy is open to moderately dense (30-65% cover). The upper tree canopy is typically codominated by *Picea engelmannii* and mature seral tree species, with *Abies lasiocarpa* dominating the subcanopy and regeneration layers. Important seral species in the tree canopy are *Pseudotsuga menziesii*, *Larix occidentalis*, *Pinus ponderosa*, and *Pinus contorta*. Undergrowth is variable; however, an open to dense dwarf-shrub layer is present and is codominated by *Arctostaphylos uva-ursi*, *Linnaea borealis*, and *Vaccinium caespitosum*. Other consistent shrubs and dwarf-shrubs include *Amelanchier alnifolia*, *Cornus canadensis*, *Lonicera utahensis*, *Mahonia repens*, *Shepherdia canadensis*, *Spiraea betulifolia*, and *Vaccinium membranaceum*. The herbaceous layer is often dominated by *Xerophyllum tenax* or *Calamagrostis rubescens*. Other relatively consistent species are *Arnica* spp., *Campanula rotundifolia*, *Galium* spp., *Lupinus argenteus*, *Maianthemum* spp., *Oryzopsis asperifolia*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Orthilia secunda* (= *Pyrola secunda*), and *Viola orbiculata*. *Thalictrum occidentale* and *Tiarella trifoliata* are often absent or have low cover.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Herb (field)	Dwarf-shrub	<i>Linnaea borealis</i> , <i>Spiraea betulifolia</i> , <i>Vaccinium caespitosum</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Herb (field)	Dwarf-shrub	<i>Linnaea borealis</i> , <i>Spiraea betulifolia</i> , <i>Vaccinium caespitosum</i>
Herb (field)	Forb	<i>Xerophyllum tenax</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Clintonia uniflora*, *Linnaea borealis*, *Picea engelmannii*, *Vaccinium caespitosum*

GLOBAL: *Abies lasiocarpa*, *Clintonia uniflora*, *Linnaea borealis*, *Picea engelmannii*, *Vaccinium caespitosum*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4 (11-Mar-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium caespitosum* Forest (CEGL000340)
- *Larix occidentalis* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (CEGL005883)
- *Picea engelmannii* / *Vaccinium caespitosum* Forest (CEGL005926)
- *Pinus contorta* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (CEGL005923)
- *Pseudotsuga menziesii* / *Vaccinium caespitosum* Forest (CEGL000465)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Vaccinium caespitosum* Phase (Pfister et al. 1977) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is relatively common west of the Continental Divide in Glacier National Park, and has not been documented in Waterton Lakes National Park. The association has been documented in the North Fork Flathead River drainage in three locations.

GLOBAL RANGE: This forest association occurs in the lower subalpine zone in the northern Rocky Mountains of northwestern Montana and Alberta.

NATIONS: CA, US

STATES/PROVINCES: AB, MT

USFS ECOREGIONS: M332B:PP, M333B:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2233, GLAC.2273, GLAC.2266.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Pfister et al. 1977, Western Ecology Working Group n.d.

***Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium caespitosum* Forest**
SUBALPINE FIR - ENGELMANN SPRUCE / DWARF BLUEBERRY FOREST

IDENTIFIER: C EGL000340

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.d.)
Alliance	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> Forest Alliance (A.168)
Alliance (English name)	Subalpine Fir - Engelmann Spruce Forest Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Vaccinium caespitosum</i> Forest
Association (English name)	Subalpine Fir - Engelmann Spruce / Dwarf Blueberry Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)

ELEMENT CONCEPT

GLOBAL SUMMARY: This widespread forest association occurs in the upper subalpine zone in the southern, central and northern Rocky Mountains. Sites are relatively cold, moist benches, basins, ridge slopes and high plateaus often in areas where cold air accumulates (frost pockets), but generally do not occur next to active streams. Substrates are well-drained, often gravelly, sand- to clay loam-textured soils. The vegetation is characterized by *Abies lasiocarpa* and *Picea engelmannii* codominating the tree canopy with a dwarf-shrub layer with 5% or more cover of *Vaccinium caespitosum* in the understory. The evergreen needle-leaved tree canopy is open to moderately dense (30-75% cover). The upper tree canopy is typically codominated by *Abies lasiocarpa*, *Picea engelmannii* and mature seral tree species, with *Abies lasiocarpa* and *Picea engelmannii* dominating the subcanopy and regeneration layers. Important seral species in the tree canopy are *Pinus contorta*, *Pinus albicaulis*, *Pseudotsuga menziesii*, *Larix occidentalis*, and sometimes *Populus tremuloides*. Undergrowth is variable depending on elevation and may be diverse, but it is an open to dense dwarf-shrub layer with 5% to abundantly more cover of *Vaccinium caespitosum*. Other relatively consistent shrubs and dwarf-shrubs present in low cover include *Arctostaphylos uva-ursi*, *Betula nana*, *Gaultheria humifusa*, *Juniperus communis*, *Linnaea borealis*, *Lonicera utahensis*, *Mahonia repens*, *Paxistima myrsinites*, *Ribes montigenum*, *Salix brachycarpa*, *Shepherdia canadensis*, *Spiraea betulifolia*, *Symphoricarpos oreophilus*, *Vaccinium myrtillus*, and *Vaccinium scoparium* (which may codominate). The open herbaceous layer is often dominated by *Calamagrostis rubescens*. Other relatively consistent species are *Arnica* spp., *Chamerion angustifolium*, *Carex* spp., *Fragaria* spp., *Galium* spp., *Lupinus argenteus*, and *Orthilia secunda* (= *Pyrola secunda*). Higher elevation stands have herbaceous layers that are often dominated by alpine forbs and graminoids.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This forest association is described from two areas: gentle foothill slopes and benchlands, and on shallow swales along scree ridges within areas of steep scree slopes east of the Continental Divide. The association is found in areas where frost pockets develop on benches and in swales. Elevation is approximately 1560-1725 m (5113-5650 feet). Parent material ranges from noncalcareous glacial fluvial deposits in lowlands to colluvium at higher elevations. Substrates are variable ranging from somewhat poorly drained, gravelly, clay loam to well-drained sand and loamy sand. Soils are not well-developed and have moderate to high cover of litter. The scree slope stands had moderately high cover of small rocks.

GLOBAL ENVIRONMENT: This forest association occurs in the subalpine zone in the southern, central and northern Rocky Mountains. Elevations range from 2560-3310 m (8400-10,850 feet) on the southern extent to down to 1525-2135 m (5000-7000 feet) in Montana and Idaho and 920 m (3015-3990 feet) in eastern Washington. Sites are relatively cold, moist benches, basins, ridge slopes and high plateaus often in areas where cold air accumulates (frost pockets), but generally do not occur next to active streams. Substrates are well-drained, often gravelly, sand- to clay loam-textured soils. Parent materials include noncalcareous sedimentary rocks and glacial outwash, dacite, granite, latite, quartzite, quartz monzonite, trachyte, or sandstone. Litter dominates the ground surface (>4 cm deep) and cover of bare soil and rock is typically low.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The tree canopy is relatively open (30-60% cover) dominated by *Pinus contorta* or *Pseudotsuga menziesii* with *Abies lasiocarpa* and *Picea engelmannii* dominating the subcanopy. Tall- and short-shrub cover are generally sparse. Each class contributes only 10% canopy cover. The most common tall shrub is *Salix scouleriana*, with an average cover of 3%. Other tall shrubs present in trace amounts include *Amelanchier alnifolia* and *Shepherdia canadensis*. Short-shrub cover is primarily *Spiraea betulifolia* and *Juniperus communis*. Dwarf-shrub cover is also 10%, with most cover coming from *Arctostaphylos uva-ursi*, *Vaccinium caespitosum*, *Vaccinium myrtillus*, and *Vaccinium scoparium* in almost equal amounts; this type is recognized based on the greater than 3% cover of *Vaccinium caespitosum*. Herbaceous species cover varies from 10-60%. The most abundant forbs are *Arnica cordifolia*, *Saxifraga bronchialis*, *Erythronium grandiflorum*, and *Thalictrum occidentale*.

GLOBAL VEGETATION: This conifer association is characterized by *Abies lasiocarpa* and *Picea engelmannii* codominating the tree canopy with a dwarf-shrub layer with of 5% or more cover of *Vaccinium caespitosum* dominating the understory. The evergreen needle-leaved tree canopy is open to moderately dense (30-75% cover). The upper tree canopy is typically codominated by *Abies lasiocarpa*, *Picea engelmannii* and mature seral tree species, with *Abies lasiocarpa* and *Picea engelmannii* dominating the subcanopy and regeneration layers. Important seral species in the tree canopy are *Pinus contorta*, *Pinus albicaulis*, *Pseudotsuga menziesii*, *Larix occidentalis*, and sometimes *Populus tremuloides*. Undergrowth is variable depending on elevation and may be diverse, but it is an open to dense dwarf-shrub layer with 5% or more cover dominated by *Vaccinium caespitosum*. *Vaccinium myrtillus* may be present with lower cover, and *Vaccinium scoparium* may be present to codominate. Other relatively consistent shrubs and dwarf-shrubs with lower cover include *Arctostaphylos uva-ursi*, *Betula nana*, *Gaultheria humifusa*, *Juniperus communis*, *Linnaea borealis*, *Lonicera utahensis*, *Mahonia repens*, *Paxistima myrsinites*, *Ribes montigenum*, *Salix planifolia*, *Shepherdia canadensis*, *Spiraea betulifolia*, *Symphoricarpos albus*, and *Symphoricarpos oreophilus*. The open herbaceous layer is often dominated by *Calamagrostis rubescens*. Other relatively consistent species are *Arnica cordifolia*, *Arnica latifolia*, *Chamerion angustifolium*, *Carex geyeri*, *Carex rossii*, *Danthonia intermedia*, *Fragaria* spp., *Galium* spp., *Lupinus argenteus*, and *Orthilia secunda* (= *Pyrola secunda*). Higher elevation stands have herbaceous layers that are often dominated by alpine forbs and graminoids such as *Sibbaldia procumbens*, *Festuca brachyphylla*, and *Trisetum spicatum*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i> , <i>Pinus contorta</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium caespitosum</i> , <i>Vaccinium myrtillus</i> , <i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Arnica cordifolia</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i> , <i>Pinus contorta</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium caespitosum</i> , <i>Vaccinium myrtillus</i> , <i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Arnica cordifolia</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Picea engelmannii*

GLOBAL: *Abies lasiocarpa*, *Picea engelmannii*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association is nearly the same as *Abies lasiocarpa* / *Vaccinium caespitosum* habitat types of Pfister et al. (1977) for Montana, Cooper et al. (1987) for northern Idaho, Steele et al. (1981) for central Idaho, and *Abies lasiocarpa* / *Vaccinium caespitosum* plant association of Colville National Forest (Williams et al. 1995) in northeastern Washington.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies grandis* / *Vaccinium caespitosum* Forest (CEGL000288)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (CEGL005918)
- *Larix occidentalis* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (CEGL005883)
- *Larix occidentalis* / *Vaccinium caespitosum* Forest (CEGL005882)
- *Picea engelmannii* / *Vaccinium caespitosum* Forest (CEGL005926)
- *Pinus contorta* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (CEGL005923)
- *Pinus contorta* / *Vaccinium caespitosum* Forest (CEGL000168)
- *Pinus contorta* / *Vaccinium scoparium* / *Calamagrostis rubescens* Forest (CEGL000174)
- *Pseudotsuga menziesii* / *Vaccinium caespitosum* Forest (CEGL000465)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Vaccinium caespitosum* Community Type (Kerr and Henderson 1979) =
- *Abies lasiocarpa* / *Vaccinium caespitosum* Habitat Type (Steele et al. 1981) B
- *Abies lasiocarpa* / *Vaccinium caespitosum* Habitat Type (Cooper et al. 1987) B
- *Abies lasiocarpa* / *Vaccinium caespitosum* Habitat Type (Pfister et al. 1977) B
- *Abies lasiocarpa* / *Vaccinium caespitosum* Habitat Type (Mauk and Henderson 1984) B
- *Abies lasiocarpa* / *Vaccinium caespitosum* Habitat Type, *Picea engelmannii* Phase (Youngblood and Mauk 1985) I
- *Abies lasiocarpa* / *Vaccinium caespitosum* Plant Association (Williams et al. 1990b) =
- *Abies lasiocarpa* / *Vaccinium caespitosum* Plant Association (Kovalchik 1993) =
- *Abies lasiocarpa* / *Vaccinium caespitosum* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE: I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association has been documented on foothill slopes on Blackfoot Tribal Lands, just east of Glacier National Park.

GLOBAL RANGE: This subalpine forest association occurs in the southern, central and northern Rocky Mountains from northern Colorado and central Utah north into northwestern Montana and eastern Washington.

NATIONS: US

STATES/PROVINCES: CO:S4, ID:S3, MT:S5, UT:S4S5, WA:S3?

USFS ECOREGIONS: M331A:CC, M331B:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: BIA (Blackfoot); NPS (Glacier, Rocky Mountain); USFS (Colville NF, Manti-La Sal, Okanogan)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.181, GLAC.217.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Cooper et al. 1987, Driscoll et al. 1984, Kerr and Henderson 1979, Kovalchik 1993, MTNHP 2002b, Mauk and Henderson 1984, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d., Williams et al. 1990b, Williams et al. 1995, Youngblood and Mauk 1985

***Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium membranaceum* / *Xerophyllum tenax*
Forest
SUBALPINE FIR - ENGELMANN SPRUCE / SQUARE-TWIG BLUEBERRY / BEAR-GRASS
FOREST**

IDENTIFIER: CEGL005917

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.d.)
Alliance	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> Forest Alliance (A.168)
Alliance (English name)	Subalpine Fir - Engelmann Spruce Forest Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Vaccinium membranaceum</i> / <i>Xerophyllum tenax</i> Forest
Association (English name)	Subalpine Fir - Engelmann Spruce / Square-twig Blueberry / Bear-grass Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is broadly distributed throughout the mid to upper subalpine zones of the northern Rocky Mountains, concentrated west of the Continental Divide. It is strongly associated with moderate to steep, cold, relatively dry slopes, usually having southeast- through south- to west-facing exposures. It typically occurs from midslopes upwards to slope shoulders, ridgetops and occasionally extending to high-elevation benchlands as well. Elevations range is from 1425-2025 m (4675-6643 feet) in the northern portion of its distribution and 1740-2470 m (5700-8100 feet) in its southern extent. These sites have well-drained, nutrient-poor soils derived from a variety of parent materials. The range in soil surface texture is broad, from silt to loamy sand with the gravel content averaging about 14% near surface and increasing markedly with depth. Litter dominates ground surface with low cover of bare soil and rock. The evergreen needle-leaved tree canopy is open to dense (30-80% cover) and may be stunted (2-5 m) in the highest elevation stands. The upper tree canopy is typically codominated by *Abies lasiocarpa*, *Picea engelmannii* trees and mature seral tree species, with *Abies lasiocarpa* dominating the subcanopy and regeneration layers. Important seral species in the tree canopy are *Pseudotsuga menziesii*, *Pinus contorta*, and *Larix occidentalis*. The short-shrub layer is typically composed of dense patches and dominated by *Vaccinium membranaceum*. Other consistent shrubs and dwarf-shrubs include *Lonicera utahensis*, *Mahonia repens*, *Paxistima myrsinites*, *Sorbus scopulina*, and *Spiraea betulifolia*. The herbaceous layer is dominated by *Xerophyllum tenax* and *Calamagrostis rubescens* (locally). Other relatively consistent species are *Arnica latifolia*, *Carex geeyeri*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, and *Viola orbiculata*. Occasionally cover of *Vaccinium membranaceum* may be low or absent, then *Xerophyllum tenax* strongly dominates the understory.

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This forest association occupies dry, moderately steep to steep slopes with southerly aspects. Its position is most often low to mid slope. Elevation ranges from 1425-2025 m (4674-6642 feet). Soils are typically well-drained and derived from noncalcareous sedimentary material. Most stands occupy slopes with underlying argillite, visible as surface bedrock outcrops or as pieces of small rock within the soil. Other stands are positioned on colluvial argillite deposits. Still other stands may develop on glacial till. The soil is usually shallow, rocky and not well-developed. Soil texture is commonly sandy loam, however, the association may occasionally develop on clay loam soil. Ground cover is primarily litter, but wood may contribute a significant amount of surface cover in stands with heavy downfall.

GLOBAL ENVIRONMENT: This association is broadly distributed throughout the mid to upper subalpine zones of the northern Rocky Mountains, concentrated west of the Continental Divide in western Montana and central and northern Idaho, northwestern Wyoming, northeastern Washington and extending into the Canadian Rockies of southwestern Alberta and British Columbia. Elevation range is from 1425-2025 m (4674-6642 feet) in the northern portion of its distribution and 1740-2470 m (5700-8100 feet) in its southern extent. It is strongly associated with moderate to steep, cold and relatively dry slopes, usually having southeast- through south- to west-facing exposures, usually occurring from midslopes upwards to slope shoulders, ridgetops and occasionally extending to high-elevation benchlands as well. These sites have well-drained, nutrient-poor soils derived from a variety of parent materials, including volcanics (quartz monzonite, undifferentiated granites, rhyolite), noncalcareous sedimentaries and metamorphics (quartzite, argillite, gneiss, schist, phyllite), and glacial till. The range in soil surface texture is broad, from silty loam to sandy loam with the gravel content averaging about 14% near the surface and increasing markedly with depth. Litter dominates ground surface with low cover of bare soil and rock.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Vegetation structure and composition are highly variable within this association. Stands may have a dense upper tree canopy approaching 80% cover, or have an open, woodland-like canopy with cover near 10%. These two examples are at the extreme ends of a broad range of well-represented gradations. Average tree height of the upper canopy typically falls between 10-15 m, and canopy cover is usually 20-60%. *Abies lasiocarpa* and *Picea engelmannii* dominate this layer, although *Picea engelmannii* is sparse or absent on the driest sites within this association. *Pinus contorta* and *Pseudotsuga menziesii* may be present with 5-10% cover. Total tree subcanopy cover ranges from 0-30% and is

dominated by *Abies lasiocarpa* in a layer less than 10 m high. Stands with a short upper tree canopy (2-5 m) often have no discernible subcanopy. The most common and abundant shrub in this association is *Vaccinium membranaceum*, which may be classified as either a tall or short shrub depending on its stature. The height of this species is most commonly 0.5-2 m and its cover ranges from 30-50%. Occasionally *Vaccinium membranaceum* will be entirely absent in this association. *Sorbus scopulina* and *Amelanchier alnifolia* are also common in these stands with approximate covers of 10% and 15%, respectively. Dwarf-shrubs are usually absent in this association, but may be present with up to 20% canopy cover. When present, common dwarf-shrub species include *Mahonia repens*, *Paxistima myrsinites*, and *Vaccinium myrtillus*. Herbaceous cover is variable. Most sampled stands reported herbaceous cover of 30-90%, though lower cover was not uncommon. *Xerophyllum tenax* has the highest constancy (100%) and cover, averaging 33% in sampled stands. Other species with relatively high constancy (at least 50%) include *Chamerion angustifolium*, *Thalictrum occidentale*, and *Carex geyeri*. Cover for these species is usually less than 10%. *Eucephalus engelmannii*, *Arnica cordifolia*, and *Valeriana sitchensis* are also common in this association with cover of less than 5%.

GLOBAL VEGETATION: This conifer association is characterized by *Abies lasiocarpa* and *Picea engelmannii* codominating the tree canopy with a typically dense understory dominated by *Vaccinium membranaceum* (canopy cover) and *Xerophyllum tenax*. Cover of *Vaccinium scoparium* and *Vaccinium myrtillus* is low (<5%). The evergreen needle-leaved tree canopy is open to dense (30-80% cover) and may be stunted (2-5 m) in the highest elevation stands. The upper tree canopy is typically codominated by *Abies lasiocarpa*, *Picea engelmannii* trees, and mature seral tree species, with *Abies lasiocarpa* dominating the subcanopy and regeneration layers. Important seral species in the tree canopy are *Pseudotsuga menziesii*, *Pinus contorta*, and *Larix occidentalis*. The short-shrub layer is typically composed of dense patches and dominated by *Vaccinium membranaceum*. Other consistent shrubs and dwarf-shrubs include *Lonicera utahensis*, *Mahonia repens*, *Paxistima myrsinites*, *Sorbus scopulina*, and *Spiraea betulifolia*. The herbaceous layer is dominated by *Xerophyllum tenax* and *Calamagrostis rubescens* (locally). Other relatively consistent species are *Arnica latifolia*, *Carex geyeri*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, and *Viola orbiculata*. Occasionally, cover of *Vaccinium membranaceum* may be low or absent, then *Xerophyllum tenax* strongly dominates the understory.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Vaccinium membranaceum</i>
Herb (field)	Forb	<i>Xerophyllum tenax</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Vaccinium membranaceum</i>
Herb (field)	Forb	<i>Xerophyllum tenax</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Chamerion angustifolium*, *Vaccinium membranaceum*

GLOBAL: *Abies lasiocarpa*, *Vaccinium membranaceum*, *Xerophyllum tenax*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: GNR (21-Apr-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Stands of this association missing *Vaccinium membranaceum* are distinguished from the similar association, *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* / *Xerophyllum tenax* Forest (CEGL005914), by the abundance of *Xerophyllum tenax*, the lack of *Vaccinium scoparium*, and a wide diversity of forbs present.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium membranaceum* Rocky Mountain Forest (CEGL000341)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* / *Xerophyllum tenax* Forest (CEGL005914)
- *Pinus albicaulis* - *Abies lasiocarpa* / *Vaccinium membranaceum* / *Xerophyllum tenax* Woodland (CEGL005837)
- *Pinus contorta* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest (CEGL005913)
- *Pseudotsuga menziesii* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest (CEGL005852)
- *Thuja plicata* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005930)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium globulare* Phase (Cooper et al. 1987) B
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium globulare* Phase (Pfister et al. 1977) B
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium globulare* Phase (Steele et al. 1981) B
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium globulare* Phase (Steele et al. 1983) B
- *Abies lasiocarpa* / *Xerophyllum tenax* Plant Association (Williams et al. 1995) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is relatively common in the IPP. It is known from several locations on mountain slopes in Waterton Lakes National Park. In Glacier National Park the association primarily occurs east of the Continental Divide. East of the divide the association has been documented in the Two Medicine, Waterton, Many Glacier and St. Mary valleys, and probably occupies similar sites in other drainages. West of the divide the association occurs near Granite Park.

GLOBAL RANGE: This association is broadly distributed throughout the mid to upper subalpine zones of the northern Rocky Mountains, concentrated west of the Continental Divide.

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT, OR?, WA, WY

USFS ECOREGIONS: M331A:CP, M331D:CC, M332A:CP, M332B:CC, M332C:CC, M332D:CP, M332E:CC, M332G:CP, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton, Rockefeller); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.1, GLAC.100, GLAC.2023, GLAC.2068, GLAC.219, GLAC.24, GLAC.270, GLAC.279, GLAC.298, GLAC.333, GLAC.49, WATE.4060, WATE.4090, WATE.5105, WATE.5123.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz, mod. G. Kittel

REFERENCES: Cooper et al. 1987, Pfister et al. 1977, Steele et al. 1981, Steele et al. 1983, Western Ecology Working Group n.d., Williams et al. 1990b, Williams et al. 1995

***Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* / *Thalictrum occidentale* Forest
SUBALPINE FIR - ENGELMANN SPRUCE / GROUSEBERRY / WESTERN MEADOWRUE
FOREST**

IDENTIFIER: CEGL005919

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.d.)
Alliance	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> Forest Alliance (A.168)
Alliance (English name)	Subalpine Fir - Engelmann Spruce Forest Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Vaccinium scoparium</i> / <i>Thalictrum occidentale</i> Forest

Association (English name) Subalpine Fir - Engelmann Spruce / Grouseberry / Western Meadowrue Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)

ELEMENT CONCEPT

GLOBAL SUMMARY: This forest association occurs in the subalpine zone in the central and northern Rocky Mountains. Sites are cool and moist north slopes and benches, but may occur on any aspect. Elevations range from 1770 to 2625 m (5805-8600 feet). Substrates are typically well-drained, medium- to fine-textured soils with moderately low gravel content (15%) that are derived from a variety of parent materials. Litter dominates ground surface often 5 cm deep with low cover of bare ground and rock. The vegetation is characterized by *Abies lasiocarpa* and *Picea engelmannii* codominating the tree canopy with *Vaccinium scoparium* or *Vaccinium myrtillus* well-represented to dominant in the dwarf-shrub layer and *Thalictrum occidentale*, *Viola orbiculata*, and/or *Valeriana sitchensis* common in the herbaceous layer. The evergreen needle-leaved tree canopy is open to moderately dense (over 25% cover) and is typically codominated by *Abies lasiocarpa*, *Picea engelmannii*, and often *Pinus contorta* (seral), with *Abies lasiocarpa* dominating the subcanopy and regeneration layers. Undergrowth is typically a moderately dense dwarf-shrub layer dominated by *Vaccinium scoparium* or *Vaccinium myrtillus*. Other consistent shrubs and dwarf-shrubs include *Juniperus communis*, *Spiraea betulifolia*, and *Vaccinium membranaceum*. The sparse to moderate herbaceous layer is dominated by forbs. Other consistent forbs include *Arnica* spp., *Eucephalus engelmannii*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), and *Orthilia secunda* (= *Pyrola secunda*).

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This open forest association occupies moist, moderately steep to steep slopes with northerly aspects. Its position is most often mid to high slope. Stands may occur along high mountain ridges or on slopes covered with colluvial material. Elevation ranges from 1770-1970 m (5805-6462 feet). Soils are typically well-drained and are derived from a variety of calcareous and noncalcareous sedimentary material, or colluvial deposits overlying bedrock. The soil is usually rocky and not well-developed. Soil texture is commonly silt loam or sandy loam, with many angular pieces of argillite present. Ground cover is primarily litter, although wood, small rock and bare soil may be present in small amounts, up to 10% surface cover.

GLOBAL ENVIRONMENT: This forest association occurs in the subalpine zone in the central and northern Rocky Mountains. Elevations are 2225-2625 m (7300-8600 feet) in the southern range, but extend down to 1770-1850 m (5805-6068 feet) in the northern extent. Sites are cool and moist north slopes and benches, but may occur on any aspect. Substrates are typically well-drained, medium to finer textured soils with moderately low gravel content (15%) that are derived from a variety of parent materials such as argillite, quartzite, gneiss, schist, granite and biotite granite, and calcareous and noncalcareous sedimentary rocks. Litter dominates ground surface often 5 cm deep with low cover of bare ground and rock.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The upper tree canopy is typically open in this association, with cover of 30-40%. Tree height in the upper stratum is usually 10-15 m, dominated by *Abies lasiocarpa*, *Picea engelmannii*, and *Pinus contorta*. *Abies lasiocarpa* is the most common and abundant species in the subcanopy, with cover near 5%. Tall and short shrubs are typically absent in the association. The dwarf-shrub *Vaccinium myrtillus* is the most dominant shrub, averaging 33% cover in sampled stands. *Sorbus scopulina*, *Rubus parviflorus*, *Spiraea betulifolia*, and *Lonicera utahensis* also had 100% constancy in sampled stands, though cover for each of these species was less than 10%. The herbaceous layer is dominated by *Arnica cordifolia*, with an average cover of 25%. *Eucephalus engelmannii*, *Pedicularis bracteosa*, *Orthilia secunda*, *Valeriana sitchensis*, and *Thalictrum occidentale* are also well-represented in this association, though cover for each species is rarely above 10%. Graminoids with 100% constancy include *Carex geyeri* and *Calamagrostis rubescens*. These two species are not well-represented, with cover seldom reaching 5% for each species.

GLOBAL VEGETATION: This Rocky Mountain conifer association is characterized by *Abies lasiocarpa* and *Picea engelmannii* codominating the tree canopy with *Vaccinium scoparium* well-represented to dominant in the dwarf-shrub layer and *Thalictrum occidentale*, *Viola orbiculata*, and/or *Valeriana sitchensis* common. The evergreen needle-leaved tree canopy is open to moderately dense (over 25% cover) and is typically codominated by *Abies lasiocarpa*, *Picea engelmannii*, and often *Pinus contorta* (seral stand), with *Abies lasiocarpa* dominating the subcanopy and regeneration layers. Undergrowth is typically a moderately dense dwarf-shrub layer dominated by *Vaccinium scoparium* or *Vaccinium myrtillus*. Other consistent shrubs and dwarf-shrubs include *Juniperus communis*, *Spiraea betulifolia*, and *Vaccinium membranaceum*. The sparse to moderate herbaceous layer is dominated by forbs. Consistent forbs include *Arnica* spp., *Eucephalus engelmannii*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, *Viola orbiculata*, and/or *Valeriana sitchensis*. *Calamagrostis rubescens* and *Carex geyeri* have high constancy, but are not well-represented, and *Arctostaphylos uva-ursi* and *Mahonia repens* are uncommon.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

Stratum

Tree canopy
Herb (field)
Herb (field)

Lifeform

Needle-leaved tree
Dwarf-shrub
Forb

Species

Abies lasiocarpa
Vaccinium myrtillus
Arnica cordifolia

Global

Stratum

Tree canopy
Herb (field)
Herb (field)

Lifeform

Needle-leaved tree
Dwarf-shrub
Forb

Species

Abies lasiocarpa
Vaccinium myrtillus, *Vaccinium scoparium*
Arnica cordifolia

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Eucephalus engelmannii*, *Thalictrum occidentale*, *Vaccinium myrtillus*

GLOBAL: *Thalictrum occidentale*, *Vaccinium scoparium*, *Valeriana sitchensis*, *Viola orbiculata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4 (11-Mar-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE:

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium myrtillus* Forest (CEGL000343) of the Colorado Rockies is very similar to this type. However, in the northern Rockies, *Vaccinium scoparium* and *Vaccinium myrtillus* intergrade with each other and occur on very similar habitats (Pfister et al. 1977); vegetation types where they occur have never been separated into different associations or habitat types (Pfister et al. 1977, Cooper et al. 1987).

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium myrtillus* Forest (CEGL000343)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* / *Xerophyllum tenax* Forest (CEGL005914)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* Forest (CEGL000344)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Vaccinium scoparium* Habitat Type, *Thalictrum occidentale* Phase (Pfister et al. 1977) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon in Waterton Lakes National Park and has not been documented in Glacier National Park.

GLOBAL RANGE: This forest association occurs mostly east of the Continental Divide in the subalpine zone in the central and northern Rocky Mountains in western Montana and may extend into mountains in adjacent Idaho and Wyoming.

NATIONS: CA, US

STATES/PROVINCES: AB, ID?, MT, WY?

USFS ECOREGIONS: M331A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M333C:??

FEDERAL LANDS: PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.4034, WATE.5052, WATE.5051.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Cooper et al. 1987, Pfister et al. 1977, Western Ecology Working Group n.d.

***Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* / *Xerophyllum tenax* Forest
SUBALPINE FIR - ENGELMANN SPRUCE / GROUSEBERRY / BEAR-GRASS FOREST**

IDENTIFIER: C EGL005914

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.d.)
Alliance	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> Forest Alliance (A.168)
Alliance (English name)	Subalpine Fir - Engelmann Spruce Forest Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Vaccinium scoparium</i> / <i>Xerophyllum tenax</i> Forest
Association (English name)	Subalpine Fir - Engelmann Spruce / Grouseberry / Bear-grass Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)

ELEMENT CONCEPT

GLOBAL SUMMARY: This forest association occurs in the subalpine zone in the central and northern Rocky Mountains near and west of the Continental Divide where climate is influenced by maritime weather. Elevations range from 1585-2530 m (5200-8300 feet) depending on latitude and landform (frost pockets are lower). Sites are cool and include upper subalpine, wind-swept upper ridge slopes, and frost pockets. Substrates are typically well-drained, coarse- to fine-textured soils (loamy sand to silt) with moderate gravel content (25-36%) that are derived from a wide variety of sedimentary, metamorphic and igneous parent materials. Litter dominates ground surface often over 2 cm deep with low cover of bare ground and rock. Vegetation is characterized by *Abies lasiocarpa* and *Picea engelmannii* codominating the tree canopy, with the dwarf-shrub *Vaccinium scoparium* codominating the understory with clumps of *Xerophyllum tenax*. The evergreen needle-leaved tree canopy is open to moderately dense (20-70% cover) and is typically codominated by *Abies lasiocarpa*, *Picea engelmannii* and mature seral trees, with *Abies lasiocarpa* dominating the subcanopy and regeneration layers. *Pinus contorta* is the most important seral species, but scattered *Pinus albicaulis* or *Pseudotsuga menziesii* may be present. Undergrowth is typically an open to dense dwarf-shrub layer dominated by *Vaccinium scoparium* (10-50% cover), however, *Vaccinium myrtilloides* or *Vaccinium caespitosum* may be well-represented. *Vaccinium membranaceum* may form an open short-shrub layer. The herbaceous layer would be sparse except for cover of *Xerophyllum tenax* (20-60%). Relatively consistent forbs and graminoids may include *Arnica* spp., *Calamagrostis rubescens*, *Carex geyeri*, *Orthilia secunda* (= *Pyrola secunda*), *Viola orbiculata*, and *Valeriana sitchensis*. *Luzula glabrata* var. *hitchcockii* is absent or uncommon (<1% cover).

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This forested association occupies dry, moderately steep to steep slopes with variable aspects. Its position is most often mid to high slope. Stands also occur in horizontal strips above exposed bedrock cliffs. Elevation ranges from 2050-2160 m (6724-7085 feet). Soils are typically well-drained to rapidly drained and derived from calcareous and noncalcareous sedimentary material. Stands have been documented overlying siltstone and limestone. The soil is usually rocky and may or may not be well-developed. Soil texture is commonly sandy loam, however, the association may occasionally develop on clay loam soil. Ground cover is approximately 40% litter. Small rock, large rock, bedrock, wood and bare soil may each contribute roughly 10% surface cover.

GLOBAL ENVIRONMENT: This forest association occurs in the subalpine zone in the central and northern Rocky Mountains near and west of the Continental Divide where climate is influenced by maritime weather. Elevations range from 1585-2530 m (5200-8300 feet) depending on latitude and landform (frost pockets are lower). Sites are cool and include upper subalpine, wind-swept upper ridge slopes, and frost pockets. Substrates are typically well-drained, coarse- to fine-textured soils (loamy sand to silt) with moderate gravel content (25-36%). Soils are derived from a wide variety of sedimentary, metamorphic and igneous parent materials such as andesite, calcareous and noncalcareous argillite, basalt, granite, gneiss, quartzite, quartz monzonite, rhyolite, schist, and calcareous and noncalcareous sedimentary rocks. Litter dominates ground surface often over 2 cm deep with low cover of bare ground and rock.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The upper tree canopy is typically open, with cover of 20-30%. However, canopy cover may approach 60% in some stands. Tree height in the upper stratum is usually less than 10

m, and a discernible subcanopy is often absent. Denser stands may support trees up to 20 m tall with an apparent subcanopy of trees 5-10 m in height. *Abies lasiocarpa* is the most common and abundant species in both the upper and lower strata. *Pinus contorta* may be well-represented in seral stands. The dwarf-shrub *Vaccinium scoparium* is characteristically present in this association, though cover of this species may be less than 10%. *Vaccinium membranaceum* is common in the short-shrub layer, with average cover of approximately 5%. The herbaceous layer is dominated by *Xerophyllum tenax*, with up to 60% cover in some stands. *Arnica cordifolia* had high constancy (75%) in sampled stands and an average cover of 11%.

GLOBAL VEGETATION: This Rocky Mountain conifer association is characterized by *Abies lasiocarpa* and *Picea engelmannii* codominating the tree canopy, with dwarf-shrub *Vaccinium scoparium* and clumps of *Xerophyllum tenax* codominating the understory, and *Luzula glabrata* var. *hitchcockii* absent or uncommon (<1% cover). The evergreen needle-leaved tree canopy is open to moderately dense (20-70% cover) and is typically codominated by *Abies lasiocarpa*, *Picea engelmannii* and mature seral trees, with *Abies lasiocarpa* dominating the subcanopy and regeneration layers. *Pinus contorta* is the most important seral species, but scattered *Pinus albicaulis* or *Pseudotsuga menziesii* may be present. Undergrowth is typically an open to dense dwarf-shrub layer dominated by *Vaccinium scoparium* (10-50% cover), however, *Vaccinium myrtillus* or *Vaccinium caespitosum* may be well-represented. *Vaccinium membranaceum* may form an open short-shrub layer. The herbaceous layer would be sparse except for cover of *Xerophyllum tenax* (20-60%). Relatively consistent forbs and graminoids may include *Arnica* spp., *Calamagrostis rubescens*, *Carex geyeri*, *Orthilia secunda* (= *Pyrola secunda*), *Viola orbiculata*, and *Valeriana sitchensis*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Xerophyllum tenax</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Xerophyllum tenax</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Arnica cordifolia*, *Vaccinium membranaceum*, *Vaccinium scoparium*

GLOBAL: *Abies lasiocarpa*, *Vaccinium scoparium*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4G5 (11-Mar-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest (CEGL005917)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium myrtillus* Forest (CEGL000343)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* / *Thalictrum occidentale* Forest (CEGL005919)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* Forest (CEGL000344)
- *Pinus contorta* / *Vaccinium scoparium* / *Calamagrostis rubescens* Forest (CEGL000174)
- *Pinus contorta* / *Vaccinium scoparium* / *Xerophyllum tenax* Forest (CEGL005924)
- *Pinus contorta* / *Vaccinium scoparium* Forest (CEGL000172)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium scoparium* Phase (Cooper et al. 1987) B
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium scoparium* Phase (Pfister et al. 1977) B
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium scoparium* Phase (Steele et al. 1981) B
- C68: *Pinus contorta* - *Abies lasiocarpa* / *Xerophyllum tenax* Vegetation Type (Achuff et al. 2002a) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is relatively uncommon in the IPP. It is known from one location in Waterton Lakes National Park. In Glacier National Park the association primarily occurs east of and near the Continental Divide. East of the divide the association has been documented near Gable Pass and Dawson Pass. West of the divide the association occurs along the Highline Trail.

GLOBAL RANGE: This forest association occurs in the subalpine zone in the central and northern Rocky Mountains near and west of the Continental Divide in west-central and northwestern Montana, central and northern Idaho and Alberta.

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT:S4

USFS ECOREGIONS: M332A:CC, M332B:CC, M332C:CC, M332D:C?, M332E:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.273, GLAC.240, GLAC.2025, WATE.4116.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Achuff et al. 2002a, Cooper et al. 1987, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d.

I.A.8.N.e. Temporarily flooded temperate or subpolar needle-leaved evergreen forest

Abies lasiocarpa Temporarily Flooded Forest Alliance

Abies lasiocarpa - *Picea engelmannii* / *Alnus viridis* ssp. *sinuata* Forest SUBALPINE FIR - ENGELMANN SPRUCE / SITKA ALDER FOREST

IDENTIFIER: C EGL000297

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Temporarily flooded temperate or subpolar needle-leaved evergreen forest (I.A.8.N.e.)
Alliance	<i>Abies lasiocarpa</i> Temporarily Flooded Forest Alliance (A.177)
Alliance (English name)	Subalpine Fir Temporarily Flooded Forest Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Alnus viridis</i> ssp. <i>sinuata</i> Forest
Association (English name)	Subalpine Fir - Engelmann Spruce / Sitka Alder Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)

ELEMENT CONCEPT

GLOBAL SUMMARY: This minor forest association occurs in scattered locations in the lower subalpine zone of the northern Rocky Mountains. Stands are typically found on steep mountain slopes on northern aspects, at elevations ranging from 1525-2290 m (5000-7500 feet). Sites are cool and moist. Substrates are typically loams or less commonly silt loams or silts. Litter dominates ground cover often 6 cm deep with low cover of rock and bare ground. The vegetation is characterized by a tree canopy codominated by *Abies lasiocarpa* and *Picea engelmannii* with tall shrub *Alnus viridis* ssp. *sinuata* dominating the understory. The evergreen needle-leaved tree canopy is moderately dense (60-90% cover) and is typically codominated by *Abies lasiocarpa* and *Picea engelmannii* with lesser

amounts of *Pinus contorta*, *Pseudotsuga menziesii*, *Pinus albicaulis*, and *Larix occidentalis* (west of the Continental Divide). The tall-shrub layer is composed of dense patches and is dominated by *Alnus viridis* ssp. *sinuata* with scattered *Ribes lacustre*. *Vaccinium membranaceum*, *Vaccinium myrtillus*, and/or *Vaccinium scoparium* often form a dwarf-shrub layer. The herbaceous layer is typically sparse and composed of diverse forbs such as *Arnica cordifolia*, *Arnica latifolia*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, and *Xerophyllum tenax*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Data from a single plot in Glacier National Park were used to describe this association. This forest association occurs on steep, high-mountain slopes with northerly aspects. Sites are cool and moist. Elevation is approximately 1905 m (6248 feet). The association occupies a thin layer of rocky soil over glacial till. Soils are typically characterized as a sandy loam and are not well-developed. Ground cover is primarily litter, but may be up to 20% wood, in the form of coarse woody debris.

GLOBAL ENVIRONMENT: This minor forest association occurs in scattered locations in the lower subalpine zone of the northern Rocky Mountains. Elevations range from 1980-2290 m (6500-7500 feet) throughout west-central Montana and central Idaho, extending down to 1525 m (5000 feet) in more northern stands. Stands are typically found on steep mountain slopes on northern aspects. Sites are cool and moist. Substrates are typically loams or less commonly silt loams or silts derived from argillite, gneiss, schist, granite and biotite granite, or noncalcareous sedimentary rocks. Litter dominates ground cover often 6 cm deep with low cover of rock and bare ground.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The upper tree canopy is comprised of a uniform layer of trees 15-20 m tall in this forest association. This layer is dense, with canopy cover of approximately 80%, and is dominated by *Abies lasiocarpa*. *Picea engelmannii* may be well-represented with near 20% cover. The tree subcanopy is also dominated by *Abies lasiocarpa*. Total subcanopy cover is typically 10%, with tree height ranging from 5-10 m. Tall shrubs contribute around 50% canopy cover. *Alnus viridis* ssp. *sinuata* is the dominant tall-shrub species, with an average of 40% cover. Other common shrubs include *Ribes inerme*, *Ribes lacustre*, and *Rubus parviflorus*. Dwarf-shrubs are absent in most stands. Herbaceous species contribute a total cover of approximately 70% in this association. *Arnica cordifolia* is the most abundant forb, with 40% cover. *Thalictrum occidentale* and *Xerophyllum tenax* are also common. Each of these species contributed 20% cover in the sampled stand.

GLOBAL VEGETATION: This minor Rocky Mountain conifer association is characterized by *Abies lasiocarpa* and *Picea engelmannii* codominating the tree canopy with tall shrub *Alnus viridis* ssp. *sinuata* dominating the understory. The evergreen needle-leaved tree canopy is moderately dense (60-90% cover) and is typically codominated by *Abies lasiocarpa* and *Picea engelmannii*, with lesser amounts of *Pinus contorta*, *Pseudotsuga menziesii*, *Pinus albicaulis*, and *Larix occidentalis* (west of the Continental Divide). The tall-shrub layer is composed of dense patches and is dominated by *Alnus viridis* ssp. *sinuata* with scattered *Ribes lacustre*. *Vaccinium membranaceum*, *Vaccinium myrtillus*, and/or *Vaccinium scoparium* often form a dwarf-shrub layer. Herbaceous layer is typically sparse and composed of diverse forbs such as *Arnica cordifolia*, *Arnica latifolia*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, and *Xerophyllum tenax*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Alnus viridis</i> ssp. <i>sinuata</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Thalictrum occidentale</i> , <i>Xerophyllum tenax</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Alnus viridis</i> ssp. <i>sinuata</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Thalictrum occidentale</i> , <i>Xerophyllum tenax</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Alnus viridis* ssp. *sinuata*, *Arnica cordifolia*

GLOBAL: *Abies lasiocarpa*, *Picea engelmannii*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Alnus incana* Forest (CEGL000296)
- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005893)
- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Xerophyllum tenax* Forest (CEGL005895)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Alnus sinuata* Habitat Type (Steele et al. 1981) B
- *Abies lasiocarpa* / *Alnus sinuata* Habitat Type (Pfister et al. 1977) B
- *Abies lasiocarpa*/ *Alnus sinuata* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon in Glacier National Park, and has not been documented in Waterton Lakes National Park. In Glacier National Park the association has been recorded in the Many Glacier valley, near Swiftcurrent Lake.

GLOBAL RANGE: This minor forest association occurs in scattered locations in the lower subalpine zone of the central and northern Rocky Mountains of Idaho and Montana.

NATIONS: US

STATES/PROVINCES: ID:S3, MT:S4

USFS ECOREGIONS: M331A:CC, M332A:C?, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M333A:C?, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.63.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, IDCDC 2005, MTNHP 2002b, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d.

***Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Forest
SUBALPINE FIR - ENGELMANN SPRUCE / CLASPING TWISTED-STALK FOREST**

IDENTIFIER: CEGL000336

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Temporarily flooded temperate or subpolar needle-leaved evergreen forest (I.A.8.N.e.)

Alliance	<i>Abies lasiocarpa</i> Temporarily Flooded Forest Alliance (A.177)
Alliance (English name)	Subalpine Fir Temporarily Flooded Forest Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Streptopus amplexifolius</i> Forest
Association (English name)	Subalpine Fir - Engelmann Spruce / Claspings Twisted-stalk Forest
ECOLOGICAL SYSTEM(S):	Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833) Northern Rocky Mountain Conifer Swamp (CES306.803)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is a very broadly distributed association occurring in the major ranges of northern Utah, Wyoming, Idaho, eastern Washington and Montana into at least west-central Alberta. In drier climates it is a small-patch type, but with higher precipitation regimes; it can expand to large patches in valley locations. Elevations range from 1250 m in the north to 3355 m at the highest in the south. In the southern portion of this type's distribution, parent materials are largely alluvium, soils are loamy to silty in texture, derived from the local country rock, which ranges from sandstone to basalt to granitics in the vicinity of major batholiths. In the north, sedimentary and metasediments are the rule with silty clay loams and loams predominating. Mottling and rust pockets are found in many soil pits, indicating high water tables or subirrigation for a portion of the year. Subirrigation is reflected by landscape positions on lower terraces and stringers of lower order streams, toeslopes and side-hill seeps. Most of the indicator forbs present are associated with the decidedly rich end of the soil-nutrient regime. The canopy for the most part is open, the modal cover ranging between 40-60%, dominated by *Abies lasiocarpa* and *Picea engelmannii*. *Pinus contorta* is the major seral species in the middle Rockies, whereas in the northern Rockies *Pseudotsuga menziesii*, *Larix occidentalis*, *Pinus monticola*, and *Abies grandis* are additional seral species. The dominant aspect of the undergrowth is an abundance of medium to tall forbs, though shrub cover can at times approach 50%; shrubs are a more important component in the northern distribution of the association. Shrubs with the highest constancy and cover include *Ribes lacustre*, *Vaccinium membranaceum*, *Alnus viridis* ssp. *sinuata*, *Lonicera utahensis*, *Cornus sericea*, and *Menziesia ferruginea*. The graminoid component is negligible. Of the forbs diagnostic for the association four, *Streptopus amplexifolius*, *Senecio triangularis*, *Heracleum maximum* and *Mitella pentandra*, are distributed across the breadth of the type, though there are numerous ancillary high-constancy forbs spanning the type's range including *Thalictrum occidentale*, *Geranium richardsonii*, *Osmorhiza berteroi*, *Maianthemum stellatum*, *Orthilia secunda*, and *Arnica cordifolia* (or *Arnica latifolia* at higher elevations). *Aconitum columbianum*, *Saxifraga odontoloma* (= *Saxifraga arguta*), *Mertensia ciliata*, and *Mertensia arizonica* are wet-site taxa occurring with relatively high constancy in the southerly portion of the association. The forb component of diagnostic species is more diverse from central Idaho northward.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This mesic forest association occupies a wide variety of topographical features within long, broad valleys. The association forms pockets or ribbons and may occupy high mountain slopes in sites where drainage is restricted, keeping the soil moist until early summer. Lower elevation stands occur on toeslopes or in floodplains, swales or seeps. The association often occurs near rivers and large streams, where the water table remains near the surface most of the growing season. Topography may be flat, gently sloped, moderately sloped or steep. Elevations range from 1130-1970 m (3706-6461 feet). Stands occur on a variety of noncalcareous parent materials, including glacial till, colluvium, fluvial deposits or siltstone. The soil is typically a well-drained loam, but may be somewhat poorly drained in lower elevation sites with gentle to flat topography. Clay and sand are significant textural components. Stands with a palustrine character have soil with a greater amount of silt.

GLOBAL ENVIRONMENT: This is a very broadly distributed association of the Intermountain West occurring from Utah's Uinta Mountains northward, occurring in the major ranges of Wyoming, Idaho, eastern Washington and Montana into at least west-central Alberta. In the south it is an incidental, small-patch type, but with higher precipitation regimes of northerly climes, it can expand to large patches in valley locations. Given this extensive latitudinal gradient it is not surprising that it occurs as high as 3355 m (11,000 feet) in the south (Uintas) and as low as 1250 m (4100 feet) in northeastern Montana; however, within a given landscape (Glacier National Park, for example) it exhibits a 915-m (3000-foot) range (1280-2200 m [4200-7200 feet]). In the southern portion of this type's distribution parent materials are largely alluvium, loamy to silty in texture, derived from the local country rock, which ranges from sandstone to basalt to granitics in the vicinity of major batholiths. In the north, sedimentary and metasediments are the rule with silty clay loams and loams predominating. Mottling and rust pockets are found in many soil pits, indicating high water tables or subirrigation for a portion of the year. Subirrigation is reflected by landscape positions on lower terraces and stringers of lower order streams, toeslopes and side-hill seeps where the moisture status is gauged to be hygric to subhydryc. Most of the indicator forbs present are associated with the decidedly rich end of the soil-nutrient regime.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The tree canopy may be open and woodland-like, with a canopy cover of 20-30%, ranging to dense, approaching 80% in some stands. Tree height is also variable. Upper elevation stands, where conditions are harsh and snow movement affects tree growth, may support trees 5-10 m tall in the upper canopy. Lower

elevation stands are often more robust, with trees reaching 35-50 m. Between these two extremes are communities with intermediate characteristics. The emergent layer, in mid- to low-elevation stands, may include early-seral species such as *Pinus contorta* and *Larix occidentalis*. Though these species may contribute significant canopy cover (5-20%), *Abies lasiocarpa* and *Picea engelmannii* typically dominate the overall forest canopy layer. A subcanopy of trees 5-10 m tall constitutes a healthy regeneration layer and is typically dominated by *Abies lasiocarpa* and *Picea engelmannii* with a cover of 5-10%. Tall- and short-shrub cover are low in most stands, ranging from 0-30%, although some stands, especially those with an open tree canopy, may develop a shrub layer approaching 60%. A wide variety of shrubs are present in these cases, with *Ribes lacustre* and *Rubus parviflorus* the most common species. This layer is usually 0.5-1 m tall, but can reach 2 m in some stands. Dwarf-shrub cover is also low, although *Linnaea borealis* may be well-represented. Herbaceous cover is dense, approaching 80-100% in most stands. A variety of moist-site species are diagnostic and characteristically dominate the undergrowth including most commonly *Galium triflorum*, *Veratrum viride*, *Gymnocarpium dryopteris*, *Mitella breweri*, and *Senecio triangularis*, although cover for each species is usually less than 10%. *Arnica cordifolia* and *Thalictrum occidentale*, though not necessarily mesic species, were present in almost all sampled plots with average canopy cover of 23% and 9%, respectively.

GLOBAL VEGETATION: The canopy for the most part is open, the modal cover ranging between 40-60%, dominated by *Abies lasiocarpa* and *Picea engelmannii*. In the south of the type's distribution *Picea engelmannii* is a long-lived seral species that dominates the canopy for 200 or more years. *Pinus contorta* is the other major seral species in the middle Rockies, whereas in the northern Rockies *Pseudotsuga menziesii*, *Larix occidentalis*, *Pinus monticola*, and *Abies grandis* are added to the seral species mix, though their cover is always less than that of the diagnostic tree species. The dominant aspect of the undergrowth is a predominance of medium to tall forbs, though shrub cover can at times approach 50%; shrubs are a more important component in the northern distribution of the association. Shrubs with the highest constancy and cover include *Ribes lacustre*, *Vaccinium membranaceum*, *Alnus viridis ssp. sinuata*, *Lonicera utahensis*, *Cornus sericea*, and *Menziesia ferruginea*. The graminoid component verges on negligible with only *Bromus vulgaris* (or the ecologically very similar *Bromus ciliatus*) having a constancy greater than 30%. Of the forbs diagnostic for the association four, *Streptopus amplexifolius*, *Senecio triangularis*, *Heracleum maximum* and *Mitella pentandra*, are distributed across the breadth of the type, though there are numerous ancillary high-constancy forbs spanning the type's range including *Thalictrum occidentale*, *Geranium richardsonii*, *Osmorhiza berteroi*, *Maianthemum stellatum*, *Orthilia secunda*, and *Arnica cordifolia* (or *Arnica latifolia* at higher elevations). *Aconitum columbianum*, *Saxifraga odontoloma* (= *Saxifraga arguta*), *Mertensia ciliata*, and *Mertensia arizonica* are wet-site taxa occurring with relatively high constancy in the southerly portion of the association. The forb component of diagnostic species is more diverse from central Idaho northward and includes *Ligusticum canbyi*, *Trautvetteria caroliniensis*, *Athyrium filix-femina*, *Mertensia paniculata*, *Veratrum viride*, *Heracleum maximum*, *Erigeron peregrinus*, *Gymnocarpium dryopteris*, *Angelica arguta* (or *Angelica dawsonii*), *Trollius laxus*, *Mitella breweri*, and *Viola glabella*. High-constancy forbs in the northern portion of the type's range include *Clintonia uniflora*, *Tiarella trifoliata*, *Eucephalus engelmannii*, *Galium triflorum*, *Actaea rubra*, *Valeriana sitchensis*, and *Xerophyllum tenax*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus parviflorus</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Thalictrum occidentale</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Herb (field)	Forb	<i>Senecio triangularis</i> , <i>Streptopus amplexifolius</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Angelica arguta*, *Galium triflorum*, *Gymnocarpium dryopteris*, *Heracleum maximum*, *Mitella breweri*, *Senecio triangularis*, *Streptopus amplexifolius*, *Veratrum viride*

GLOBAL: *Abies lasiocarpa*, *Heracleum maximum*, *Mitella pentandra*, *Picea engelmannii*, *Ribes lacustre*, *Senecio triangularis*, *Streptopus amplexifolius*, *Vaccinium membranaceum*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION**STATUS:** Standard**CLASSIFICATION CONFIDENCE:** 1 - Strong**WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:**

GLOBAL COMMENTS: This association has a broad distribution and has been variously recognized by a stand having just a trace of the nominal species *Streptopus amplexifolius*, to any of a number of indicator species being present, singly or in combination, up to 5% canopy cover. There is considerable floristic diversity represented within the type given the broad geographical range, but the sites basically represent a rather narrow environmental spectrum, hygric to subhygric moisture regimes. All the globally similar associations have *Picea engelmannii* as an import canopy component, often having greater cover than *Abies lasiocarpa*, thus the adoption of the new dual designation of the upper canopy should be more meaningful. *Streptopus amplexifolius* should be retained to designate the undergrowth because it has relatively high constancy, a broad geographic distribution, priority of use, and there is no doubt of its association with wet sites. *Abies lasiocarpa* / *Trautvetteria carolinensis* Forest (CEGL000339) should be archived because it is virtually identical in terms of site parameters and composition to what has been defined elsewhere in the northern Rocky Mountains as *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Forest (CEGL000336). It is also unclear why various authors have recognized *Abies lasiocarpa* - *Picea engelmannii* / *Galium triflorum* Forest (CEGL000311) as a separate entity; it would appear to have lower total forb cover, possibly because tree canopy cover is greater, though forb composition is virtually identical. It too should probably be synonymized with this association and archived.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Actaea rubra* Forest (CEGL000295)
- *Abies lasiocarpa* - *Picea engelmannii* / *Galium triflorum* Forest (CEGL000311)
- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Streptopus amplexifolius* Woodland (CEGL005897)
- *Abies lasiocarpa* - *Picea engelmannii* / *Mertensia ciliata* Forest (CEGL002663)
- *Abies lasiocarpa* - *Picea engelmannii* / *Oplopanax horridus* Forest (CEGL000322)
- *Abies lasiocarpa* / *Trautvetteria carolinensis* Forest (CEGL000339)
- *Populus tremuloides* - *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Forest (CEGL005908)
- *Tsuga mertensiana* / *Streptopus amplexifolius* Forest (CEGL000511)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Aconitum columbianum* Habitat Type (Youngblood et al. 1985b) B
- *Abies lasiocarpa* / *Streptopus amplexifolius* Forest (Kovalchik 1993) =
- *Abies lasiocarpa* / *Streptopus amplexifolius* Habitat Type (Mauk and Henderson 1984) B
- *Abies lasiocarpa* / *Streptopus amplexifolius* (Bourgeron and Engelking 1994) =
- Conifer / *Aconitum columbianum* Community Type (Padgett et al. 1989) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B
- O32: *Abies lasiocarpa* / *Valeriana sitchensis* - *Pedicularis bracteosa* - *Thalictrum occidentale* Vegetation Type (Achuff et al. 2002a) I
- S22: *Abies lasiocarpa* / *Arnica cordifolia* Vegetation Type (Achuff et al. 2002a) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is fairly common in both Glacier National Park and Waterton Lakes National Park, especially east of the Continental Divide. In Glacier National Park the association occurs east of the divide on mountain slopes and in valley bottomlands. Specifically, the association was documented in the St. Mary, Two Medicine, Waterton and Belly River drainages. West of the divide the association was documented in the McDonald Valley near Granite Park, and along the Middle Fork Flathead River near Essex.

GLOBAL RANGE: This is a very broadly distributed association of the Intermountain West occurring from Utah's Uinta Mountains northward, occurring in the major ranges of Wyoming, Idaho, eastern Washington and Montana into at least west-central Alberta.

NATIONS: CA, US**STATES/PROVINCES:** AB, ID:S4, MT:S3, OR:S2, UT:S2S3, WA:S2S3, WY:S2**USFS ECOREGIONS:** M331A:CC, M331D:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC**FEDERAL LANDS:** NPS (Glacier, Grand Teton); PC (Waterton Lakes); USFS (Wallowa-Whitman)**ELEMENT SOURCES****WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.16, GLAC.189, GLAC.2021, GLAC.2037, GLAC.2045, GLAC.236, GLAC.237, GLAC.2514, GLAC.45, GLAC.81, GLAC.91, WATE.4028, WATE.4115, WATE.5019, WATE.5020, WATE.5066, WATE.5122.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper, mod. G. Kittel

REFERENCES: Achuff et al. 2002a, Bourgeron and Engelking 1994, Cooper et al. 1987, Driscoll et al. 1984, Hansen et al. 1991, Hansen et al. 1995, IDCDC 2005, Johnson and Simon 1987, Kovalchik 1993, MTNHP 2002b, Mauk and Henderson 1984, Padgett et al. 1988b, Padgett et al. 1989, Steele et al. 1981, Steele et al. 1983, Western Ecology Working Group n.d., Youngblood and Mauk 1985, Youngblood et al. 1985b

***Tsuga heterophylla* Temporarily Flooded Forest Alliance**

***Tsuga heterophylla* / *Athyrium filix-femina* Forest WESTERN HEMLOCK / COMMON LADYFERN FOREST**

IDENTIFIER: C EGL000491

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Temporarily flooded temperate or subpolar needle-leaved evergreen forest (I.A.8.N.e.)
Alliance	<i>Tsuga heterophylla</i> Temporarily Flooded Forest Alliance (A.174)
Alliance (English name)	Western Hemlock Temporarily Flooded Forest Alliance
Association	<i>Tsuga heterophylla</i> / <i>Athyrium filix-femina</i> Forest
Association (English name)	Western Hemlock / Common Ladyfern Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland (CES306.804)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association occurs in northern Idaho, on the west slope of the Bitterroot Mountains, in the Coeur d'Alene National Forest, and western Montana in Glacier National Park. It occurs on stream terraces, toeslopes and lower slope positions, from roughly 915 to 2500 m (3000-8200 feet) elevation. Slopes are less than 25% and aspects are northwestern to eastern. Soils are well-drained, loamy sands to silt loams in texture, with some having a high gravel content. This is a needle-leaved evergreen forest, dominated by *Tsuga heterophylla*. Other trees occasionally present may include *Thuja plicata*, *Abies grandis*, *Pinus monticola*, *Abies lasiocarpa*, and *Picea engelmannii*, but only *Tsuga heterophylla* is reproducing successfully. Scattered shrubs occur, but none are particularly abundant. Shrub species occasionally present include *Taxus brevifolia*, *Menziesia ferruginea*, *Acer glabrum*, and *Rubus parviflorus*. The herbaceous layer is abundant and dominated by perennial ferns. *Athyrium filix-femina* is always present, with cover usually over 10% and occasionally over 50%. *Gymnocarpium dryopteris* is also common.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs exclusively in the McDonald Lake drainage, an area of inland maritime climatic influence, on old stream terraces and toeslopes elevations between 960 and 1049 m (3160-3440 feet). These areas are expected to be subirrigated and have mostly alluvial soils, deep silty loams. This area of the park virtually never experiences the Arctic cold fronts and Chinook winds that typify the park east of the Continental Divide. This association is just a degree wetter than *Tsuga heterophylla* / *Gymnocarpium dryopteris* Forest (CEGL000494), a type to which it most frequently abruptly grades. The forest floor is covered with a thick mat of litter and some downed wood.

GLOBAL ENVIRONMENT: This association occurs in a mountainous region of inland maritime climate, characterized by mild, moderate winters with prolonged gentle rains, deep snow accumulations at higher altitudes and abundant clouds, fog and high humidity. Summers are typically very dry for most of the region (<1 inch precipitation/month). Geologically, the region is underlain by metamorphosed, Precambrian sedimentary strata that have been folded and intensely faulted. This association occupies stream terraces, toeslopes and lower slope positions, from roughly 915 to 2500 m (3000-8200 feet) elevation. Slopes are less than 25% and aspects are northwestern to eastern. Soils are well-drained, loamy sands to silt loams in texture, with a high gravel content. Litter depth averages 5 cm.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: *Tsuga heterophylla* or *Thuja plicata* can dominate the tree canopy of this association as long as *Tsuga* comprises 25% of the total cover. The tree canopy is predominantly closed with greater than 60% cover, although mortality of mature individuals leaves large canopy gaps, mostly occupied by seedlings and saplings of *Tsuga heterophylla* and *Thuja plicata*. *Tsuga heterophylla* cover can range from 25-80% ,while cover of *Thuja plicata* ranges from 2-60%. *Larix occidentalis*, *Populus balsamifera ssp. trichocarpa*, and *Abies lasiocarpa* are the other canopy species but contribute considerably less cover. *Oplopanax horridus* and *Symphoricarpos albus* are consistently present in this type with low cover. Other shrubs, such as *Taxus brevifolia* and *Acer glabrum*, are sometimes present, generally occurring in trace amounts. The herbaceous layer is usually species-rich and always dominated by perennial ferns, including the tall (to 1 m) *Athyrium filix-femina* with 10-40% cover and relatively diminutive (to 3 dm) *Gymnocarpium dryopteris* with 3-30% cover. Other consistent forbs within this association include *Tiarella trifoliata*, *Clintonia uniflora*, *Maianthemum stellatum*, and *Viola glabella*, each with trace to 3% cover. Mesic forbs, such as *Adenocaulon bicolor*, *Aralia nudicaulis*, *Bromus vulgaris*, *Osmorhiza berteroi*, *Thalictrum occidentale*, *Actaea rubra*, *Circaea alpina*, and *Galium triflorum*, may also be present in low amounts.

GLOBAL VEGETATION: This association is a needle-leaved evergreen forest dominated by *Tsuga heterophylla*. Other trees occasionally present may include *Thuja plicata*, *Abies grandis*, *Pinus monticola*, *Abies lasiocarpa*, and *Picea engelmannii*, but only *Tsuga heterophylla* is reproducing successfully. Scattered shrubs occur, but none are particularly abundant. Species occasionally present include the needle-leaved evergreen *Taxus brevifolia* and the deciduous broad-leaved *Menziesia ferruginea*, *Acer glabrum*, and *Rubus parviflorus*. The herbaceous layer is abundant and dominated by perennial ferns. *Athyrium filix-femina* is always present, with cover usually over 10% and occasionally over 50%. *Gymnocarpium dryopteris* is also common.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Tree subcanopy	Needle-leaved tree	<i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Herb (field)	Forb	<i>Tiarella trifoliata</i>
Herb (field)	Fern or fern ally	<i>Athyrium filix-femina</i> , <i>Gymnocarpium dryopteris</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Picea engelmannii</i> , <i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Tall shrub/sapling	Needle-leaved tree	<i>Taxus brevifolia</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Menziesia ferruginea</i>
Herb (field)	Forb	<i>Tiarella trifoliata</i>
Herb (field)	Fern or fern ally	<i>Athyrium filix-femina</i> , <i>Gymnocarpium dryopteris</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Athyrium filix-femina*, *Clintonia uniflora*, *Gymnocarpium dryopteris*, *Oplopanax horridus*, *Symphoricarpos albus*, *Thuja plicata*, *Tiarella trifoliata*, *Tsuga heterophylla*

GLOBAL: *Tsuga heterophylla*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2Q (1-Feb-1996). This association has a restricted range of distribution and is described from only two locations.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: In terms of composition, abiotic parameters and geographic range *Tsuga heterophylla* / *Athyrium filix-femina* Forest (CEGL000491) and *Thuja plicata* / *Athyrium filix-femina* Forest (CEGL000473) are virtually identical. The difference between *Tsuga* and *Thuja* dominance of the upper canopy is quite probably related to historical accident, past disturbance events and

subsequent successional patterns. Despite the very long fire-return intervals (200-500 years for stand-replacing fire), the longevity of both species, especially *Thuja*, argues for considering the dual designation (*Thuja plicata* - *Tsuga heterophylla*) as appropriate (i.e., combining these two associations into one); if one or the other species responds to disturbance by attaining canopy dominance it is unlikely the non-dominant species will become dominant in the average fire-free interval. Others have recognized that quite probably a dominance continuum exists between these two species by naming at least 8 plant associations with the dual designation (*Tsuga heterophylla* - *Thuja plicata* /_).

Arguing against this approach is the approach being taken by the NVC placing emphasis on existing vegetation composition, and it is indisputable that either climax tree species can be strongly dominant with the other species occurring only in the reproductive layers, if at all. In northern Idaho, where these species are sympatric over an extensive range, there are drainages where one or the other species is present and its complement is not (Daubenmire and Daubenmire 1968); this phenomenon has never been satisfactorily explained and again argues for recognizing separate *Thuja plicata* and *Tsuga heterophylla* types.

GLOBAL SIMILAR ASSOCIATIONS:

- *Thuja plicata* - *Tsuga heterophylla* / *Oplopanax horridus* Rocky Mountain Forest (CEGL000479)
- *Thuja plicata* / *Athyrium filix-femina* Forest (CEGL000473)
- *Tsuga heterophylla* / *Gymnocarpium dryopteris* Forest (CEGL000494)

GLOBAL RELATED CONCEPTS:

- *Thuja plicata* / *Athyrium filix-femina* Habitat Type (Cooper et al. 1987) I
- *Tsuga heterophylla* / *Athyrium filix-femina* (Topik et al. 1986) =
- *Tsuga heterophylla*/ *Athyrium filix-femina* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association occurs west of the Continental Divide in the Lake McDonald drainage.

GLOBAL RANGE: It has been described from northern Idaho, on the west slope of the Bitterroot Mountains, in the Coeur d'Alene National Forest, and west of the Continental Divide (Lake McDonald drainage) in Montana's Glacier National Park.

NATIONS: US

STATES/PROVINCES: ID:S2, MT:S2

USFS ECOREGIONS: M332A:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); USFS (Coeur d'Alene, Gifford Pinchot)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2216, AAGL.C102.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper, mod. J. Asebrook

GLOBAL DESCRIPTION AUTHORS: M.S. Reid, mod. S.V. Cooper

REFERENCES: Bourgeron and Engelking 1994, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Driscoll et al. 1984, Moseley and Wellner 1988, Topik et al. 1986, Wellner 1985, Western Ecology Working Group n.d.

I.A.8.N.f. Seasonally flooded temperate or subpolar needle-leaved evergreen forest

Abies lasiocarpa Seasonally Flooded Forest Alliance

Abies lasiocarpa - *Picea engelmannii* / *Calamagrostis canadensis* Forest SUBALPINE FIR - ENGELMANN SPRUCE / BLUEJOINT FOREST

IDENTIFIER: CEGL000300

NVC Classification

Physiognomic Class Forest (I)

Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Seasonally flooded temperate or subpolar needle-leaved evergreen forest (I.A.8.N.f.)
Alliance	<i>Abies lasiocarpa</i> Seasonally Flooded Forest Alliance (A.190)
Alliance (English name)	Subalpine Fir Seasonally Flooded Forest Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Calamagrostis canadensis</i> Forest
Association (English name)	Subalpine Fir - Engelmann Spruce / Bluejoint Forest
ECOLOGICAL SYSTEM(S):	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)

ELEMENT CONCEPT

GLOBAL SUMMARY: This spruce-fir riparian forest type is a minor and sporadic plant association in the middle Rocky Mountains of Colorado and Utah, but is consistently present in most mountain ranges in the northern Rocky Mountains well into Canada. It occupies the lower to middle reaches of the subalpine zone, occurring from 1400 to 2776 m (4595-9075 feet), and occasionally to 3300 m (10,800 feet) in elevation. It has the coldest and wettest environment in the *Abies lasiocarpa* alliance because of high groundwater levels and cold-air drainage from surrounding uplands. Snowpack often persists late into the season. Sites include toeslopes and footslopes and stream terraces of all gradients. However, the most common landscape position is poorly drained depressions or basins, from pond margins, to fairly sizable kettleholes to minor swales. These depositional positions are typified by fine-textured soils. These sites are typically subirrigated and in the early portion of the growing season are saturated to the surface, but they become dry by mid summer or earlier. The canopy of this type is highly variable with some stands having a dense canopy of *Abies lasiocarpa*, with *Picea engelmannii* a lesser component and *Pinus contorta* or *Populus tremuloides* seral components. *Abies* and *Picea* are sometimes only poorly represented as stunted or very slow-growing individuals in old-growth stands of persistent *Pinus contorta*. These prolonged seral conditions typically occur with sites that are not too wet. Sites are sufficiently wet that *Pseudotsuga menziesii* and *Larix occidentalis* do poorly here as seral species. *Pinus albicaulis* may occur when this type extends into the upper subalpine zone in protected basins, where it is most commonly found on hummocks or drier sites within the stand. Shrub associates include *Ledum glandulosum*, *Lonicera involucrata*, *Ribes lacustre*, *Vaccinium caespitosum*, *Vaccinium myrtillus*, and *Vaccinium scoparium*. *Rubus parviflorus*, *Symphoricarpos albus*, and *Spiraea betulifolia*, can comprise a distinct layer in some stands. The modal undergrowth condition is characterized as a relatively lush sward of *Calamagrostis canadensis* (or *Calamagrostis stricta*) with scattered shrubs and herbs. Other graminoids can include *Carex aquatilis*, *Carex disperma*, *Carex microptera* (= *Carex festivella*), *Carex norvegica* ssp. *inferalpina* (= *Carex media*), *Carex utriculata*, *Luzula parviflora*, and *Poa reflexa*. Associated forbs are geographically variable, and occasionally they can be conspicuous. Those forbs with high constancy include *Thalictrum occidentale*, *Senecio triangularis*, *Veratrum viride*, *Heracleum maximum*, *Dodecatheon jeffreyi*, *Maianthemum stellatum* (= *Smilacina stellata*), *Streptopus amplexifolius*, and *Equisetum arvense*. Moss cover is typically high.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This small-patch forest association occupies gentle slopes, channel beds and floodplain terraces on or near basin floors. Saturated soils prevail through much of the growing season, the result of seasonal flooding, subterranean irrigation and/or poor soil drainage. The association often occurs adjacent to lakes and streams or immediately above a river floodplain. Elevations range from 1040-1840 m (3400-6035 feet). Geologic parent material is noncalcareous glacial fluvial in origin. Soil texture is highly variable, ranging from poorly drained clay to well-drained sand and typically contains a moderate amount of silt. Ground cover is primarily litter. Wood, bare soil and rock of various sizes may be present in trace amounts.

GLOBAL ENVIRONMENT: This riparian forest type is a minor and sporadic plant association in the middle Rocky Mountains but is consistently present in most mountain ranges in the northern Rocky Mountains well into Canada. It occupies the lower to middle reaches of the subalpine zone, occurring at elevations as low as 1400 m (4600 feet, in frost pockets) to 2776 m (9100 feet), and occasionally as high as 3300 m (10,800 feet, Rocky Mountain National Park). It has the coldest and wettest environment in the *Abies lasiocarpa* alliance because of high groundwater levels and cold-air drainage from surrounding uplands (Hess and Alexander 1986). In Colorado, at the southern extreme of its distribution, this association is characterized as having a narrow niche, occurring on toeslopes adjacent to moderate-gradient streams. Snowpack often persists late into the season. Conversely, in the northern Rockies sites include toeslopes and footslopes and stream terraces of all gradients. However, the most common landscape position is poorly drained depressions or basins, from pond margins, to fairly sizable kettleholes to minor swales. Being predominantly depositional positions in the landscape, these sites are typified by fine-textured soils, clay loams being quite prevalent (Pfister et al. 1977). These sites are subirrigated and in the early portion of the growing season are saturated to the surface, some even having standing water; they become dry by mid summer or earlier. Permanently wet sites (seeps) have mucky surface soils below a typically thick organic layer. Better drained sites have a loamy surface soil texture, and often gravel. Areas of bare soil or rock are negligible on most sites. Average litter depths are extremely variable, ranging from almost none in stream bottom sites to depths of 15 cm in seepage or depression areas.

Parent material for soils varies widely and includes granitics, quartzite, alluvium and colluvium, glacial till and drift of sedimentary origin (both calcareous and noncalcareous), and volcanics, both extrusive and intrusive.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: *Abies lasiocarpa* and *Picea engelmannii* typically dominate the forest canopy in this association, with a total cover of 30-50%. *Pinus contorta* may also contribute significant cover in younger stands, or be present in the form of standing dead or coarse woody debris. Tree height in the upper stratum is usually 20-35 m. Combined tall- and short-shrub cover is 20-40% in a layer 0.5 to 1.5 m tall. A wide variety of species is usually present, including *Rubus parviflorus*, *Alnus viridis ssp. sinuata*, *Symphoricarpos albus*, and *Spiraea betulifolia*. Dwarf-shrubs are absent or present in trace amounts. Herbaceous cover is dense (60-100%) in most stands, with moist-site species characteristically dominating the undergrowth. *Calamagrostis canadensis* is the most abundant herb (contributing an average cover of 45%) and diagnostic of these wet sites. *Elymus glaucus* was present in all sampled plots with a cover of 1-5%. *Heracleum maximum*, *Galium triflorum*, and *Veratrum viride* are characteristic of this association with cover for each species ranging from 1-10%.

GLOBAL VEGETATION: The canopy of this type is highly variable, with stands of the southern distribution having a dense canopy of *Abies lasiocarpa*, with *Picea engelmannii* a lesser component and *Pinus contorta* a highly constant seral component. *Populus tremuloides* is also present sometimes as a seral component. Often these *Abies lasiocarpa*-dominated stands represent a later successional stage, from which the formerly dominant *Pinus contorta* has been removed by natural mortality. According to Mauk and Henderson (1984), *Abies* and *Picea* are sometimes only poorly represented as stunted or very slow-growing individuals in old-growth stands of persistent *Pinus contorta*. These prolonged seral conditions typically occur with sites that are not too wet. In the north all degrees of canopy closer have been documented, with the cover usually not greater than 50% and dominated by highly variable combinations of *Abies lasiocarpa* and *Picea engelmannii*. Sites are sufficiently wet that *Pseudotsuga menziesii* and *Larix occidentalis* do poorly here as seral species, though *Pinus contorta* may constitute a significant component, its cover often exceeding that of climax dominants. Pfister et al. (1977) report that *Pinus albicaulis* may occur when this type extends into the upper subalpine zone in protected basins, where it is most commonly found on hummocks or drier sites within the stand. Shrub associates include *Ledum glandulosum*, *Lonicera involucrata*, *Ribes lacustre*, *Vaccinium caespitosum*, *Vaccinium myrtillus*, and *Vaccinium scoparium*. Shrubs characteristic of drier sites may grow on hummocks or at the base of trees (Steele et al. 1983). *Rubus parviflorus*, *Symphoricarpos albus*, and *Spiraea betulifolia*, can comprise a distinct layer in some stands.

The modal undergrowth condition is characterized as a relatively lush sward of *Calamagrostis canadensis* (or *Calamagrostis stricta*) with scattered shrubs and herbs. Other graminoids include *Carex aquatilis*, *Carex disperma*, *Carex microptera* (= *Carex festivella*), *Carex norvegica ssp. inferalpina* (= *Carex media*), *Luzula parviflora*, and *Poa reflexa*. Associated forbs are geographically variable, and occasionally they can be conspicuous. Those forbs with high constancy at least in the northern portion of this type's range include *Thalictrum occidentale*, *Senecio triangularis*, *Veratrum viride*, *Heracleum maximum*, *Dodecatheon jeffreyi*, *Maianthemum stellatum* (= *Smilacina stellata*), *Streptopus amplexifolius*, and *Equisetum arvense*. In particular geographic areas *Ligusticum* spp., *Trautvetteria caroliniensis*, and *Aconitum columbianum* can comprise significant cover; other important species include *Actaea rubra*, *Arnica cordifolia*, *Linnaea borealis*, *Mertensia ciliata*, *Mitella pentandra*, *Osmorhiza depauperata*, *Pyrola chlorantha*, *Saxifraga odontoloma* (= *Saxifraga arguta*), and *Trollius laxus*. Due to the high coverage values for both shrubs and graminoids, the forb component of some sites is negligible (Cooper 1975). Moss cover is typically high.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Galium triflorum*, *Heracleum maximum*, *Picea engelmannii*, *Veratrum viride*

GLOBAL: *Abies lasiocarpa*, *Calamagrostis canadensis*, *Equisetum arvense*, *Heracleum maximum*, *Maianthemum stellatum*, *Picea engelmannii*, *Senecio triangularis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:**CONSERVATION STATUS RANK****GLOBAL RANK & REASONS:** G5 (1-Feb-1996).**CLASSIFICATION****STATUS:** Standard**CLASSIFICATION CONFIDENCE:** 1 - Strong**WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:**

GLOBAL COMMENTS: The association name proposed here is new and better reflects the fact that a mix of the two climax dominant tree species exists in these stands in all combinations of cover and structure. Prior classifications (Pfister et al. 1977, Steele et al. 1983) have recognized and termed this same type *Abies lasiocarpa* / *Calamagrostis canadensis*, accepting that *Picea engelmannii* might constitute anything from a dominant to a trace or even be absent. They viewed the absence of *Abies lasiocarpa*, where *Picea engelmannii* was dominant with the same undergrowth composition, as somehow different. We have recognized that *Abies lasiocarpa* and *Picea engelmannii* are close ecological analogues and that this community is the wettest in which these two species are capable of sharing dominance. There is presently no indication that *Picea engelmannii* / *Calamagrostis canadensis* Forest (CEGL002678), defined by a total lack of *Abies lasiocarpa*, is other than a stochastic phenomena, though in some portions of Montana the lower elevation limits of *Picea* are noted to exceed those of *Abies lasiocarpa*. In situations as wet as denoted by say *Picea engelmannii* / *Equisetum arvense* Forest (CEGL000363), *Abies lasiocarpa* is either not present, or found only in microsites, or as unthrifty specimens that will never reach the upper canopy.

A number of phases of the *Abies lasiocarpa* / *Calamagrostis canadensis* association have been recognized (Pfister et al. 1977, Steele et al. 1981, 1983, Cooper et al. 1987), but at this juncture we have considered those with an appreciable cover of forbs (for example the *Ligusticum canbyi* phase in northern Idaho) as just variation to be accepted within the association. There is no information to suggest they measurably differ in site parameters, rather they seem more to represent geographic floristic distinctions. The shrub-dominated phases (*Vaccinium caespitosum*, *Ledum glandulosum*) do exhibit differences in site parameters and probably should be elevated to the association level (for example *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium caespitosum* / *Calamagrostis canadensis*), but this has not yet been thoroughly reviewed. Some (including Hansen et al. (1995)) have apparently included stands with appreciable (>10%) cover of *Carex utriculata*, *Carex disperma*, or *Carex scopulorum* in this association, when in fact a yet wetter soil moisture regime is indicated by these species when exhibiting such relatively high cover.

GLOBAL SIMILAR ASSOCIATIONS:

- *Picea engelmannii* / *Calamagrostis canadensis* Forest (CEGL002678)
- *Pinus contorta* / *Calamagrostis canadensis* Forest (CEGL000138)
- *Populus balsamifera* ssp. *trichocarpa* - *Populus tremuloides* - Conifer / *Calamagrostis canadensis* Forest (CEGL005909)
- *Populus tremuloides* / *Calamagrostis canadensis* Forest (CEGL000574)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Calamagrostis canadensis* Forest (Carsey et al. 2003a) =
- *Abies lasiocarpa* - *Picea engelmannii* / *Calamagrostis canadensis* Plant Association (Baker 1984a) =
- *Abies lasiocarpa* / *Calamagrostis canadensis* Habitat Type (Pfister et al. 1977) B
- *Abies lasiocarpa* / *Calamagrostis canadensis* (Crowe and Clausnitzer 1997) =
- *Abies lasiocarpa* / *Calamagrostis canadensis* Association (Crowe et al. 2004) =
- *Abies lasiocarpa* / *Calamagrostis canadensis* Habitat Type (Cooper et al. 1987) B
- *Abies lasiocarpa* / *Calamagrostis canadensis* Habitat Type (Hess and Alexander 1986) B
- *Abies lasiocarpa* / *Calamagrostis canadensis* Habitat Type (Mauk and Henderson 1984) B
- *Abies lasiocarpa* / *Calamagrostis canadensis* Habitat Type (Steele et al. 1983) B
- *Abies lasiocarpa* / *Calamagrostis canadensis* Habitat Type (Steele et al. 1981) B
- *Abies lasiocarpa* / *Calamagrostis canadensis* Habitat Type (Cooper 1975) ?
- *Abies lasiocarpa* / *Calamagrostis canadensis* Habitat Type (Komarkova et al. 1988b) =
- *Abies lasiocarpa* / *Calamagrostis canadensis* Habitat Type, *Calamagrostis canadensis* Phase (Cooper et al. 1987) =
- *Abies lasiocarpa* / *Calamagrostis canadensis* Habitat Type, *Ligusticum canbyi* Phase (Cooper et al. 1987) =
- *Abies lasiocarpa* / *Calamagrostis canadensis* Habitat Type, *Vaccinium caespitosum* Phase (Cooper et al. 1987) =
- *Abies lasiocarpa* / *Calamagrostis canadensis* (Bourgeron and Engelking 1994) =
- Conifer / *Calamagrostis canadensis* Community Type (Padgett et al. 1989) B
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is common in valleys east of the Continental Divide along streams or lakes. It occurs in Glacier National Park and Waterton Lakes National Park. Specifically, in Glacier National Park the association is documented in the Many Glacier, Two Medicine and Slide Lake/Otatso Creek drainages and at the head of Waterton Lake; within IPP it can be expected to occupy a much broader geographic range than documented by sample plots alone.

GLOBAL RANGE: This association occurs in Colorado, northern Utah, western Wyoming, Idaho, Montana, and north into Alberta, Canada.

NATIONS: CA, US

STATES/PROVINCES: AB, CO:S3, ID:S3, MT:S5, OR, UT:S4?, WA?, WY:S2

USFS ECOREGIONS: M331A:CC, M331B:CC, M331D:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton, Rocky Mountain, Yellowstone); PC (Waterton Lakes); USFS (Arapaho-Roosevelt, Caribou-Targhee, Colville NF?, Gunnison, Wallowa-Whitman)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.242, GLAC.268, GLAC.281, GLAC.59, GLAC.82, GLAC.2010, WATE.5085.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper, mod. S.L. Neid

REFERENCES: Baker 1984a, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Cooper 1975, Cooper and Cottrell 1990, Cooper et al. 1987, Crowe and Clausnitzer 1997, Crowe et al. 2004, Driscoll et al. 1984, Fischer and Bradley 1987, Hansen et al. 1995, Hess and Alexander 1986, IDCDC 2005, Johnston 1987, Kettler and McMullen 1996, Kittel et al. 1999a, Komarkova et al. 1988b, MTNHP 2002b, Mauk and Henderson 1984, Padgett et al. 1989, Pfister et al. 1977, Richard et al. 1996, Steele et al. 1981, Steele et al. 1983, Terwilliger et al. 1979a, Western Ecology Working Group n.d.

***Abies lasiocarpa* - *Picea engelmannii* / *Oplopanax horridus* Forest**
SUBALPINE FIR - ENGELMANN SPRUCE / DEVIL'S-CLUB FOREST

IDENTIFIER: CEGL000322

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Seasonally flooded temperate or subpolar needle-leaved evergreen forest (I.A.8.N.f.)
Alliance	<i>Abies lasiocarpa</i> Seasonally Flooded Forest Alliance (A.190)
Alliance (English name)	Subalpine Fir Seasonally Flooded Forest Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Oplopanax horridus</i> Forest
Association (English name)	Subalpine Fir - Engelmann Spruce / Devil's-club Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)
 Northern Rocky Mountain Conifer Swamp (CES306.803)

ELEMENT CONCEPT

GLOBAL SUMMARY: This minor coniferous forest association occurs in drainages and seeps at mid-elevations in mountain ranges of northwestern Montana and northern Idaho. Elevations range from 1200-1500 m. Stands tend to be small (<8 ha) and are restricted to low-lying areas with high water tables most of the year, such as along streams, springs and seeps. Sites are seasonally flooded with surface water present for extended periods during the growing season, and tree regeneration is dominated by *Abies lasiocarpa*. This association often forms long narrow stands within floodplains. Soils are variable, but generally acidic with a deep organic layer. Lateral stands are characterized by a moderately dense to dense, sometimes giant (>50 m tall) tree canopy codominated by *Abies lasiocarpa* and *Picea engelmannii* or *Picea glauca*. Minor tree associates include *Pseudotsuga menziesii*, *Larix occidentalis*, and

Pinus monticola. *Oplopanax horridus* and *Taxus brevifolia* dominate the moderately dense to dense tall-shrub layer; at least 5% cover of *Oplopanax horridus* is considered diagnostic for the association. Other common shrub associates include *Menziesia ferruginea*, *Rubus parviflorus*, *Symphoricarpos albus*, and *Vaccinium* spp. *Linnaea borealis* may also have high cover, and *Abies lasiocarpa* dominates the tree regeneration. The herbaceous layer is abundant, diverse, and forb-dominated, including species such as *Clintonia uniflora*, *Maianthemum stellatum*, *Streptopus amplexifolius*, *Tiarella trifoliata*, and the ferns *Athyrium filix-femina* and *Gymnocarpium dryopteris*. Diagnostic of this association is the closed coniferous tree canopy codominated by *Abies lasiocarpa* with an *Oplopanax horridus*-dominated tall-shrub layer.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This forest association occupies low-level swales, terraces and alluvial fans in valley bottomlands. The association often occurs near rivers and large streams, seeps or subirrigated areas where the water table remains near the surface most of the growing season. Topography may be flat, undulating, or gently sloped. Elevations extend from 1015-1385 m (3329-4543 feet), though the association is more common at the lower end of this range. Stands occur on a variety of noncalcareous parent materials, including argillite. The soil is moderately well-drained to poorly drained, and clay is usually a significant textural component. Soils range from clay loam to silty clay. However, one stand was sampled on well-drained soil with a silt loam texture.

GLOBAL ENVIRONMENT: This relatively uncommon wetland plant association occurs at the lowest elevations of the subalpine zone with a demonstrated elevation range of 1200 to 1500 m (3900-5000 feet). This association occurs on wet, subirrigated bottomlands, as a streamside stringer, near springs, and seepage areas (including moderate to steep slopes of various aspects) where the water table remains near the surface (within 1 m) throughout the year. Parent materials include a wide variety of noncalcareous rock types. Soil texture varies widely from fine to coarse, but rock fragments generally constitute at least 35% of the soil volume. Soil drainage varies from well-drained to poorly drained. Adjacent wetter communities are often *Carex* spp.-dominated, whereas relatively drier sites support *Abies lasiocarpa* - *Picea engelmannii* / *Calamagrostis canadensis* Forest (CEGL000300), *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Forest (CEGL000336), or most frequently *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Forest (CEGL005912). The much more common *Thuja plicata* - *Tsuga heterophylla* / *Oplopanax horridus* Rocky Mountain Forest (CEGL000479) occupies similar sites located on lower, warmer elevations.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: *Abies lasiocarpa* and *Picea engelmannii* typically dominate the forest canopy in this association, with a cover of 30-50%. *Larix occidentalis* and *Pseudotsuga menziesii* may be present in small amounts. Tree height in the upper stratum is usually 20-50 m. A subcanopy of trees 5-10 m tall is typically dominated by *Abies lasiocarpa* and *Picea engelmannii* with a cover of 5-20%. The tall-shrub (2-5 m) and short-shrub (0.5-2 m) cover are dense, ranging from 70-100%. *Oplopanax horridus*, which can span the range from short- to tall-shrub classes depending on environment, was present in all sampled plots with an average cover of 45%. *Rubus parviflorus* was also present with 10-20% cover. A variety of species, such as *Vaccinium membranaceum* and *Spiraea betulifolia*, are usually present in small amounts (1-5%). Dwarf-shrub cover is also low, with *Linnaea borealis* the most common species. Herbaceous cover is dense, approaching 100% in most stands. Moist-site species characteristically dominate the undergrowth. *Athyrium filix-femina*, *Gymnocarpium dryopteris*, and *Tiarella trifoliata* are typically well-represented with 10-30% cover for each species. All three of these species had 100% constancy in sampled plots.

GLOBAL VEGETATION: The upper canopy ranges from quite open to moderately closed with 40 to 70% cover dominated by a variable mix of *Abies lasiocarpa* and *Picea engelmannii* (or *Picea engelmannii* X *Picea glauca* hybrid swarms). Seral tree species establish in minimum numbers, though their subsequent growth appears to be normal; the following have been noted: *Pseudotsuga menziesii*, *Larix occidentalis*, *Pinus monticola*, and *Pinus contorta*. At least 5% cover of *Oplopanax horridus* is considered diagnostic for the association, but the modal situation would have this distinctive, well-armed shrub with 20 to 50% cover; it does not attain the high cover and is lower in height (0.8-1.4 m) than when found in *Thuja plicata* - *Tsuga heterophylla* / *Oplopanax horridus* Rocky Mountain Forest (CEGL000479) (heights over 2 m commonly). Other shrubs are scarce with only *Taxus brevifolia* and *Ribes lacustre* being consistently present. The graminoid component is very depauperate with only *Cinna latifolia* and *Bromus vulgaris* regularly represented. Forbs are generally abundant and diverse with *Aralia nudicaulis*, *Clintonia uniflora*, *Tiarella trifoliata*, *Circaea alpina*, *Gymnocarpium dryopteris*, *Athyrium filix-femina*, *Streptopus amplexifolius*, and *Senecio triangularis* having the greatest constancy and cover.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Oplopanax horridus</i>
Herb (field)	Forb	<i>Tiarella trifoliata</i>
Herb (field)	Fern or fern ally	<i>Athyrium filix-femina</i> , <i>Gymnocarpium dryopteris</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Oplopanax horridus</i>
Herb (field)	Forb	<i>Aralia nudicaulis</i> , <i>Clintonia uniflora</i> , <i>Senecio triangularis</i> , <i>Streptopus amplexifolius</i> , <i>Tiarella trifoliata</i>
Herb (field)	Fern or fern ally	<i>Athyrium filix-femina</i> , <i>Gymnocarpium dryopteris</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Athyrium filix-femina*, *Gymnocarpium dryopteris*, *Oplopanax horridus*, *Picea engelmannii*

GLOBAL: *Aralia nudicaulis*, *Gymnocarpium dryopteris*, *Oplopanax horridus*, *Picea engelmannii*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3 (14-Nov-1997). The few known examples of this association typically occupy small areas less than 20 acres. Large stands have recently been located in Montana. Occurrence of the association is poorly documented in Idaho, and it is suspected that surveys will reveal additional stands. Logging is a potential but unlikely threat as stands occupy streamside locations and saturated toeslopes that should be protected by state forest Best Management Practices.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association is always dominated by a combination of *Abies lasiocarpa* and *Picea engelmannii* of which the latter tree species nearly always is the tallest and the canopy dominant; *Abies lasiocarpa* appears more successful in the regeneration layers. This is the wettest association in which *Abies lasiocarpa* is capable of normal growth (not stunted and unthrifty) and functions as a dominant.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Forest (CEGL000336)
- *Abies lasiocarpa* / *Gymnocarpium dryopteris* Forest (CEGL002611)
- *Thuja plicata* - *Tsuga heterophylla* / *Oplopanax horridus* Rocky Mountain Forest (CEGL000479)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Oplopanax horridus* Habitat Type (Pfister et al. 1977) B
- *Abies lasiocarpa* / *Oplopanax horridus* Habitat Type (Hansen et al. 1995) B
- *Abies lasiocarpa*/*Oplopanax horridus* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is fairly common in Glacier National Park, especially west of the Continental Divide. It has not been documented in Waterton Lakes National Park. In Glacier National Park the association occurs west of the divide in valley bottomlands near the Middle Fork Flathead River and in the McDonald Valley. Specifically, the association was documented along the lower reaches of the Nyack River and Fern Creek. East of the divide the association was documented in the Waterton Valley, along the Waterton River.

GLOBAL RANGE: Minor type in northern Idaho and northwestern Montana. Similar plant associations have been described in eastern British Columbia and southwestern Alberta (Pfister et al. 1977).

NATIONS: CA?, US

STATES/PROVINCES: AB, ID:S2, MT:S2

USFS ECOREGIONS: M333A:CC, M333B:CC, M333C:C?, M333D:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2285, GLAC.2288, GLAC.2536, GLAC.99.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: M. Jankovsky-Jones, mod. S.V. Cooper

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Hansen et al. 1995, IDCDC 2005, Illingworth and Arlidge 1960, MTNHP 2002b, Ogilvie 1962, Pfister et al. 1977, Western Ecology Working Group n.d.

Picea engelmannii* Seasonally Flooded Forest Alliance**Picea engelmannii* / *Equisetum arvense* Forest****ENGELMANN SPRUCE / FIELD HORSETAIL FOREST**

IDENTIFIER: CEGL005927

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Seasonally flooded temperate or subpolar needle-leaved evergreen forest (I.A.8.N.f.)
Alliance	<i>Picea engelmannii</i> Seasonally Flooded Forest Alliance (A.191)
Alliance (English name)	Engelmann Spruce Seasonally Flooded Forest Alliance
Association	<i>Picea engelmannii</i> / <i>Equisetum arvense</i> Forest
Association (English name)	Engelmann Spruce / Field Horsetail Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Conifer Swamp (CES306.803)

ELEMENT CONCEPT

GLOBAL SUMMARY: This spruce-dominated riparian forest association is widely distributed in the upper montane and subalpine zones of the central and northern Rocky Mountains. It occurs on gently sloping stream terraces, wet benches, flat, poorly drained sites, and sidehill seeps, from 1000 to 2880 m (3300-9440 feet) in elevation. It occurs on sites too cold or too wet for *Abies lasiocarpa* to be abundant. It can occur adjacent to the wet forest margins of lakes, fens or bogs, and is often associated with the margins of wet basins or subirrigated terraces and toeslopes. Soils are Mollisols, or Histosols, sandy loam to clay in texture, often with a mucky organic surface layer and usually over coarse alluvial or glacial material. The upper canopy is dominated by *Picea engelmannii* or *Picea engelmannii* X *glauca* hybrids, with 20-70% cover. Other conifers typically present are *Pinus contorta* and *Abies lasiocarpa*. Other tree species occasionally present, depending on geographic location, are *Picea pungens*, *Populus tremuloides*, *Populus angustifolia*, and *Populus balsamifera* ssp. *trichocarpa*. Shrub cover is generally low (<5%), but has been reported as high as 50%. Typical species include *Alnus incana*, *Lonicera involucrata*, *Cornus sericea*, *Vaccinium scoparium*, *Ribes* spp., and *Salix* spp. Herbaceous species diversity is high and extremely variable between stands. However, herbaceous undergrowth is dominated by *Equisetum arvense*, which generally is the most abundant species, with average cover 30-40%, although it can have less than 10% cover. Other forbs and grasses present are mesic or hydric. Typical species include *Calamagrostis canadensis*, *Glyceria* spp., *Caltha leptosepala*, *Gymnocarpium dryopteris*, *Athyrium filix-femina*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Senecio triangularis*, *Cardamine cordifolia*, *Streptopus amplexifolius*, and *Maianthemum stellatum*, among many others. Disturbance from flooding is necessary to maintain this community.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This forest association occurs in broad alluvial valley bottoms. It is often found along streams channels or within river floodplains affected by seasonal flooding. The association also occurs in seeps, where moisture is present most of the growing season. Topography is typically flat, but may be undulating or gently sloped. When sloped, the aspect is variable. Elevation ranges from 1010-1690 m (3313-5543 feet). Parent material is usually glacio-fluvial, with an overlying layer of muck. Soils vary from peat to clay loam. One stand was sampled on loamy sand. The soil is typically poorly drained, but may be well-drained in sites with sandy soil. Wet soil and standing water are common in this association. Ground cover is 75-90% litter in some stands, with trace amounts of wood, water and bare soil. In other stands moss and lichen account for 75-90% of the ground cover, while litter makes up the remaining 25-10%.

GLOBAL ENVIRONMENT: This forested association occurs on gently sloping stream terraces, wet benches, flat, poorly drained sites, and sidehill seeps, from 1000 to 2880 m (3300-9440 feet) in elevation. It occurs in sites too cold or too wet for *Abies lasiocarpa* to be abundant. It can occur adjacent to the wet forest margins of lakes, fens or bogs, and is often associated with the margins of wet basins or subirrigated terraces and toeslopes. Soils are Mollisols, or Histosols, sandy loam to clay textures, often with a mucky organic surface layer and usually occur over coarse alluvial or glacial material.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The upper forest canopy cover is characteristically 50-70% in this association, but can be as low as 30% in some stands. The canopy is heavily dominated by *Picea engelmannii* with a height of 15-35 m. Other tree species, such as *Pinus contorta*, *Abies lasiocarpa* and *Populus balsamifera ssp. trichocarpa* may be present with less than 10% cover. *Picea engelmannii* is successfully reproducing in the understory, with shrub-sized trees well-represented. Tall-shrub cover is highly variable and quite diverse. In some stands tall shrubs are entirely absent, while cover approaches 50% in other stands. Short-shrub cover is equally variable and diverse. Common shrub species with low cover (less than 5%) in this association include *Symphoricarpos albus*, *Lonicera involucrata*, and *Ribes lacustre*. Dwarf-shrub cover is 0-10%. Typical dwarf-shrub species are *Rubus arcticus ssp. acaulis* and *Rubus pubescens*. Herbaceous cover ranges from 40-100% and is dominated consistently by *Equisetum arvense*. Herbaceous species diversity is high and extremely variable between stands. Mesic to hygric species are characteristic, such as *Galium triflorum*, *Maianthemum stellatum*, and *Streptopus amplexifolius*. Occasionally stands may support *Viola glabella*, *Tiarella trifoliata*, or *Gymnocarpium dryopteris* with canopy cover of 20-25%.

GLOBAL VEGETATION: This forested association is dominated by *Picea engelmannii* or *Picea engelmannii X glauca* hybrids, with 20-70% cover. Other conifers typically present are *Pinus contorta* and *Abies lasiocarpa*. Other tree species occasionally present, depending on geographic location are *Picea pungens*, *Populus tremuloides*, *Populus angustifolia*, and *Populus balsamifera ssp. trichocarpa*. *Picea engelmannii* is typically successfully reproducing in the understory, with shrub-sized trees well-represented. Tall-shrub cover is highly variable and quite diverse, as is the short-shrub layer. Total shrub cover is generally low (<5%), but has been reported as high as 50%. Typical species include *Alnus incana*, *Cornus sericea*, *Lonicera involucrata*, *Vaccinium scoparium*, *Ribes* spp., *Rubus* spp., and *Salix* spp. The herbaceous undergrowth is dominated by *Equisetum arvense*, which generally is the most abundant species, with average cover 30-40%, although it can have less than 10% cover. Other forbs and grasses present are mesic or hydric. Typical species include *Calamagrostis canadensis*, *Glyceria* spp., *Caltha leptosepala*, *Gymnocarpium dryopteris*, *Athyrium filix-femina*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Senecio triangularis*, *Cardamine cordifolia*, *Streptopus amplexifolius*, and *Maianthemum stellatum* (= *Smilacina stellata*), among many others. Occasionally stands may support *Viola glabella*, *Tiarella trifoliata*, or *Gymnocarpium dryopteris* with canopy cover of 20-25%.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Picea engelmannii</i>
Herb (field)	Forb	<i>Maianthemum stellatum</i> , <i>Tiarella trifoliata</i> , <i>Viola glabella</i>
Herb (field)	Fern or fern ally	<i>Equisetum arvense</i> , <i>Gymnocarpium dryopteris</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Picea engelmannii</i>
Herb (field)	Fern or fern ally	<i>Equisetum arvense</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Equisetum arvense*, *Galium triflorum*, *Picea engelmannii*, *Streptopus amplexifolius*

GLOBAL: *Maianthemum stellatum*, *Picea engelmannii*, *Streptopus amplexifolius*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association now includes the former *Picea (engelmannii X glauca, engelmannii) / Equisetum arvense* Forest (CEGL000408), originally identified by Pfister et al. (1977) from throughout western Montana. *Picea engelmannii* and/or *Picea engelmannii X glauca* (hybrids) are the diagnostic overstory species in this plant association. Stands can include pure *Picea engelmannii* and *Picea engelmannii X glauca* hybrid, or both. Hansen et al. (1995) explained that the frequent absence of mature cones, similar morphology, and ecological amplitudes led them to lump *Picea engelmannii* and *Picea glauca* (hybrids) into a single type, as did Pfister et al. (1977).

GLOBAL SIMILAR ASSOCIATIONS:

- *Picea pungens / Alnus incana* Woodland (CEGL000894)
- *Picea pungens / Equisetum arvense* Woodland (CEGL000389)
- *Populus balsamifera* ssp. *trichocarpa* - *Picea engelmannii / Equisetum arvense* Forest (CEGL005907)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa - Picea engelmannii / Equisetum arvense* (Kittel et al. 1999b) =
- *Abies lasiocarpa - Picea engelmannii / Equisetum arvense* Forest (Carsey et al. 2003a) =
- *Picea / Equisetum arvense* Community Type (Youngblood et al. 1985b) B
- *Picea / Equisetum arvense* Habitat Type (Hansen et al. 1995) B
- *Picea engelmannii / Equisetum arvense - Streptopus* (Kovalchik 1987) =
- *Picea engelmannii / Equisetum arvense* (Crowe and Clausnitzer 1997) =
- *Picea engelmannii / Equisetum arvense* Association (Kovalchik 1993) =
- *Picea engelmannii / Equisetum arvense* Association (Crowe et al. 2004) =
- *Picea engelmannii / Equisetum arvense* Community (Huckaby and Moir 1998) =
- *Picea engelmannii / Equisetum arvense* Habitat Type (Mauk and Henderson 1984) B
- *Picea engelmannii / Equisetum arvense* Habitat Type (Steele et al. 1983) B
- *Picea engelmannii / Equisetum arvense* Habitat Type (Steele et al. 1981) B
- *Picea engelmannii / Equisetum* Association (Williams et al. 1995) =
- *Picea engelmannii / Equisetum* Plant Association (Williams and Lillybridge 1983) =
- *Picea engelmannii / Equisetum* spp. Association (Kovalchik 1993) =
- *Picea engelmannii/Equisetum arvense* (Bourgeron and Engelking 1994) =
- *Picea pungens - Picea engelmannii / Equisetum arvense* Plant Association (Johnston 1987) =
- *Picea* spp./*Equisetum arvense* (Bourgeron and Engelking 1994) =
- C78: *Picea engelmannii / Equisetum arvense* Vegetation Type (Achuff et al. 2002a) I
- Conifer / *Equisetum arvense* Community Type (Padgett et al. 1989) B
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association occupies valley bottoms in Glacier National Park, on both sides of the Continental Divide. The association has been documented in the St. Mary and Many Glacier valleys east of the divide, and in the North and Middle Fork Flathead River drainages west of the divide. The association also occurs in Waterton Lakes National Park in the Belly River drainage, and may occur in other river valleys.

GLOBAL RANGE: This association occurs in the mountains of southeastern Oregon, eastern Washington, central and eastern Idaho, eastern Montana, western Wyoming, south into the Wasatch Range in Utah and into northern Colorado. It also is found in Alberta, Canada, and may occur in the Rocky Mountains of British Columbia.

NATIONS: CA, US

STATES/PROVINCES: AB, CO:S2, ID:S2, MT:S4, OR:S3, UT:S3?, WA:S3, WY:S2

USFS ECOREGIONS: 342B:CC, M331A:CC, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton, Rockefeller, Rocky Mountain); PC (Waterton Lakes); USFS (Arapaho-Roosevelt, Bighorn, Colville NF, Deschutes, Malheur, Medicine Bow, Okanogan, Pike-San Isabel, Routt, Shoshone, Wallowa-Whitman, Wenatchee, Winema)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2222, GLAC.2251, GLAC.2277, GLAC.43, GLAC.77, WATE.5145, WATE.9017, WATE.9018.

LOCAL DESCRIPTION AUTHORS: S. Kimball**GLOBAL DESCRIPTION AUTHORS:** G. Kittel, mod. S.L. Neid

REFERENCES: Achuff et al. 2002a, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Cooper 1975, Cooper 1986a, Cooper and Cottrell 1990, Crowe and Clausnitzer 1997, Crowe et al. 2004, Driscoll et al. 1984, Hansen et al. 1995, Huckaby and Moir 1998, IDCDC 2005, Jensen 1990, Johnston 1987, Jones and Ogle 2000, Kagan et al. 2000, Kettler and McMullen 1996, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1993, Kovalchik 2001, MTNHP 2002b, Manning and Padgett 1995, Mauk and Henderson 1984, Moseley et al. 1991, Padgett et al. 1989, Peet 1975, Pfister et al. 1977, Steele et al. 1981, Steele et al. 1983, WNHP unpubl. data, Western Ecology Working Group n.d., Williams and Lillybridge 1983, Williams and Lillybridge 1985, Williams and Smith 1990, Williams et al. 1990b, Williams et al. 1995, Youngblood and Mueggler 1981, Youngblood et al. 1985b

Pinus contorta* Seasonally Flooded Forest Alliance**Pinus contorta* / *Calamagrostis canadensis* Forest****LOGEPOLE PINE / BLUEJOINT FOREST****IDENTIFIER:** C EGL000138**NVC Classification**

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Seasonally flooded temperate or subpolar needle-leaved evergreen forest (I.A.8.N.f.)
Alliance	<i>Pinus contorta</i> Seasonally Flooded Forest Alliance (A.188)
Alliance (English name)	Lodgepole Pine Seasonally Flooded Forest Alliance
Association	<i>Pinus contorta</i> / <i>Calamagrostis canadensis</i> Forest
Association (English name)	Lodgepole Pine / Bluejoint Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)**ELEMENT CONCEPT**

GLOBAL SUMMARY: This association is found in the upper montane and subalpine zone of the central and northern Rocky Mountains on cool, seasonally moist sites. Elevations range between 968 and 3050 m (3175-10,000 feet) depending on longitude and aspect. Stands occur in narrow canyons, valley bottoms to lower slopes, small flats and benches with gentle slopes. Soils are seasonally moist either from an impermeable soil horizon that impedes drainage or are subirrigated from nearby riparian areas, but may dry out in late summer. The vegetation is characterized by a *Pinus contorta*-dominated tree canopy with a grassy understory. The tree canopy is open to moderately dense (30-80% cover), but may be nearly closed and is often solely dominated by *Pinus contorta*. However, in some stands, *Populus tremuloides*, *Abies lasiocarpa*, or *Picea engelmannii* trees may be present, especially in the subcanopy. Scattered dwarf-, short and tall shrubs are often present, and may form a distinct layer. Common shrubs may include *Amelanchier alnifolia*, *Betula nana*, *Dasiphora fruticosa* ssp. *floribunda*, *Juniperus communis*, *Ribes* spp., *Rosa* spp., *Rubus parviflorus*, *Salix* spp., *Spiraea betulifolia*, *Symphoricarpos albus*, *Vaccinium caespitosum*, *Vaccinium membranaceum*, or *Vaccinium scoparium*. The moderately dense to dense (30-90% cover) herbaceous layer is typically dominated by the perennial graminoid *Calamagrostis canadensis* (>5% cover) and diverse forbs. Wet-site forbs such as *Aconitum columbianum*, *Dodecatheon jeffreyi*, and *Senecio triangularis* are absent or have very low cover. Diagnostic of this association is the dominance of *Pinus contorta* in the tree canopy with *Calamagrostis canadensis* dominating the graminoid layer. Moss cover can be quite high (up to 98%).

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:** Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this forest association are found on the lower portions of slopes, drainages, and benches of glacio-fluvial deposits. They occur on collecting or subirrigated positions of gentle topography with little or no slope; slope aspect is insignificant compared to the augmented soil moisture these sites receive. This association has been found at elevations between 968 and 1684 m (3175-5524 feet). The brown soil tends to be moderately well-drained silt to clay loam with an insignificant percentage of gravel. Litter and duff cover much of the ground surface, although in some stands mosses can cover much of the surface.

GLOBAL ENVIRONMENT: This association is found in the upper montane and subalpine zone of the central and northern Rocky Mountains on cool, seasonally moist sites. Elevations range between 968 and 2985 m (3175-9800 feet) depending on longitude and aspect. Stands occur in narrow canyons, valley bottoms to lower slopes, small flats and benches with gentle slopes. Soils are

seasonally moist from high water table or poor soil drainage that is often caused by an impermeable soil horizon that impedes drainage, or the site is subirrigated from nearby riparian areas. Soils generally dry out in late summer. Soil texture is variable (sandy loam to clay) and includes well-developed fine-textured loams with an agile horizon and poorly developed, coarse-textured alluvium. Substrates are derived from quartzite, granite, volcanic, and/or calcareous sedimentary alluvium. Litter dominates ground cover often over 3 cm deep with low cover of rock and bare ground.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This vegetation type is dominated by an open to nearly closed tree canopy of *Pinus contorta*, with cover varying from 30 to 70%. The height of the canopy varies from 5 to 35 m, depending on the age of the stand. The subcanopy is also dominated by *Pinus contorta* with averages of 12% cover and 5 m or less in height. Species in the tree regeneration layer consist of *Abies lasiocarpa*, *Picea engelmannii*, *Pinus contorta*, and *Tsuga heterophylla*. The shrub layer is usually well-developed, with a mix of taller and shorter species. *Amelanchier alnifolia*, *Rubus parviflorus*, and *Sorbus scopulina* have low cover and moderate constancy. *Salix bebbiana*, *Symphoricarpos albus*, *Spiraea betulifolia*, and *Vaccinium membranaceum* are other shrubs that can be present. Shrub cover can be as much as 30-40%. The herbaceous layer is diverse and appreciable with an average canopy cover of 78%. Species included in this layer are the dominant graminoid *Calamagrostis canadensis* with an average cover of 38% and the forbs *Angelica arguta*, *Eurybia conspicua* (= *Aster conspicuus*), *Fragaria virginiana*, and *Thalictrum occidentale*.

GLOBAL VEGETATION: This association is characterized by a *Pinus contorta*-dominated tree canopy with a grassy understory. The evergreen needle-leaved tree canopy is 5-15 m tall. It is open to moderately dense (30-80% cover), but may be nearly closed. The tree canopy is often solely dominated by *Pinus contorta*, however, in some stands *Populus tremuloides*, *Abies lasiocarpa*, or *Picea engelmannii* trees may be present, especially in the subcanopy. Stands are often relatively young (<150 years old) with evidence of past fire. Scattered dwarf-, short and tall shrubs are often present and may form a distinct layer. Common shrubs may include *Dasiphora fruticosa* ssp. *floribunda*, *Amelanchier alnifolia*, *Antennaria microphylla*, *Betula nana*, *Juniperus communis*, *Ribes* spp., *Rosa* spp., *Rubus parviflorus*, *Salix bebbiana*, *Salix drummondiana*, *Sorbus scopulina*, *Spiraea betulifolia*, *Symphoricarpos albus*, *Vaccinium caespitosum*, *Vaccinium membranaceum*, or *Vaccinium scoparium*. The herbaceous layer is moderately dense to dense (30-90% cover) and typically strongly dominated by the perennial graminoid *Calamagrostis canadensis* (with minimum cover of 5%) and diverse forbs. Common herbaceous species include *Angelica arguta*, *Arnica cordifolia*, *Eurybia conspicua* (= *Aster conspicuus*), *Astragalus miser*, *Carex rossii*, *Elymus caninus*, *Fragaria virginiana*, *Geum macrophyllum*, *Lupinus argenteus*, *Maianthemum stellatum*, *Poa wheeleri*, *Solidago simplex* var. *spatulata* (= *Solidago spatulata*), *Trifolium longipes*, and *Trisetum spicatum*. Wet-site forbs such as *Aconitum columbianum*, *Dodecatheon jeffreyi*, and *Senecio triangularis* are absent or have very low cover. Mosses may be very abundant with up to 98% cover on the ground surface.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Tree subcanopy	Needle-leaved tree	<i>Pinus contorta</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i> , <i>Symphoricarpos albus</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Tree subcanopy	Needle-leaved tree	<i>Pinus contorta</i>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Calamagrostis canadensis*

GLOBAL: *Calamagrostis canadensis*, *Pinus contorta*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Phleum pratense*, *Poa pratensis*, *Taraxacum officinale*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Apr-1999).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association was considered seral and included in the *Abies lasiocarpa* / *Calamagrostis canadensis* Habitat Type (Cooper 1975, Pfister et al. 1977, Steele et al. 1981, 1983).

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Calamagrostis canadensis* Forest (CEGL000300)
- *Populus balsamifera* ssp. *trichocarpa* - *Populus tremuloides* - Conifer / *Calamagrostis canadensis* Forest (CEGL005909)
- *Populus tremuloides* / *Calamagrostis canadensis* Forest (CEGL000574)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Calamagrostis canadensis* - *Calamagrostis canadensis* Habitat Type (Steele et al. 1981) B
- *Abies lasiocarpa* / *Calamagrostis canadensis* Habitat Type (Tuhy and Jensen 1982) B
- *Abies lasiocarpa* / *Calamagrostis canadensis* Habitat Type (Pfister et al. 1977) B
- *Abies lasiocarpa* / *Calamagrostis canadensis* Habitat Type (Cooper 1975) B
- *Abies lasiocarpa* / *Calamagrostis canadensis* Habitat Type (Steele et al. 1983) B
- *Pinus contorta* / *Calamagrostis canadensis* - *Thalictrum occidentale* Community Type (Tuhy 1981) B
- *Pinus contorta* / *Calamagrostis canadensis* (Crowe and Clausnitzer 1997) =
- *Pinus contorta* / *Calamagrostis canadensis* Community Type (Mutz and Queiroz 1983) F
- *Pinus contorta* / *Calamagrostis canadensis* Community Type (Mauk and Henderson 1984) =
- *Pinus contorta* / *Calamagrostis canadensis* Community Type (Henderson et al. 1977) =
- *Pinus contorta* / *Calamagrostis canadensis* Ecological Type (Girard et al. 1997) =
- *Pinus contorta* / *Calamagrostis canadensis* (Bourgeron and Engelking 1994) =
- *Pinus contorta* var. *latifolia* / *Calamagrostis canadensis* Association (Crowe et al. 2004) =
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from four stands throughout Glacier National Park.

GLOBAL RANGE: This association occurs in subalpine riparian areas in the central and northern Rocky Mountains from the Uinta Mountains to northwestern Montana.

NATIONS: US

STATES/PROVINCES: CA?, ID:S5, MT, OR:SU, UT:S3S4, WY

USFS ECOREGIONS: M331A:CC, M331D:CC, M332A:CP, M332B:CP, M332C:CC, M332E:CP, M333C:CC, M333D:CP

FEDERAL LANDS: NPS (Glacier, Grand Teton, Rockefeller); USFS (Bighorn, Manti-La Sal, Umatilla)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2201, GLAC.264, GLAC.295, GLAC.2648.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz, mod. G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Cooper 1975, Cooper et al. 1987, Crowe and Clausnitzer 1997, Crowe et al. 2004, Driscoll et al. 1984, Girard et al. 1997, Henderson et al. 1977, IDCDC 2005, Jones and Ogle 2000, Kagan et al. 2004, Mauk and Henderson 1984, Mutz and Queiroz 1983, Padgett et al. 1989, Pfister et al. 1977, Steele et al. 1981, Steele et al. 1983, Titus et al. 1998, Tuhy 1981, Tuhy and Jensen 1982, Western Ecology Working Group n.d.

Thuja plicata Seasonally Flooded Forest Alliance

***Thuja plicata* - *Tsuga heterophylla* / *Oplopanax horridus* Rocky Mountain Forest**
WESTERN RED-CEDAR - WESTERN HEMLOCK / DEVIL'S-CLUB ROCKY MOUNTAIN FOREST

IDENTIFIER: C EGL000479**NVC Classification**

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Seasonally flooded temperate or subpolar needle-leaved evergreen forest (I.A.8.N.f.)
Alliance	<i>Thuja plicata</i> Seasonally Flooded Forest Alliance (A.193)
Alliance (English name)	Western Red-cedar Seasonally Flooded Forest Alliance
Association	<i>Thuja plicata</i> - <i>Tsuga heterophylla</i> / <i>Oplopanax horridus</i> Rocky Mountain Forest
Association (English name)	Western Red-cedar - Western Hemlock / Devil's-club Rocky Mountain Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Conifer Swamp (CES306.803)
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland (CES306.804)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is a linear, small-patch association located within moist and mild climatic regimes in the northern Rocky Mountains of Washington, Idaho and Montana. This is a saturated to seasonally flooded wetland forest community usually found in a mosaic with other wetland or riparian *Thuja plicata* or *Tsuga heterophylla* types. Ranging in elevation from 455 to 1311 m (1500-4300 feet), it is found on seep toeslopes and along riparian zones on wet streambank terraces. Landforms include lower benches, valleys, lower stream terraces, wet bottoms, and toeslope seepage areas. High water tables and cold-air drainage are characteristic of these sites. The water table is typically shallow, and soils are loams and sandy loams. Either *Thuja plicata* or *Tsuga heterophylla* dominate a nearly closed-canopy forest often with *Picea engelmannii* (or *Picea engelmannii* X *glauca*) or *Abies grandis* trees. In Montana *Tsuga heterophylla* is present in all occurrences, but *Thuja plicata* is often codominant. *Abies lasiocarpa*, *Populus balsamifera* ssp. *trichocarpa*, and *Pseudotsuga menziesii* are also occasionally present in the overstory, but typically with very low cover. *Tsuga heterophylla*, *Thuja plicata*, *Pseudotsuga menziesii*, and *Abies lasiocarpa* saplings are common in the subcanopy, with the latter being most common in higher elevation occurrences in Montana. The understory has a patchy to dense layer of tall *Oplopanax horridus* shrubs, which is a rhizomatous species; at least 5% cover of *Oplopanax* is diagnostic for this type. Other species that infrequently occur in the shrub layer include *Acer glabrum* or *Taxus brevifolia*. The shrub layers are typically low in diversity. Herbaceous diversity is typically high, primarily composed of forbs. *Athyrium filix-femina* and *Gymnocarpium dryopteris* can be prominent members of the luxuriant herbaceous layer along with *Tiarella trifoliata* var. *unifoliata*, *Clintonia uniflora*, *Actaea rubra*, *Asarum caudatum*, *Streptopus amplexifolius*, *Maianthemum stellatum*, *Viola orbiculata*, or *Osmorhiza berteroi*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs along toeslopes and other subirrigated positions. It is found on flats to moderate slopes with various aspects (aspect is a moot point given the abundant moisture) at elevations between 1012 and 1184 (3320-3882 feet). Soil texture is predominantly sandy loams to silty clays derived from glacial till or colluvial materials. Drainage varies from somewhat poorly drained to well-drained. Litter, moss and downed wood cover much of the ground surface, although there can be patches of large rock and lichen.

GLOBAL ENVIRONMENT: This linear, small-patch association is located within moist and mild climatic regimes in the northern Rocky Mountains of Washington, Idaho and Montana. This is a saturated to seasonally flooded wetland forest community usually found in a mosaic with other wetland or riparian *Thuja plicata* or *Tsuga heterophylla* types. Ranging in elevation from 455 to 1311 m (1500-4300 feet), it is found on seep toeslopes and along riparian zones on wet streambank terraces. Landforms include lower benches, valleys, lower stream terraces, wet bottoms, and toeslope seepage areas. Stream gradients are most typically low, but can be steep. High water tables and cold-air drainage are characteristic of these sites. Parent materials are quartzite and alluvial mixtures of metasediments, siltite, ash, and mica schist (Cooper et al. 1987). Textures tend to be coarse, ranging from loams to gravelly loamy sands. The ground surface rarely has any bare soil or rock; rather it is covered by lichen, moss, litter and downed wood, with litter depths up to 6 cm.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This evergreen, mature forest occurs on montane, subhygric to hygric sites, having fairly low overall species diversity. The tree layer is dominated by a mix of *Tsuga heterophylla* and *Thuja plicata*, together averaging over 60% cover and heights of 20-35 m. *Abies lasiocarpa*, *Populus balsamifera* ssp. *trichocarpa*, and *Pseudotsuga menziesii* are also occasionally present in the overstory, but typically with very low cover. *Tsuga heterophylla*, *Thuja plicata*, and *Abies lasiocarpa* saplings are common in the subcanopy with 3% cover, but only *Tsuga heterophylla* is present as seedlings in the sampled stands. The shrub layers are low in diversity, but cover is usually over 20%. *Oplopanax horridus* clearly dominates the short-shrub layer, and is always present with an average of 25% cover (ranging from 10% to 40%). Tall-shrub

cover is much lower with typically less than 5% cover, mostly from *Acer glabrum* and *Taxus brevifolia*. Cover of herbaceous species is usually high (often 60% or higher) and is dominated by ferns and forbs. *Gymnocarpium dryopteris*, *Clintonia uniflora*, and *Tiarella trifoliata* are always present, often with cover greater than 10%. *Dryopteris expansa* and *Athyrium filix-femina* can be abundant, but are not constant. A few other herbaceous species that are common include *Galium triflorum*, *Maianthemum stellatum*, and *Viola orbiculata*. Overall, the shrub and herbaceous layers have a uniform height of 0.5-1 m.

GLOBAL VEGETATION: Either *Thuja plicata* or *Tsuga heterophylla* dominate a nearly closed-canopy forest often with *Picea engelmannii* (or *Picea engelmannii* X *glauca*) or *Abies grandis*. In Montana, Pfister et al. (1977) and Hansen et al. (1995) report that *Tsuga heterophylla* is present in all occurrences, but *Thuja plicata* is often codominant. *Abies lasiocarpa*, *Populus balsamifera* ssp. *trichocarpa*, and *Pseudotsuga menziesii* are also occasionally present in the overstory, but typically with very low cover. *Tsuga heterophylla*, *Thuja plicata*, *Pseudotsuga menziesii*, and *Abies lasiocarpa* saplings are common in the subcanopy, with the latter being most common in higher elevation occurrences in Montana. The undergrowth has a patchy to dense layer of the shrub *Oplopanax horridus*, a rhizomatous species varying from short to tall in stature depending on region and/or environment. Other species that infrequently occur in the shrub layer include *Acer glabrum* or *Taxus brevifolia*. The shrub layers are typically low in diversity. Herbaceous diversity is typically high, primarily composed of forbs. *Athyrium filix-femina* and *Gymnocarpium dryopteris* can be prominent members of the herbaceous layer along with *Tiarella trifoliata* var. *unifoliata*, *Clintonia uniflora*, *Actaea rubra*, *Asarum caudatum*, *Senecio triangularis*, *Streptopus amplexifolius*, *Maianthemum stellatum*, *Viola orbiculata*, or *Osmorhiza berteroi*. Mosses and lichen cover can be significant.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Tree subcanopy	Needle-leaved tree	<i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Acer glabrum</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Oplopanax horridus</i>
Herb (field)	Forb	<i>Clintonia uniflora</i> , <i>Tiarella trifoliata</i>
Herb (field)	Fern or fern ally	<i>Gymnocarpium dryopteris</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Tree subcanopy	Needle-leaved tree	<i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Acer glabrum</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Oplopanax horridus</i>
Herb (field)	Forb	<i>Clintonia uniflora</i> , <i>Tiarella trifoliata</i>
Herb (field)	Fern or fern ally	<i>Athyrium filix-femina</i> , <i>Gymnocarpium dryopteris</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Gymnocarpium dryopteris*, *Oplopanax horridus*, *Tiarella trifoliata*, *Tsuga heterophylla*

GLOBAL: *Athyrium filix-femina*, *Gymnocarpium dryopteris*, *Oplopanax horridus*, *Tiarella trifoliata*, *Tsuga heterophylla*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3 (16-Oct-2002). This is a relatively common wetland forest type in the interior Pacific Northwest that occupies very few acres at any given location. Total estimated acreage is less than 10,000 acres (4032 ha), and perhaps much less than this. This association supports large, valuable trees and occurs on productive sites. Many of these sites have been logged thus altering community structure and site hydrology.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association (CEGL000479) is distinguished from *Tsuga heterophylla* - (*Thuja plicata*) / *Oplopanax horridus* / *Polystichum munitum* Forest (CEGL000497) which has "maritime" character species such as *Alnus rubra*, *Polystichum munitum*, *Achlys triphylla*, *Acer circinatum*, and *Vaccinium parvifolium* of the Cascades and west and is more upland/riparian in habitat. Whereas, the association discussed here has the presence/relative abundance of inland species, such as more *Abies grandis* (in U.S.), *Picea engelmannii*, *Acer glabrum*, and *Osmorhiza berteroi* in Canadian Rocky Mountains. This association tends to be more a wetland/riparian community. This type also needs to be compared to the several other associations already in the NVC occurring in the Pacific Northwest coastal ranges that have both *Tsuga heterophylla* and *Oplopanax horridus* in their names.

As defined here, this association allows for either *Tsuga* or *Thuja* to be the dominant in the canopy, alone or in combination with the other; it is recognized however, that most documented stands have both species at least present. This type was previously described by Pfister et al. (1977) and Cooper et al. (1987) as part of the *Thuja plicata* / *Oplopanax horridum* Habitat Type. In those treatments, *Thuja plicata* was given greater weight than *Tsuga heterophylla*, regardless of the abundance of *Tsuga*. Because *Thuja* is considered the species most likely to be the dominant in climax stands, and is the longest-lived, we have kept this association in the *Thuja plicata* Seasonally Flooded Forest Alliance (A.193) rather than moving it to one of the *Tsuga heterophylla* alliances.

The difference between *Tsuga* and *Thuja* dominance of the upper canopy in this association is quite probably related to historical accident, past disturbance events and subsequent successional patterns. Despite the very long fire-return intervals (200-500 years for stand-replacing fire), the longevity of both species, especially that of *Thuja*, argues for considering the dual designation (*Thuja plicata* - *Tsuga heterophylla*) as appropriate; if one or the other species responds to disturbance by attaining canopy dominance, it is unlikely the non-dominant species will become dominant in the average fire-free interval. Others have recognized that quite probably a dominance continuum exists between these two species by naming at least 8 plant associations with the dual designation (*Tsuga heterophylla* - *Thuja plicata* / _). Arguing against this approach is the indisputable observation that either of these species can be strongly dominant, with the other occurring only in the reproductive layers, if at all. In northern Idaho, where these species are sympatric over an extensive range, there are drainages where one or the other species is present, and its complement is not (Daubenmire and Daubenmire 1968); this phenomenon has never been satisfactorily explained and again argues for recognizing separate *Thuja plicata* and *Tsuga heterophylla* types.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Oplopanax horridus* Forest (CEGL000322)--*Thuja* and *Tsuga* are not present in this type, except occasionally at lowest/warmest locations.
- *Thuja plicata* / *Athyrium filix-femina* Forest (CEGL000473)
- *Tsuga heterophylla* - (*Thuja plicata*) / *Oplopanax horridus* / *Polystichum munitum* Forest (CEGL000497)--has "maritime" character species such as *Alnus rubra*, *Polystichum munitum*, *Achlys triphylla*, *Acer circinatum*, and *Vaccinium parvifolium* of the Cascades and west and is more upland/riparian in habitat.
- *Tsuga heterophylla* / *Athyrium filix-femina* Forest (CEGL000491)--has less than 5% cover of *Oplopanax horridus* if it is present at all.

GLOBAL RELATED CONCEPTS:

- *Thuja plicata* - (*Pseudotsuga menziesii*) / *Oplopanax horridum* - (*Athyrium filix-femina* - *Gymnocarpium dryopteris*) (Kovalchik 2001) I
- *Thuja plicata* - *Tsuga heterophylla* / *Oplopanax horridum* - (*Athyrium filix-femina* - *Gymnocarpium dryopteris*) (Kovalchik 2001) I
- *Thuja plicata* - *Tsuga heterophylla* / *Oplopanax horridum* (Daubenmire 1952) =
- *Thuja plicata* - *Tsuga heterophylla* / *Oplopanax horridus* / *Athyrium filix-femina* (Braumandl and Curran 1992) I
- *Thuja plicata* / *Oplopanax horridum* Association (Kovalchik 1993) =
- *Thuja plicata* / *Oplopanax horridum* Habitat Type (Hansen et al. 1995) =
- *Thuja plicata* / *Oplopanax horridum* Habitat Type (Daubenmire and Daubenmire 1968) B
- *Thuja plicata* / *Oplopanax horridum* Habitat Type (Pfister et al. 1977) =
- *Thuja plicata* / *Oplopanax horridus* Habitat Type (Cooper et al. 1987) =
- *Thuja plicata* / *Oplopanax horridus* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:IA.9.c. (Driscoll et al. 1984) B
- ICHa1. *Oplopanax horridum* - *Galium triflorum* (Utzig et al. 1986) I
- ICHa2. *Oplopanax horridum* - *Gymnocarpium dryopteris* (Utzig et al. 1986) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: Although stands of this association can be extensive, this association is uncommon on the west side of Glacier National Park. It is found only within the Lake McDonald valley on very moist toeslopes and bottomlands. Specific locations include along McDonald Creek, along Avalanche Creek, and along Snyder Creek.

GLOBAL RANGE: This association is known from the eastern Cascades, eastern Okanogan Highlands, southeastern Thompson Plateau, and west-central northern Rockies of Washington, Idaho and Montana. It appears to also occur in British Columbia.

NATIONS: CA?, US

STATES/PROVINCES: BC?, ID:S3, MT:S3, OR:S1, WA:S2S3

USFS ECOREGIONS: M242C:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); USFS (Coeur d'Alene, Colville NF, Flathead, Idaho Panhandle, Kootenai, Wenatchee)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2042, GLAC.2064, GLAC.2665.

LOCAL DESCRIPTION AUTHORS: J. Asebrook, mod. M.S. Reid

GLOBAL DESCRIPTION AUTHORS: R.C. Crawford, mod. M.S. Reid

REFERENCES: Bourgeron and Engelking 1994, Braumandl and Curran 1992, Cooper et al. 1987, Daubenmire 1952, Daubenmire and Daubenmire 1968, Douglas 1971, Driscoll et al. 1984, Franklin 1966, Hansen et al. 1995, IDCDC 2005, Kagan et al. 2004, Kovalchik 1993, Kovalchik 2001, Kovalchik pers. comm., MTNHP 2002b, MacKenzie pers. comm., Parker 1986, Pfister et al. 1977, Utzig et al. 1986, WNHP unpubl. data, Western Ecology Working Group n.d., Williams and Lillybridge 1985, Williams et al. 1990b, Williams et al. 1995

Thuja plicata / *Athyrium filix-femina* Forest

WESTERN RED-CEDAR / COMMON LADYFERN FOREST

IDENTIFIER: CEGLO00473

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Evergreen forest (I.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
Formation	Seasonally flooded temperate or subpolar needle-leaved evergreen forest (I.A.8.N.f.)
Alliance	<i>Thuja plicata</i> Seasonally Flooded Forest Alliance (A.193)
Alliance (English name)	Western Red-cedar Seasonally Flooded Forest Alliance
Association	<i>Thuja plicata</i> / <i>Athyrium filix-femina</i> Forest
Association (English name)	Western Red-cedar / Common Ladyfern Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Conifer Swamp (CES306.803)

ELEMENT CONCEPT

GLOBAL SUMMARY: This small-patch, hygric (damp) to hydric (wet) community is associated with the inland penetration of a Pacific maritime climatic regime, occurring in the east Cascades and northeastern Washington, east into northern Idaho and northwestern Montana. This type ranges in elevation from 460 to 1430 m (1500-4700 feet). The primary environmental driver is abundant water throughout the growing season; standing water is often present early in the growing season, and water tables are high throughout the year. This is typically a streamside stringer, around seeps, where toeslopes intercept the water table, and some of the most extensive examples are associated with gentle slopes (<20 % inclination) with perched water tables. The stands are often sheltered in valley bottoms. Sites often have considerable microsite variation due to hummocking, and this can be reflected in the within-stand vegetation patterning. Soils are derived primarily from alluvium of various geologic origins. With textures ranging from loamy sands to silt loams and often having an appreciable gravel content, soils are very permeable. The tree canopy is highly variable in cover with dense old-growth *Thuja*-dominated stands approaching 100% canopy cover and other sites that perhaps have experienced wind throw having less than 50% cover. *Thuja plicata* dominates both the upper canopy and the reproductive layers; *Tsuga heterophylla*, *Abies grandis* and *Picea engelmannii* are consistent upper canopy components; only *Tsuga* has appreciable cover in the reproductive layers. In a modal expression of the type a nearly continuous layer of *Athyrium filix-femina* dominates the undergrowth, concealing a rich diversity of forbs. Some sites have appreciable cover of tall shrubs including *Taxus brevifolia*, *Alnus viridis* ssp. *sinuata*, and *Acer glabrum*. Incidental individuals or small patches of *Oplopanax horridus* may be found. The short and dwarf-shrub layers are relatively inconspicuous, a combined cover seldom exceeding 10%. Some consistently present hygric- to hydric-indicating forbs include *Senecio triangularis*, *Trautvetteria caroliniensis*, *Streptopus amplexifolius*, *Gymnocarpium dryopteris*, *Viola glabella*, *Aconitum columbianum*, and *Circaea alpina*; some have considered the presence of the first four of these forbs to be indicative of the type when the cover of *Athyrium* is less than 1%.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This forested association is a dense cedar forest found on gentle slopes at 1042 m (3420 feet) elevation. The one location sampled in the park occurs on an alluvial terrace near the valley bottom, facing northwest. Soils are silty clay, somewhat poorly drained.

GLOBAL ENVIRONMENT: This small-patch, hygric (damp) to hydric (wet) community occurs from just west of the Continental Divide in Montana, west into the east Cascades of Washington. It ranges in elevation from 460 to 1430 m (1500-4700 feet), but the majority of occurrences are below 1070 m (3500 feet), at least in Idaho, Montana and northeastern Washington. The primary environmental driver is abundant water throughout the growing season; standing water is often present early in the growing season, and water tables are high throughout the year. It typically occurs as a streamside stringer, around seeps, where toeslopes intercept the water table, and some of the most extensive examples are associated with gentle slopes (<20 % inclination) with perched water tables. The stands are often sheltered in valley bottoms. Sites often have considerable microsite variation due to hummocking, and this can be reflected in the within-stand vegetation patterning. Soils are derived primarily from alluvium of various geologic origins, including quartzite, sandstone, granite, metasediments, biotite, and shale. With textures ranging from loamy sands to silt loams and often having an appreciable gravel content, soils are very permeable.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The tree canopy is dominated by large, old (240 years) *Thuja plicata* with 80% cover. *Pseudotsuga menziesii* is present with 3% cover. *Tsuga heterophylla* is present in the shrub canopy layer (7%) along with *Thuja plicata* and *Taxus brevifolia* each with 1% cover. The dwarf-shrub layer is very scattered, not really forming a shrub layer, with *Oplopanax horridus* (3%). The herbaceous undergrowth is moderate with 23% cover. Predominant species (>10% cover) are *Clintonia uniflora*, *Athyrium filix-femina*, *Dryopteris expansa*, and *Gymnocarpium dryopteris*.

GLOBAL VEGETATION: The tree canopy is highly variable in cover with dense old-growth *Thuja*-dominated stands approaching 100% canopy cover, and other sites that perhaps have experienced wind throw having less than 50% cover. *Thuja plicata* dominates both the upper canopy and the reproductive layers; *Tsuga heterophylla*, *Abies grandis* and *Picea engelmannii* are consistent upper canopy components with only *Tsuga* having appreciable cover in the reproductive layers. Tree species that are major seral components on mesic upland sites, e.g., *Larix occidentalis*, *Pinus contorta*, and *Pseudotsuga*, are at most incidental on this wetter association. In a modal expression of the type a nearly continuous layer of *Athyrium filix-femina* dominates the undergrowth, concealing a rich diversity of forbs. Some sites have appreciable cover of tall shrubs including *Taxus brevifolia*, *Alnus viridis ssp. sinuata*, and *Acer glabrum*. Incidental individuals or small patches of *Oplopanax horridus* may be found [see Global Classification Comments]. The short and dwarf-shrub layers are relatively inconspicuous, a combined cover seldom exceeding 10% due to the prevalence of *Athyrium*, with only *Rubus parviflorus*, *Rosa gymnocarpa*, *Ribes lacustre*, *Cornus canadensis*, and *Linnaea borealis* having greater than 50% constancy. Some consistently present hygric- to hydric-indicating forbs include *Senecio triangularis*, *Trautvetteria caroliniensis*, *Streptopus amplexifolius*, *Gymnocarpium dryopteris*, *Viola glabella*, *Aconitum columbianum*, *Mertensia paniculata*, and *Circaea alpina*; some have considered the presence of the first four of these forbs to be indicative of the type (Cooper et al. 1987, Hansen et al. 1995) when the cover of *Athyrium* is meager (less than 1%). Other forbs of high constancy but lacking indicator value within this type include *Clintonia uniflora*, *Maianthemum stellatum*, *Prosartes hookeri* (= *Disporum hookeri*), *Galium triflorum*, *Coptis occidentalis*, *Tiarella trifoliata*, *Trillium ovatum*, and *Viola orbiculata*. Within Idaho from the St. Joe to the Selway rivers the presence (>5% cover) of *Adiantum pedatum* is said to denote the warm (low-elevation) and nutrient-rich expression (cove-like, collecting topographic positions) of the association; another fern, *Polystichum munitum*, also is most numerous and vigorous within this type and geographic restriction.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i> , <i>Thuja plicata</i>
Shrub/sapling (tall & short)	Needle-leaved shrub	<i>Taxus brevifolia</i>
Herb (field)	Forb	<i>Clintonia uniflora</i>
Herb (field)	Fern or fern ally	<i>Athyrium filix-femina</i> , <i>Dryopteris expansa</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies grandis</i> , <i>Picea engelmannii</i> , <i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Tree subcanopy	Needle-leaved tree	<i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Tall shrub/sapling	Needle-leaved shrub	<i>Taxus brevifolia</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Acer glabrum</i> , <i>Alnus viridis ssp. sinuata</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Ribes lacustre</i> , <i>Rosa gymnocarpa</i> , <i>Rubus parviflorus</i> , <i>Symphoricarpos albus</i>
Herb (field)	Dwarf-shrub	<i>Cornus canadensis</i> , <i>Linnaea borealis</i>

Herb (field)	Forb	<i>Circaea alpina</i> , <i>Clintonia uniflora</i> , <i>Maianthemum stellatum</i> , <i>Prosartes hookeri</i> , <i>Tiarella trifoliata</i>
Herb (field)	Fern or fern ally	<i>Adiantum pedatum</i> , <i>Athyrium filix-femina</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Athyrium filix-femina*, *Thuja plicata*

GLOBAL: *Athyrium filix-femina*, *Gymnocarpium dryopteris*, *Senecio triangularis*, *Streptopus amplexifolius*, *Thuja plicata*, *Trautvetteria caroliniensis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL: *Polystichum munitum*

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: It has been the approach of Inland Northwest U.S. vegetation scientists to consider stands with a mix of *Thuja plicata* and *Tsuga heterophylla* (and *Abies grandis*) or either species alone and occurring on sites sufficiently wet to support at least 5% *Oplopanax horridus* or *Athyrium filix-femina* to be classed as *Thuja plicata* habitat types or plant associations. Daubenmire and Daubenmire (1968) argued, based on their investigations in northern Idaho and eastern Washington, that even where *Tsuga* constitutes the dominant tree species in a stand, it would not so remain. Ultimately the nurse-logs, from which these trees generated and grew, would decay, favoring *Thuja* reproduction in these wet environments (*Tsuga* not establishing well on mineral substrates). The Daubenmires also noted that, if *Tsuga* / *Athyrium* or *Tsuga* / *Oplopanax* segregates were recognized, they would include few stands and little area; they also demonstrated that there was no floristic differences in the undergrowth between *Thuja*- and *Tsuga*-dominated stands. Others have followed suit (Pfister et al. 1977, Lillybridge et al. 1995, Williams et al. 1995) and have included, even as did the Daubenmires, stands from wet environments and having *Tsuga* and no *Thuja* within the *Thuja* series (alliance).

The classification effort underway in Waterton-Glacier International Peace Park (IPP) has chosen to follow the NVC and its predilection for recognizing actual cover rather than potential. The IPP classification distinguishes *Tsuga* types when the cover of this species is at least 25% of the upper canopy; the 25% figure is rather arbitrary and corresponds to no intrinsic break in the cover of either tree species. Another problematical distinction is that between the relative indicator values of *Oplopanax* and *Athyrium*; some consider these two species to be indicator equivalents (Lillybridge et al. 1995), whereas others (Hansen et al. 1995) are unequivocal in stating that *Oplopanax* is characteristic of wetter environments. Where the distribution of *Athyrium* and *Oplopanax* overlap, from the Clearwater River northward in Idaho, *Thuja plicata* / *Athyrium filix-femina* Forest (CEGL000473) is considerably more uncommon, these sites being occupied by *Thuja plicata* - *Tsuga heterophylla* / *Oplopanax horridus* Rocky Mountain Forest (CEGL000479) in which *Athyrium* is 100% constant and its cover frequently exceeds that of *Oplopanax*. One cannot invoke cold-air drainage and ponding on the latter type (noted by Hansen et al. 1995) as the distinguishing factor because *Athyrium* is abundantly represented on all *Oplopanax* sites. At least in northern Idaho *Oplopanax* sites occurred on coarser-textured soils with greater amounts of gravel (40-60 %).

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies grandis* / *Athyrium filix-femina* Forest (CEGL000270)
- *Thuja plicata* - *Tsuga heterophylla* / *Oplopanax horridus* Rocky Mountain Forest (CEGL000479)--has at least 5% cover of *Oplopanax*.
- *Thuja plicata* / *Carex disperma* Forest [Provisional] (CEGL005931)
- *Thuja plicata* / *Gymnocarpium dryopteris* Forest (CEGL000476)
- *Tsuga heterophylla* / *Athyrium filix-femina* Forest (CEGL000491)

GLOBAL RELATED CONCEPTS:

- *Thuja plicata* / *Athyrium filix-femina* Habitat Type (Daubenmire and Daubenmire 1968) =
- *Thuja plicata* / *Athyrium filix-femina* Habitat Type, *Athyrium filix-femina* Phase (Hansen et al. 1995) =
- *Thuja plicata* / *Athyrium filix-femina* Habitat Type, *Athyrium filix-femina* and *Adiantum pedatum* phases (Cooper et al. 1987) =
- *Thuja plicata* / *Oplopanax horridus* Plant Association (Williams et al. 1995) I
- *Thuja plicata* / *Oplopanax horridus* Plant Association (Lillybridge et al. 1995) I

- *Thuja plicata*/*Athyrium filix-femina* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The one location sampled in the park occurs on an alluvial terrace near the valley bottom, facing northwest.

GLOBAL RANGE: This small-patch, hygric to hydric community occurs from the Selway River of Idaho northward to southern British Columbia, westward to the Cascade Range and eastward to lower elevation sites of northwestern Montana to just west of the Continental Divide; it is associated with the inland penetration of a Pacific maritime climatic regime.

NATIONS: US

STATES/PROVINCES: ID:S3, MT:S3, OR:S2, WA:S2

USFS ECOREGIONS: M332A:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); USFS (Colville NF, Flathead, Wenatchee)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2506.

LOCAL DESCRIPTION AUTHORS: G. Kittel

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Bourgeron and Engelking 1994, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Diaz and Mellen 1996, Driscoll et al. 1984, Hansen et al. 1991, Hansen et al. 1995, IDCDC 2005, Kagan et al. 2004, Kovalchik 1987, Lillybridge et al. 1995, MTNHP 2002b, WNHP unpubl. data, Western Ecology Working Group n.d., Williams et al. 1990b, Williams et al. 1995

I.B.2.N.b. Montane or boreal cold-deciduous forest

Larix occidentalis Forest Alliance

Larix occidentalis / *Clintonia uniflora* - *Xerophyllum tenax* Forest

WESTERN LARCH / BRIDE'S BONNET - BEAR-GRASS FOREST

IDENTIFIER: CEG005881

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
Alliance	<i>Larix occidentalis</i> Forest Alliance (A.275)
Alliance (English name)	Western Larch Forest Alliance
Association	<i>Larix occidentalis</i> / <i>Clintonia uniflora</i> - <i>Xerophyllum tenax</i> Forest
Association (English name)	Western Larch / Bride's Bonnet - Bear-grass Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Western Larch Savanna (CES306.837)

ELEMENT CONCEPT

GLOBAL SUMMARY: This wholly seral, large-patch to matrix type occupies the relatively cold and dry environments across a number of climax tree series and associated geographic regions; the species defining these series include, but are not limited to, *Thuja plicata*, *Tsuga heterophylla*, *Tsuga mertensiana*, *Abies grandis*, *Abies lasiocarpa*, and *Picea engelmannii*. Thus this mesic type is found throughout the northern Rocky Mountains and may extend as far west as the Cascade Crest on environments characterized as foothills and montane to lower and even mid-subalpine. This association's possible elevation range is from 915 to 1800 m (3000-5900 feet), and regardless of the climax series in which it is found, it consistently occurs on south- through west-facing exposures. The range of parent materials is, with the exception of highly unusual substrates like serpentinite, literally as great as possible types occurring in the northern Rocky Mountains and northernmost middle Rocky Mountains and may include some ultramafics east of the

Cascade Crest. It is difficult to characterize the soils as well, but they are uniformly well-drained and have a low coarse-fragment content, except those sites within the lower to mid-subalpine zone. The overstory is dominated by *Pseudotsuga menziesii* with a whole host of tree species capable of playing a subordinate role; on warmer sites these include *Thuja plicata*, *Tsuga heterophylla*, *Abies grandis*, and on colder or higher elevation sites are found *Abies lasiocarpa*, *Tsuga mertensiana*, and *Picea engelmannii*. However the most frequent canopy codominants or associates are the seral species *Larix occidentalis*, *Pinus contorta*, and in a restricted portion of the type's range, *Pinus monticola*. The tall-shrub component is relatively unimportant, only *Alnus viridis ssp. sinuata* and *Amelanchier alnifolia* approach 50% constancy (and have low cover values). The short-shrub layer exhibits greater cover and diversity than the other shrub components with *Vaccinium membranaceum*, *Paxistima myrsinites*, *Rosa gymnocarpa*, *Rubus parviflorus*, and *Spiraea betulifolia* being consistently present. *Linnaea borealis* and *Chimaphila umbellata* have high constancy in the dwarf-shrub layer. *Bromus vulgaris* (or *Bromus ciliatus*) are the only graminoids of note. The diagnostic forbs *Clintonia uniflora*, *Xerophyllum tenax*, and *Tiarella trifoliata* naturally have high constancy and/or cover; however, a number of other forbs also exhibit high constancy, including *Arnica latifolia*, *Aralia nudicaulis*, *Adenocaulon bicolor*, *Coptis occidentalis*, *Cornus canadensis*, *Galium triflorum*, *Goodyera oblongifolia*, *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Pedicularis racemosa*, *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, *Trillium ovatum*, and *Viola orbiculata*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands in this mesic, montane association are located on mostly south- and east-facing toeslopes to midslopes. They can occur on benches or ridges at elevations between 1090 and 1370 m (3580-4500 feet). Soil texture is a moderately well- to well-drained silt or sandy loam that has 5-25% rock content. Soils are derived from either glacial-fluvial deposits or glacial till that is comprised of argillite. Litter and moss cover 65-95% of the ground surface, although downed wood is also common. Stand ages of the sampled areas were 105 and 200 years old.

GLOBAL ENVIRONMENT: This wholly seral, large-patch to matrix type occupies the relatively cold and dry environments across a number of climax tree series and associated geographic regions; the species defining these series include, but are not limited to, *Thuja plicata*, *Tsuga heterophylla*, *Tsuga mertensiana*, *Abies grandis*, *Abies lasiocarpa*, and *Picea engelmannii*. Thus this mesic type is found throughout the northern Rocky Mountains and may extend as far west as the Cascade Crest on environments characterized as foothills and montane to lower and even mid-subalpine. This association's possible elevation range is from 915 to 1800 m (3000-5900 feet). Regardless of the climax series in which it is found, it consistently occurs on south- through west-facing exposures. The range of parent materials is, with the exception of highly unusual substrates like serpentine, literally as great as possible types occurring in the northern Rocky Mountains and northernmost middle Rocky Mountains and may include some ultramafics east of the Cascade Crest. It is difficult to characterize the soils as well, but they are uniformly well-drained and have a low coarse-fragment content, except those sites within the lower to mid-subalpine zone.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This mixed evergreen forest exists in areas that have had fire in the last 100-200 years. Stands were observed to be either even-aged or two-tiered depending on fire severity. Tree canopy cover averages 30-60% with heights ranging from 20-50 m. *Larix occidentalis* consistently dominates the canopy layer with 20-60% cover. *Abies lasiocarpa*, *Picea engelmannii*, *Pinus monticola*, and *Betula papyrifera* are often mixed in the overstory with low cover, averaging 4-7% (ranging from 1-20% cover). Subcanopy tree cover ranges from 10-40% with heights between 2-15 m. *Abies lasiocarpa* consistently dominates this layer with 10-20% cover, although *Picea engelmannii* is also often present with low cover. *Thuja plicata*, *Pinus contorta*, *Pseudotsuga menziesii*, and *Tsuga heterophylla* are occasionally present in the canopy or the subcanopy with low cover.

Tall shrubs are common in the understory with 30-40% cover and heights between 0.5-5 m. *Acer glabrum* is often the dominant tall shrub with 1-25% cover. In addition *Amelanchier alnifolia*, *Rubus parviflorus*, *Menziesia ferruginea*, *Abies lasiocarpa* saplings, *Lonicera utahensis*, and *Ribes lacustre* are consistently common, each with 1-10% cover. *Sorbus scopulina*, *Taxus brevifolia*, and saplings of *Pinus monticola*, *Picea engelmannii*, and *Thuja plicata* may also sometimes be present with noticeable cover. Short shrubs have a wide range of cover, averaging 20-70% cover with heights between 0.5-1 m. *Vaccinium membranaceum*, an indicator for this type, is the dominant short shrub with 10-65% cover. *Spiraea betulifolia* is also consistently present with 1-10% cover. *Symphoricarpos albus* and a variety of *Rosa* species may be present with low cover. Dwarf-shrub cover is lower, ranging from 5-25%. This layer is dominated by *Linnaea borealis* with 1-25% cover and *Paxistima myrsinites* with 1-3% cover.

Overall herbaceous cover ranges from 40-100%, dominated by *Arnica cordifolia* with 1-50% cover, *Aralia nudicaulis* with 1-35% cover, *Tiarella trifoliata* with 10-20% cover, *Clintonia uniflora* with 3-13% cover, and *Xerophyllum tenax* with 1-20% cover. Other high-constancy, common forbs include *Osmorhiza berteroi*, *Maianthemum stellatum*, *Adenocaulon bicolor*, *Prosartes hookeri* (= *Disporum hookeri*), *Thalictrum occidentale*, *Viola glabella*, *Chimaphila umbellata*, *Chamerion angustifolium*, and *Orthilia secunda*, each with 1-2% average cover. *Bromus vulgaris*, *Fragaria vesca*, *Elymus glaucus*, and *Galium triflorum* are also sometimes present with higher cover.

GLOBAL VEGETATION: The overstory is dominated by seral *Larix occidentalis* with a whole host of tree species capable of playing a subordinate role; on warmer sites these include *Thuja plicata*, *Tsuga heterophylla*, *Abies grandis*, and on colder or higher elevation sites are found *Abies lasiocarpa*, *Tsuga mertensiana*, and *Picea engelmannii*. However, the most frequent canopy codominants or associates are the seral species *Pseudotsuga menziesii*, *Pinus contorta*, and in a restricted portion of the type's range, *Pinus monticola*. The tall-shrub component is relatively unimportant, only *Alnus viridis ssp. sinuata* and *Amelanchier alnifolia* approach 50% constancy (and have low cover values). The short-shrub layer exhibits greater cover and diversity than the other shrub components with *Vaccinium membranaceum*, *Paxistima myrsinites*, *Rosa gymnocarpa*, *Rubus parviflorus*, and *Spiraea betulifolia* being consistently present. *Linnaea borealis* and *Chimaphila umbellata* have high constancy in the dwarf-shrub layer. *Bromus vulgaris* (or *Bromus ciliatus*) are the only graminoids of note. The diagnostic forbs *Clintonia uniflora* and *Tiarella trifoliata* between them are 100% constant though their cover seldom exceeds 10% singly or in combination. See Classification Comments for a more in-depth exposition on the reasons both *Vaccinium membranaceum* and *Xerophyllum tenax* are used as alternative indications of a particular subset of plots (and distinct environment) than characterized by *Clintonia uniflora* or *Tiarella* alone; in any given locality this type should be located at higher elevations and on warmer slopes with better drained soils than say *Larix occidentalis* / *Clintonia uniflora*. A number of other forbs also exhibit high constancy include *Arnica latifolia*, *Aralia nudicaulis*, *Adenocaulon bicolor*, *Coptis occidentalis*, *Cornus canadensis*, *Galium triflorum*, *Goodyera oblongifolia*, *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Pedicularis racemosa*, *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, *Trillium ovatum*, and *Viola orbiculata*. Within local landscapes some forbs exhibit high constancy not recorded in other regions, e.g., in northern Idaho *Anemone piperi* and *Pyrola asarifolia* are nearly always present.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Larix occidentalis</i> , <i>Picea engelmannii</i>
Tree subcanopy	Needle-leaved tree	<i>Abies lasiocarpa</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Acer glabrum</i> , <i>Menziesia ferruginea</i> , <i>Rubus parviflorus</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Dwarf-shrub	<i>Linnaea borealis</i>
Herb (field)	Forb	<i>Aralia nudicaulis</i> , <i>Arnica cordifolia</i> , <i>Clintonia uniflora</i> , <i>Tiarella trifoliata</i> , <i>Xerophyllum tenax</i>
Herb (field)	Graminoid	<i>Bromus vulgaris</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Pinus contorta</i> , <i>Pseudotsuga menziesii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus parviflorus</i> , <i>Symphoricarpos albus</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Dwarf-shrub	<i>Chimaphila umbellata</i> , <i>Linnaea borealis</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Arnica latifolia</i> , <i>Clintonia uniflora</i> , <i>Coptis occidentalis</i> , <i>Maianthemum stellatum</i> , <i>Thalictrum occidentale</i> , <i>Viola orbiculata</i> , <i>Xerophyllum tenax</i>
Herb (field)	Graminoid	<i>Bromus ciliatus</i> , <i>Bromus vulgaris</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Acer glabrum*, *Amelanchier alnifolia*, *Arnica cordifolia*, *Clintonia uniflora*, *Larix occidentalis*, *Linnaea borealis*, *Maianthemum stellatum*, *Osmorhiza berteroi*, *Rubus parviflorus*, *Spiraea betulifolia*, *Vaccinium membranaceum*, *Xerophyllum tenax*

GLOBAL: *Clintonia uniflora*, *Larix occidentalis*, *Tiarella trifoliata*, *Vaccinium membranaceum*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Calochortus apiculatus*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: GNR (21-Apr-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association defines an extremely broad environmental range due to the relatively recent approach stipulated by the NVC of defining as unique associations that would formerly have been subsumed within a number of different climax or potential vegetation types; in the case of this association it is a successional stage in environments as mild and wet (defining a Pacific maritime climatic influence) as those supporting *Thuja plicata* or *Tsuga heterophylla* / *Clintonia uniflora* associations (and permutations) to those of the lower subalpine zone characterized by *Abies lasiocarpa* /, *Abies grandis* /, *Tsuga mertensiana* /, and even *Picea engelmannii* / *Clintonia uniflora* forest associations; however, by far the greatest proportion of this type is seral to *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (NEW-IPP#1). That this association in fact occurs in the states and USFS sections listed derives from this writer's interpretation of constancy/cover tables of various authors/publications; where *Larix occidentalis* is listed as a major seral species, the inference has been made that stands quite likely occur on the landscape where this species strongly dominates the upper canopy (often observed by this author throughout northern Idaho and western Montana). It should also be noted that this type is probably less common in zones where *Thuja plicata* and *Tsuga heterophylla* are the climax dominants because following disturbance in these environments the climax trees are quick to reclaim the site, i.e., they comprise a significant cover of the earliest forested successional stages. Considering *Xerophyllum tenax* and *Vaccinium membranaceum* as ecological analogues may be questionable when applied across the geographic ranges of these species; *Vaccinium membranaceum* is more broadly distributed, and thus this type could be recognized for northeastern Oregon, where little or no *Xerophyllum* occurs. The crosswalking for this type is incomplete, and it may well eventually be documented west of the Cascade Crest in Oregon, Washington and British Columbia.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies grandis* / *Clintonia uniflora* Forest (CEGL000272)
- *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Forest (CEGL005912)
- *Picea (engelmannii X glauca, engelmannii)* / *Clintonia uniflora* Forest (CEGL000406)
- *Pseudotsuga menziesii* / *Clintonia uniflora* Forest (CEGL005850)
- *Thuja plicata* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005930)
- *Thuja plicata* / *Clintonia uniflora* Forest (CEGL000474)
- *Tsuga heterophylla* / *Clintonia uniflora* Forest (CEGL000493)
- *Tsuga mertensiana* / *Clintonia uniflora* Forest (CEGL000504)

GLOBAL RELATED CONCEPTS:

- *Abies grandis* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987) I
- *Abies grandis* / *Vaccinium membranaceum* / *Clintonia uniflora* Plant Association (Williams et al. 1995) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Pfister et al. 1977) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987) I
- *Larix occidentalis* - *Pseudotsuga menziesii* (*Pinus contorta*) / *Vaccinium membranaceum* / *Xerophyllum tenax* (Leavell 2000) I
- *Thuja plicata* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987) I
- *Tsuga heterophylla* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987) I
- *Tsuga mertensiana* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987) I
- *Tsuga mertensiana* / *Vaccinium membranaceum* Plant Association (Lillybridge et al. 1995) I
- *Tsuga mertensiana* / *Xerophyllum tenax* - *Vaccinium myrtillus* Plant Association (Lillybridge et al. 1995) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon parkwide, but locally common in the Lake McDonald subdistrict on the west side of Glacier National Park. It has been specifically documented along the Trout Lake Trail, along the Lincoln Lake Trail, along the Camas Road, west of Fern Creek, and near the Nyack Ranger Station within the Lake McDonald subdistrict.

GLOBAL RANGE: This association occurs from the Blue, Wallowa and Seven Devils mountains of northeastern Oregon and southern portion of the Idaho Batholith of central Idaho northward to the Colville National Forest of northeastern Washington, across northern Idaho and into western Montana (almost exclusively west of the Continental Divide). Given the opportunity for more complete crosswalking, this type might well be documented from British Columbia and the east slope of the Cascades; Lillybridge et al. (1995) do document both *Clintonia uniflora* and *Larix occidentalis* as common forest components from the eastern slope of the Cascades, but the two species do not uniquely overlap in space.

NATIONS: CA?, US

STATES/PROVINCES: ID, MT, OR, WA

USFS ECOREGIONS: M242C:CC, M332A:CC, M332B:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); USFS (Colville NF, Wallowa-Whitman, Wenatchee)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2014, GLAC.2017, GLAC.2286, GLAC.2535, GLAC.2611.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Bourgeron and Engelking 1994, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Driscoll et al. 1984, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Leavell 2000, Lillybridge et al. 1995, Pfister et al. 1977, Western Ecology Working Group n.d., Williams et al. 1995

***Larix occidentalis* / *Clintonia uniflora* Forest**
WESTERN LARCH / BRIDE'S BONNET FOREST

IDENTIFIER: C EGL005880

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
Alliance	<i>Larix occidentalis</i> Forest Alliance (A.275)
Alliance (English name)	Western Larch Forest Alliance
Association	<i>Larix occidentalis</i> / <i>Clintonia uniflora</i> Forest
Association (English name)	Western Larch / Bride's Bonnet Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Western Larch Savanna (CES306.837)

ELEMENT CONCEPT

GLOBAL SUMMARY: Broadly distributed throughout the northern Rocky Mountains and adjacent terrain, this large-patch to matrix seral community occupies relatively moist (mesic) and warm to cool sites having free air drainage and lacking frost pocket conditions. Elevations range in the north from 760 to 1585 m (4500-5200 feet) (extreme outliers at 1710 m (5600 feet)), whereas to the south it ranges from 1060 to 1710 m (3500-5600 feet). It occurs on slopes of all degrees of steepness and aspect orientation, though it is more likely to occur from toeslope through midslope positions (predominantly collecting positions). At the dry extreme of its distribution it is more strongly associated with protected positions such as concave slopes, moist depressions on gentle slopes or plateaus, stringers along perennial stream bottoms, toeslopes and northeastern aspects. Though sites are mesic, verging on hygric, they are inferred to be only briefly or seasonally influenced, if at all, by a high water table; *Larix occidentalis* occurrence is strongly associated with well-drained positions. A wide variety of parent materials are represented, including those as disparate as granite and limestone, including all manner of glacial-fluvial material. In northern Idaho and northwestern Montana it is routinely found on ash caps, ranging from 3 to 60 cm in depth. The soil textures are predominantly loams and silt loams (reflecting in part the volcanic ash); soils typically have less than 15% coarse fragment content and are well-drained.

This mesic seral association is characterized by *Larix occidentalis* dominating the upper canopy, though other tree species occur with lesser cover, including both other species considered almost exclusively seral *Pinus contorta* and *Pinus monticola* and those capable of functioning as both seral and climax species, including those from warmer environments, *Pinus ponderosa* (very limited representation), *Pseudotsuga menziesii*, *Thuja plicata*, and *Tsuga heterophylla* and those of colder environments, *Abies lasiocarpa*, *Abies grandis*, and *Picea engelmannii*. The shrub layer may be highly diverse with tall shrubs (e.g., *Acer glabrum*, *Taxus brevifolia*, *Amelanchier alnifolia*), short shrubs (*Symphoricarpos albus*, *Paxistima myrsinites*, *Rubus parviflorus*, *Spiraea betulifolia*), and dwarf shrubs (e.g., *Chimaphila umbellata*, *Linnaea borealis*, *Mahonia repens*) abundantly represented. The graminoid component is inconspicuous with no one species exhibiting high constancy, though *Bromus vulgaris*, *Bromus ciliatus*, and *Calamagrostis rubescens* are more consistently present and with greater cover than other graminoids. The cover of the diagnostic forbs *Clintonia uniflora* and *Tiarella trifoliata* is greatest when this type occurs in the zones potentially dominated by *Thuja plicata* and *Tsuga heterophylla*, up to 30% canopy cover (can even be a dominant forb), whereas in the colder environments characterized by *Abies lasiocarpa*, *Abies grandis*, and *Picea engelmannii* potential dominance cover of these diagnostics and all forbs is generally less. Other forbs of high constancy, at least in some portion of this association's considerable range, are *Aralia nudicaulis*, *Adenocaulon bicolor*, *Coptis occidentalis*, *Cornus canadensis*, *Galium triflorum*, *Goodyera oblongifolia*, *Maianthemum stellatum*, *Osmorhiza berteroi* (=

Osmorhiza chilensis), *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, *Trillium ovatum*, *Viola glabella* (or *Viola canadensis*), and *Viola orbiculata*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this montane, mesic association are located on gentle lowslopes to moderately steep midslopes at elevations between 970 and 1300 m (3170-4250 feet) at variable aspects. Soils are moderately well- to well-drained with textures including sandy loams, silt loams, and sandy clay loams. Parent material is typically glacial till or colluvium comprised of argillite. Litter, downed wood, and moss comprise 75-90% of the ground surface. Stand age of this type typically averages 80-100 years old with older *Larix occidentalis* and sometimes *Picea engelmannii* emerging in the tree canopy.

GLOBAL ENVIRONMENT: Broadly distributed throughout the northern Rocky Mountains and adjacent Okanogan Highlands of Washington, Blue Mountains of northeastern Oregon, and Wallowa and Seven Devils uplifts of northeastern Oregon and central Idaho, this large-patch to matrix seral community occupies relatively moist (mesic) and warm to cool sites having free air drainage, and lacking frost pocket conditions. Elevations range in the north from 760 to 1585 m (4500-5200 feet) (extreme outliers at 1710 m (5600 feet)), whereas to the south it ranges from 1060 to 1710 m (3500-5600 feet). It occurs on slopes of all degrees of steepness and aspect orientation, though it is more likely to occur from toeslope through midslope positions (predominantly collecting positions). At the dry extreme of its distribution it is more strongly associated with protected positions such as concave slopes, moist depressions on gentle slopes or plateaus, stringers along perennial stream bottoms, toeslopes and northeastern aspects. Though sites are mesic, verging on hygric, they are inferred to be only briefly or seasonally influenced, if at all, by a high water table; *Larix occidentalis* occurrence is strongly associated with well-drained positions. A wide variety of parent materials are represented, including those as disparate as granite and limestone, including all manner of glacial-fluvial material. In northern Idaho and northwestern Montana it is routinely found on ash caps, ranging from 3 to 60 cm in depth. The soil textures are predominantly loams and silt loams (reflecting in part the volcanic ash); soils typically have less than 15% coarse fragment content and are well-drained.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This evergreen to mixed evergreen-cold deciduous forest occurs in areas that have had moderately severe fires where tree mortality is confined to the subcanopy. *Larix occidentalis* generally survives these fires and dominates the overstory with 10-50% cover. The remaining tree canopy has 10-70% cover with heights of 20-50 m, and is comprised of *Picea engelmannii*, *Pinus contorta*, *Betula papyrifera*, *Abies lasiocarpa*, and *Pseudotsuga menziesii*. *Larix occidentalis* and *Picea engelmannii* may be emergent above the canopy layer. The subcanopy tree layer averages 20-40% cover and has heights between 5-15 m, although cover may reach 80% in some cases where regeneration is high. *Picea engelmannii*, *Abies lasiocarpa*, and *Pseudotsuga menziesii* are the most common trees in the subcanopy layer, each with 1-20% cover. *Thuja plicata*, *Pinus ponderosa*, *Pinus monticola*, *Tsuga heterophylla*, and *Populus balsamifera ssp. trichocarpa* are also sometimes present as mature or pole-sized trees in both the canopy or subcanopy layers.

Shrub cover is abundant and diverse, with rich layers. Tall shrubs, short shrubs, and dwarf-shrubs each have overall covers ranging from 5-50%, although there are a few places where dwarf-shrubs are absent. Tall shrubs are 0.5-5 m in height and are dominated by *Rubus parviflorus* and *Acer glabrum*, each with 1-30% cover. *Amelanchier alnifolia* and *Picea engelmannii* saplings are also common with 1-7% cover. Diversity of tall shrubs may be quite high in some areas with many additional shrubs having conspicuous cover. Conifer sapling cover can also be quite high with all trees listed above, in addition to *Taxus brevifolia*, contributing to the tall-shrub cover. The short-shrub layer, averaging 0.5-1 m in height, has lower diversity and is dominated by *Spiraea betulifolia*, *Symphoricarpos albus*, and *Vaccinium membranaceum* with 1-25% cover each. The dwarf-shrub layer is dominated by *Linnaea borealis* with 1-50% cover; *Mahonia repens* and *Paxistima myrsinites* are also common with 1-20% cover.

Overall herbaceous cover ranges between 20-100% with heights averaging <0.5-2 m. A variety of herbaceous species may dominate this layer, including *Clintonia uniflora* (1-25% cover), *Cornus canadensis* (1-10% cover), *Arnica cordifolia* (1-60%), *Aralia nudicaulis* (1-30% cover), *Calamagrostis rubescens* (1-70% cover), *Bromus vulgaris* (1-30% cover), and *Elymus glaucus* (1-20% cover). Other high-constancy forbs with 1-5% cover include *Thalictrum occidentale*, *Prosartes hookeri* (= *Disporum hookeri*), *Maianthemum stellatum*, *Viola orbiculata*, *Osmorhiza berteroi*, *Chimaphila umbellata*, and *Goodyera oblongifolia*. Low-constancy forbs that may have high cover in certain areas include *Tiarella trifoliata*, *Xerophyllum tenax*, *Chamerion angustifolium*, *Fragaria virginiana*, *Eurybia conspicua* (= *Aster conspicuus*), *Lupinus argenteus*, and *Schizachne purpurascens*. Seedlings of various tree species may also have high cover in certain areas.

GLOBAL VEGETATION: This mesic seral association is characterized by the dominance of *Larix occidentalis* in the upper canopy, though other tree species occur with lesser cover, including both species considered almost exclusively seral, *Pinus contorta* and *Pinus monticola*, and those capable of functioning as both seral and climax species, including those from warmer environments, *Pinus ponderosa* (very limited representation), *Pseudotsuga menziesii*, *Thuja plicata*, and *Tsuga heterophylla* and those of colder environments, *Abies lasiocarpa*, *Abies grandis*, and *Picea engelmannii*. The shrub layer may be highly diverse with tall shrubs (e.g.,

Acer glabrum, *Taxus brevifolia*, *Amelanchier alnifolia*), short shrubs (*Symphoricarpos albus*, *Paxistima myrsinites*, *Rubus parviflorus*, *Spiraea betulifolia*), and dwarf-shrubs (e.g., *Chimaphila umbellata*, *Linnaea borealis*, *Mahonia repens*) abundantly represented. The graminoid component is inconspicuous with no one species exhibiting high constancy, though *Bromus vulgaris*, *Bromus ciliatus*, and *Calamagrostis rubescens* are more consistently present and with greater cover than other graminoids. The cover of the diagnostic forbs *Clintonia uniflora* and *Tiarella trifoliata* is greatest when this type occurs in the zones potentially dominated by *Thuja plicata* and *Tsuga heterophylla*, up to 30% canopy cover (can even be a dominant forb), whereas in the colder environments characterized by *Abies lasiocarpa*, *Abies grandis*, and *Picea engelmannii* potential dominance cover of these diagnostics and all forbs is generally less. Other forbs of high constancy, at least in some portion of this association's considerable range, are *Aralia nudicaulis*, *Adenocaulon bicolor*, *Coptis occidentalis*, *Cornus canadensis*, *Galium triflorum*, *Goodyera oblongifolia*, *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, *Trillium ovatum*, *Viola glabella* (or *Viola canadensis*), and *Viola orbiculata*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Picea engelmannii</i> , <i>Pinus contorta</i>
Tree subcanopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Acer glabrum</i>
TALL SHRUB/SAPLING		
Short shrub/sapling	Broad-leaved deciduous shrub	<i>RUBUS PARVIFLORUS</i> <i>Spiraea betulifolia</i> , <i>Symphoricarpos albus</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Dwarf-shrub	<i>Linnaea borealis</i> , <i>Mahonia repens</i> , <i>Paxistima myrsinites</i>
Herb (field)	Forb	<i>Aralia nudicaulis</i> , <i>Arnica cordifolia</i> , <i>Clintonia uniflora</i> , <i>Cornus canadensis</i>
Herb (field)	Graminoid	<i>Bromus vulgaris</i> , <i>Calamagrostis rubescens</i> , <i>Elymus glaucus</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Pinus contorta</i> , <i>Pseudotsuga menziesii</i>
Tree subcanopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Pseudotsuga menziesii</i> , <i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Acer glabrum</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rosa gymnocarpa</i> , <i>Spiraea betulifolia</i>
SHORT SHRUB/SAPLING		
Herb (field)	Dwarf-shrub	<i>VACCINIUM MEMBRANACEUM</i> <i>Chimaphila umbellata</i> , <i>Linnaea borealis</i> , <i>Mahonia repens</i>
Herb (field)	Forb	<i>Adenocaulon bicolor</i> , <i>Clintonia uniflora</i> , <i>Coptis occidentalis</i> , <i>Maianthemum stellatum</i> , <i>Thalictrum occidentale</i> , <i>Tiarella trifoliata</i> , <i>Viola orbiculata</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Acer glabrum*, *Amelanchier alnifolia*, *Arnica cordifolia*, *Chimaphila umbellata*, *Clintonia uniflora*, *Larix occidentalis*, *Linnaea borealis*, *Maianthemum stellatum*, *Osmorhiza berteroi*, *Picea engelmannii*, *Prosartes hookeri*, *Rubus parviflorus*, *Spiraea betulifolia*, *Symphoricarpos albus*, *Thalictrum occidentale*, *Viola orbiculata*

GLOBAL: *Clintonia uniflora*, *Larix occidentalis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Agrostis stolonifera*, *Calochortus apiculatus*, *Cirsium arvense*, *Phleum pratense*, *Prunella vulgaris*, *Trifolium hybridum*, *Trifolium pratense*, *Veronica officinalis*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: GNR (21-Apr-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association defines an extremely broad environmental range due to the relatively recent approach stipulated by the NVC of defining as unique associations that would formerly have been subsumed within a number of different climax or potential vegetation types; in the case of this association it is a successional stage in environments as mild and wet (defining a Pacific maritime climatic influence) as those supporting *Thuja plicata* or *Tsuga heterophylla* / *Clintonia uniflora* associations (and permutations) to those of the lower subalpine zone characterized by *Abies lasiocarpa*, *Abies grandis*, *Tsuga mertensiana*, and even *Picea engelmannii* / *Clintonia uniflora* forest associations. That this association in fact occurs in the states and USFS sections listed derives from this writer's interpretation of constancy/cover tables of various authors/publications; where *Larix occidentalis* is listed as a major seral species, the inference has been made that stands quite likely occur on the landscape where this species strongly dominates the upper canopy (often observed by this author throughout northern Idaho and western Montana). It should also be noted that this type is probably less common in zones where *Thuja plicata* and *Tsuga heterophylla* are the climax dominants because, following disturbance in these zones, the climax trees are quick to reclaim the site, i.e., they comprise a significant cover of the earliest forested successional stages. The crosswalking for this type is incomplete, and it may well eventually be documented west of the Cascade Crest in Oregon and Washington.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies grandis* / *Clintonia uniflora* Forest (CEGL000272)
- *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Forest (CEGL005912)
- *Pinus contorta* / *Clintonia uniflora* Forest (CEGL005916)
- *Thuja plicata* / *Clintonia uniflora* Forest (CEGL000474)
- *Tsuga heterophylla* / *Clintonia uniflora* Forest (CEGL000493)
- *Tsuga mertensiana* / *Clintonia uniflora* Forest (CEGL000504)

GLOBAL RELATED CONCEPTS:

- *Abies grandis* / *Acer glabrum* / *Clintonia uniflora* Plant Association (Williams et al. 1995) I
- *Abies grandis* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Cooper et al. 1987) I
- *Abies grandis* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Pfister et al. 1977) I
- *Abies grandis* / *Clintonia uniflora* Plant Association (Johnson and Clausnitzer 1992) I
- *Abies grandis* / *Clintonia uniflora* Plant Association (Johnson and Simon 1987) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Cooper et al. 1987) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Pfister et al. 1977) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Steele et al. 1981) I
- *Abies lasiocarpa* / *Clintonia uniflora* Plant Association (Johnson and Simon 1987) I
- *Abies lasiocarpa* / *Clintonia uniflora* Plant Association (Williams et al. 1995) I
- *Larix occidentalis* - *Betula papyrifera* (*Populus tremuloides*) / *Acer glabrum* - *Alnus sinuata* (Leavell 2000) I
- *Thuja plicata* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Pfister et al. 1977) I
- *Thuja plicata* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Cooper et al. 1987) I
- *Tsuga heterophylla* / *Acer circinatum* / *Clintonia uniflora* Plant Association (Lillybridge et al. 1995) I
- *Tsuga heterophylla* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Pfister et al. 1977) I
- *Tsuga heterophylla* / *Clintonia uniflora* Habitat Type, *Clintonia uniflora* Phase (Cooper et al. 1987) I
- *Tsuga heterophylla* / *Pachistima myrsinites* / *Clintonia uniflora* Plant Association (Lillybridge et al. 1995) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is common on the west side of Glacier National Park in areas that have had moderately severe fires within the last century. This type can be found in the North Fork subdistrict near the Logging Creek Ranger Station, along Dutch Creek, and along the Bowman Lake Trail, in the Lake McDonald subdistrict along the Lake McDonald Trail, along the Howe Lake Trail, on McGee Hill, and near the Glacier Institute, and in the Middle Fork or Walton subdistrict near the Walton Ranger Station, along the Ole Creek Trail, and near the Nyack Ranger Station.

GLOBAL RANGE: This association occurs from the Blue, Wallowa and Seven Devils mountains of northeastern Oregon and southern portion of the Idaho Batholith of central Idaho northward to the Colville National Forest of northeastern Washington, across northern Idaho and into western Montana (almost exclusively west of the Continental Divide). Given the opportunity for more complete crosswalking, this type might well be documented from British Columbia and the east slope of the Cascades; Lillybridge et al. (1995) do document both *Clintonia uniflora* and *Larix occidentalis* as common forest components from the eastern slope of Cascades, but the two species do not uniquely overlap in space.

NATIONS: CA?, US

STATES/PROVINCES: ID, MT, OR, WA

USFS ECOREGIONS: M242C:CC, M332A:CC, M332B:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); USFS (Colville NF, Wallowa-Whitman, Wenatchee)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2056, GLAC.2210, GLAC.2218, GLAC.2231, GLAC.2236, GLAC.2258, GLAC.2287, GLAC.2511, GLAC.2515, GLAC.2640, GLAC.2643.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Bourgeron and Engelking 1994, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Driscoll et al. 1984, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Leavell 2000, Lillybridge et al. 1995, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d., Williams et al. 1995

Larix occidentalis / *Vaccinium caespitosum* / *Clintonia uniflora* Forest WESTERN LARCH / DWARF BLUEBERRY / BRIDE'S BONNET FOREST

IDENTIFIER: C EGL005883

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
Alliance	<i>Larix occidentalis</i> Forest Alliance (A.275)
Alliance (English name)	Western Larch Forest Alliance
Association	<i>Larix occidentalis</i> / <i>Vaccinium caespitosum</i> / <i>Clintonia uniflora</i> Forest
Association (English name)	Western Larch / Dwarf Blueberry / Bride's Bonnet Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Western Larch Savanna (CES306.837)

ELEMENT CONCEPT

GLOBAL SUMMARY: This mesic, small- to large-patch forested community is a minor type found from northwestern Montana (west of the Continental Divide) westward across northern Idaho to northeastern Washington as far west as the Okanogan Plateau; its southern extent is central Idaho's Seven Devils and southern Batholith regions. In both northeastern Washington and western Montana, it is found at elevations predominantly between 915 to 1220 m (3000-4000 feet) with extremes from 680 to 1400 m (2230-4590 feet); at its southern extent it is found between 1400 and 1675 m (4600-5500 feet). This association typically is found on lower elevation benchlands and gentle lower slopes of low gradient, areas that would be expected to be frosty or where cold-air ponding occurs with a relatively high frequency. Daytime temperatures are warm, which results in a strong diurnal contrast that is apparently limiting to tree species that potentially are climax dominants. Sites are confined to well-drained glacial till and outwash deposits or similarly derived relatively coarse-textured sediments (mostly fine sandy loams to loams in texture) that frequently have an appreciable gravel content. Soil reactions vary from acidic to very acidic.

The upper canopy is relatively open (ranging from 40 to 70% canopy cover with extremes to 20%) and dominated by *Larix occidentalis* with minor contributions of *Pinus contorta* and *Pseudotsuga menziesii*. *Pseudotsuga* characteristically has the greatest understory cover, followed by *Abies lasiocarpa*, *Picea engelmannii*, or *Picea engelmannii* X *glauca* hybrids. With the exception of *Amelanchier alnifolia*, tall shrubs are not represented, and while a diversity of short shrubs (*Shepherdia canadensis*, *Spiraea betulifolia*, *Lonicera utahensis*, *Paxistima myrsinites*, *Vaccinium membranaceum*) are consistently present, their aggregate cover does not often exceed 20%. Besides containing two of the three undergrowth indicator species, *Vaccinium caespitosum* and *Arctostaphylos uva-ursi*, the dwarf-shrub layer in combination with consistently high *Calamagrostis rubescens* cover (in excess of 30%) gives modal stands their prevailing aspect of nearly continuous cover; other dwarf-shrubs of moderate to high constancy and highly variable cover include *Linnaea borealis*, *Mahonia repens* or *Mahonia aquifolium* (depending on locality), *Chimaphila umbellata*, *Vaccinium scoparium*, and *Vaccinium myrtillus*. Of two forbs, *Clintonia uniflora* and *Cornus canadensis*, indicative of this association's relatively mesic status (as compared to say *Larix occidentalis* / *Vaccinium caespitosum*) only *Clintonia* is also 100% constant and used as an indicator. Forbs are usually a negligible component with only *Arnica cordifolia*, *Fragaria* spp., *Orthilia secunda* (= *Pyrola secunda*), *Lupinus sericeus* or *Lupinus argenteus* (depending on locality), *Hieracium albiflorum*, and *Maianthemum racemosum* exhibiting moderate to high constancy and a combined cover seldom exceeding 10%.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This montane, mesic association is located on gentle to moderately steep lowslopes at elevations between 1130 and 1205 m (3700-3950 feet). Stands tend to occur on warm slopes, benches, or terraces with south-facing aspects. Soils are well- to rapidly drained silt loams, sandy loams, or loamy sands that have been developed on glacial till. Litter comprises 60-80% of the ground surface, although downed wood is also common due to beetle kill or fire.

GLOBAL ENVIRONMENT: This mesic, small- to large-patch forested community is a minor type found from northwestern Montana (west of the Continental Divide) westward across northern Idaho to northeastern Washington as far west as the Okanogan Plateau; its southern extent is central Idaho's Seven Devils and southern Batholith regions. In both northeastern Washington and western Montana it is found at elevations predominantly between 915 to 1220 m (3000-4000 feet) with extremes from 680 to 1400 m (2230-4590 feet); at its southern extent it is found between 1400 and 1675 (4600-5500 feet). This association typically is found on lower elevation benchlands and gentle lower slopes of low gradient, areas that would be expected to be frosty or where cold-air ponding occurs with a relatively high frequency. Daytime temperatures are warm, which results in a strong diurnal contrast that is apparently limiting to tree species that potentially are climax dominants. Sites are confined to well-drained glacial till and outwash deposits or similarly derived relatively coarse-textured sediments (mostly fine sandy loams to loams in texture) that frequently have an appreciable gravel content. For at least a portion of the type's range, subsoil compaction has been demonstrated and could be responsible for an elevated soil moisture regime and a more mesic forb component (than exhibited for say the *Larix occidentalis* / *Vaccinium caespitosum* association). Soil reactions vary from acidic to very acidic.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This evergreen forest occurs as a result of moderate intensity to intense stand-replacing fires that have left scattered *Larix occidentalis* in the overstory. *Pinus contorta* trees range in age from 20-80 years old, while emergent *Larix occidentalis* may be 200 years old. Stands have seen considerable mortality from mountain pine beetle kill, as one area had numerous downed *Pinus contorta* trees. Tree canopy cover averages 10-40% with heights ranging from 20-35 m. *Larix occidentalis* and *Pinus contorta* codominate the canopy layer, each with 1-20% cover. *Pseudotsuga menziesii* and *Abies lasiocarpa* may also be present with low cover. Subcanopy tree cover also ranges from 10-40% with heights between 2-20 m. *Pseudotsuga menziesii* dominates the subcanopy layer with 5-30% cover, while *Populus tremuloides*, *Picea engelmannii*, *Pinus contorta*, and *Larix occidentalis* are sometimes present with low cover.

Dwarf-shrubs have the highest cover of all shrub layers with 10-90% cover. *Vaccinium caespitosum*, *Arctostaphylos uva-ursi*, and *Linnaea borealis* dominate the dwarf-shrub layer, each with 3-30% cover. *Mahonia repens* is consistently present with 1-15% cover. Short shrubs are common with 5-40% cover, generally less than 1 m tall. *Spiraea betulifolia* dominates this layer with 3-25% cover, *Shepherdia canadensis* is also very common with 1-17% cover. *Rosa woodsii* and *Symphoricarpos albus* are also usually present with 1-3% cover. Tall-shrub cover ranges between 5-30% and is dominated by *Amelanchier alnifolia* with 1-30% cover. Saplings of *Abies lasiocarpa*, *Pinus contorta*, *Larix occidentalis*, and *Picea engelmannii* are also common with 1-4% cover.

Overall herbaceous cover ranges from 40-70% with heights less than 0.5 m. *Calamagrostis rubescens* clearly dominates this layer with 20-60% cover. Presence of *Clintonia uniflora* is the indicator forb for this association. Other high-constancy forbs in the herbaceous layer that have 1-4% cover include *Fragaria virginiana*, *Galium boreale*, *Hieracium cynoglossoides* (= *Hieracium albertinum*), *Lupinus argenteus*, *Symphyotrichum laeve* (= *Aster laevis*), *Achillea millefolium*, *Chamerion angustifolium*, *Antennaria racemosa*, *Chimaphila umbellata*, and *Cornus canadensis*. *Populus tremuloides* seedlings, *Fragaria vesca*, *Eurybia conspicua* (= *Aster conspicuus*), *Phleum pratense*, *Elymus glaucus*, *Vicia americana*, and *Thalictrum occidentale* are lower constancy species that may have conspicuous cover. Cover of nonvascular plants is generally very low.

GLOBAL VEGETATION: The upper canopy is relatively open (ranging from 40 to 70% canopy cover with extremes to 20%) and dominated by *Larix occidentalis* with minor contributions of *Pinus contorta* and *Pseudotsuga menziesii*. *Pseudotsuga* characteristically has the greatest understory cover, followed by *Abies lasiocarpa*, *Picea engelmannii*, or *Picea engelmannii* X *glauca* hybrids. With the exception of *Amelanchier alnifolia*, tall shrubs are not represented, and though a diversity of short shrubs (*Shepherdia canadensis*, *Spiraea betulifolia*, *Lonicera utahensis*, *Paxistima myrsinites*, *Vaccinium membranaceum*) are consistently present, their aggregate cover does not often exceed 20%. Besides containing two of the three undergrowth indicator species, *Vaccinium caespitosum* and *Arctostaphylos uva-ursi*, the dwarf-shrub layer in combination with consistently high *Calamagrostis rubescens* cover (in excess of 30%) gives modal stands their prevailing aspect of nearly continuous cover; other dwarf-shrubs of moderate to high constancy and highly variable cover include *Linnaea borealis*, *Mahonia repens* or *Mahonia aquifolium* (depending on locality), *Chimaphila umbellata*, *Vaccinium scoparium*, and *Vaccinium myrtillus*. Only one forb, *Clintonia uniflora* is 100% constant and indicative of this association's relatively mesic status (as compared to say *Larix occidentalis* / *Vaccinium caespitosum*); *Cornus canadensis* is also consistently present and reflects an augmented moisture status. Forbs are usually a negligible component with only *Arnica cordifolia* or *Arnica latifolia* (locality dependent), *Fragaria* spp., *Orthilia secunda* (= *Pyrola secunda*), *Lupinus*

sericeus or *Lupinus argenteus* (depending on locality), *Hieracium albiflorum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Maianthemum racemosum*, and *Viola orbiculata* exhibiting moderate to high constancy and a combined cover seldom exceeding 10%.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Pinus contorta</i>
Tree subcanopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Shepherdia canadensis</i> , <i>Spiraea betulifolia</i>
Herb (field)	Dwarf-shrub	<i>Arctostaphylos uva-ursi</i> , <i>Linnaea borealis</i> , <i>Mahonia repens</i> , <i>Vaccinium caespitosum</i>
Herb (field)	Forb	<i>Fragaria virginiana</i> , <i>Lupinus argenteus</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Pinus contorta</i> , <i>Pseudotsuga menziesii</i>
Tree subcanopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i> , <i>Pseudotsuga menziesii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Shepherdia canadensis</i> , <i>Spiraea betulifolia</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Dwarf-shrub	<i>Arctostaphylos uva-ursi</i> , <i>Chimaphila umbellata</i> , <i>Linnaea borealis</i> , <i>Mahonia aquifolia</i> , <i>Mahonia repens</i> , <i>Vaccinium caespitosum</i> , <i>Vaccinium myrtillus</i> , <i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Arnica latifolia</i> , <i>Fragaria virginiana</i> , <i>Hieracium albiflorum</i> , <i>Lupinus argenteus</i> , <i>Lupinus sericeus</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Amelanchier alnifolia*, *Arctostaphylos uva-ursi*, *Calamagrostis rubescens*, *Clintonia uniflora*, *Galium boreale*, *Hieracium albiflorum*, *Larix occidentalis*, *Linnaea borealis*, *Mahonia repens*, *Pinus contorta*, *Pseudotsuga menziesii*, *Spiraea betulifolia*, *Vaccinium caespitosum*

GLOBAL: *Arctostaphylos uva-ursi*, *Clintonia uniflora*, *Larix occidentalis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Phleum pratense*, *Prunella vulgaris*, *Taraxacum officinale*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: GNR (21-Apr-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Differences in site parameters probably do not exist between this association (CEGL005883) and *Pinus contorta* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (CEGL005923); these two communities owe their differences to happenstance; tree layer site dominance is attributed to whichever species has greater proximity (in a statistical sense) to an appropriate disturbed site and an abundant, upwind cone crop at the time of disturbance. This association is differentiated from *Larix occidentalis* / *Vaccinium caespitosum* by the mere presence of *Clintonia uniflora*; there is generally no easily discernable environmental distinction between the two association, but the presence of this mesophytic forb is considered indicative of a slightly more favorable moisture regime. The cover values at which *Vaccinium caespitosum* and *Arctostaphylos uva-ursi* are recognized as indicators range from merely present and not confined to microsites (Pfister et al. 1977, Williams and Lillybridge 1983) to greater than 5% (Lillybridge et al. 1995, Williams et al. 1995), though in most keys *Vaccinium caespitosum* is generally accorded greater indicator potential than *Arctostaphylos uva-ursi*, being recognized as indicative at lower cover values.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies grandis* / *Vaccinium caespitosum* Forest (CEGL000288)
- *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Forest (CEGL005912)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (CEGL005918)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium caespitosum* Forest (CEGL000340)
- *Picea engelmannii* / *Vaccinium caespitosum* Forest (CEGL005926)
- *Pinus contorta* / *Vaccinium caespitosum* Forest (CEGL000168)

GLOBAL RELATED CONCEPTS:

- *Abies grandis* / *Vaccinium caespitosum* Plant Association (Williams et al. 1995) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Vaccinium cespitosum* Phase (Pfister et al. 1977) I
- *Abies lasiocarpa* / *Vaccinium caespitosum* Plant Association (Williams et al. 1995) I
- *Abies lasiocarpa* / *Vaccinium caespitosum* Plant Association (Lillybridge et al. 1995) I
- *Abies lasiocarpa* / *Vaccinium* spp. Plant Association (Williams and Lillybridge 1983) I
- *Larix occidentalis* - *Pseudotsuga menziesii* (*Pinus contorta*) / *Shepherdia canadensis* - *Spiraea betulifolia* / *Calamagrostis rubescens* (Leavell 2000) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon on the west side of Glacier National Park, known only from the North Fork subdistrict in low-elevation areas with recent fires or beetle kill. It has been documented along Dutch Creek and near the Ford Creek Ranger Station.

GLOBAL RANGE: This community occurs from the Idaho Batholith (Payette National Forest) northward in Idaho, throughout northwestern Montana and eastward to the Continental Divide and northeastern Washington as far west as the eastern slopes of the Cascades. It is not reported from Canada but would be expected in southern British Columbia (but not Alberta as *Larix occidentalis* does not extend, except as scattered individuals, east of the Continental Divide).

NATIONS: CA?, US

STATES/PROVINCES: ID, MT, WA

USFS ECOREGIONS: M242C:CC, M332A:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); USFS (Wenatchee)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.1009, GLAC.2297, GLAC.2533.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Bourgeron and Engelking 1994, Cooper et al. 1987, Driscoll et al. 1984, Leavell 2000, Lillybridge et al. 1995, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d., Williams and Lillybridge 1983, Williams et al. 1995

***Larix occidentalis* / *Vaccinium caespitosum* Forest
WESTERN LARCH / DWARF BLUEBERRY FOREST**

IDENTIFIER: C EGL005882

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
Alliance	<i>Larix occidentalis</i> Forest Alliance (A.275)
Alliance (English name)	Western Larch Forest Alliance
Association	<i>Larix occidentalis</i> / <i>Vaccinium caespitosum</i> Forest
Association (English name)	Western Larch / Dwarf Blueberry Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Western Larch Savanna (CES306.837)

ELEMENT CONCEPT

GLOBAL SUMMARY: This small- to large-patch minor forested type occurs throughout the northern Rocky Mountains. Its presence is strongly associated with well-drained sites in frosty basins or benchlands where cold air accumulates. It is found at moderate elevations between 915 to 1220 m (3000-4000 feet) in the western portion of its distribution but occurs as high as 1525 m (5000 feet) on the Flathead and Kootenai national forests, and yet further to the east it may be found to 2195 m (7200 feet) in basins along the Continental Divide. These sites are postulated to experience frequent summer frost coupled with warm daily maximum temperatures; this factor combination is thought to be limiting to climax conifer species, which establish and grow slowly on these sites. Surface soils are mostly derived from alluvial and to lesser degree colluvial deposits, both gravelly and non-gravelly sandy loams to silts with acidic reaction (pH averaged 5.0 in Montana for comparable type). Sites with the above suite of characteristics are generally dominated by *Pinus contorta* in the overstory, but occasionally *Larix occidentalis* becomes abundantly established, the unique result of a plentiful local *Larix* cone crop and a stand-replacing disturbance (wildfire) and a non-serotinous local population of *Pinus contorta*. *Pseudotsuga menziesii* and *Pinus contorta* are present as a minor component of open canopies dominated by *Larix occidentalis*; *Abies lasiocarpa* and *Picea engelmannii* are present as depauperate specimens in the reproductive layers. Though short shrubs may be represented and even exhibit high constancy (e.g., *Amelanchier alnifolia*, *Lonicera utahensis*, *Spiraea betulifolia*, *Shepherdia canadensis*, *Juniperus communis*), it is the dwarf-shrub layer that dominates. Cover of the two indicators of the type, *Vaccinium caespitosum* and *Arctostaphylos uva-ursi*, varies markedly, from a few percent to nearly a continuous layer. Other dwarf-shrubs with a consistent presence and occasional abundance are *Linnaea borealis*, *Mahonia repens*, *Vaccinium scoparium*, and *Vaccinium myrtillus*. *Calamagrostis rubescens* consistently dominates the graminoid component, and frequently it fills the interstices between dwarf-shrubs to create a virtually unbroken layer. *Carex geyeri* and *Carex concinnoides* are also moderately constant within the type. Forbs are usually a negligible component with only *Arnica cordifolia*, *Orthilia secunda* (= *Pyrola secunda*), *Hieracium albiflorum*, and *Maianthemum racemosum* exhibiting moderate to high constancy.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this mesic to subxeric, montane forest occur on gentle benches and moderate toeslopes at elevations between 1080 and 1180 m (3550-3860 feet) with variable aspects. Soils are well-drained to rapidly drained sandy or silt loams that are derived from glacial drift or till. Litter comprises 80-90% of the ground surface. Two of the three locations where data were collected for this association were burned. One stand burned in 1928, while another was burned in the 1996 Anaconda Fire.

GLOBAL ENVIRONMENT: This small- to large-patch minor forested type occurs throughout the northern Rocky Mountains. Its presence is strongly associated with well-drained sites in frosty basins or benchlands where cold air accumulates. It is found at moderate elevations between 915 to 1220 m (3000-4000 feet) in the western portion of its distribution but occurs as high as 1525 m (5000 feet) on the Flathead and Kootenai national forests, and yet further to the east it may be found to 2195 m (7200 feet) in basins along the Continental Divide. These sites are postulated to experience frequent summer frost coupled with warm daily maximum temperatures; this factor combination is thought to be limiting to climax conifer species, which establish and grow slowly on these sites. Surface soils are mostly derived from alluvial and to lesser degree colluvial deposits, both gravelly and non-gravelly sandy loams to silts with acidic reaction (pH averaged 5.0 in Montana for comparable type).

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This open, evergreen forest occurs as a result of ground fires that remove many pole-sized trees and ground cover, as well as mountain pine beetle kill that has removed *Pinus contorta* from the canopy and subcanopy. Tree canopy cover ranges from 10-40% with heights averaging 20-50 m. *Larix occidentalis* dominates the canopy layer with 15-25% cover, although *Pseudotsuga menziesii* and *Pinus contorta* may also be common with 1-20% cover and 7-15% cover, respectively. *Picea engelmannii* and *Pinus ponderosa* are sometimes scattered in the overstory as well with low cover. Subcanopy cover averages 5-10% with heights between 1-10 m. Dwarf-shrubs have the highest cover of all shrub layers with 10-65% cover. *Vaccinium caespitosum*, *Arctostaphylos uva-ursi*, and *Linnaea borealis* are high-constancy dwarf-shrubs each with cover ranging between 1-30%. *Mahonia repens* is also commonly present with low cover. Short shrubs are also common with 10-25% cover and heights ranging between >0.5-1 m. *Spiraea betulifolia* dominates this layer with 7-25% cover, although *Rosa woodsii* and *Symphoricarpos albus* are also commonly present with low cover. The tall-shrub strata cover is low at 5%, and is dominated by tree saplings that are 0.5-1 m in height. *Larix occidentalis*, *Pinus contorta*, *Picea engelmannii*, and *Amelanchier alnifolia* are common in the tall-shrub layer, with 1-2% cover. Overall herbaceous cover ranges from 50-100% with heights less than 0.5 m. *Calamagrostis rubescens* dominates this layer with 40-85% cover, although *Lupinus argenteus* is also common with 5-20% cover. Other high-constancy forbs and trees in the herbaceous layer that have lower cover include *Fragaria virginiana*, *Achillea millefolium*, *Pseudotsuga menziesii* seedlings, *Symphotrichum laeve* (= *Aster laevis*), *Lathyrus ochroleucus*, *Picea engelmannii*, and *Erythronium grandiflorum*. *Antennaria racemosa*, *Chamerion angustifolium*, *Elymus glaucus*, and *Populus tremuloides* are low-constancy species that may have conspicuous cover.

GLOBAL VEGETATION: Sites having the above suite of abiotic characteristics generally exhibit an overstory dominated by *Pinus contorta*, but occasionally *Larix occidentalis* becomes abundantly established. Its dominance results from the unique conjunction of a stand-replacing disturbance (wildfire), a plentiful local *Larix* cone crop and a non-serotinous local population of *Pinus contorta* (which assures that *Pinus* will not prolifically seed into the disturbed area). *Pseudotsuga menziesii* and *Pinus contorta* are present as a minor component of open canopies dominated by *Larix occidentalis*; *Abies lasiocarpa* and *Picea engelmannii* are present as depauperate specimens in the reproductive layers. Though short shrubs may be represented and even exhibit high constancy (e.g., *Amelanchier alnifolia*, *Lonicera utahensis*, *Spiraea betulifolia*, *Shepherdia canadensis*, *Juniperus communis*), it is the dwarf-shrub layer that dominates. Cover of the two indicators of the type, *Vaccinium caespitosum* and *Arctostaphylos uva-ursi*, varies markedly, from a few percent to nearly a continuous layer. Other dwarf-shrubs with a consistent presence and occasional abundance are *Linnaea borealis*, *Mahonia repens*, *Vaccinium scoparium*, and *Vaccinium myrtillus*. *Calamagrostis rubescens* consistently dominates the graminoid component, and frequently it fills the interstices between dwarf-shrubs to create a virtually unbroken layer. *Carex geyeri* and *Carex concinnoides* are also moderately constant within the type. Forbs are usually a negligible component with only *Arnica cordifolia*, *Fragaria* spp., *Orthilia secunda* (= *Pyrola secunda*), *Lupinus sericeus* or *Lupinus argenteus* (depending on locality), *Hieracium albiflorum*, and *Maianthemum racemosum* exhibiting moderate to high constancy and a combined cover seldom exceeding 10%.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Pinus contorta</i> , <i>Pseudotsuga menziesii</i>
Tree subcanopy	Needle-leaved tree	<i>Larix occidentalis</i>
Tall shrub/sapling	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Pinus contorta</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i>
Herb (field)	Dwarf-shrub	<i>Arctostaphylos uva-ursi</i> , <i>Linnaea borealis</i> , <i>Vaccinium caespitosum</i>
Herb (field)	Forb	<i>Fragaria virginiana</i> , <i>Lupinus argenteus</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Pinus contorta</i> , <i>Pseudotsuga menziesii</i>
Tree subcanopy	Needle-leaved tree	<i>Abies grandis</i> , <i>Abies lasiocarpa</i> , <i>Picea engelmannii</i> , <i>Pseudotsuga menziesii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i> , <i>Lonicera utahensis</i> , <i>Spiraea betulifolia</i>
Herb (field)	Dwarf-shrub	<i>Arctostaphylos uva-ursi</i> , <i>Linnaea borealis</i> , <i>Vaccinium caespitosum</i> , <i>Vaccinium myrtillus</i> , <i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Hieracium albiflorum</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i> , <i>Carex geyeri</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Achillea millefolium*, *Arctostaphylos uva-ursi*, *Larix occidentalis*, *Linnaea borealis*, *Pinus contorta*, *Pseudotsuga menziesii*, *Spiraea betulifolia*, *Vaccinium caespitosum*

GLOBAL: *Arctostaphylos uva-ursi*, *Larix occidentalis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Trifolium repens*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: GNR (21-Apr-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Differences in site parameters are probably insignificant among *Larix occidentalis* / *Vaccinium caespitosum*, *Pinus contorta* / *Vaccinium caespitosum*, and *Pseudotsuga* / *Vaccinium caespitosum* communities; these communities owe their canopy differences to happenstance; tree layer dominance accrues to whichever species has greater effective proximity (in a

statistical sense) to an appropriate disturbed site and an abundant cone crop upwind of the site (at the time of and following disturbance). The cover values at which *Vaccinium caespitosum* and *Arctostaphylos uva-ursi* are recognized as indicators ranges from merely present and not confined to microsites (Pfister et al. 1977, Williams and Lillybridge 1983) to greater than 5% (Lillybridge et al. 1995, Williams et al. 1995), though in most keys *Vaccinium caespitosum* is generally accorded greater indicator potential than *Arctostaphylos uva-ursi*, being recognized as indicative at lower cover values.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium caespitosum* Forest (CEGL000340)
- *Picea engelmannii* / *Vaccinium caespitosum* Forest (CEGL005926)
- *Pinus contorta* / *Vaccinium caespitosum* Forest (CEGL000168)
- *Pinus ponderosa* / *Vaccinium caespitosum* Woodland (CEGL005841)

GLOBAL RELATED CONCEPTS:

- *Abies grandis* / *Vaccinium caespitosum* Habitat Type (Steele et al. 1981) I
- *Abies grandis* / *Vaccinium caespitosum* Plant Association (Williams et al. 1995) I
- *Abies lasiocarpa* / *Vaccinium caespitosum* Plant Association (Lillybridge et al. 1995) I
- *Abies lasiocarpa* / *Vaccinium caespitosum* Plant Association (Williams et al. 1995) I
- *Abies lasiocarpa* / *Vaccinium caespitosum* Habitat Type (Pfister et al. 1977) I
- *Abies lasiocarpa* / *Vaccinium caespitosum* Habitat Type (Cooper et al. 1987) I
- *Abies lasiocarpa* / *Vaccinium* spp. Plant Association (Williams and Lillybridge 1983) I
- *Larix occidentalis* - *Pseudotsuga menziesii* (*Pinus contorta*) / *Shepherdia canadensis* - *Spiraea betulifolia* / *Calamagrostis rubescens* (Leavell 2000) I
- *Larix occidentalis* - *Pseudotsuga menziesii* (*Pinus contorta*) / *Spiraea betulifolia* - *Amelanchier alnifolia* / *Calamagrostis rubescens* (Leavell 2000) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon on the west side of Glacier National Park but can be locally common in low-elevation, burned or beetle-infested areas within the North Fork subdistrict. It has been documented on benches near the Logging Creek Ranger Station and south of the Kintla Ranger Station.

GLOBAL RANGE: This community occurs from the Idaho Batholith (Payette National Forest) northward in Idaho, throughout northwestern Montana eastward to the Continental Divide and northeastern Washington as far west as the eastern slopes of the Cascades. It is not reported from Canada but would be expected in southern British Columbia (but not Alberta as *Larix occidentalis* does not extend, except as scattered individuals, east of the Continental Divide).

NATIONS: CA?, US

STATES/PROVINCES: ID, MT, WA

USFS ECOREGIONS: M242C:CC, M332A:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); USFS (Flathead, Kootenai, Payette, Wenatchee)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2290, GLAC.2255, GLAC.2261.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Bourgeron and Engelking 1994, Cooper et al. 1987, Driscoll et al. 1984, Leavell 2000, Lillybridge et al. 1995, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d., Williams and Lillybridge 1983, Williams et al. 1995

***Populus tremuloides* Forest Alliance**

***Populus tremuloides* - Conifer / *Spiraea betulifolia* - *Symphoricarpos albus* Forest
QUAKING ASPEN - CONIFER / SHINYLEAF MEADOWSWEET - COMMON SNOWBERRY
FOREST**

IDENTIFIER: CEGL005911

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
Alliance	<i>Populus tremuloides</i> Forest Alliance (A.274)
Alliance (English name)	Quaking Aspen Forest Alliance
Association	<i>Populus tremuloides</i> - Conifer / <i>Spiraea betulifolia</i> - <i>Symphoricarpos albus</i> Forest
Association (English name)	Quaking Aspen - Conifer / Shinyleaf Meadowsweet - Common Snowberry Forest
ECOLOGICAL SYSTEM(S):	Rocky Mountain Aspen Forest and Woodland (CES306.813)

ELEMENT CONCEPT

GLOBAL SUMMARY: This tentatively defined mixed aspen-conifer forest has been reported from Glacier National Park, Montana. It is a mesic montane association typically located on flat basin floors to moderately steep toeslopes on variable aspects. This type occurs at elevations between 1585 and 1685 m (5200-5530 feet) east of the Continental Divide and near 1135 m (3720 feet) west of the Continental Divide. Soil texture is a moderately well- to well-drained loam to sandy clay loam with moderate gravel content (5-30%) comprised of argillite. Parent material is glacial till. Litter, with 60-90% cover, dominates the ground surface, although downed wood may be common with 2-20% cover. Stand age for one of the sampled areas on the west side of Glacier National Park was 60 years. This mixed evergreen-cold deciduous forest occurs in transitional zones between pure aspen stands and mixed evergreen forests on the east side of Glacier National Park and in low-elevation areas that have burned in the last century on the west side of the park. Tree canopy cover averages 60-70% and is dominated by *Populus tremuloides* with four conifer species, *Pinus contorta*, *Picea engelmannii*, *Abies lasiocarpa*, and *Pseudotsuga menziesii*. The subcanopy tree layer is dominated by *Populus tremuloides*, but *Abies lasiocarpa* and *Pseudotsuga menziesii* may also be present. The short-shrub layer in the understory is prominent, with *Spiraea betulifolia* and *Symphoricarpos albus* the most abundant species. *Juniperus communis* is often present with low cover. Tall and dwarf-shrubs occur only occasionally, and when present comprise only 5% average cover. Common tall shrubs include *Salix scouleriana*, *Acer glabrum*, and *Amelanchier alnifolia*. Dwarf-shrub species include *Clematis columbiana*, *Juniperus horizontalis*, and *Mahonia repens*. Overall herbaceous abundance is variable with 5-80% cover. *Carex geyeri* and *Calamagrostis rubescens* may sometimes be present in these stands with high to very high cover. Dominant forbs include *Thalictrum occidentale*, *Eurybia conspicua* (= *Aster conspicuus*), and *Chamerion angustifolium*. Other common species include *Pedicularis bracteosa*, *Osmorhiza occidentalis*, *Abies lasiocarpa* and *Populus tremuloides* seedlings, *Castilleja miniata*, *Elymus glaucus*, *Galium boreale*, *Lathyrus ochroleucus*, and *Maianthemum racemosum* ssp. *amplexicaule*. Cover of nonvascular species is low at 0-5%.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this mesic montane association are located on flat basin floors to moderately steep toeslopes on variable aspects. This type occurs at elevations between 1585 and 1685 m (5200-5530 feet) east of the Continental Divide and near 1135 m (3720 feet) west of the Continental Divide. Soil texture is a moderately well- to well-drained loam to sandy clay loam with moderate gravel content (5-30%) comprised of argillite. Parent material is glacial till. Litter, with 60-90% cover, dominates the ground surface, although downed wood may be common with 2-20% cover. Stand age for one of the sampled areas on the west side of Glacier National Park was 60 years.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This mixed evergreen-cold deciduous forest occurs in transitional zones between pure aspen stands and mixed evergreen forests on the east side of Glacier National Park and in low-elevation areas that have burned in the last century on the west side of the park. Tree canopy cover averages 60-70% with heights ranging from 10-35 m. The canopy is dominated by *Populus tremuloides* with 20-30% cover and four conifer species, including *Pinus contorta* with 20-40% cover, *Picea engelmannii* with 4-25% cover, *Abies lasiocarpa* with 3-20% cover, and *Pseudotsuga menziesii* with 3-10% cover. The subcanopy tree layer averages 10-20% cover, ranges from 2-20 m in height, and is dominated by *Populus tremuloides* with 3-10% cover. *Abies lasiocarpa* and *Pseudotsuga menziesii* may also be present in the subcanopy layer with low cover.

Short shrubs with heights averaging 0.5-1 m have 10-40% cover in the understory. *Spiraea betulifolia* and *Symphoricarpos albus*, both indicator species for this association, dominate the short-shrub layer with 3-30% cover and 3-10% cover, respectively. *Juniperus communis* is often present with low cover. Tall and dwarf-shrubs occur only occasionally, and when present comprise only 5% average cover. Common tall shrubs include *Salix scouleriana*, *Acer glabrum*, and *Amelanchier alnifolia*. Dwarf-shrub species include *Clematis columbiana*, *Juniperus horizontalis*, and *Mahonia repens*.

Overall herbaceous cover is variable with 5-80% cover. Dominant forbs in the herbaceous layer are *Thalictrum occidentale* with 1-25% cover, *Eurybia conspicua* (= *Aster conspicuus*) with 10-20% cover, and *Chamerion angustifolium* with 3-10% cover. Other common species include *Pedicularis bracteosa*, *Osmorhiza occidentalis*, *Abies lasiocarpa* and *Populus tremuloides* seedlings, *Castilleja miniata*, *Elymus glaucus*, *Galium boreale*, *Lathyrus ochroleucus*, and *Maianthemum racemosum* ssp. *amplexicaule*, each with 1-5% cover. *Carex geyeri* and *Calamagrostis rubescens* may sometimes be present in these stands with high to very high cover. Cover of nonvascular species is low at 0-5%.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i> , <i>Pinus contorta</i> , <i>Pseudotsuga menziesii</i>
Tree canopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Salix scouleriana</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i> , <i>Symphoricarpos albus</i>
Herb (field)	Forb	<i>Chamerion angustifolium</i> , <i>Eurybia conspicua</i> , <i>Thalictrum occidentale</i>
Herb (field)	Graminoid	<i>Carex geyeri</i> , <i>Elymus glaucus</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Castilleja miniata*, *Chamerion angustifolium*, *Elymus glaucus*, *Eurybia conspicua*, *Galium boreale*, *Juniperus communis*, *Lathyrus ochroleucus*, *Maianthemum racemosum* ssp. *amplexicaule*, *Osmorhiza occidentalis*, *Pedicularis bracteosa*, *Picea engelmannii*, *Pinus contorta*, *Populus tremuloides*, *Pseudotsuga menziesii*, *Spiraea betulifolia*, *Symphoricarpos albus*, *Thalictrum occidentale*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Calochortus apiculatus*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3? (9-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Symphoricarpos albus* Forest (CEGL000337)
- *Abies lasiocarpa* / *Spiraea betulifolia* Forest (CEGL000335)
- *Pinus contorta* / *Spiraea betulifolia* Forest (CEGL000164)
- *Pseudotsuga menziesii* / *Spiraea betulifolia* Forest (CEGL000457)
- *Pseudotsuga menziesii* / *Symphoricarpos albus* Forest (CEGL000459)

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is relatively uncommon in Glacier National Park. It occurs in transition zones between aspen stands and mixed conifer forests on the east side of the park and in low-elevation areas that have burned in the last century on the west side of the park. This type has been documented near the Cut Bank

Ranger Station in the Two Medicine subdistrict, near Poia Lake in the Many Glacier subdistrict, and in the western part of Tepee Flats north of Polebridge in the North Fork subdistrict.

GLOBAL RANGE:

NATIONS: CA?, US

STATES/PROVINCES: AB?, MT:S3?

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.67, GLAC.116, GLAC.2249.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Western Ecology Working Group n.d.

***Populus tremuloides* / *Calamagrostis rubescens* Forest
QUAKING ASPEN / PINEGRASS FOREST**

IDENTIFIER: CEGLO00575

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
Alliance	<i>Populus tremuloides</i> Forest Alliance (A.274)
Alliance (English name)	Quaking Aspen Forest Alliance
Association	<i>Populus tremuloides</i> / <i>Calamagrostis rubescens</i> Forest
Association (English name)	Quaking Aspen / Pinegrass Forest

ECOLOGICAL SYSTEM(S): Northwestern Great Plains Aspen Forest and Parkland (CES303.681)
Rocky Mountain Aspen Forest and Woodland (CES306.813)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is a relatively common deciduous forest known from Washington, Idaho, Montana, Wyoming, and Utah. It is described from over 100 plots. It occurs on benches and slopes irrespective of slope steepness or aspect. It occurs primarily below 2440 m (8000 feet) in elevation, ranging from 1829 to 2440 m (6000-8000 feet). Soils are primarily derived from sandstone. The vegetation of this major association is comparatively simple both in structure and in composition. Most of the time, *Populus tremuloides* is the only tree in the overstory. Conifers, if present, are incidental and can include *Pinus contorta*, *Picea engelmannii*, and *Pseudotsuga menziesii*. Shrubs such as *Symphoricarpos oreophilus*, *Rosa woodsii*, *Amelanchier alnifolia*, and *Juniperus communis* may be present but never form a distinct layer. The herbaceous undergrowth is dominated by *Calamagrostis rubescens*. Other graminoids include *Elymus trachycaulus* (= *Agropyron trachycaulum*), *Bromus carinatus*, *Elymus glaucus*, and *Poa pratensis*. Commonly found forbs include *Geranium viscosissimum*, *Lupinus argenteus*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Fragaria vesca*, and *Achillea millefolium* var. *occidentalis* (= *Achillea lanulosa*).

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association has been found only east of the Continental Divide from 1390 to 1670 m (4550-5350 feet) elevation, generally occupying gentle to moderate terrain, with southerly exposures predominating. Parent materials include relatively shallow colluvium (from sedimentary rock) or glacial debris, both producing well-drained soils.

GLOBAL ENVIRONMENT: This is a relatively common deciduous forest known from Washington, Idaho, Wyoming, and Utah. It is described from over 100 plots. It occurs on benches and slopes irrespective of slope steepness or aspect. It occurs primarily below 2440 m (8000 feet) in elevation, ranging from 1829 to 2440 m (6000-8000 feet). Soils are primarily derived from sandstone.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The tree canopy, especially the upper layer, is monospecifically dominated by *Populus tremuloides*; very scattered *Pinus contorta* (exclusively upper canopy) and *Picea* hybrids (reproductive layer only) were the only other tree species noted. Shrub diversity is low to moderate, and their combined cover does not exceed 20%, with *Amelanchier alnifolia*, *Rosa acicularis*, *Symphoricarpos albus*, and *Spiraea betulifolia* having high constancy. The herbaceous layer is dominated by graminoids, with *Calamagrostis rubescens* and *Carex geyeri* usually having in excess of 50% combined cover; *Elymus glaucus* and *Bromus marginatus* may also contribute significantly to the undergrowth cover. Forbs of highest constancy and cover are *Thalictrum occidentale* and *Geranium viscosissimum*; other herbs in trace amounts, such as *Osmorhiza occidentalis*, *Heracleum maximum*, *Tiarella trifoliata*, *Galium triflorum*, *Calamagrostis canadensis*, and *Maianthemum stellatum*, hint at a relatively mesic moisture regime for this type as compared to the modal condition.

GLOBAL VEGETATION: The vegetation of this major association is comparatively simple both in structure and in composition. Most of the time, *Populus tremuloides* is the only tree in the overstory. Conifers, if present, are incidental and can include *Pinus contorta*, *Picea engelmannii*, and *Pseudotsuga menziesii*. Shrubs such as *Symphoricarpos oreophilus*, *Rosa woodsii*, *Amelanchier alnifolia*, and *Juniperus communis* may be present but never form a distinct layer. The herbaceous undergrowth is dominated by *Calamagrostis rubescens*. Other graminoids include *Elymus trachycaulus* (= *Agropyron trachycaulum*), *Bromus carinatus*, *Elymus glaucus*, and *Poa pratensis*. Commonly found forbs include *Geranium viscosissimum*, *Lupinus argenteus*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Fragaria vesca*, and *Achillea millefolium* var. *occidentalis* (= *Achillea lanulosa*).

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Herb (field)	Forb	<i>Thalictrum occidentale</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i> , <i>Carex geyeri</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Calamagrostis rubescens*, *Populus tremuloides*

GLOBAL: *Calamagrostis rubescens*, *Populus tremuloides*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5? (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Some stands included in the *Populus tremuloides* / *Calamagrostis rubescens* Community Type described in Mueggler (1988) belong to *Populus tremuloides* / *Carex geyeri* Forest (CEGL000579).

GLOBAL SIMILAR ASSOCIATIONS:

- *Populus tremuloides* / *Symphoricarpos oreophilus* / *Calamagrostis rubescens* Forest (CEGL000612)

GLOBAL RELATED CONCEPTS:

- *Populus tremuloides* / *Calamagrostis rubescens* - *Poa pratensis* Community Type (Mueggler and Campbell 1986) =
- *Populus tremuloides* / *Calamagrostis rubescens* Community Type (Mueggler and Campbell 1986) =

- *Populus tremuloides* / *Calamagrostis rubescens* Community Type (Youngblood and Mueggler 1981) =
- *Populus tremuloides* / *Calamagrostis rubescens* Habitat Type (Alexander 1986) =
- *Populus tremuloides* / *Calamagrostis rubescens* Plant Association (Williams and Lillybridge 1983) =
- *Populus tremuloides*/ *Calamagrostis rubescens* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This community has been documented only from the eastside of the IPP and only from Glacier National Park, though there is no intrinsic reason it could not occur in Canada (Waterton Lakes National Park), especially in the parkland east of the Rocky Mountain Front; potential sites on the westside are usually sufficiently mesic that indicator forbs of this condition abound.

GLOBAL RANGE: This association is known from north-central Washington, Idaho, northern Utah, western Wyoming, and Montana, and may also occur in Nevada, Oregon and Alberta parkland.

NATIONS: CA?, US

STATES/PROVINCES: AB?, ID:S3?, MT:S4, NV?, OR?, UT:S5, WA:S2, WY:S3S4

USFS ECOREGIONS: 331D:CC, M331A:CC, M331D:CC, M331H:CC, M331I:CC, M332C:CC, M332D:CC, M332E:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton); USFS (Bridger-Teton, Caribou-Targhee, Medicine Bow)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.1911, GLAC.1964, GLAC.b103, GLAC.B113, GLAC.B274.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Alexander 1986, Bader 1932, Bourgeron and Engelking 1994, Cooper and Pfister 1981, Driscoll et al. 1984, Jones and Ogle 2000, MTNHP 2002b, Mueggler 1988, Mueggler and Campbell 1982, Mueggler and Campbell 1986, NVNHP 2003, Western Ecology Working Group n.d., Williams and Lillybridge 1983, Youngblood and Mueggler 1981

Populus tremuloides / *Heracleum maximum* Forest QUAKING ASPEN / COW-PARSNIP FOREST

IDENTIFIER: C EGL000595

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
Alliance	<i>Populus tremuloides</i> Forest Alliance (A.274)
Alliance (English name)	Quaking Aspen Forest Alliance
Association	<i>Populus tremuloides</i> / <i>Heracleum maximum</i> Forest
Association (English name)	Quaking Aspen / Cow-parsnip Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Aspen Forest and Woodland (CES306.813)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association has been extensively documented from the East Front of the Rocky Mountains of Montana and into Alberta, on sites ranging from 1290-1750 m (4200-5750 feet). It occurs as small- to large-patch types in narrow mountain valleys, glacial moraine depressions underlain by clay lenses and often filled with loessal soils, lee slope position also having deep loess deposits, springs or seeps on hillslopes, and as a fringe about glacial kettle lakes. The overstory is dominated by *Populus tremuloides* with an occasional *Populus balsamifera* ssp. *trichocarpa* and seedling/saplings of several conifer species scattered and showing little potential to eventually dominate. The dominant aspect of the undergrowth is that of a rich assortment of tall forbs, but occasionally *Symphoricarpos albus* comprises a conspicuous layer below the forbs. Forbs both diagnostic and usually dominant in

various combinations include *Osmorhiza occidentalis*, *Angelica arguta* (or *Angelica dawsonii*), *Heracleum maximum* (= *Heracleum lanatum*), *Geranium richardsonii*, *Viola canadensis*, *Veratrum viride*, *Galium triflorum*, and *Actaea rubra*. Among the tall graminoids, *Elymus glaucus* often has the greatest canopy cover and highest constancy; others include *Bromus carinatus*, *Calamagrostis canadensis*, *Schizachne purpurascens*, and *Cinna latifolia*. This type appears to be a self-perpetuating community as inferred by tree population age-class structure. Charcoal has not been found in the soil of these sites which indicates a lack of fire and points to long-term site occupancy by *Populus tremuloides* in a landscape where the prevailing model of succession predicts (erroneously) these sites to be eventually dominated by conifers. Conifers establish, if at all, at a glacial rate. This association is considered premier grizzly bear habitat in the spring and early summer and excellent wildlife habitat in general.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is found from 1290 to 1720 m (4230-5640 feet) elevation, and is known from low-angle basin floors to moderately steep toeslopes and midslopes. Slopes most commonly have easterly aspects. It is found on sedimentary rock and colluvial slopes, but more typically stands occur on glacial deposits (e.g., fluvial, lacustrine, and moraines). Soil is usually dark and well-developed sandy loam or clay loam. Soils vary from very little or no rocks and gravel, to very gravelly and rocky. The moisture regime is subhygric to mesic, but sites are only infrequently temporarily flooded or poorly drained and fed by seeps.

GLOBAL ENVIRONMENT: This association occurs on sites ranging from 1290-1750 m (4200-5750 feet). It occurs as small- to large-patch types in narrow mountain valleys, glacial moraine depressions underlain by clay lenses and often filled with loessal soils, lee slope position also having deep loess deposits, springs or seeps on hillslopes, and as a fringe about glacial kettle lakes. Soils are dark and well-developed sandy loam or clay loam. Soils vary from very little or no rocks and gravel, to very gravelly and rocky. The moisture regime is subhygric to mesic, but sites are only infrequently temporarily flooded or poorly drained and fed by seeps.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: *Populus tremuloides* clearly dominates this association with 46% average cover in the tree canopy and 17% average cover in the tree subcanopy. Trees are usually less than 20 m tall. Several conifers of various age classes, including *Picea engelmannii*, *Pinus contorta*, and *Pseudotsuga menziesii*, are sometimes present with low cover. In over 70% of the stands, taller *Amelanchier alnifolia* and shorter *Symphoricarpos* spp. codominate the variable-height shrub layers with an individual average cover of 10 to 15%. However, in shady and well-drained stands, *Symphoricarpos albus* can dominate the understory with up to 73% cover. *Rubus parviflorus*, with an average cover of about 35%, dominates the shrub layer in one-third of the stands. *Ribes* spp., *Rosa* spp., *Spiraea betulifolia*, *Mahonia repens*, and *Prunus virginiana* are sometimes present, but each has an average cover of less than 10%.

Tall forbs, especially *Heracleum maximum* (with up to 80% cover) and *Osmorhiza occidentalis* (with up to 63% cover) usually codominate the herbaceous layer, although *Viola canadensis* (on the ground layer) and *Prosartes hookeri* (= *Disporum hookeri*) can also be present with high cover. Forb species with high constancy but lower cover include *Thalictrum occidentale*, *Fragaria virginiana*, *Chamerion angustifolium*, and *Vicia americana*. Numerous other tall and ground-layer forbs are present with low cover and constancy in the diverse understory. In contrast, graminoids are fewer in cover and constancy. *Elymus glaucus* is present in 63% of the stands with low cover, and *Bromus* species are present in up to 38% of the stands with low cover. The ground cover is primarily litter and duff with up to 15% downed wood in some stands. Moss cover averages less than 5%.

GLOBAL VEGETATION: The overstory is dominated by *Populus tremuloides* with an occasional *Populus balsamifera* ssp. *trichocarpa*. *Picea engelmannii*, *Pinus contorta*, and *Pseudotsuga menziesii*, are sometimes present with low cover. The dominant aspect of the undergrowth is that of a rich assortment of tall forbs, but occasionally *Symphoricarpos albus* comprises a conspicuous layer below the forbs. Tall shrubs may also be present such as *Amelanchier alnifolia*, but rarely comprising more than 10-15% cover. Forbs both diagnostic and usually dominant in various combinations include *Heracleum maximum* (= *Heracleum lanatum*), with often as much as 80% cover, on average, *Osmorhiza occidentalis*, *Angelica arguta* (or *Angelica dawsonii*), *Geranium richardsonii*, *Viola canadensis*, *Veratrum viride*, *Galium triflorum*, and *Actaea rubra*. Among the tall graminoids, *Elymus glaucus* often has the greatest canopy cover and highest constancy; others include *Bromus carinatus*, *Calamagrostis canadensis*, *Schizachne purpurascens*, and *Cinna latifolia*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Prunus virginiana</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i> , <i>Rubus parviflorus</i>
Herb (field)	Dwarf-shrub	<i>Mahonia repens</i>

Herb (field)	Forb	<i>Heracleum maximum</i> , <i>Osmorhiza occidentalis</i> , <i>Prosartes hookeri</i> , <i>Viola canadensis</i>
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Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Symphoricarpos albus</i>
Herb (field)	Forb	<i>Heracleum maximum</i> , <i>Osmorhiza occidentalis</i> , <i>Prosartes hookeri</i> , <i>Viola canadensis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Amelanchier alnifolia*, *Elymus glaucus*, *Heracleum maximum*, *Mahonia repens*, *Osmorhiza occidentalis*, *Populus tremuloides*, *Spiraea betulifolia*, *Symphoricarpos albus*, *Thalictrum occidentale*, *Vicia americana*

GLOBAL: *Amelanchier alnifolia*, *Elymus glaucus*, *Heracleum maximum*, *Mahonia repens*, *Populus tremuloides*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Phleum pratense*, *Poa pratensis*, *Taraxacum officinale*

GLOBAL: *Ursus arctos*

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3 (10-Dec-2000). Though only a rough estimate of stand numbers exists, it almost certainly is more than 100. However, this acknowledgment is tempered by the fact that the type has been and can be readily degraded, especially by livestock and fragmented by timber harvest. This degradation is a very real threat, not only to ecosystem diversity, but to function as well because of the type's importance to wildlife, especially *Ursus arctos* (grizzly bear).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This association is very similar to both *Populus tremuloides* / Tall Forbs Forest (CEGL000618) and *Populus balsamifera ssp. trichocarpa* - (*Populus tremuloides*) / *Heracleum maximum* Forest (CEGL000542). Although *Populus tremuloides* is often present in the latter association, which is dominated by *Populus balsamifera*, it has a lower constancy and cover than in *Populus tremuloides* / *Heracleum maximum* Forest (CEGL000595). It is distinguished by having <5% cover of *Populus balsamifera ssp. trichocarpa*. This association (CEGL000595) includes the *Populus tremuloides* / *Rubus parviflorus* / *Heracleum maximum* association of the preliminary classification for the IPP.

GLOBAL COMMENTS: We are now separating what were once very similar types by the predominant tree canopy. Stands dominated by *Populus tremuloides* with only an occasional *Populus balsamifera ssp. trichocarpa* belong here (CEGL000595), and stands dominated by the cottonwood mixed with aspen belong in *Populus balsamifera ssp. trichocarpa* - (*Populus tremuloides*) / *Heracleum maximum* Forest (CEGL000542). This forest (CEGL000595) is different from *Populus tremuloides* / Tall Forbs Forest (CEGL000618) (from the Intermountain Region), both geographically and compositionally.

GLOBAL SIMILAR ASSOCIATIONS:

- *Populus balsamifera ssp. trichocarpa* - (*Populus tremuloides*) / *Heracleum maximum* Forest (CEGL000542)
- *Populus balsamifera ssp. trichocarpa* - *Populus tremuloides* - Conifer / *Heracleum maximum* Forest (CEGL0005910)
- *Populus tremuloides* / Tall Forbs Forest (CEGL000618)

GLOBAL RELATED CONCEPTS:

- *Populus tremuloides* / *Osmorhiza occidentalis* Habitat Type (Hansen et al. 1995) =
- *Populus tremuloides*/*Osmorhiza occidentalis* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is known from numerous sites across the east side of the IPP. In Glacier National Park, it is known from the Summit Creek, Two Medicine, North Fork Cutbank, Saint Mary, Many Glacier, and Belly River drainages. In Waterton Lakes, this association is known from the Belly River and Waterton River drainages, as well as from several other sites.

GLOBAL RANGE: This association occurs in the northernmost U.S. portion of the East Front of the Rocky Mountains on sites ranging from 1550-1750 m (5080-5750 feet) and may extend into adjacent Canada.

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S3, SK?

USFS ECOREGIONS: M332B:CC, M332C:CC, M332E:CC, M333B:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.14, GLAC.170, GLAC.174, GLAC.193, GLAC.28, GLAC.31, GLAC.34, GLAC.44, GLAC.5, GLAC.9, GLAC.94, GLAC.151, GLAC.261, GLAC.72, WATE.4005, WATE.4009, WATE.4015, WATE.4017, WATE.4021, WATE.4067, WATE.5082, WATE.5097, WATE.5137, WATE.9019, WATE.4024, WATE.4031, WATE.5043.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper and G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Cooper 1981, Cooper and Heidel 1997, Driscoll et al. 1984, Hansen et al. 1991, Hansen et al. 1995, MTNHP 2002b, Western Ecology Working Group n.d.

Populus tremuloides / Invasive Perennial Grasses Forest QUAKING ASPEN / INVASIVE PERENNIAL GRASSES FOREST

IDENTIFIER: CEGL003748

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
Alliance	<i>Populus tremuloides</i> Forest Alliance (A.274)
Alliance (English name)	Quaking Aspen Forest Alliance
Association	<i>Populus tremuloides</i> / Invasive Perennial Grasses Forest
Association (English name)	Quaking Aspen / Invasive Perennial Grasses Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Aspen Forest and Woodland (CES306.813)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is a widespread grazing-induced type found across much of the western U.S. within the range of aspen, including the southern and central Rocky Mountains west into the Colorado Plateau and Great Basin into eastern California and throughout much of Idaho and Montana. Stands typically occur within the elevational range of 1830-2830 m (6000-9280 feet) on flat to moderate (1-27%) benches, alluvial terraces and lower slopes, swales, near springs and especially along stream channels and valley bottoms where livestock congregate. Stands typically have current or past heavy grazing. Aspects and substrates are variable. Soils are often relatively mesic and well-developed (Mollisols) but include sandy or silty loam derived from recent alluvium, granite or volcanics. The vegetation is characterized by a moderately dense (40-60% cover) tree canopy 5-15 m tall composed of *Populus tremuloides* but may include sparse and scattered conifers, such as *Pinus contorta*, *Picea engelmannii*, and *Abies lasiocarpa*. There is no distinct shrub stratum; however, scattered shrubs, such as *Dasiphora fruticosa* ssp. *floribunda*, *Juniperus communis* var. *montana*, *Mahonia repens*, *Ribes inerme*, *Rosa woodsii*, and *Symphoricarpos rotundifolius*, may be present. The diagnostic feature of the understory is the lush herbaceous layer that is strongly dominated by introduced perennial graminoids, usually *Poa pratensis* (20-30% cover or more), or other introduced forage species, such as *Agrostis stolonifera*, *Alopecurus* spp., *Bromus inermis*, *Dactylis glomerata*, and *Phleum pratense*. Other graminoid species may include *Bromus carinatus*, *Bromus ciliatus*, *Bromus porteri*, *Carex* spp., *Elymus trachycaulus*, and *Juncus balticus*. Forb cover is generally low but often diverse. Forb species with high frequency include *Achillea millefolium*, *Artemisia ludoviciana*, *Astragalus miser*, *Fragaria* spp., *Galium boreale*, *Geranium viscosissimum*, *Ligusticum porteri*, *Lupinus* sp., *Potentilla* spp., *Thalictrum fendleri*, *Thermopsis divaricarpa*, and *Trifolium longipes*. Introduced species, such as *Taraxacum officinale* and *Trifolium* spp., are common in this frequently grazing-disturbed type.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This community was sampled at 1460 m (4800 feet) elevation on the eastside of Glacier National Park on gentle terrain associated with old lacustrine sediments. It has been noted in reconnaissance on the gently rolling parkland on the Blackfeet Indian Reservation where grazing has historically been intensive.

GLOBAL ENVIRONMENT: This association is a widespread grazing-induced type found across much of the western U.S. within the range of aspen, including the southern and central Rocky Mountains west into the Colorado Plateau and Great Basin into eastern California and throughout much of Idaho and Montana. Stands typically occur within the elevational range of 1830-2830 m (6000-9280 feet) on flat to moderate (1-27%) benches, alluvial terraces and lower slopes, swales, near springs and especially along stream channels and valley bottoms where livestock congregate. Stands typically have current or past heavy livestock grazing. Aspects and substrates are variable. Soils are often relatively mesic and well-developed (Mollisols) but include sandy or silty loam derived from recent alluvium, granite or volcanics. Surface rock does not play a large role in the surface cover; however, litter and duff may comprise significant ground cover.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: *Populus tremuloides* is the sole canopy dominant, and the understory structure (including reconnaissance plots) gives no indication that it will be replaced by conifers. The undergrowth lacks diversity in structure and composition, with shrubs only scattered at most, and exotic grasses dominant, in this case *Elymus repens* and *Poa pratensis*. In reconnaissance we have noted *Phleum pratense*, *Bromus inermis*, *Dactylis glomerata*, and *Alopecurus pratensis* to be important components under some circumstances. *Taraxacum officinale* and, in the most moist positions, *Ranunculus uncinatus* are the most common forbs. Both are notable increasers with disturbance, attributable to domestic stock.

GLOBAL VEGETATION: This deciduous forest association is characterized by a moderately dense (40-60% cover) tree canopy 5-15 m tall composed of *Populus tremuloides* but may include sparse and scattered conifers, such as *Pinus contorta*, *Picea engelmannii*, and *Abies lasiocarpa*. There is no distinct shrub stratum; however, scattered shrubs, such as *Dasiphora fruticosa ssp. floribunda*, *Juniperus communis var. montana*, *Mahonia repens*, *Ribes inerme*, *Rosa woodsii*, and *Symphoricarpos rotundifolius*, may be present. The diagnostic feature of the understory is the lush herbaceous layer that is strongly dominated by introduced perennial graminoids, usually *Poa pratensis* (20-30% cover or more), or other introduced forage species, such as *Agrostis stolonifera*, *Alopecurus spp.*, *Bromus inermis*, *Dactylis glomerata*, and *Phleum pratense*. Other graminoid species may include *Bromus carinatus*, *Bromus ciliatus*, *Bromus porteri*, *Carex spp.*, *Elymus trachycaulus*, and *Juncus balticus*. Forb cover is generally low but often diverse. Forb species with high frequency include *Achillea millefolium*, *Artemisia ludoviciana*, *Astragalus miser*, *Fragaria spp.*, *Galium boreale*, *Geranium viscosissimum*, *Ligusticum porteri*, *Lupinus sp.*, *Potentilla spp.*, *Thalictrum fendleri*, *Thermopsis divaricarpa*, and *Trifolium longipes*. Introduced species, such as *Taraxacum officinale* and *Trifolium spp.*, are common in this frequently grazing-disturbed type (Mueggler 1988, Padgett et al. 1989, Hansen et al. 1995).

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Herb (field)	Graminoid	<i>Alopecurus pratensis</i> , <i>Bromus inermis</i> , <i>Dactylis glomerata</i> , <i>Phleum pratense</i> , <i>Poa pratensis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Herb (field)	Graminoid	<i>Agrostis stolonifera</i> , <i>Bromus inermis</i> , <i>Dactylis glomerata</i> , <i>Phleum pratense</i> , <i>Poa pratensis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Alopecurus pratensis*, *Bromus inermis*, *Dactylis glomerata*, *Phleum pratense*, *Poa pratensis*, *Populus tremuloides*

GLOBAL: *Agrostis stolonifera*, *Bromus inermis*, *Dactylis glomerata*, *Phleum pratense*, *Poa pratensis*, *Populus tremuloides*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: GNA (ruderal) (26-May-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: The concept of this semi-natural aspen forest association includes aspen stands with understories dominated by introduced herbaceous species, especially forage species that have escaped from cultivation, such as *Agrostis stolonifera*, *Alopecurus* spp., *Bromus inermis*, *Dactylis glomerata*, *Phleum pratense*, *Medicago sativa*, *Melilotus officinalis*, and *Trifolium* spp.

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

- *Populus tremuloides* / *Poa pratensis* Community Type (Hall and Hansen 1997) F
- *Populus tremuloides* / *Poa pratensis* Community Type (Girard et al. 1997) F
- *Populus tremuloides* / *Poa pratensis* Community Type (Hansen et al. 1995) F
- *Populus tremuloides* / *Poa pratensis* Community Type (Padgett et al. 1989) F
- *Populus tremuloides* / *Poa pratensis* Community Type (Mueggler 1988) F
- *Populus tremuloides* / *Poa pratensis* Community Type (Mueggler and Campbell 1982) F
- *Populus tremuloides* / *Poa pratensis* Community Type (Mueggler and Campbell 1986) F
- *Populus tremuloides* / *Poa pratensis* Community Type (Manning and Padgett 1995) F

OTHER COMMENTS

OTHER COMMENTS: Within the IPP this type results from both legal pasturing of domestic stock (particularly prevalent around park facilities (reconnaissance information) where domestic stock has long been and continues to be pastured) and trespass of domestic stock (noted in and adjacent to the buffer area as a result of cattle trespass from reservation lands). It should be noted that several of the above-noted pasture grasses, most particularly *Phleum pratense*, have been seeded on disked prairie (both U.S. and Canada) adjacent to *Populus tremuloides*-dominated vegetation; the intent of this practice is to increase forage production, but it certainly provides a ready seed source of alien species to the aspen parklands.

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This community is found on the eastside of Glacier National Park and has been noted in reconnaissance on the gently rolling parkland on the Blackfoot Indian Reservation where grazing has historically been intensive.

GLOBAL RANGE: This association is a widespread grazing-induced type found across much of the western U.S. within the range of aspen, including the southern and central Rocky Mountains west into the Colorado Plateau and Great Basin into eastern California and throughout southern and eastern Idaho and much of Montana.

NATIONS: US

STATES/PROVINCES: CA, CO, ID, MT, NV, UT, WY

USFS ECOREGIONS: 313A:CC, 313B:CC, 341G:CC, M261E:CC, M331E:CC, M331G:CC, M331I:CC, M341A:CC

FEDERAL LANDS: BIA (Blackfoot); NPS (Curecanti, Glacier, Rocky Mountain, Yosemite); USFS (Arapaho-Roosevelt, Ashley, Caribou-Targhee, Dixie, Fishlake, Humboldt-Toiyabe, Manti-La Sal, Uinta, Wasatch-Cache)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: Accuracy Assessment plots: AAGL.1834, AAWA.24.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Girard et al. 1997, Hall and Hansen 1997, Hansen et al. 1995, Manning and Padgett 1995, Mueggler 1988, Mueggler and Campbell 1982, Mueggler and Campbell 1986, NVNHP 2003, Padgett et al. 1989, Western Ecology Working Group n.d., Wexelman et al. 1999

***Populus tremuloides* / *Rubus parviflorus* Forest**
QUAKING ASPEN / THIMBLEBERRY FOREST

IDENTIFIER: C EGL000602

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
Alliance	<i>Populus tremuloides</i> Forest Alliance (A.274)
Alliance (English name)	Quaking Aspen Forest Alliance
Association	<i>Populus tremuloides</i> / <i>Rubus parviflorus</i> Forest
Association (English name)	Quaking Aspen / Thimbleberry Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Aspen Forest and Woodland (CES306.813)

ELEMENT CONCEPT

GLOBAL SUMMARY: This rare but widespread forest occurs on slopes at high elevations in the mountains of western Wyoming, southeastern Idaho, northeastern Utah, and northwestern Montana. Stands of this type have been documented from 2440 to 2835 m (8000-9300 feet) elevation, on the upper and middle portions of fairly steep slopes with a variety of aspects and parent materials. *Populus tremuloides* forms the tree overstory, and *Rubus parviflorus* strongly dominates the shrub layer. The herbaceous layer consists primarily of low-growing forbs.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This forest type is found on gently rolling lacustrine deposits in the vicinity of Lake Sherberne at 1463 m (4800 feet) elevation.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: *Populus tremuloides* is the only tree present in both the canopy and understory; this observation, combined with a relatively robust shrub layer solidly dominated by *Rubus parviflorus*, predicts this type's long-term occupation of these sites. Other important shrubs include *Prunus virginiana*, *Symphoricarpos albus*, *Rosa woodsii*, and *Amelanchier alnifolia*. Though none of the following herbs exhibit more than 5% cover, their presence indicates a comparatively mesophytic site: *Calamagrostis canadensis*, *Aralia nudicaulis*, *Viola canadensis*, and *Elymus glaucus*.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Prunus virginiana</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus parviflorus</i> , <i>Symphoricarpos albus</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Populus tremuloides*, *Prunus virginiana*, *Rubus parviflorus*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2 (30-Nov-1998). This association is known to occur from northeastern Utah north to west-central Wyoming and northwestern Montana and west to southeastern Utah. While it occurs over a fairly large geographic range, a comprehensive survey of aspen types in that range (Mueggler 1988) documented only four stands. Stands of this type have been documented only from a high-elevation range (2440-2835 m [8000-9300 feet]) on fairly steep slopes, but they occupy a variety of aspects and parent materials. The rank is being changed from G2? to G2 to reflect more confidence in the information on rarity within a limited geographic range.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This type is distinguished from the very similar *Populus balsamifera* ssp. *trichocarpa* - *Populus tremuloides* - Conifer / *Heracleum maximum* Forest (CEGL005910) by lacking sufficient cover of mesic to sub-hydric herbs that would be indicative of a yet more mesic environment, though in fact many plots of the more mesic type are dominated by a robust short- to tall-shrub layer with *Rubus parviflorus* frequently the having the greatest cover.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Populus balsamifera* ssp. *trichocarpa* - (*Populus tremuloides*) / *Heracleum maximum* Forest (CEGL000542)
- *Populus balsamifera* ssp. *trichocarpa* - *Populus tremuloides* - Conifer / *Heracleum maximum* Forest (CEGL005910)--indicated by presence of mesic to sub-hydric herbs that would be indicative of a yet more mesic environment.
- *Populus tremuloides* / *Ceanothus velutinus* Forest (CEGL000581)

GLOBAL RELATED CONCEPTS:

- *Populus tremuloides*/*Rubus parviflorus* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This community has been documented from only the east of the Continental Divide in Glacier National Park; it has been noted in reconnaissance on the Blackfoot Indian Reservation immediately east of Glacier National Park.

GLOBAL RANGE: This association is known to occur from northeastern Utah north to west-central Wyoming and west to southeastern Idaho and extends at least to northern Montana.

NATIONS: US

STATES/PROVINCES: ID:S2?, MT, UT:S2?, WY:S2

USFS ECOREGIONS: M331D:CC, M331J:CC

FEDERAL LANDS: BIA (Blackfoot); NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.D689.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: G.P. Jones

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Mueggler 1988, Western Ecology Working Group n.d.

Populus tremuloides / *Spiraea betulifolia* Forest QUAKING ASPEN / SHINYLEAF MEADOWSWEET FOREST

IDENTIFIER: CEGL000607

NVC Classification

Physiognomic Class Forest (I)

Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
Alliance	<i>Populus tremuloides</i> Forest Alliance (A.274)
Alliance (English name)	Quaking Aspen Forest Alliance
Association	<i>Populus tremuloides</i> / <i>Spiraea betulifolia</i> Forest
Association (English name)	Quaking Aspen / Shinyleaf Meadowsweet Forest
ECOLOGICAL SYSTEM(S):	Rocky Mountain Aspen Forest and Woodland (CES306.813)

ELEMENT CONCEPT

GLOBAL SUMMARY: This aspen forest type is found on gently sloping or rolling topography, at higher elevations in the Central Core, Limestone Plateau, Minnekahta Foothills and Bear Lodge Mountains of the Black Hills in the United States. It has also been found in western Montana in Glacier National Park. In the Black Hills, aspen stands are best developed and extend to lower elevations (1586-1740 m) in the northern part of the range, including the Bear Lodge Mountains. In northwestern Montana, this type was found at 1537 m (5040 feet) on a moderately steep, south-facing talus slope composed of limestone and dolomite rocks. This type can have a moderately closed to closed canopy. *Populus tremuloides* is the dominant tree. *Picea glauca*, *Pinus contorta*, or *Pinus ponderosa* may occur in this community as emergent trees. Understory composition was found to be quite variable in stands surveyed. Shrub cover typically is heavy and diverse, with *Spiraea betulifolia* and *Mahonia repens* often codominant. Other shrubs frequently present include *Amelanchier alnifolia*, *Arctostaphylos uva-ursi*, *Prunus virginiana*, *Rosa woodsii*, *Shepherdia canadensis*, and *Symphoricarpos albus*. The herbaceous stratum also is diverse, and forb cover often is greater than graminoid cover. *Symphotrichum laeve* (= *Aster laevis*), *Lathyrus ochroleucus*, and *Monarda fistulosa* are among the more abundant species. The one stand sampled in Glacier National Park had no herbaceous species present.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is known from 1537 m (5040 feet) elevation on a moderately steep, south-facing talus slope. The stand occurred on the back of a knob located on the side of a glacial trough. The soil was well-drained, poorly developed loam found between limestone and dolomite talus.

GLOBAL ENVIRONMENT: This community has been found on flat to moderately sloping topography (Severson and Thilenius 1976, Hoffman and Alexander 1987, BHCI 1999) in the Black Hills, and on moderately steep south-facing talus in northwestern Montana. Documented sites range in elevation from 1530 to 1740 m (5020-5700 feet). This community is most extensive in the wetter, cooler northern Black Hills, including the Bear Lodge Mountains. It has been found in areas underlain by a variety of bedrock, including Tertiary intrusive rocks, limestone and sandstone (Marriott and Faber-Langendoen 2000). In Montana it was found on limestone and dolomite talus slopes, with a well-drained, poorly developed loam soil.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: In the one stand sampled, *Populus tremuloides* clearly dominated with 60% cover in the tree/subcanopy. Taller *Pinus contorta* were also present, but with only 2% cover. The trees were unusually short in this stand (only 5% were taller than 2 m); this was most likely due to frequent high winds, although the limestone-derived soils could also impact *Populus tremuloides*. *Spiraea betulifolia*, with 20% cover, was the most dominant shrub. Other short shrubs, such as *Prunus* species and *Symphoricarpos albus* (with 3 to 5% cover), were intermixed. *Arctostaphylos uva-ursi* formed a sparse ground layer. No herbaceous species were present in the stand sampled. The ground cover was primarily large rocks (63%), with litter and bare soil each covering approximately 15% of the remaining ground. Moss cover was minimal.

GLOBAL VEGETATION: The vegetation can have a moderately closed to closed canopy (Severson and Thilenius 1976, Hoffman and Alexander 1987, BHCI 1999). *Populus tremuloides* is the dominant tree. *Picea glauca*, *Pinus contorta*, or *Pinus ponderosa* may occur in this community as emergent trees. Understory composition was found to be quite variable in stands surveyed. Shrub cover typically is heavy and diverse, with *Spiraea betulifolia* and *Mahonia repens* often codominant. Other shrubs frequently present include *Amelanchier alnifolia*, *Arctostaphylos uva-ursi*, *Prunus virginiana*, *Rosa woodsii*, *Shepherdia canadensis*, and *Symphoricarpos albus*. The herbaceous stratum also is diverse, and forb cover often is greater than graminoid cover. *Symphotrichum laeve* (= *Aster laevis*), *Lathyrus ochroleucus*, and *Monarda fistulosa* are among the more abundant species (Marriott and Faber-Langendoen 2000).

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>

Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i> , <i>Symphoricarpos albus</i>
Herb (field)	Dwarf-shrub	<i>Arctostaphylos uva-ursi</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i> , <i>Symphoricarpos albus</i>
Herb (field)	Dwarf-shrub	<i>Arctostaphylos uva-ursi</i>
Herb (field)	Forb	<i>Symphyotrichum laeve</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Populus tremuloides*, *Spiraea betulifolia*

GLOBAL: *Amelanchier alnifolia*, *Populus tremuloides*, *Spiraea betulifolia*, *Symphoricarpos albus*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4Q (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This type should be compared with *Populus tremuloides* / *Spiraea betulifolia* - *Calamagrostis rubescens* community type of Mueggler and Campbell (1982) and the *Populus tremuloides* / *Spiraea betulifolia* type of Youngblood and Mueggler (1981). This community is equivalent to the *Populus tremuloides* / *Spiraea lucida* / *Lathyrus ochroleucus* association of Severson and Thilenius (1976). No equivalent habitat type was described by Hoffman and Alexander (1987). Mueggler (1988) included all three of these aspen community types in his *Populus tremuloides* / *Amelanchier alnifolia* - *Symphoricarpos albus* / *Calamagrostis rubescens* community type, which has been adopted into the NVC as *Populus tremuloides* / *Amelanchier alnifolia* - *Symphoricarpos oreophilus* / *Calamagrostis rubescens* Forest (CEGL000567). It could be that *Populus tremuloides* / *Spiraea betulifolia* Forest (CEGL000607) should be merged, following Mueggler's (1988) treatment, into this broader NVC association.

Classification of aspen communities in the Black Hills remains incomplete and problematic. Aspen stands in the area are highly variable in composition (Severson and Thilenius 1976, Marriott et al. 1999), consistent with the concept of aspen as an early successional dominant species. *Populus tremuloides* / *Pteridium aquilinum* Forest (CEGL000597) and *Populus tremuloides* / *Corylus cornuta* Forest (CEGL000583) are relatively consistent and distinctive. This type is more variable and is not clearly circumscribed. Severson and Thilenius (1976) recognized nine aspen associations, some based on data from single stands. For the Black Hills Community Inventory, at least four of these associations were included in this type, the *Populus tremuloides* / *Spiraea betulifolia* Forest (Marriott et al. 1999, Marriott and Faber-Langendoen 2000).

There remain aspen stands in the Black Hills that do not fit into any of these associations. For example, at higher elevations on the Limestone Plateau, aspen stands are common between Black Hills Montane Grasslands in broad drainage bottoms and conifer stands on slopes above. Little survey of these stands has been done, and they remain unclassified to association. Aspen also can contribute significant cover in stands of white spruce (*Picea glauca*) and ponderosa pine (*Pinus ponderosa*), representing successional stages from aspen to spruce and pine forest types. In the Black Hills Community Inventory, such stands were treated as inclusions in the surrounding coniferous forest type (Marriott and Faber-Langendoen 2000).

GLOBAL SIMILAR ASSOCIATIONS:

- *Populus tremuloides* / *Amelanchier alnifolia* - *Symphoricarpos oreophilus* / *Calamagrostis rubescens* Forest (CEGL000567)
- *Populus tremuloides* / *Amelanchier alnifolia* Forest (CEGL000564)
- *Populus tremuloides* / *Symphoricarpos albus* Forest (CEGL000609)

GLOBAL RELATED CONCEPTS:

- *Populus tremuloides* / *Amelanchier alnifolia* - *Symphoricarpos albus* / *Calamagrostis rubescens* Community Type (Mueggler 1988) B
- *Populus tremuloides* / *Spiraea betulifolia* - *Calamagrostis rubescens* Community Type (Mueggler and Campbell 1982) =

- *Populus tremuloides* / *Spiraea betulifolia* Community Type (Youngblood and Mueggler 1981) ?
- *Populus tremuloides* / *Spiraea betulifolia* Forest (Marriott et al. 1999) =
- *Populus tremuloides* / *Spiraea lucida* / *Lathyrus ochroleucus* association (Severson and Thilenius 1976) =
- *Populus tremuloides* / *Spiraea betulifolia* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is found in the Many Glacier drainage on the east side of Glacier National Park.

GLOBAL RANGE: This aspen forest type is found on gently sloping or rolling topography, at higher elevations in the Black Hills of the United States. It was also found in northwestern Montana in Glacier National Park, on the east side of the Continental Divide.

NATIONS: US

STATES/PROVINCES: MT, SD, WY:S3S4

USFS ECOREGIONS: M331B:CC, M332C:CC, M334A:CC

FEDERAL LANDS: NPS (Glacier); USFS (Black Hills, Caribou-Targhee)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES: Further sampling will provide data necessary for better characterizing the vegetation and environmental conditions of this association.

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.55.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: D. Faber-Langendoen, mod. G. Kittel

REFERENCES: BHCI unpubl. data 1999, Bourgeron and Engelking 1994, Driscoll et al. 1984, Hoffman and Alexander 1987, MTNHP unpubl. data, Marriott and Faber-Langendoen 2000, Marriott et al. 1999, Mueggler 1988, Mueggler and Campbell 1982, Severson and Thilenius 1976, Western Ecology Working Group n.d., Youngblood and Mueggler 1981

Populus tremuloides / *Symphoricarpos albus* Forest QUAKING ASPEN / COMMON SNOWBERRY FOREST

IDENTIFIER: CEG000609

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
Alliance	<i>Populus tremuloides</i> Forest Alliance (A.274)
Alliance (English name)	Quaking Aspen Forest Alliance
Association	<i>Populus tremuloides</i> / <i>Symphoricarpos albus</i> Forest
Association (English name)	Quaking Aspen / Common Snowberry Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Aspen Forest and Woodland (CES306.813)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is a minor type described from only a few plots in Montana, Wyoming, and north-central Washington. It occurs adjacent to very wet sites, irrigation ditches, marshes or wet meadows. It occurs from 1155 to 1973 m (3790-6473 feet) in elevation. It occurs on basin floors to slopes up to 48%. Soils are fine-textured. This is a wet, low-lying aspen forest, distinguished by an abundant layer of *Symphoricarpos albus*. The overstory canopy is dominated by *Populus tremuloides*. Conifers when present are low in abundance and include *Pinus contorta* or *Larix occidentalis*, *Pinus ponderosa*, or *Pseudotsuga menziesii*. Tall shrubs may be present but do not form a distinct layer, with *Amelanchier alnifolia* and sapling *Populus tremuloides*. The short-shrub layer is distinct, with *Symphoricarpos albus* the dominant. Other low-stature shrubs include *Rosa woodsii* and *Mahonia repens*. The herbaceous layer is diverse with many grasses and forbs. Graminoids include *Achnatherum nelsonii*, *Elymus trachycaulus*, *Phleum pratense*, and *Poa pratensis*. Forbs include *Actaea rubra*, *Helianthella uniflora*, *Lupinus sericeus*, and *Symphotrichum spathulatum*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Both stands of this association occur west of the Continental Divide on lower-slope or bottomland positions with colluvium and alluvium as parent material. Elevations range from 1080 to 1770 m (3550-5800 feet).

GLOBAL ENVIRONMENT: This is a minor type described from only a few plots in Montana, Wyoming, and north-central Washington. It occurs adjacent to very wet sites, irrigation ditches, marshes or wet meadows. It occurs from 1155 to 1973 m (3790-6473 feet) in elevation. It occurs on basin floors to slopes up to 48%. Soils are fine-textured.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Both stands, based on canopy height, stem diameter and open canopy structure (30-40% canopy cover) of the dominant *Populus tremuloides*, appear to be early- to mid-seral; *Picea engelmannii* and *Pseudotsuga* are present in the reproductive layer. The shrub component is decidedly dominated (30-40% cover) by *Symphoricarpos albus*, but a number of species are present, including *Acer glabrum*, *Alnus viridis*, *Sorbus scopulina*, *Rubus parviflorus*, *Ribes lacustre*, and *Prunus virginiana*, that, should their coverage increase under ameliorating conditions, these stands would cease to be classed as this type. Several forbs present, including *Clintonia uniflora*, *Equisetum arvense*, *Elymus glaucus*, *Elymus trachycaulus*, *Veratrum viride*, and *Xerophyllum tenax*, connote a seral condition transitional to more mesic community types.

GLOBAL VEGETATION: This is a wet, low-lying aspen forest, distinguished by an abundant layer of *Symphoricarpos albus*. The overstory canopy is dominated by *Populus tremuloides*. Conifers when present are low in abundance and include *Pinus contorta* or *Larix occidentalis*, *Pinus ponderosa*, or *Pseudotsuga menziesii*. Tall shrubs may be present but do not form a distinct layer, with *Amelanchier alnifolia* and sapling *Populus tremuloides*. The short-shrub layer is distinct, with *Symphoricarpos albus* the dominant. Other low-stature shrubs include *Rosa woodsii* and *Mahonia repens*. The herbaceous layer is diverse with many grasses and forbs. Graminoids include *Achnatherum nelsonii*, *Elymus trachycaulus*, *Phleum pratense*, and *Poa pratensis*. Forbs include *Actaea rubra*, *Helianthella uniflora*, *Lupinus sericeus*, and *Symphyotrichum spathulatum*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Symphoricarpos albus</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Symphoricarpos albus</i>
Herb (field)	Dwarf-shrub	<i>Mahonia repens</i> , <i>Rosa woodsii</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Populus tremuloides*, *Symphoricarpos albus*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3? (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: The undergrowth hints at being considerably more mesic than would be indicated by the dominance of *Symphoricarpos albus*; with a 5 to 10% increase in cover of any of the above-named species (see IPP Vegetation section), which is not unlikely given the open tree canopy, these stands would transition to *Populus tremuloides*-dominated stands of more mesic community types (e.g., *Populus tremuloides* / *Rubus parviflorus* Forest (CEGL000602), *Populus tremuloides* / *Heracleum maximum* Forest (CEGL000595)).

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Populus tremuloides* / *Spiraea betulifolia* Forest (CEGL000607)
- *Populus tremuloides* / *Symphoricarpos occidentalis* Forest [Provisional] (CEGL005848)
- *Populus tremuloides* / *Urtica dioica* Forest [Provisional] (CEGL005849)

GLOBAL RELATED CONCEPTS:

- *Populus tremuloides* / *Symphoricarpos albus* Temporarily Flooded Forest (POPTRE/SYMALB) (Crawford 2003) =
- *Populus tremuloides* / *Symphoricarpos albus* Plant Association (Williams and Lillybridge 1983) =
- *Populus tremuloides*/ *Symphoricarpos albus* (Bourgeron and Engelking 1994) =
- *Populus tremuloides*/ *Symphoricarpos albus* Association (Crowe et al. 2004) =
- DRISCOLL FORMATION CODE:I.B.3.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This has only been verified only from west of the Continental Divide but is fully expected to occur on the eastside as well.

GLOBAL RANGE: The association is known from western Montana, western Wyoming, and north-central Washington.

NATIONS: US

STATES/PROVINCES: MT:S3?, OR:S3, WA:S2?, WY

USFS ECOREGIONS: M242C:CC, M331D:CC, M333A:CC, M333B:C?, M333C:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton, Rockefeller)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.B167, GLAC.D64.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Cooper and Pfister 1981, Crawford 2001, Crawford 2003, Crowe and Clausnitzer 1997, Crowe et al. 2004, Driscoll et al. 1984, Kagan et al. 2004, Kovalchik 1987, Kovalchik 2001, MTNHP 2002b, Titus et al. 1998, WNHP unpubl. data, Weixelman et al. 1996, Western Ecology Working Group n.d., Williams and Lillybridge 1983

***Populus tremuloides* / *Symphoricarpos occidentalis* Forest [Provisional]
QUAKING ASPEN / WESTERN SNOWBERRY FOREST**

IDENTIFIER: CEGL005848

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
Alliance	<i>Populus tremuloides</i> Forest Alliance (A.274)
Alliance (English name)	Quaking Aspen Forest Alliance
Association	<i>Populus tremuloides</i> / <i>Symphoricarpos occidentalis</i> Forest [Provisional]
Association (English name)	Quaking Aspen / Western Snowberry Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Aspen Forest and Woodland (CES306.813)

ELEMENT CONCEPT

GLOBAL SUMMARY: This forest association is reported from Waterton Lakes National Park in Alberta, Canada. It occupies upland terraced slopes with a gentle to moderate grade. The association is most common at midslope or lower. Aspects vary from southeasterly to easterly. The association was documented at elevations ranging from 1320-1360 m (4330-4461 feet), though it may occasionally be present above or below this narrow band. Parent material is glacio-fluvial, and soils are well-developed. The soil is

typically well-drained to moderately well-drained with a silty clay loam texture. Ground cover is primarily litter, but wood and small rock may account for 5-10%. *Populus tremuloides* forms a uniform layer of trees 5-10 m tall in the upper canopy, with average canopy cover of 60%. *Amelanchier alnifolia* is the only tall shrub present, but is not abundant. Short-shrub cover ranges from 40-60% and is dominated by *Symphoricarpos occidentalis*. Average canopy cover for this species is 33%. *Spiraea betulifolia* and *Prunus virginiana* are usually well-represented. Cover of herbaceous species is quite variable, ranging from 30-80%, and species diversity is relatively low. *Prosartes trachycarpa* (= *Disporum trachycarpum*), *Thalictrum occidentale*, and *Eurybia conspicua* (= *Aster conspicuus*) had 100% constancy in sampled plots, with cover for each species between 8% and 13%. Other herbaceous species that may be present in this association include *Chamerion angustifolium*, *Actaea rubra*, and *Galium boreale*. This type frequently grades to *Populus tremuloides* / *Calamagrostis canadensis* Forest (CEGL000574) on moister (downslope) positions.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This forest association occupies upland terraced slopes with a gentle to moderate grade. The association is most common at midslope or lower. Aspects vary from southeasterly to easterly. The association was documented at elevations ranging from 1320-1360 m (4330-4461 feet), though it may occasionally be present above or below this narrow band. Parent material is glacio-fluvial, and soils are well-developed. The soil is typically well-drained to moderately well-drained with a silty clay loam texture. Ground cover is primarily litter, but wood and small rock may account for 5-10%.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: *Populus tremuloides* forms a uniform layer of trees 5-10 m tall in the upper canopy. Average canopy cover for this layer is approximately 60%. A sparse subcanopy of *Populus tremuloides* may also be present with less than 5% cover. Tall-shrub (2-5 m) cover is also sparse (less than 10%), with *Amelanchier alnifolia* dominating a layer 2-5 m high. Short-shrub (0.5-1 m) cover ranges from 40-60% and is dominated by *Symphoricarpos occidentalis*. Average canopy cover for this species is 33%. *Spiraea betulifolia* and *Prunus virginiana* are usually well-represented. Dwarf-shrubs are absent or uncommon in this association. *Mahonia repens* was documented in only one plot, with a canopy cover of 10%. Cover of herbaceous species is quite variable, ranging from 30-80%, and species diversity is relatively low. *Prosartes trachycarpa* (= *Disporum trachycarpum*), *Thalictrum occidentale*, and *Eurybia conspicua* (= *Aster conspicuus*) had 100% constancy in sampled plots, with cover for each species between 8% and 13%. Other herbaceous species that may be present in this association include *Chamerion angustifolium*, *Actaea rubra*, and *Galium boreale*. This type frequently grades to *Populus tremuloides* / *Calamagrostis canadensis* Forest (CEGL000574) on moister (downslope) positions.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Symphoricarpos occidentalis</i>
Herb (field)	Forb	<i>Prosartes trachycarpa</i> , <i>Thalictrum occidentale</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Eurybia conspicua*, *Populus tremuloides*, *Symphoricarpos occidentalis*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: GNR (21-Apr-2004).

CLASSIFICATION

STATUS: Provisional

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: *Symphoricarpos albus* and *Symphoricarpos occidentalis* are very similar ecologically and can be difficult to distinguish in the field. This provisional association could prove to be similar enough with *Populus tremuloides* / *Symphoricarpos albus* Forest (CEGL000609) that the two types should be combined into one association.

GLOBAL SIMILAR ASSOCIATIONS:

- *Populus tremuloides* / *Symphoricarpos albus* Forest (CEGL000609)
- *Populus tremuloides* / *Urtica dioica* Forest [Provisional] (CEGL005849)

GLOBAL RELATED CONCEPTS:

- *Populus tremuloides* / *Symphoricarpos occidentalis* Vegetation Type (Achuff et al. 2002a) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association occurs on upland slopes above broad valleys in Waterton Lakes National Park.

GLOBAL RANGE: Reported from the Front Range of Alberta, Canada, in Waterton Lakes National Park.

NATIONS: CA

STATES/PROVINCES: AB

USFS ECOREGIONS:

FEDERAL LANDS: PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.5014, WATE.5016.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: M.S. Reid

REFERENCES: Achuff et al. 2002a, Western Ecology Working Group n.d.

Populus tremuloides / *Urtica dioica* Forest [Provisional] QUAKING ASPEN / STINGING NETTLE FOREST

IDENTIFIER: CEGL005849

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
Alliance	<i>Populus tremuloides</i> Forest Alliance (A.274)
Alliance (English name)	Quaking Aspen Forest Alliance
Association	<i>Populus tremuloides</i> / <i>Urtica dioica</i> Forest [Provisional]
Association (English name)	Quaking Aspen / Stinging Nettle Forest
ECOLOGICAL SYSTEM(S):	Rocky Mountain Aspen Forest and Woodland (CES306.813)

ELEMENT CONCEPT

GLOBAL SUMMARY: This forest association is reported from Waterton Lakes National Park in southern Alberta, Canada. Reconnaissance information suggests this type also occurs on fine-textured eolian material at the edge of Glacier National Park and onto the Blackfoot Indian Reservation in Montana. It is present on flat, low-level, fluvial and glacio-fluvial landforms, near 1300 m

(4260 feet) in elevation. Soils are well-drained Orthic Black Chernozems that are moderately well-developed, moderately acidic to moderately alkaline soils developed on coarse-textured glacio-fluvial material over Mesozoic soft rock. Soils as exemplified by the Glacier National Park data indicate a very low moisture-storage capacity, but this is manifestly not the case for the deep eolian soils found under this type on reservation lands. Litter and small rock dominate the ground surface. This association is a mesic, cold-deciduous, low-elevation, low-diversity forest. Overall tree cover is 65%, dominated exclusively by *Populus tremuloides* with heights of 5-10 m. Shrub cover is moderately low, averaging 15%, and is generally dominated by *Symphoricarpos albus* and *Rosa woodsii*. Herbaceous cover is very high at 100%. *Urtica dioica*, a species known to increase with grazing disturbance, dominates the herbaceous layer with 70% cover; other increasers (both native and introduced) having 5-10 % cover include *Cirsium arvense*, *Bromus inermis*, *Hackelia micrantha*, and *Thalictrum occidentale*. Native species that are present with low cover include *Geranium viscosissimum*, *Calochortus apiculatus*, *Galium boreale*, *Maianthemum stellatum*, *Monarda fistulosa*, *Osmorhiza occidentalis*, *Senecio hydrophiloides*, and *Vicia americana*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is present on flat, low-level areas near 1300 m (4260 feet) in elevation. Soils are well-drained Orthic Black Chernozems that are moderately well-developed, moderately acidic to moderately alkaline soils developed on coarse-textured glacio-fluvial material over Mesozoic soft rock. Reconnaissance information suggests this type also occurs on fine-textured eolian material at the edge of Glacier National Park and onto the Blackfoot Indian Reservation. Soils as exemplified by the Glacier National Park data indicate a very low moisture-storage capacity, but this is manifestly not the case for the deep eolian soils found on this type on reservation lands. Litter and small rock dominate the ground surface.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This association is a mesic, cold-deciduous, low-elevation, low-diversity forest. Overall tree cover is 65%, dominated exclusively by *Populus tremuloides* with heights of 5-10 m. Shrub cover is moderately low, averaging 15%, and is generally dominated by *Symphoricarpos albus* and *Rosa woodsii*. Herbaceous cover is high at 100% with heights less than 0.5 m. *Urtica dioica*, a species known to increase with grazing disturbance, dominates the herbaceous layer with 70% cover; other increasers (both native and introduced) having 5-10 % cover include *Cirsium arvense*, *Bromus inermis*, *Hackelia micrantha*, and *Thalictrum occidentale*. Native species that are present with low cover include *Geranium viscosissimum*, *Calochortus apiculatus*, *Galium boreale*, *Maianthemum stellatum*, *Monarda fistulosa*, *Osmorhiza occidentalis*, *Senecio hydrophiloides*, and *Vicia americana*.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Symphoricarpos albus</i>
Herb (field)	Forb	<i>Cirsium arvense</i> , <i>Hackelia micrantha</i> , <i>Thalictrum occidentale</i> , <i>Urtica dioica</i>
Herb (field)	Graminoid	<i>Bromus inermis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Osmorhiza occidentalis*, *Senecio hydrophiloides*, *Symphoricarpos albus*, *Urtica dioica*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Calochortus apiculatus*, *Cynoglossum officinale*, *Taraxacum officinale*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2G3 (3-Mar-2004).

CLASSIFICATION

STATUS: Provisional

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Populus tremuloides* / *Symphoricarpos albus* Forest (CEGL000609)
- *Populus tremuloides* / *Symphoricarpos occidentalis* Forest [Provisional] (CEGL005848)

GLOBAL RELATED CONCEPTS:

- *Populus tremuloides* / *Urtica dioica* Vegetation Type (Achuff et al. 2002a) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon in Waterton Lakes National Park on disturbed, heavily grazed, low-level areas. It is specifically located in the Bison Paddock 1 ecosite within the Waterton River watershed. It has been identified in field reconnaissance on the western margin of the Blackfoot Indian Reservation.

GLOBAL RANGE:

NATIONS: CA, US

STATES/PROVINCES: AB, MT

USFS ECOREGIONS: M332C:CC

FEDERAL LANDS: BIA (Blackfeet); NPS (Glacier?); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.4008.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: M.S. Reid

REFERENCES: Achuff et al. 2002a, Western Ecology Working Group n.d.

I.B.2.N.d. Temporarily flooded cold-deciduous forest

***Populus balsamifera* ssp. *trichocarpa* Temporarily Flooded Forest Alliance**

***Populus balsamifera* ssp. *trichocarpa* - (*Populus tremuloides*) / *Heracleum maximum* Forest
BLACK COTTONWOOD - (QUAKING ASPEN) / COW-PARSNIP FOREST**

IDENTIFIER: CEGL000542

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
Alliance	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> Temporarily Flooded Forest Alliance (A.311)
Alliance (English name)	Black Cottonwood Temporarily Flooded Forest Alliance
Association	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - (<i>Populus tremuloides</i>) / <i>Heracleum maximum</i> Forest
Association (English name)	Black Cottonwood - (Quaking Aspen) / Cow-parsnip Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland (CES306.804)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association has been described from the foothills of the eastern slope of the Rocky Mountains in northwestern Montana. It is found on the bottoms of narrow mountain valleys, intra- and inter-morainal depressions, areas possibly underlain by clay lenses, and fringing kettle lakes, from 1372-1678 m (4500-5500 feet) elevation. These sites have gentle slopes and occur on all aspects. Sites on southerly aspects are typically moist mountain slopes where soil moisture is probably augmented by subsurface flow. Soils are derived from alluvium (some deposited by slopewash), colluvium, or aeolian materials derived from sedimentary rock types and layered over morainal drift. Soils are seasonally saturated and have relatively high organic matter. This forest association is dominated by the broad-leaved deciduous tree *Populus balsamifera ssp. trichocarpa* (= *Populus trichocarpa*), with *Populus tremuloides* usually present. Where both species are present, *Populus balsamifera ssp. trichocarpa* has at least 1-5% cover, and is the indicator species for this association. Occasional individuals of *Picea engelmannii* and *Pseudotsuga menziesii* occur, but seedlings of these species are rare. The understory is characterized by a low-shrub layer composed of patches of *Symphoricarpos albus*. *Amelanchier alnifolia* and *Mahonia repens* (= *Berberis repens*) occur in most stands, but are typically not abundant. The herbaceous layer is diverse, well-developed and composed of species indicative of mesic conditions. Important perennial forbs include *Osmorhiza occidentalis*, *Heracleum maximum* (= *Heracleum lanatum*), *Actaea rubra*, *Galium triflorum*, *Viola canadensis*, and *Angelica arguta*. Other forbs of high constancy are *Thalictrum occidentale*, *Fragaria virginiana*, *Maianthemum stellatum* (= *Smilacina stellata*), *Geranium viscosissimum*, *Geranium richardsonii*, and *Packera pseud aurea* (= *Senecio pseud aureus*). On sites that are transitional to those with permanently saturated soils, *Equisetum arvense*, *Streptopus amplexifolius*, and *Calamagrostis canadensis* become more important.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is known from 1280 to 1700 m (4197-5574 feet) elevation on gentle to moderately steep slopes in a variety of riparian and wetland settings. For example, stands occur in a draw, on a low-level lakeplain, as well as on toeslopes, midslope fluvial fans, and an avalanche fan. The association is found on colluvial, glacio-fluvial, lacustrine, and fluvial deposits with well-drained sandy loam or clay loam soil with few rocks. Sites usually are temporarily flooded. Small streams, shallow channels, and dry streambeds run through some stands.

GLOBAL ENVIRONMENT: This association is found in the eastern foothills of a mountainous region, from about 1280 to 1680 m (4190-5500 feet) elevation, intergrading with montane coniferous forests. Much of the region was glaciated during the Pleistocene by both Cordilleran ice sheets and mountain glaciers. Deposits of morainal material and glacial till occur throughout the region. The climate is strongly influenced by the Continental Divide to the west (the ridgeline of the Rockies) and the continental interior to the east. Summers are very warm, while winters can be very cold, and strong downslope winds can create chinooks (warm, drying winds). Precipitation falls primarily from April to September, up to one-third of the annual total in May and June. Total annual precipitation averages between 10 and 20 inches.

This association is found on the bottoms of narrow mountain valleys, intra- and inter-morainal depressions, areas possibly underlain by clay lenses, and fringing kettle lakes. These sites have gentle slopes and occur on all aspects. Sites on southerly aspects are typically moist mountain slopes where soil moisture is probably augmented by subsurface flow. Small streams, shallow channels, and dry streambeds run through some stands. Soils are derived from alluvium (some deposited by slopewash), colluvium, or aeolian materials derived from sedimentary rock types and layered over morainal drift. The soils are relatively gravel free, typically to at least 80 cm in depth, and loamy in texture, with relatively high organic matter. They are seasonally saturated. There is no exposed soil or rock on the ground surface; the duff and litter layer ranges from 1 to 9.5 cm deep.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: In this association, *Populus balsamifera ssp. trichocarpa* is almost always dominant in the tree canopy layer (up to 60% cover and usually 10-20 m tall), and young individuals are found throughout all understory layers. Variable-height *Populus tremuloides* is found in approximately half of the stands with up to 45% cover in the tree canopy and trace to low cover in understory layers. *Picea engelmannii* is also found in various canopy layers throughout this association, but with lower constancy and low cover. *Betula papyrifera* is infrequently codominant in the tree canopy. *Rubus parviflorus* (with up to 50% cover), *Symphoricarpos occidentalis* (with up to 40% cover), *Symphoricarpos albus* (with up to 20% cover), and *Lonicera utahensis* (with up to 20% cover) each can dominate the diverse short-shrub layer. *Ribes* spp. have low constancy but can have up to 10% cover, while *Spiraea betulifolia* and *Amelanchier alnifolia* occur in the majority of stands but with low cover.

Heracleum maximum is found in all stands with an average cover of 9%. Other important forbs with high constancy are tall species, such as *Thalictrum occidentale* and *Osmorhiza occidentalis*, with 13% and 16% average cover, respectively; these forbs are subdominant in the diverse forb-dominated understory. *Symphotrichum ciliolatum* (= *Aster ciliolatus*), *Actaea rubra*, and

Maianthemum stellatum (each with less than 3% average cover) occur in two-thirds of stands. *Chamerion* spp. with 6% average cover and *Viola canadensis* with 12% average cover each occur in several stands, while *Symphyotrichum ciliolatum* and *Xerophyllum tenax* each have high cover (20 and 15%, respectively) but rarely occur. *Elymus* species and *Melica smithii*-the only two notable grasses-have medium constancy, each with up to 10% cover. In 71% of the stands, ground cover is primarily litter and duff with some small rocks, downed wood, and bare soil. Average moss cover is less than 5%.

GLOBAL VEGETATION: This forest association is dominated by the broad-leaved deciduous tree *Populus balsamifera* ssp. *trichocarpa* (= *Populus trichocarpa*), with *Populus tremuloides* usually present. Both species root sprout following disturbance to produce relatively even-aged stands, but where both are present, *Populus balsamifera* ssp. *trichocarpa* has at least 1-5% cover, and is the indicator species for this association. Occasional individuals of the conifers *Picea engelmannii* and *Pseudotsuga menziesii* occur, but seedlings of these species are rare. The understory is characterized by a low-shrub layer composed of patches of the deciduous *Symphoricarpos albus*. *Amelanchier alnifolia* and *Mahonia repens* (= *Berberis repens*) occur in most stands, but are typically not abundant. The herbaceous layer is diverse, well-developed and composed of species indicative of mesic conditions. Important perennial forbs include *Osmorhiza occidentalis*, *Heracleum maximum* (= *Heracleum lanatum*), *Actaea rubra*, *Galium triflorum*, *Viola canadensis*, and *Angelica arguta*. Other forbs of high constancy are *Thalictrum occidentale*, *Fragaria virginiana*, *Maianthemum stellatum* (= *Smilacina stellata*), *Geranium viscosissimum*, *Geranium richardsonii*, and *Packera pseud aurea* (= *Senecio pseud aureus*). On sites that are transitional to those with permanently saturated soils, *Equisetum arvense*, *Streptopus amplexifolius*, and *Calamagrostis canadensis* become more important.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Betula papyrifera</i> , <i>Populus balsamifera</i> ssp. <i>trichocarpa</i> , <i>Populus tremuloides</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Lonicera utahensis</i> , <i>Rubus parviflorus</i>
Herb (field)	Forb	<i>Chamerion angustifolium</i> , <i>Heracleum maximum</i> , <i>Osmorhiza occidentalis</i> , <i>Symphyotrichum ciliolatum</i> , <i>Thalictrum occidentale</i> , <i>Viola canadensis</i> , <i>Xerophyllum tenax</i>
Herb (field)	Graminoid	<i>Elymus glaucus</i> , <i>Melica smithii</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> , <i>Populus tremuloides</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Symphoricarpos albus</i>
Herb (field)	Forb	<i>Chamerion angustifolium</i> , <i>Heracleum maximum</i> , <i>Osmorhiza occidentalis</i> , <i>Thalictrum occidentale</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Actaea rubra*, *Amelanchier alnifolia*, *Eurybia conspicua*, *Heracleum maximum*, *Osmorhiza occidentalis*, *Picea engelmannii*, *Populus balsamifera* ssp. *trichocarpa*, *Populus tremuloides*, *Rubus parviflorus*, *Spiraea betulifolia*

GLOBAL: *Angelica arguta*, *Heracleum maximum*, *Osmorhiza occidentalis*, *Populus balsamifera* ssp. *trichocarpa*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Taraxacum officinale*

GLOBAL: *Phleum pratense*

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2 (23-Feb-2004). This association has a restricted range of occurrence on the eastern slope of the northern Rockies, with an unusual combination of tree dominants related to the mesic soil conditions.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This association is similar to *Populus tremuloides* / *Heracleum maximum* Forest (CEGL000595), which differs by having a consistently higher cover of *Populus tremuloides*, and <5% cover of *Populus balsamifera* ssp. *trichocarpa*.

GLOBAL COMMENTS: *Populus balsamifera* ssp. *trichocarpa* generally has a narrower ecological amplitude and better serves as a diagnostic species for this association. This distinguishes it from *Populus tremuloides* / *Heracleum maximum* Forest (CEGL000595) which is always (nearly) pure aspen and no poplar.

GLOBAL SIMILAR ASSOCIATIONS:

- *Populus balsamifera* ssp. *trichocarpa* / *Calamagrostis canadensis* Forest [Provisional] (CEGL005845)--has less forbs and is wetter.
- *Populus tremuloides* / *Heracleum maximum* Forest (CEGL000595)
- *Populus tremuloides* / *Rubus parviflorus* Forest (CEGL000602)

GLOBAL RELATED CONCEPTS:

- *Populus tremuloides*-*Populus trichocarpa*/*Osmorhiza occidentalis* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.2.b. (Driscoll et al. 1984) B
- UNESCO FORMATION CODE: I.B.2b (UNESCO 1973) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is known from the east side of the IPP. In Glacier National Park, the association is known from the St. Mary Lake, Lake Sherburne, and Waterton Lake basins. In Waterton Lakes National Park, it is known from the Cameron Creek drainage, as well as from several other locations.

GLOBAL RANGE: This association has been described from the foothills of the eastern slope of the Rocky Mountains in northwestern Montana, including on the Blackfoot Indian Reservation. It extends farther north along the eastern slope into Alberta, Canada.

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S2

USFS ECOREGIONS: M332B:CC, M332C:CC, M332D:C?, M333B:CC, M333C:CC

FEDERAL LANDS: BIA (Blackfoot); NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.175, GLAC.53, GLAC.141, WATE.5115, WATE.5135, WATE.5023, WATE.9003.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: M.S. Reid

REFERENCES: Bourgeron and Engelking 1994, Cooper and Pfister 1981, Driscoll et al. 1984, Lynch 1955, MTNHP 2002b, UNESCO 1973, Western Ecology Working Group n.d.

***Populus balsamifera* ssp. *trichocarpa* - *Picea engelmannii* / *Equisetum arvense* Forest
BLACK COTTONWOOD - ENGELMANN SPRUCE / FIELD HORSETAIL FOREST**

IDENTIFIER: CEGL005907

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
Alliance	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> Temporarily Flooded Forest Alliance (A.311)
Alliance (English name)	Black Cottonwood Temporarily Flooded Forest Alliance
Association	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Picea engelmannii</i> / <i>Equisetum arvense</i> Forest
Association (English name)	Black Cottonwood - Engelmann Spruce / Field Horsetail Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)

ELEMENT CONCEPT

GLOBAL SUMMARY: This uncommon association is known from scattered locations in Glacier National Park, Montana, and Waterton Lakes National Park, Alberta. This forest association is found at 949 m (3110 feet) elevation on the basin floor of a wide river valley (on an old river meander) and at 1380 m (4525 feet) elevation on a gentle west-facing slope in bottomlands. The association occurs on silty loam soils on glacio-fluvial deposits. Stands vary from saturated much of the year to seasonally flooded but are moderately well-drained by early autumn. *Picea engelmannii* and *Populus balsamifera* ssp. *trichocarpa* dominate the multi-layered canopy, with *Equisetum arvense* abundant in the herbaceous layer. *Picea engelmannii* has an average cover of 23% in the tree canopy with trace cover of younger trees and seedlings in other layers. *Populus balsamifera* ssp. *trichocarpa* has 35% cover in the tree canopy, 15% in the tree subcanopy, and 3% cover of saplings and seedlings. In more mesic stands, *Symphoricarpos albus* clearly dominates the shrub layer with 60% cover. Other shrubs with 50% constancy but noticeable cover were *Cornus sericea*, *Symphoricarpos occidentalis*, *Rubus pubescens*, and *Crataegus douglasii*. The herbaceous layer is dominated by *Equisetum arvense*, which ranges from 10% to 70% cover. Tall forbs are conspicuous, such as *Maianthemum* species and *Heracleum maximum*. Mosses have 0 to 10% cover in both sites, and litter and duff cover up to 80% of the ground.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is found at 949 m (3110 feet) elevation on the basin floor of a wide river valley (on an old river meander) and at 1380 m (4525 feet) elevation on a gentle west-facing slope in bottomlands. The association occurs on silty loam soils on glacio-fluvial deposits. Stands vary from saturated much of the year to seasonally flooded but are moderately well-drained by early autumn.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: *Picea engelmannii* and *Populus balsamifera* ssp. *trichocarpa* dominate the multi-layered canopy, with *Equisetum arvense* abundant in the herbaceous layer. *Picea engelmannii* has an average cover of 23% in the tree canopy with trace cover of younger trees and seedlings in other layers. *Populus balsamifera* ssp. *trichocarpa* has 35% cover in the tree canopy, 15% in the tree subcanopy, and 3% cover of saplings and seedlings. In the wetter stand, *Symphoricarpos albus* clearly dominated the shrub layer with 60% cover, but was absent from the other stand. Other shrubs with 50% constancy but noticeable cover were *Cornus sericea*, *Symphoricarpos occidentalis*, *Rubus pubescens*, and *Crataegus douglasii*. The herbaceous layer is dominated by *Equisetum arvense*, which ranges from 10% to 70% cover. Tall forbs are conspicuous, such as *Maianthemum* species, which codominated the herbaceous layer in one stand sampled (with 30% cover), and *Heracleum maximum* with an average cover of 14%. Graminoids are rare in this association. Mosses have 0 to 10% cover in both sites, and litter and duff cover up to 80% of the ground.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Picea engelmannii</i>
Tree canopy	Broad-leaved deciduous tree	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Cornus sericea</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus pubescens</i> , <i>Symphoricarpos albus</i> , <i>Symphoricarpos occidentalis</i>
Herb (field)	Forb	<i>Angelica arguta</i> , <i>Heracleum maximum</i>
Herb (field)	Fern or fern ally	<i>Equisetum arvense</i>
Nonvascular	Moss	<i>Campylium stellatum</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Equisetum arvense*, *Heracleum maximum*, *Picea engelmannii*, *Populus balsamifera* ssp. *trichocarpa*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2? (9-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This association is also codominated by *Populus balsamifera* ssp. *trichocarpa* and *Picea engelmannii*; however, it has a much higher cover of *Cornus sericea*, more conifers (in both constancy and cover), a greater diversity of shrubs, and trace *Equisetum arvense*.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Picea engelmannii* / *Equisetum arvense* Forest (CEGL005927)
- *Populus balsamifera* ssp. *trichocarpa* - *Populus tremuloides* - Conifer / *Cornus sericea* Forest (CEGL005905)

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is known from a meadow just north of the Middle Fork Flathead River (west side of Glacier National Park) and also from a low-elevation area in Waterton Lakes National Park.

GLOBAL RANGE:

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S2?

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2089, WATE.5086.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Western Ecology Working Group n.d.

***Populus balsamifera* ssp. *trichocarpa* - *Populus tremuloides* - Conifer / *Calamagrostis canadensis* Forest**

BLACK COTTONWOOD - QUAKING ASPEN - SUBALPINE FIR - ENGELMANN SPRUCE / BLUEJOINT FOREST

IDENTIFIER: CEGL005909

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
Alliance	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> Temporarily Flooded Forest Alliance (A.311)

Alliance (English name)	Black Cottonwood Temporarily Flooded Forest Alliance
Association	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Populus tremuloides</i> - Conifer / <i>Calamagrostis canadensis</i> Forest
Association (English name)	Black Cottonwood - Quaking Aspen - Subalpine Fir - Engelmann Spruce / Bluejoint Forest
ECOLOGICAL SYSTEM(S):	Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)

ELEMENT CONCEPT

GLOBAL SUMMARY: This tentatively defined association has been sampled in Glacier National Park, Montana. It is found at 1440 to 1585 m (4720-5197 feet) elevation on moderately steep toeslopes, as well as on an outwash fan on a basin floor. The association occurs on both colluvial and glacial deposits, with the majority of stands having well-drained sandy loam soil containing up to 50% argillite gravel. The other stand sampled has poorly drained clay loam soil. Despite the apparently well-drained soils and not necessarily collecting positions, this type is hypothesized to be subirrigated. An open canopy of young to mature mixed tree species characterizes this association. *Populus tremuloides*, *Picea engelmannii*, *Abies lasiocarpa*, and *Pinus contorta* dominate the tree layers, with individuals of all ages present in varying amounts. *Populus tremuloides* is the most abundant, with all age classes represented and cover of up to 50% in each layer. No conifer species has more than 20% cover in any layer. *Rubus parviflorus* and *Symphoricarpos albus* codominate an open short-shrub layer (10 to 20% average cover each) in all stands. *Spiraea betulifolia* also has high constancy, but lower cover. The dwarf-shrub *Paxistima myrsinites* dominates the ground layer in one stand with 30% cover. *Calamagrostis canadensis* is present in all stands with up to 23% cover, clearly dominating the herbaceous layer. *Carex geyeri* is also always present, with 3% average cover. Although forb diversity is high, the only forb with high constancy and more than trace cover is *Eurybia conspiciua* (= *Aster conspiciuus*). Ground cover is primarily litter and duff with 5% cover of mosses.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is found at 1440 to 1585 m (4720-5197 feet) elevation on moderately steep toeslopes, as well as on an outwash fan on a basin floor. The association occurs on both colluvial and glacial deposits, with the majority of stands having well-drained sandy loam soil containing up to 50% argillite gravel. The other stand sampled has poorly drained clay loam soil. Despite the apparently well-drained soils and not necessarily collecting positions, this type is hypothesized to be subirrigated.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: An open canopy of young to mature mixed tree species characterizes this association. *Populus tremuloides*, *Picea engelmannii*, *Abies lasiocarpa*, and *Pinus contorta* dominate the tree layers, with individuals of all ages present in varying amounts. *Populus tremuloides* is the most abundant, with all age classes represented and cover of up to 50% in each layer. No conifer species has more than 20% cover in any layer. *Rubus parviflorus* and *Symphoricarpos albus* codominate an open short-shrub layer (10 to 20% average cover each) in all stands. *Spiraea betulifolia* also has high constancy, but lower cover. The dwarf-shrub *Paxistima myrsinites* dominates the ground layer in one stand with 30% cover. *Calamagrostis canadensis* is present in all stands with up to 23% cover, clearly dominating the herbaceous layer. *Carex geyeri* is also always present, with 3% average cover. Although forb diversity is high, the only forb with high constancy and more than trace cover is *Eurybia conspiciua* (= *Aster conspiciuus*). Ground cover is primarily litter and duff with 5% cover of mosses.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Picea engelmannii</i> , <i>Pinus contorta</i>
Tree canopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus parviflorus</i> , <i>Symphoricarpos albus</i>
Herb (field)	Dwarf-shrub	<i>Paxistima myrsinites</i>
Herb (field)	Forb	<i>Eurybia conspiciua</i> , <i>Xerophyllum tenax</i>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i>

Global

Stratum

Lifeform

Species

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Calamagrostis canadensis*, *Picea engelmannii*, *Pinus contorta*, *Populus tremuloides*, *Rubus parviflorus*, *Spiraea betulifolia*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2? (9-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This mixed *Populus tremuloides*-conifer association is apparently transitional between more pure stands of other *Populus tremuloides* associations and adjacent drier conifer-dominated associations; it also represents a late-successional stage of a process that should result in conifer dominance.

GLOBAL COMMENTS: This mixed *Populus tremuloides*-conifer association is apparently transitional between more pure stands of other *Populus tremuloides* associations and adjacent drier conifer-dominated associations; it also represents a late-successional stage of a process that should result in conifer dominance.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Calamagrostis canadensis* Forest (CEGL000300)
- *Pinus contorta* / *Calamagrostis canadensis* Forest (CEGL000138)
- *Populus balsamifera* ssp. *trichocarpa* / *Calamagrostis canadensis* Forest [Provisional] (CEGL005845)
- *Populus tremuloides* / *Calamagrostis canadensis* Forest (CEGL000574)

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: In Glacier National Park, this association is found east of the Continental Divide in the Many Glacier and Belly River drainages.

GLOBAL RANGE:

NATIONS: US

STATES/PROVINCES: MT:S2?

USFS ECOREGIONS: M332C:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.329, GLAC.995, GLAC.71.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Western Ecology Working Group n.d.

***Populus balsamifera* ssp. *trichocarpa* - *Populus tremuloides* - Conifer / *Clintonia uniflora* Forest**

BLACK COTTONWOOD - QUAKING ASPEN - CONIFER / BRIDE'S BONNET FOREST

IDENTIFIER: C EGL005906**NVC Classification**

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
Alliance	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> Temporarily Flooded Forest Alliance (A.311)
Alliance (English name)	Black Cottonwood Temporarily Flooded Forest Alliance
Association	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Populus tremuloides</i> - Conifer / <i>Clintonia uniflora</i> Forest
Association (English name)	Black Cottonwood - Quaking Aspen - Conifer / Bride's Bonnet Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is relatively uncommon on both the east and west sides of the Continental Divide in Glacier National Park, Montana. This montane association occurs along flat bottomlands and alluvial terraces on the west side of Glacier National Park and on gentle valley floors to moderately steep lowslopes on the east side of the park with variable aspects. Elevations on the west side range from 970 to 1030 m (3170-3390 feet), while they range from 1300 to 1630 m (4280-5350 feet) on the east side of the park. Soil texture ranges from moderately well- to rapidly drained sand, sandy loam, and silt loam to somewhat poorly drained clay. Soils have high gravel and rock content and tend to contain red and green argillite. They are developed on alluvial, glacio-fluvial, and morainal landforms. Litter dominates the ground surface with 40-60% cover. Wood is also common with 10-30% cover. This mesic, mixed evergreen-deciduous forest occurs on both riparian bottomlands and in the transition zone between *Populus tremuloides* types and *Pseudotsuga menziesii* or *Pinus contorta* forests. Total tree cover ranges from 30-70% with heights ranging from 10-35 m. A mix of tree species dominates the overstory, including *Picea engelmannii*, *Populus tremuloides*, *Pinus contorta*, and *Abies lasiocarpa*. *Pseudotsuga menziesii*, *Betula papyrifera*, and *Populus balsamifera* ssp. *trichocarpa* are infrequently scattered in the subcanopy. Tall shrubs are present in most stands with 30-50% cover. *Amelanchier alnifolia* and *Rubus parviflorus* are the most common shrubs. Other shrubs include *Acer glabrum*, *Menziesia ferruginea*, and *Sorbus scopulina*. *Salix scouleriana* and *Alnus viridis* ssp. *sinuata* are low-constancy shrubs that may have high cover. The herbaceous cover ranges from 20-50% and is dominated by native forbs. *Arnica cordifolia* and *Xerophyllum tenax* have the highest individual cover with 1-20% cover. Other species include *Clintonia uniflora*, *Thalictrum occidentale*, *Viola orbiculata*, *Orthilia secunda*, *Eurybia conspicua* (= *Aster conspicuus*), *Fragaria virginiana*, and *Picea engelmannii* seedlings. Less infrequent herbs include *Chimaphila umbellata*, *Elymus glaucus*, *Aralia nudicaulis*, *Prosartes trachycarpa* (= *Disporum trachycarpum*), *Heracleum maximum*, *Athyrium filix-femina*, *Equisetum arvense*, *Packeria pseudaurea* (= *Senecio pseudaureus*), and *Pteridium aquilinum*. Nonvascular plants have 5-10% cover.

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This montane association occurs along flat bottomlands and alluvial terraces on the west side of Glacier National Park and on gentle valley floors to moderately steep lowslopes on the east side of the park with variable aspects. Elevations on the west side range from 970 to 1030 m (3170-3390 feet), while they range from 1300 to 1630 m (4280-5350 feet) on the east side of the park. Soil texture ranges from moderately well- to rapidly drained sand, sandy loam, and silt loam to somewhat poorly drained clay. Soils have high gravel and rock content and tend to contain red and green argillite. They are developed on alluvial, glacio-fluvial, and morainal landforms. Litter dominates the ground surface with 40-60% cover. Wood is also common with 10-30% cover.

GLOBAL ENVIRONMENT:**VEGETATION DESCRIPTION**

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This mesic, mixed evergreen-deciduous forest occurs on both riparian bottomlands and in the transition zone between *Populus tremuloides* types and *Pseudotsuga menziesii* or *Pinus contorta* forests. Total tree cover ranges from 30-70% with heights ranging from 10-35 m. A mix of tree species dominates the overstory, including *Picea engelmannii* (3-30% cover), *Populus tremuloides* (17-30% cover), *Pinus contorta* (7-30% cover), and *Abies lasiocarpa* (2-3% cover). *Pseudotsuga menziesii*, *Betula papyrifera*, and *Populus balsamifera* ssp. *trichocarpa* are infrequently scattered in the subcanopy with 5-20% cover.

Tall shrubs are present in most stands with 30-50% cover. *Amelanchier alnifolia* and *Rubus parviflorus* are the most common shrubs with 1-3% and 5-50% cover, respectively. Other shrubs include *Acer glabrum*, *Menziesia ferruginea*, and *Sorbus scopulina*. *Salix scouleriana* and *Alnus viridis* ssp. *sinuata* are low-constancy shrubs that may have high cover. *Spiraea betulifolia*, *Symphoricarpos*

albus, and *Vaccinium membranaceum* are also common each with 1-30% cover. Dwarf-shrubs occur infrequently within this association with only 5-10% cover, and include *Mahonia repens*, *Paxistima myrsinites*, and *Vaccinium caespitosum*.

The herbaceous cover ranges from 20-50% and is dominated by native forbs. *Arnica cordifolia* and *Xerophyllum tenax* have the highest individual cover with 1-20% cover. Other species include *Clintonia uniflora*, *Thalictrum occidentale*, *Viola orbiculata*, *Orthilia secunda*, *Eurybia conspicua* (= *Aster conspicuus*), *Fragaria virginiana*, and *Picea engelmannii* seedlings. Less infrequent herbs include *Chimaphila umbellata*, *Elymus glaucus*, *Aralia nudicaulis*, *Prosartes trachycarpa* (= *Disporum trachycarpum*), *Heracleum maximum*, *Athyrium filix-femina*, *Equisetum arvense*, *Packera pseudaurea* (= *Senecio pseudaureus*), and *Pteridium aquilinum*. Nonvascular plants have 5-10% cover.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Picea engelmannii</i> , <i>Pinus contorta</i>
Tree canopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Tree subcanopy	Needle-leaved tree	<i>Picea engelmannii</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Acer glabrum</i> , <i>Amelanchier alnifolia</i> , <i>Menziesia ferruginea</i> , <i>Rubus parviflorus</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i> , <i>Symphoricarpos albus</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Clintonia uniflora</i> , <i>Thalictrum occidentale</i> , <i>Xerophyllum tenax</i>
Herb (field)	Graminoid	<i>Elymus glaucus</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Amelanchier alnifolia*, *Arnica cordifolia*, *Clintonia uniflora*, *Eurybia conspicua*, *Orthilia secunda*, *Picea engelmannii*, *Pinus contorta*, *Populus tremuloides*, *Spiraea betulifolia*, *Viola orbiculata*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Taraxacum officinale*, *Veronica officinalis*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3? (9-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is relatively uncommon on both the east and west sides of the Continental Divide in Glacier National Park. It occurs on riparian bottomlands on the west side of the park and within transition areas between aspen groves and conifer forests on the east side of the park. Sampled stands occur within the Many Glacier subdistrict near Swiftcurrent Creek and along the Swiftcurrent Pass Trail. Within the Goat Haunt subdistrict it occurs near the Goat Haunt shelters and along the Waterton Lake Trail. Within the Two Medicine subdistrict stands were sampled along the Firebrand

Pass Trail. Within the Lake McDonald subdistrict this association occurs along the North Fork of the Flathead River near the Camas Road and near the Glacier Institute.

GLOBAL RANGE:

NATIONS: CA?, US

STATES/PROVINCES: AB?, ID?, MT:S3?

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.10, GLAC.70, GLAC.80, GLAC.89, GLAC.254, GLAC.265, GLAC.2007, GLAC.2202.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Western Ecology Working Group n.d.

***Populus balsamifera ssp. trichocarpa* - *Populus tremuloides* - Conifer / *Cornus sericea* Forest**

BLACK COTTONWOOD - QUAKING ASPEN - CONIFER / RED-OSIER DOGWOOD FOREST

IDENTIFIER: CEGL005905

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
Alliance	<i>Populus balsamifera ssp. trichocarpa</i> Temporarily Flooded Forest Alliance (A.311)
Alliance (English name)	Black Cottonwood Temporarily Flooded Forest Alliance
Association	<i>Populus balsamifera ssp. trichocarpa</i> - <i>Populus tremuloides</i> - Conifer / <i>Cornus sericea</i> Forest
Association (English name)	Black Cottonwood - Quaking Aspen - Conifer / Red-osier Dogwood Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is known from east of the Continental Divide in Glacier National Park, Montana. This association is known from the bottom of large glacial troughs, on low terraces and moderate to steep slopes at elevations ranging from 1293 to 1464 m (4240-4800 feet). The association is found on glacial-fluvial and lacustrine deposits with well-drained sandy loam to clay loam soils. This association is known from avalanche chutes and from a bottomland stand bordering a spring-fed stream. This association consists of a multi-aged canopy dominated by *Populus balsamifera ssp. trichocarpa* and *Picea engelmannii* with lesser amounts of *Pseudotsuga menziesii* and *Abies lasiocarpa*. Conifer species are always present, with *Picea engelmannii* being most characteristic; however, *Abies lasiocarpa* and *Pseudotsuga menziesii* are present as seedlings and saplings. *Betula papyrifera* is present in half the stands with up to 10% cover. *Cornus sericea* is present in all stands with variable height and multiple ages. With up to 70% cover, it can dominate the shrub canopies, but more often the diversity of shrubs renders no species clearly dominant. Other common variable-height shrubs include *Rubus parviflorus*, *Symphoricarpos albus*, and *Amelanchier alnifolia*, with average coverages of 5 to 25%. *Acer glabrum* and *Rhamnus alnifolia* are less frequently present but can have high cover. *Elymus glaucus* has high constancy but low cover. Forb diversity is high, but the only species with more than trace cover is *Heracleum maximum*, which has low constancy. In at least one stand (surrounding a spring-fed stream), the forb level is likely kept low by snow and water levels most of the season. Mosses are present with 5 to 10% cover, and the ground cover is otherwise made up of litter and woody debris.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is known from the bottom of a large glacial trough, on low terraces and moderate to steep slopes at elevations ranging from 1293 to 1464 m (4240-4800 feet). The association is found on glacial-fluvial and lacustrine deposits with well-drained sandy loam to clay loam soils. It is known from avalanche chutes and from a bottomland stand bordering a spring-fed stream.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This association consists of a multi-aged canopy dominated by *Populus balsamifera* ssp. *trichocarpa* and *Picea engelmannii* with lesser amounts of *Pseudotsuga menziesii* and *Abies lasiocarpa*. Conifer species are always present, with *Picea engelmannii* being most characteristic; however, *Abies lasiocarpa* and *Pseudotsuga menziesii* are present as seedlings and saplings. *Betula papyrifera* is present in half the stands with up to 10% cover. *Cornus sericea* is present in all stands with variable height and multiple ages. With up to 70% cover, it can dominate the shrub canopies, but more often the diversity of shrubs renders no species clearly dominant; *Cornus sericea* is highly favored browse which can also account for its low stature (compared to potential) and cover. Other common variable-height shrubs include *Rubus parviflorus*, *Symphoricarpos albus*, and *Amelanchier alnifolia*, with average coverages of 5 to 25%. *Acer glabrum* and *Rhamnus alnifolia* are less frequently present but can have high cover. *Elymus glaucus* has high constancy but low cover. Forb diversity is high, but the only species with more than trace cover is *Heracleum maximum*, which has low constancy. In at least one stand (surrounding a spring-fed stream), the forb level is likely kept low by snow and water levels most of the season. Mosses are present with 5 to 10% cover, and the ground cover is otherwise made up of litter and woody debris.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Picea engelmannii</i>
Tree canopy	Broad-leaved deciduous tree	<i>Betula papyrifera</i> , <i>Populus balsamifera</i> ssp. <i>trichocarpa</i>
Tree subcanopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Acer glabrum</i> , <i>Cornus sericea</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rhamnus alnifolia</i> , <i>Rubus parviflorus</i> , <i>Symphoricarpos albus</i>
Herb (field)	Forb	<i>Heracleum maximum</i>
Herb (field)	Graminoid	<i>Elymus glaucus</i> , <i>Melica smithii</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Acer glabrum*, *Amelanchier alnifolia*, *Galium triflorum*, *Maianthemum stellatum*, *Picea engelmannii*, *Pseudotsuga menziesii*, *Rubus parviflorus*, *Thalictrum occidentale*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Poa palustris*, *Taraxacum officinale*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2G3 (9-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Picea engelmannii* / *Cornus sericea* Woodland (CEGL002677)
- *Populus balsamifera* ssp. *trichocarpa* - *Picea engelmannii* / *Equisetum arvense* Forest (CEGL005907)--has less conifer cover, less *Cornus sericea*, and abundant *Equisetum arvense*.

- *Pseudotsuga menziesii* / *Cornus sericea* Woodland (CEGL000899)

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is known from east of the Divide in the IPP. It is found at the head of St. Mary Lake and also in close proximity to the border of the parks, in both the Waterton Lake basin and the Boundary Creek drainage.

GLOBAL RANGE:

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S2?

USFS ECOREGIONS:

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.224, GLAC.46, GLAC.83, WATE.9029.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Western Ecology Working Group n.d.

***Populus balsamifera* ssp. *trichocarpa* - *Populus tremuloides* - Conifer / *Heracleum maximum* Forest**

BLACK COTTONWOOD - QUAKING ASPEN - CONIFER / COW-PARSNIP FOREST

IDENTIFIER: CEGL005910

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
Alliance	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> Temporarily Flooded Forest Alliance (A.311)
Alliance (English name)	Black Cottonwood Temporarily Flooded Forest Alliance
Association	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Populus tremuloides</i> - Conifer / <i>Heracleum maximum</i> Forest
Association (English name)	Black Cottonwood - Quaking Aspen - Conifer / Cow-parsnip Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)

ELEMENT CONCEPT

GLOBAL SUMMARY: This mesic, montane to lower subalpine, mixed coniferous-deciduous forest occurs at elevations between 1370 and 1700 m (4500-5600 feet) on flat to moderate toeslopes or low slopes at variable aspects. Stands at higher elevations tend to be found on south-facing slopes. Soil texture ranges from well-drained sandy loams to moderately well-drained silty clay loams. Soils tend to be moderately well-developed and gravelly, developed on glacio-fluvial or morainal landforms. Average litter cover is 50%. This mixed evergreen-deciduous forest generally occurs in the transition zone between higher elevation *Pinus contorta* and *Pseudotsuga menziesii* forests and lower elevation pure *Populus tremuloides* stands. Total tree canopy ranges from 30-60% with heights between 10-15 m. *Populus tremuloides* dominates the tree canopy with 20-40% cover. Conifer species present are variable and include *Pinus contorta*, *Pseudotsuga menziesii*, *Abies lasiocarpa*, or *Picea engelmannii*; the total conifer cover ranges between 3 and 40%. *Populus balsamifera* ssp. *trichocarpa* may be present with low cover. Short shrubs, averaging 0.5-2 m in height, dominate the midstory with 10-40% cover. *Symphoricarpos albus* and *Amelanchier alnifolia* are consistently present with 1-30% cover and 1-3% cover, respectively. Other dominant shrubs that may be present include *Spiraea betulifolia* with 3-20% cover and *Rubus parviflorus* with 3-10% cover. *Rosa woodsii*, *Ribes inerme*, and *Sorbus scopulina* may also be present with low cover. Diversity of herbaceous species and abundance is high with an average cover of 5%, ranging between 2-100%. Highly constant species include *Heracleum*

maximum, *Melica subulata*, *Elymus glaucus*, *Osmorhiza occidentalis*, *Thalictrum occidentale*, and *Angelica arguta*. Some herbaceous species that may have high cover include forbs *Viola glabella*, *Actaea rubra*, *Veratrum viride*, *Chamerion angustifolium*, *Prosartes trachycarpa* (= *Disporum trachycarpum*), *Geranium viscosissimum*, *Cirsium hookerianum*, and *Hackelia floribunda*, and graminoids *Carex geyeri*, *Bromus carinatus*, and *Melica smithii*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This mesic, montane to lower subalpine, mixed coniferous-deciduous forest occurs at elevations between 1370 and 1700 m (4500-5600 feet) on flat to moderate toeslopes or low slopes at variable aspects. Stands at higher elevations tend to be found on south-facing slopes. Soil texture ranges from well-drained sandy loams to moderately well-drained silty clay loams. Soils tend to be moderately well-developed and gravelly, developed on glacio-fluvial or morainal landforms. Average litter cover is 50%.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This mixed evergreen-deciduous forest generally occurs in the transition zone between higher elevation *Pinus contorta* and *Pseudotsuga menziesii* forests and lower elevation pure *Populus tremuloides* stands. Total tree canopy ranges from 30-60% with heights between 10-15 m. *Populus tremuloides* dominates the tree canopy with 20-40% cover. Conifer species present are variable and include *Pinus contorta*, *Pseudotsuga menziesii*, *Abies lasiocarpa*, or *Picea engelmannii*; the total conifer cover ranges between 3 and 40%. *Populus balsamifera ssp. trichocarpa* may be present with low cover. Short shrubs, averaging 0.5-2 m in height, dominate the midstory with 10-40% cover. *Symphoricarpos albus* and *Amelanchier alnifolia* are consistently present with 1-30% cover and 1-3% cover, respectively. Other dominant shrubs that may be present include *Spiraea betulifolia* with 3-20% cover and *Rubus parviflorus* with 3-10% cover. *Rosa woodsii*, *Ribes inerme*, and *Sorbus scopulina* may also be present with low cover. Diversity of herbaceous species and abundance is high with an average cover of 5%, ranging between 2-100%. Consistently present (75-100%) species include *Heracleum maximum*, *Melica subulata*, *Elymus glaucus*, *Osmorhiza occidentalis*, *Thalictrum occidentale*, and *Angelica arguta*. *Galium boreale*, *Eurybia conspicua* (= *Aster conspicuus*), *Fragaria virginiana*, and *Vicia americana* are also common but have low cover. Some herbaceous species that may have high cover include forbs *Viola glabella*, *Actaea rubra*, *Veratrum viride*, *Chamerion angustifolium*, *Prosartes trachycarpa* (= *Disporum trachycarpum*), *Geranium viscosissimum*, *Cirsium hookerianum*, and *Hackelia floribunda*, and graminoids *Carex geyeri*, *Bromus carinatus*, and *Melica smithii*.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Tree canopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Tree subcanopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus parviflorus</i> , <i>Spiraea betulifolia</i> , <i>Symphoricarpos albus</i>
Herb (field)	Forb	<i>Angelica arguta</i> , <i>Heracleum maximum</i> , <i>Osmorhiza occidentalis</i> , <i>Thalictrum occidentale</i>
Herb (field)	Graminoid	<i>Elymus glaucus</i> , <i>Melica subulata</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Amelanchier alnifolia*, *Angelica arguta*, *Elymus glaucus*, *Galium boreale*, *Heracleum maximum*, *Osmorhiza occidentalis*, *Pinus contorta*, *Populus tremuloides*, *Symphoricarpos albus*, *Thalictrum occidentale*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Calochortus apiculatus*, *Phleum pratense*, *Taraxacum officinale*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2? (9-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Populus tremuloides* / *Heracleum maximum* Forest (CEGL000595)
- *Populus tremuloides* / *Rubus parviflorus* Forest (CEGL000602)

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is relatively common on the eastern boundary of Glacier National Park and along the western boundary of the Blackfoot Reservation. It has been documented along the lower Redgap Pass Trail in the Many Glacier subdistrict, near St. Mary Lake on the Red Eagle Trail, near Mackinaw Bay in the St. Mary subdistrict, and along Looking Glass Hill on the Blackfoot Reservation.

GLOBAL RANGE:

NATIONS: US

STATES/PROVINCES: MT

USFS ECOREGIONS: M332C:CC

FEDERAL LANDS: BIA (Blackfoot); NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.50, GLAC.41, GLAC.29, GLAC.169.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Western Ecology Working Group n.d.

Populus balsamifera ssp. *trichocarpa* / *Calamagrostis canadensis* Forest [Provisional] BLACK COTTONWOOD / BLUEJOINT FOREST

IDENTIFIER: CEGL005845

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
Alliance	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> Temporarily Flooded Forest Alliance (A.311)
Alliance (English name)	Black Cottonwood Temporarily Flooded Forest Alliance
Association	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Calamagrostis canadensis</i> Forest [Provisional]
Association (English name)	Black Cottonwood / Bluejoint Forest
ECOLOGICAL SYSTEM(S):	Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland (CES306.804)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is currently known from one low-elevation site in Waterton Lakes National Park, Alberta. It was sampled at 1440 m (4721 feet) on a gently sloping fluvial fan. The stand occurred on temporarily flooded, but well-drained, Orthic Humic Regosol soil. Multi-aged *Populus balsamifera* ssp. *trichocarpa* dominates this association, with 20% cover in the tree canopy and up to 10% cover in the subcanopy and young tree layers. *Populus tremuloides* is subdominant, with up to 10% cover in both canopy and reproduction layers. *Symphoricarpos occidentalis* dominates a short-shrub layer with 30% cover, while *Rosa woodsii* and *Spiraea betulifolia* are also present. Tall grasses dominate the herbaceous layer, although a diverse mix of both tall and ground-layer forbs are also present. The most important grasses are *Calamagrostis canadensis* and *Elymus glaucus*, each with 15% cover, and *Phleum pratense* with 10% cover. The most abundant forbs are *Cirsium arvense*, *Chamerion angustifolium*, *Eucephalus engelmannii*, and *Galium triflorum*. Less abundant forbs include *Actaea rubra*, *Fragaria virginiana*, *Geranium richardsonii*, *Heracleum maximum*, and *Viola canadensis*. The ground cover is primarily litter and duff with 5% cover of mosses.

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association was sampled at 1440 m (4721 feet) on a gently sloping fluvial fan. The stand occurred on temporarily flooded, but well-drained, Orthic Humic Regosol soil.

GLOBAL ENVIRONMENT:**VEGETATION DESCRIPTION**

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Multi-aged *Populus balsamifera* ssp. *trichocarpa* dominates this association, with 20% cover in the tree canopy and up to 10% cover in the subcanopy and young tree layers. *Populus tremuloides* is subdominant, with up to 10% cover in both canopy and reproduction layers. *Symphoricarpos occidentalis* dominates a short-shrub layer with 30% cover, while *Rosa woodsii* and *Spiraea betulifolia* are also present with 5% and 10% cover, respectively. Tall grasses dominate the herbaceous layer, although a diverse mix of both tall and ground-layer forbs are also present. The most important grasses are *Calamagrostis canadensis* and *Elymus glaucus*, each with 15% cover, and *Phleum pratense* with 10% cover. The most abundant forbs (with 10% cover each) are *Cirsium arvense*, *Chamerion angustifolium*, *Eucephalus engelmannii*, and *Galium triflorum*. Less abundant forbs include *Actaea rubra*, *Fragaria virginiana*, *Geranium richardsonii*, *Heracleum maximum*, and *Viola canadensis*. The ground cover is primarily litter and duff with 5% cover of mosses.

GLOBAL VEGETATION:**MOST ABUNDANT SPECIES****WATERTON-GLACIER INTERNATIONAL PEACE PARK**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> , <i>Populus tremuloides</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rosa woodsii</i> , <i>Spiraea betulifolia</i> , <i>Symphoricarpos occidentalis</i>
Herb (field)	Forb	<i>Chamerion angustifolium</i> , <i>Cirsium arvense</i> , <i>Eucephalus engelmannii</i> , <i>Galium triflorum</i>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i> , <i>Elymus glaucus</i>

**Global
Stratum****Lifeform****Species****CHARACTERISTIC SPECIES**

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Calamagrostis canadensis*, *Chamerion angustifolium*, *Elymus glaucus*, *Eucephalus engelmannii*, *Galium triflorum*, *Populus balsamifera* ssp. *trichocarpa*, *Populus tremuloides*, *Spiraea betulifolia*

GLOBAL:**OTHER NOTEWORTHY SPECIES**

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Phleum pratense*

GLOBAL:**CONSERVATION STATUS RANK**

GLOBAL RANK & REASONS: G2? (23-Feb-2004).

CLASSIFICATION

STATUS: Provisional

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: Dominance by *Populus balsamifera* ssp. *trichocarpa* and general lack of conifers distinguishes this association from *Populus tremuloides* - *Abies lasiocarpa* - *Picea engelmannii* / *Calamagrostis canadensis* Forest [Provisional] (CEGL005909).

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Populus balsamifera* ssp. *trichocarpa* - (*Populus tremuloides*) / *Heracleum maximum* Forest (CEGL000542)
- *Populus balsamifera* ssp. *trichocarpa* - *Populus tremuloides* - Conifer / *Calamagrostis canadensis* Forest (CEGL005909)
- *Populus tremuloides* / *Calamagrostis canadensis* Forest (CEGL000574)

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is known from one low-elevation site in Waterton Lakes National Park.

GLOBAL RANGE:

NATIONS: CA, US?

STATES/PROVINCES: AB, MT?

USFS ECOREGIONS: M332C:PP

FEDERAL LANDS: PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.5144.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Western Ecology Working Group n.d.

Populus balsamifera ssp. *trichocarpa* / *Cornus sericea* Forest BLACK COTTONWOOD / RED-OSIER DOGWOOD FOREST

IDENTIFIER: CEGL000672

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
Alliance	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> Temporarily Flooded Forest Alliance (A.311)
Alliance (English name)	Black Cottonwood Temporarily Flooded Forest Alliance
Association	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Cornus sericea</i> Forest
Association (English name)	Black Cottonwood / Red-osier Dogwood Forest

ECOLOGICAL SYSTEM(S): Columbia Basin Foothill Riparian Woodland and Shrubland (CES304.768)
North Pacific Lowland Riparian Forest and Shrubland (CES204.869)
Northern Rocky Mountain Avalanche Chute Shrubland (CES306.801)
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland (CES306.804)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association has been documented from Washington south to northern California and eastward to Idaho and Montana west of the Continental Divide, as well as central Montana. It occurs over a broad elevation range of 610 to 2135 m (2000-7000 feet) where *Populus balsamifera* ssp. *trichocarpa* is the dominant cottonwood at elevations considered relatively low to

mid gradient. This forest type occupies alluvial terraces of major rivers and streams, point bars, side bars, mid-channel bars, delta bars, an occasional lake or pond margin, and even creeps onto footslopes and lower subirrigated slopes of hilly or mountainous terrain. Stands occasionally occur on upper positions of moderate to steep toeslopes and colluvial fans at the base of avalanche chutes. Many of these sites are flooded in the spring and dry deeply by summer's end; capillary action keeps upper portions of the soil profile moist. Other sites are merely subirrigated. *Populus balsamifera ssp. trichocarpa* dominates the overstory with average cover values ranging from approximately 30-90%. *Populus angustifolia*, *Populus tremuloides*, *Betula papyrifera*, and *Salix amygdaloides* are common subordinates. Several conifer species can be present with low cover (2-10%) in the upper canopy or as young saplings and are never consistently present. Conifers include *Tsuga heterophylla*, *Pseudotsuga menziesii*, *Abies lasiocarpa*, and *Picea engelmannii*. The shrub layer comprises at least 25% cover, with *Cornus sericea* diagnostic for the type and having anywhere from 1-90% cover; other shrub taxa with high constancy include *Symphoricarpos* spp., *Rosa* spp., *Salix* spp., *Crataegus* spp., *Amelanchier alnifolia*, *Salix lutea*, *Acer glabrum*, and *Alnus incana*. There are no graminoids exhibiting high constancy, though any one of a number of disturbance-associated exotics can manifest high coverages. Native grasses such as *Calamagrostis canadensis*, *Glyceria striata*, and *Deschampsia caespitosa* can be abundant in undisturbed stands, but this is increasingly less common. *Maianthemum stellatum*, *Galium triflorum*, *Solidago canadensis*, and *Equisetum* spp. are the only forbs that exhibit even relatively high constancy across the range of the type.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This is a widely distributed association typically occurring on the active floodplains of low- to moderate-gradient streams and rivers of various sizes. Such sites are usually found at low elevations (below 1400 m), but stands can occur up to 1770 m (5800 feet). Stands occur on banks of actively cutting stream channels, in areas of annual flood scouring and deposition, as well as in less dynamic sites such as along flood overflow channels, abandoned channels, and beaver ponds. Stands are usually seasonally or temporarily flooded, although sites with very fine-textured soil are sometimes saturated for the entire growing season. While many stands are disturbed by flooding or avalanches, and are in mid-seral condition, stands on stable sites vary from 60 to about 100 years old. Stands occasionally occur on upper positions of moderate to steep toeslopes and colluvial fans at the base of avalanche chutes. Although occasional sites are very cobbly or gravelly, stands typically occur on moderately well-drained, fine-textured alluvial soils with minimal coarse fragments. About a third of the stands occur on clay loam soil, a third on sandy loam, and the remainder on silt loam or other soils.

GLOBAL ENVIRONMENT: This association has been documented from Washington south to northern California and eastward to Idaho, Montana and Wyoming. It occurs over a broad elevational range of 610 to 2135 m (2000-7000 feet) where *Populus balsamifera ssp. trichocarpa* is the dominant cottonwood. This forest type occupies alluvial terraces of major rivers and streams, point bars, side bars, mid-channel bars, delta bars, an occasional lake or pond margin, and even creeps onto footslopes and lower subirrigated slopes of hilly or mountainous terrain. Stands occasionally occur on upper positions of moderate to steep toeslopes and colluvial fans at the base of avalanche chutes or erosional gullies, where they are subject to avalanche or flash-flood disturbance. Many of these sites are flooded in the spring and dry deeply by summer's end; capillary action keeps upper portions of the soil profile moist. Other sites are merely subirrigated. Adjacent wetter sites are dominated by a suite of wetland *Salix* spp., *Alnus incana*, wetland-associated *Carex* spp. often including *Carex utriculata*, *Carex aquatilis* and *Carex buxbaumii*, or *Typha latifolia*-dominated communities. Adjacent drier sites are dominated by *Populus balsamifera ssp. trichocarpa* or *Populus tremuloides* types or any of a number of conifer-dominated types.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: In the typical floodplain phase of this association, mature *Populus balsamifera ssp. trichocarpa* (with an average cover of 29%) dominates a diverse tree canopy ranging from 10 to over 35 m tall. Tree-sized *Populus tremuloides* are occasionally codominant, with a mix of less abundant trees, such as *Betula papyrifera*, *Picea engelmannii*, *Pseudotsuga menziesii*, with various other conifer species also present. The same species mix occurs as younger trees, saplings, and seedlings, although *Populus balsamifera ssp. trichocarpa*, *Picea engelmannii*, and *Abies lasiocarpa* are the most frequently reproducing species. Other than *Picea engelmannii*, which may indicate the eventual successional potential on some sites, no other understory tree has high constancy or consistently high cover. When this association occurs at the base of avalanche chutes, *Populus balsamifera ssp. trichocarpa* and the other characteristic trees are stunted due to snow loading and breakage (typically 5 m tall or less).

In well-developed floodplain stands, *Cornus sericea* dominates a tall-shrub layer, occasionally codominated by *Acer glabrum* or *Crataegus douglasii*, with lesser amounts of *Amelanchier alnifolia*. Under certain environmental conditions (e.g., heavy ungulate browsing, avalanche disturbance, excess wetness, or droughty site conditions), the shrub understory is much shorter. *Cornus sericea* (with up to 70% cover) is still dominant, with subdominant *Symphoricarpos albus* (averaging between 20 and 25% cover) frequently present. *Rhamnus alnifolia* and various *Ribes* spp., *Rosa* spp., and *Rubus* spp., along with *Mahonia repens* in the ground layer, are also characteristic of the diverse shrub understory.

The herbaceous layer is also diverse, composed primarily of a mix of tall mesic forbs and tall grasses, although no species has an average cover greater than 10%. The most frequently occurring tall forbs and grasses (often also the most abundant) are *Thalictrum*

occidentale, *Maianthemum stellatum*, *Elymus glaucus*, *Chamerion angustifolium*, and *Heracleum maximum*. There is occasionally an herbaceous ground layer dominated by herbs with moderate cover, such as *Viola glabella*, *Equisetum arvense*, *Aralia nudicaulis*, *Taraxacum officinale*, *Pteridium aquilinum*, and/or various *Galium* species. Litter cover is typically moderate to high, with lesser amounts of woody debris and exposed flood sediments on the ground.

GLOBAL VEGETATION: *Populus balsamifera* ssp. *trichocarpa* dominates the overstory with cover values ranging from approximately 30-90%. *Populus angustifolia*, *Populus tremuloides*, *Betula papyrifera*, and *Salix amygdaloides* are common subordinates. Several conifer species can be present with low cover (2-10%) in the upper canopy or as young saplings and are never consistently present. Conifers include *Tsuga heterophylla*, *Abies lasiocarpa*, *Pseudotsuga menziesii*, and *Picea engelmannii*. The shrub layer comprises at least 10% cover, with *Cornus sericea* diagnostic for the type and having anywhere from 1-90% cover; other shrub taxa with high constancy include *Symphoricarpos* spp., *Ribes* spp., *Rosa* spp., *Salix* spp., *Crataegus* spp., *Amelanchier alnifolia*, *Salix lutea*, and *Alnus incana*. There are no graminoids exhibiting high constancy, though any one of a number of disturbance-associated exotics can manifest high coverages. Native grasses such as *Calamagrostis canadensis*, *Calamagrostis rubescens*, *Carex geyeri*, *Glyceria striata*, and *Deschampsia caespitosa* can be abundant in undisturbed stands, but this is increasingly less common. *Maianthemum stellatum*, *Galium triflorum*, *Solidago canadensis*, and *Equisetum* spp. are the only forbs that exhibit even relatively high constancy across the range of the type.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> , <i>Populus tremuloides</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Betula papyrifera</i> , <i>Populus balsamifera</i> ssp. <i>trichocarpa</i>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Cornus sericea</i> , <i>Crataegus douglasii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Cornus sericea</i> , <i>Rhamnus alnifolia</i> , <i>Rubus parviflorus</i> , <i>Symphoricarpos albus</i>
Herb (field)	Forb	<i>Aralia nudicaulis</i> , <i>Taraxacum officinale</i> , <i>Thalictrum occidentale</i> , <i>Viola glabella</i>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i> , <i>Elymus glaucus</i> , <i>Poa pratensis</i>
Herb (field)	Fern or fern ally	<i>Equisetum arvense</i> , <i>Pteridium aquilinum</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> , <i>Populus tremuloides</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Cornus sericea</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Symphoricarpos albus</i>
Herb (field)	Forb	<i>Taraxacum officinale</i>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i> , <i>Elymus glaucus</i> , <i>Poa pratensis</i>
Herb (field)	Fern or fern ally	<i>Equisetum arvense</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Amelanchier alnifolia*, *Chamerion angustifolium*, *Cornus sericea*, *Elymus glaucus*, *Galium triflorum*, *Heracleum maximum*, *Maianthemum stellatum*, *Picea engelmannii*, *Populus balsamifera* ssp. *trichocarpa*, *Populus tremuloides*, *Rubus parviflorus*, *Symphoricarpos albus*, *Vicia americana*

GLOBAL: *Populus balsamifera* ssp. *trichocarpa*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Bromus inermis*, *Cirsium arvense*, *Cynoglossum officinale*, *Medicago lupulina*, *Phalaris arundinacea*, *Phleum pratense*, *Poa palustris*, *Trifolium pratense*, *Trifolium repens*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4 (23-Feb-2004). Association rank has been changed from G3? to G3G4 on the basis of this type's broad geographic distribution and the fact that within local landscapes, say western Montana, it is relatively common. A thorough crosswalk of this type across its range of distribution is needed; there may be local variations in composition and ecology that would bear recognition of separate associations. Threats to this type include floodplain harvesting of cottonwood and over-browsing from livestock and wildlife, which both find *Cornus sericea* extremely palatable to the point of extirpating it from local floodplain landscapes. The more serious over-browsing consequences are reduced diversity, the introduction of weedy species, and the increase in unpalatable native taxa such as *Symphoricarpos occidentalis*, *Ribes* spp., and *Urtica dioica*.

CLASSIFICATION**STATUS:** Standard**CLASSIFICATION CONFIDENCE:** 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This association is easily recognized and broadly distributed with some stands occurring on avalanche chutes; although avalanches may keep stature low, abundant moisture and a high water table are more important factors in creating a consistent vegetative response. Although it was considered, a decision was made not to put the stands with avalanche chutes into a separate association. This association description will need to be reviewed and carefully edited to reflect variation in site parameters, and the field key includes this type in both the tree-dominated and the shrubland keys. Also, this association is closely related to *Populus balsamifera* ssp. *trichocarpa* - Conifer / *Cornus sericea* Forest (CEGL005905), but it differs by having lower conifer cover.

GLOBAL COMMENTS: In the concept for this association, stands containing both *Populus balsamifera* ssp. *trichocarpa* and *Populus tremuloides* are defined as belonging to a *Populus balsamifera* ssp. *trichocarpa* alliance, rather than the *Populus tremuloides* Forest Alliance (A.274). This is because *Populus balsamifera* ssp. *trichocarpa* generally has a narrower ecological amplitude and better serves as a diagnostic species. More than half of the identified stands in Glacier National Park have less than 60% tree canopy cover, which means that a significant portion of this association qualifies physiognomically as woodland, rather than as forest as currently classified. There are strongly discordant criteria as to how much *Cornus sericea* cover should be represented (ranging from 1-25%) for a stand to be considered a member of this association, however, if *Cornus* is the dominant, or at least the most abundant of all shrubs present, it would fall into this type. [SVC comment May 2005: the above type (POPBST / CORSER) as we have defined it could be a problem when this type (already in NVCS for CA, ID, MT, OR, WA) is compared carefully against P.As. already in NVCS because there exists POPBST / ALNINC (ID, OR, WA), POPBST / CRADOU (ID, OR, WA) POPBST / SALIX SPP. (AK): SVC has little doubt that using these shrub species as alternative indicators achieves (my) assumed goal of aggregating all plots with a particular ecological niche into a given type. If we were to take a strict "existing vegetation" approach, then perhaps this type should be fragmented into what might be its component "existing veg" types. From Hansen et al. (1995) description, almost all our plots, including AA plots, would fit here by the criterion of CORSER present at 1%.]

GLOBAL SIMILAR ASSOCIATIONS:

- *Picea engelmannii* / *Cornus sericea* Woodland (CEGL002677)
- *Populus balsamifera* ssp. *trichocarpa* / *Cornus sericea* / *Carex obnupta* Forest (CEGL002844)
- *Populus tremuloides* / *Cornus sericea* Forest (CEGL000582)
- *Pseudotsuga menziesii* / *Cornus sericea* Woodland (CEGL000899)

GLOBAL RELATED CONCEPTS:

- *Populus balsamifera* ssp. *trichocarpa* / *Alnus incana* - *Cornus sericea* ssp. *sericea* Association (Crowe et al. 2004) B
- *Populus trichocarpa* / *Cornus stolonifera* Community Type (Hall and Hansen 1997) =
- *Populus trichocarpa* / *Cornus stolonifera* Community Type (Hansen et al. 1995) =
- *Populus trichocarpa* / *Cornus stolonifera* Forest (Kovalchik 1993) =
- *Populus trichocarpa* / *Cornus stolonifera* Forest (Evans 1989a) =
- *Populus trichocarpa* / *Cornus sericea* (Bourgeron and Engelking 1994) =
- Black cottonwood - Engelmann spruce / mountain alder - red-osier dogwood community type (Kovalchik 1987) =
- DRISCOLL FORMATION CODE:I.B.3.d. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is easily recognized and broadly distributed throughout Glacier National Park, and in Waterton Lakes National Park as well.

GLOBAL RANGE: This association has been documented from Washington south to northern California and eastward to Idaho, Montana and Wyoming. It also occurs north along the Front Range of Montana into southern Alberta, Canada.

NATIONS: CA, US**STATES/PROVINCES:** AB, CA:S1?, ID:S3, MT:S3?, OR:S2, WA:S2?, WY**USFS ECOREGIONS:** 342B:CC, 342C:CC, 342H:CC, 342I:CC, M242C:CC, M261G:CC, M331A:CC, M331D:CC, M332A:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC**FEDERAL LANDS:** NPS (Glacier, Grand Teton); PC (Waterton Lakes); USFS (Winema)**ELEMENT SOURCES****WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.132, GLAC.15, GLAC.2006, GLAC.2044, GLAC.2085, GLAC.22, GLAC.2275, GLAC.2276, GLAC.2280, GLAC.2284, GLAC.2298, GLAC.23, GLAC.27, GLAC.51, GLAC.66, GLAC.2061, GLAC.2642, GLAC.2048, GLAC.2062, WATE.5015, WATE.5084, WATE.9008.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper, mod. G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Caicco 1988, Crowe et al. 2004, Driscoll et al. 1984, Evans 1989a, Hall and Hansen 1997, Hansen et al. 1991, Hansen et al. 1995, IDCDC 2005, Kagan et al. 2000, Kovalchik 1987, Kovalchik 1993, MTNHP 2002b, Manning and Padgett 1991, Titus et al. 1998, Walford et al. 2001, Western Ecology Working Group n.d.

***Populus tremuloides* Temporarily Flooded Forest Alliance**

***Populus tremuloides* / *Cornus sericea* Forest**

QUAKING ASPEN / RED-OSIER DOGWOOD FOREST

IDENTIFIER: C EGL000582

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
Alliance	<i>Populus tremuloides</i> Temporarily Flooded Forest Alliance (A.300)
Alliance (English name)	Quaking Aspen Temporarily Flooded Forest Alliance
Association	<i>Populus tremuloides</i> / <i>Cornus sericea</i> Forest
Association (English name)	Quaking Aspen / Red-osier Dogwood Forest

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Avalanche Chute Shrubland (CES306.801)
Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association occurs in scattered locations throughout the mountains of Colorado, Montana, Utah, Idaho, Oregon, Washington, Alberta, and possibly California. This is a moist forest often located in narrow ravines where upland *Populus tremuloides* forests intermix with the riparian shrub vegetation. It occurs from 732-2500 m (2400-8200 feet) in elevation. It also typically occurs on alluvial terraces adjacent to streams and rivers, or near springs and seeps. Stands are located on moist soil, but are not restricted to riparian or wetland habitats. Water tables average 30 cm below the surface, but water depths in several stands were greater than 1 meter. Coarse-textured soils, moderate to steep gradients, and high coarse fragments provide for rapid movement of highly aerated groundwater. Soils range from very rocky and shallow sands to deeper sandy clay loams and silty clay loams. Stands have a deciduous tree canopy that is dominated by *Populus tremuloides* with a shrub layer dominated by *Cornus sericea*, often with several other shrub species, such as *Alnus incana*, *Betula occidentalis*, *Lonicera involucrata*, and several *Salix* spp., including *Salix geyeriana*, *Salix boothii*, *Salix lucida* ssp. *lasiandra* (= *Salix lasiandra*), or *Salix lutea*. The herbaceous undergrowth is relatively sparse, but often diverse with *Equisetum arvense*, *Maianthemum stellatum*, *Heracleum maximum*, *Actaea rubra*, and *Galium triflorum*. *Cornus sericea* is at least as abundant as other shrubs in the stand, and is often the most abundant shrub present. The obligate riparian shrub species distinguish this association from upland *Populus tremuloides* communities.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is known from 1198 to 1490 m (3929-4885 feet) elevation on low-angle toeslopes and midslopes, as well as in swales and on basin floors. The association is found on glacio-fluvial and lacustrine deposits, as well as on shale-derived substrates. Although seasonal flooding is indicated for at least a portion of the stands, all are well-drained by summer. Stands are located on moist soil, but are not restricted to riparian or wetland habitats. Soils are dark brown to black with very little rock or gravel, and predominantly clay loams in texture.

GLOBAL ENVIRONMENT: This is a moist forest often located in narrow ravines where upland *Populus tremuloides* forests intermix with the riparian shrub vegetation. It occurs from 732-2500 m (2400-8200 feet) in elevation. It also typically occurs on alluvial terraces adjacent to streams and rivers, or near springs and seeps. In the intermountain basin area, stands are located on moist soil, but are not necessarily restricted to riparian or wetland habitats. Water tables average 30 cm below the surface, but water depths in several stands were greater than 1 meter. Coarse-textured soils, moderate to steep gradients, and high coarse fragments provide for

rapid movement of highly aerated groundwater. Soils range from very rocky and shallow sands to deeper sandy clay loams and silty clay loams.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This association is characterized by mature *Populus tremuloides*, averaging 45% cover, and a diverse mix of shrubs of variable heights. Younger *Populus tremuloides* are also present in the subcanopy layers. *Picea engelmannii* of various age classes is also sometimes present, but only with low cover. The short-shrub layer is composed mainly of *Cornus sericea*, *Rubus parviflorus*, and *Symphoricarpos* spp., each with average cover ranging from 15 to 20%. Tall *Crataegus douglasii* and shorter *Lonicera involucrata* each have similar cover but lower constancy. *Amelanchier alnifolia* is often present but has less than 10% cover. The forb layer is quite diverse, with most species averaging less than 5% cover. *Prosartes* spp. (= *Disporum* spp.), an exception, is present in 40 to 60% of the stands, averaging 23% cover. *Osmorhiza occidentalis* and *Vicia americana* are usually present but with low cover. More abundant species with lower constancy include tall forbs (especially *Urtica dioica* and *Heracleum maximum*) and *Viola canadensis* in the ground layer. *Calamagrostis canadensis* is present in two-thirds of stands with trace cover; graminoids are otherwise rare in this association. The ground cover is primarily duff, although woody debris sometimes has moderate cover. Moss cover ranges from 5 to 20%.

GLOBAL VEGETATION: This association is characterized by an overstory canopy of *Populus tremuloides*. Other trees occasionally present include *Picea engelmannii*, *Populus balsamifera* ssp. *trichocarpa*, *Juniperus scopulorum*, and *Betula papyrifera*. The shrub layer is dominated by *Cornus sericea* (with greatest cover or at least as abundant as any other shrubs present). Other shrubs that may be present include *Alnus incana*, *Amelanchier alnifolia*, *Crataegus douglasii*, *Lonicera involucrata*, *Symphoricarpos* spp., and several *Salix* spp., including *Salix geeyeriana*, *Salix lucida* ssp. *lasiandra* (= *Salix lasiandra*), or *Salix lutea*. The herbaceous undergrowth is relatively sparse, usually due to the thick shading of the shrub layer. Typical species include *Equisetum arvense*, *Galium triflorum*, *Heracleum maximum*, *Maianthemum stellatum*, *Actaea rubra*, *Aconitum columbianum*, and *Viola* spp.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i> , <i>Crataegus douglasii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Cornus sericea</i> , <i>Lonicera involucrata</i> var. <i>involucrata</i> , <i>Rubus parviflorus</i>
Herb (field)	Dwarf-shrub	<i>Cornus canadensis</i>
Herb (field)	Forb	<i>Heracleum maximum</i> , <i>Urtica dioica</i> , <i>Viola canadensis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Cornus sericea</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Cornus sericea*, *Crataegus douglasii*, *Lonicera involucrata* var. *involucrata*, *Osmorhiza occidentalis*, *Populus tremuloides*

GLOBAL: *Cornus sericea*, *Populus tremuloides*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Phleum pratense*, *Poa pratensis*, *Taraxacum officinale*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: *Cornus sericea*, *Lonicera involucrata*, and *Crataegus douglasii* are indicators; a stand needs 5% of any one of these to place it in this association.

GLOBAL COMMENTS: Padgett et al. (1989) mention two stands dominated by *Populus tremuloides* and *Cornus sericea* in the Wasatch Plateau and the Abajo Mountains of Utah [see Misc. Unclassified Tall Deciduous Tree-Dominated Communities (Padgett et al. 1989, p. 47)]. [SVC notes that much the same comments apply here as to POPBST / CORSER; there exists POPTRE / ALNINC - SALIX SPP (OR), POPTRE / LONINV (WY) and, of course, POPTRE / CORSER (CA, ID, MT, WA, G4); we will go with shrub species as habitat indicators rather than try to describe all the existing vegetation variation based on few and incomplete plots.]

GLOBAL SIMILAR ASSOCIATIONS:

- *Picea engelmannii* / *Cornus sericea* Woodland (CEGL002677)
- *Populus balsamifera* ssp. *trichocarpa* / *Cornus sericea* Forest (CEGL000672)
- *Pseudotsuga menziesii* / *Cornus sericea* Woodland (CEGL000899)

GLOBAL RELATED CONCEPTS:

- *Populus tremuloides* / *Alnus incana* - *Cornus stolonifera* (Crowe and Clausnitzer 1997) =
- *Populus tremuloides* / *Cornus sericea* Forest (Crawford 2003) =
- *Populus tremuloides* / *Cornus sericea* (Kittel et al. 1999b) =
- *Populus tremuloides* / *Cornus sericea* Forest (Carsey et al. 2003a) =
- *Populus tremuloides* / *Cornus sericea* ssp. *sericea* Association (Crowe et al. 2004) =
- *Populus tremuloides* / *Cornus stolonifera* Association (Kovalchik 1993) =
- *Populus tremuloides* / *Cornus stolonifera* Habitat Type (Hansen et al. 1995) =
- *Populus tremuloides*/ *Cornus sericea* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: In Glacier National Park, the association is found west of the Continental Divide in the Fish Creek drainage and east of the Divide in the Many Glacier basin. In Waterton Lakes National Park, the association is found in the Belly River and Waterton Lake valleys.

GLOBAL RANGE: This association occurs in Colorado, Montana, Utah, Idaho, Oregon, Washington, Alberta, and possibly California.

NATIONS: CA, US

STATES/PROVINCES: AB, CA?, CO:S2S3, ID:S3, MT:S3, OR:S2?, UT, WA:S1S2

USFS ECOREGIONS: M331G:CC, M331H:CC, M332A:C?, M332C:CC, M332G:CC, M333A:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes); USFS (San Juan, Wallowa-Whitman)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2079, GLAC.54, WATE.5017, WATE.5138, WATE.9023.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Crawford 2001, Crawford 2003, Crowe and Clausnitzer 1997, Crowe et al. 2004, Driscoll et al. 1984, Evans 1989a, Hansen et al. 1990, Hansen et al. 1991, Hansen et al. 1995, IDCDC 2005, Jankovsky-Jones et al. 2001, Kagan et al. 2000, Kittel et al. 1994, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1993, Kovalchik 2001, MTNHP 2002b, Manning and Padgett 1995, Padgett et al. 1989, Richard et al. 1996, Titus et al. 1998, WNHP unpubl. data, Western Ecology Working Group n.d.

I.B.2.N.e. Seasonally flooded cold-deciduous forest

***Populus tremuloides* Seasonally Flooded Forest Alliance**

***Populus tremuloides* / *Calamagrostis canadensis* Forest**

QUAKING ASPEN / BLUEJOINT FOREST

IDENTIFIER: CEGL000574

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Seasonally flooded cold-deciduous forest (I.B.2.N.e.)
Alliance	<i>Populus tremuloides</i> Seasonally Flooded Forest Alliance (A.340)
Alliance (English name)	Quaking Aspen Seasonally Flooded Forest Alliance
Association	<i>Populus tremuloides</i> / <i>Calamagrostis canadensis</i> Forest
Association (English name)	Quaking Aspen / Bluejoint Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)

ELEMENT CONCEPT

GLOBAL SUMMARY: These lush, deciduous, riparian forests occur in the Rocky Mountains of Montana, Idaho, Colorado, and possibly Wyoming. Elevations range from 850 to 3170 m (2800-10,400 feet). Sites are riparian, occurring along stream terraces or floodplains, or upland on wet flats, benches, and gentle toeslopes where groundwater emerges as seeps. Substrates are often coarse-loamy soils over coarse alluvium. Stands have a moderately dense to dense tree canopy that is dominated by *Populus tremuloides*. Other trees present with low cover (<10%) may include *Pinus contorta*, or *Populus balsamifera ssp. trichocarpa*. The shrub layer is sparse to moderate (cover ranging from 0 to 30% cover) and composed of any of a variety of shrubs, such as *Alnus incana*, *Rosa* spp., *Amelanchier alnifolia*, *Cornus sericea*, and several *Salix* spp., including *Salix geyeriana*, *Salix bebbiana*, and *Salix monticola*. Shorter shrub species present include *Symphoricarpos albus*, *Ribes lacustre*, and *Rosa acicularis*. The herbaceous layer is moderately dense to dense depending on shrub cover. It is dominated by the wet-site perennial graminoid *Calamagrostis canadensis*. Other frequently occurring species include *Bromus ciliatus*, *Carex siccata* (= *Carex foenea*), *Equisetum arvense*, *Geranium richardsonii*, *Heracleum* spp., *Ligusticum porteri*, *Maianthemum stellatum*, *Mertensia ciliata*, *Senecio triangularis*, and *Viola* spp. These are usually in low abundance but occasionally can have as much as 30% cover individually. The introduced species *Poa pratensis*, *Poa palustris*, and *Taraxacum officinale* may be present. The abundant and near uniform cover of the *Calamagrostis canadensis*-dominated herbaceous layer in the understory separates this type from other *Populus tremuloides* forests.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This forest association occupies moist valley bottomlands, toeslopes and low-level benches on both sides of the Continental Divide. Topography may be flat or gently sloped. When sloped, the aspect is variable, the critical factor being abundant soil moisture via subirrigation. Stands were documented on northwest-, northeast-, and east-facing slopes. Elevations range from 1300-1450 m (4264-4756 feet). Parent material is primarily glacio-fluvial deposits but may be derived from glacial till in some situations. Soil is a silty clay, clay or silty clay loam with very little gravel or rock. The soil is typically deep, moist and well-developed. Ground cover is primarily litter, but wood and small rock may account for 1-10% cover.

GLOBAL ENVIRONMENT: These lush deciduous forests occur in the Rocky Mountains of Montana, Idaho, Colorado, and possibly Wyoming. Elevations range from 850 to 3170 m (2800-10,400 feet). Sites are riparian, occurring along stream terraces or floodplains, or upland on wet flats, benches, and gentle toeslopes where groundwater seeps. Substrates range from coarse loamy soils to silty clay, clay or silty clay loams with very little gravel or rock. The soil is typically deep, moist and well-developed.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The upper tree canopy cover typically ranges from 30-50% in this forest association, with trees 5-15 m tall. More mature stands may have canopy cover as high as 70%; tree heights evidence a marked dichotomy east and west of the Continental Divide with those west of the divide ranging from 20-35 m tall and the wind-impacted trees on the east side never taller than 18 m. All stands are dominated by *Populus tremuloides*, with an average canopy cover of 40%. *Pinus contorta* may be present in small amounts (less than 10% canopy cover) in some stands. The subcanopy layer is sparse, with a total canopy cover of 5-10%. This layer is also dominated by *Populus tremuloides*, but may contain small amounts of other species, such as *Populus balsamifera ssp. trichocarpa*. Tall-shrub cover is typically less than 30%, and may be nonexistent in some stands. Common tall-shrub species include *Amelanchier alnifolia* and *Cornus sericea*. Short-shrub cover is also less than 30%. *Symphoricarpos albus* had 100% constancy in sampled plots, but was present in relatively low amounts (less than 10% cover). Other short-shrub species, such as *Ribes lacustre* and *Rosa acicularis*, are usually present in trace amounts, if present at all. Dwarf-shrubs are rarely observed in these stands, although *Rubus pubescens* was documented in one plot with 23% cover.

Herbaceous diversity and cover are high, with cover ranging from 90-100% in most stands. Occasionally herbaceous canopy cover is around 70%. *Calamagrostis canadensis* is the most abundant herbaceous species, averaging 29% canopy cover. The remaining canopy cover is contributed by a wide variety of species, including *Vicia americana*, *Lathyrus ochroleucus*, and *Galium boreale*. In some

stands, moist-site species, such as *Heracleum maximum*, *Senecio hydrophiloides*, or *Geranium richardsonii*, may account for 10-30% canopy cover. Exotic invasion is relatively high in these stands compared to most plant associations within the International Peace Park. *Taraxacum officinale* was documented in all plots, though cover was very low. *Phleum pratense* and *Poa pratensis* had 60% and 40% constancy, respectively. Canopy cover for both of these species was 5-10%, but in reconnaissance these exotic grasses were noted to be dominant over *Calamagrostis canadensis*, where disturbance (primarily cattle trespass) was intensive and prolonged.

GLOBAL VEGETATION: Stands have a moderately dense to dense tree canopy that is dominated by *Populus tremuloides*. Other trees present with low cover (<10%) may include *Pinus contorta* or *Populus balsamifera ssp. trichocarpa*. The shrub layer is sparse to moderately dense (cover ranging from 0 to 50% cover), and composed of a variety of shrubs such as *Alnus incana*, *Rosa* spp., *Symphoricarpos* spp., *Amelanchier alnifolia*, *Cornus sericea*, and several *Salix* spp., including *Salix geeyeriana*, *Salix bebbiana*, and *Salix monticola*. Shorter shrub species present include *Symphoricarpos albus*, *Ribes lacustre*, and *Rosa acicularis*. The herbaceous layer is moderately dense to dense depending on shrub cover. It is dominated by the wet-site perennial graminoid *Calamagrostis canadensis*. Other common species include *Bromus ciliatus*, *Carex siccata* (= *Carex foenea*), *Equisetum arvense*, *Geranium richardsonii*, *Heracleum* spp., *Ligusticum porteri*, *Maianthemum stellatum*, *Mertensia ciliata*, *Senecio triangularis*, *Senecio hydrophiloides*, *Viola* spp., *Vicia americana*, *Lathyrus ochroleucus*, and *Galium boreale*. These are usually low in cover, but occasionally occur with as much as 30% cover individually. Introduced species *Poa pratensis*, *Poa palustris*, and *Taraxacum officinale* may be present. The abundance and nearly uniform cover of the *Calamagrostis canadensis*-dominated herbaceous layer in the understory separates this type from other *Populus tremuloides* forests.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Symphoricarpos albus</i>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Elymus glaucus*, *Galium boreale*, *Lathyrus ochroleucus*, *Populus tremuloides*, *Symphoricarpos albus*, *Vicia americana*

GLOBAL: *Calamagrostis canadensis*, *Populus tremuloides*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3 (29-Dec-1999). This riparian association is known from the mountains in eastern Washington and Oregon, southeastern Idaho, western Montana, Colorado, and western Wyoming. While seemingly widespread, it appears to be rare, with fewer than 100 occurrences, and is found only locally throughout much of its range. Sites are uncommon and small in size. The trend is stable; however, improper grazing by livestock can degrade the condition of these stands by reducing the abundance of palatable species. Additional threats may include introduce plants species and possibly logging.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Calamagrostis canadensis* Forest (CEGL000300)
- *Pinus contorta* / *Calamagrostis canadensis* Forest (CEGL000138)
- *Populus balsamifera ssp. trichocarpa* - *Populus tremuloides* - Conifer / *Calamagrostis canadensis* Forest (CEGL005909)
- *Populus balsamifera ssp. trichocarpa* / *Calamagrostis canadensis* Forest [Provisional] (CEGL005845)

- *Populus tremuloides* / *Carex aquatilis* var. *aquatilis* Forest (CEGL003442)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Calamagrostis canadensis* Habitat Type (Hess and Alexander 1986) I
- *Populus tremuloides* / *Calamagrostis canadensis* (Huckaby and Moir 1998) =
- *Populus tremuloides* / *Calamagrostis canadensis* (Crowe and Clausnitzer 1997) =
- *Populus tremuloides* / *Calamagrostis canadensis* (Baker 1984a) =
- *Populus tremuloides* / *Calamagrostis canadensis* Association (Crowe et al. 2004) =
- *Populus tremuloides* / *Calamagrostis canadensis* Habitat Type (Hansen et al. 1995) =
- *Populus tremuloides*/ *Calamagrostis canadensis* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.B.3.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association occupies a variety of moist sites within valleys east and west of the Continental Divide in Glacier National Park. Specifically, it was documented in the Belly River and Logging Creek drainages. The association also occurs in Waterton Lakes National Park.

GLOBAL RANGE: This association occurs in the mountains of eastern Washington and Oregon, Montana, Idaho, Colorado, and possibly Wyoming. It also is found in southern Alberta, Canada.

NATIONS: CA, US

STATES/PROVINCES: AB, CO:S3, ID:S2, MT:S2, OR:S1, WA:S1, WY?

USFS ECOREGIONS: M331A:CC, M331E:CC, M331F:CC, M331I:CC, M332C:CC, M332D:CC, M332E:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier, Rocky Mountain); PC (Waterton Lakes); USFS (Arapaho-Roosevelt, Bighorn, Umatilla, Wallowa-Whitman)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.71, GLAC.128, GLAC.133, GLAC.2253, WATE.4037, WATE.5032.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz and G. Kittel, mod. S.L. Neid

REFERENCES: Baker 1984a, Boggs et al. 1990, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Crowe and Clausnitzer 1997, Crowe et al. 2004, Driscoll et al. 1984, Hansen et al. 1991, Hansen et al. 1995, Hess and Alexander 1986, Huckaby and Moir 1998, IDCDC 2005, Jones and Ogle 2000, Kagan et al. 2000, MTNHP 2002b, Mutel 1973, Powell 1988a, Titus et al. 1998, Western Ecology Working Group n.d.

I.C.3.N.a. Mixed needle-leaved evergreen - cold-deciduous forest

***Abies lasiocarpa* - *Populus tremuloides* Forest Alliance**

***Populus tremuloides* - *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Forest
QUAKING ASPEN - SUBALPINE FIR - ENGELMANN SPRUCE / CLASPING TWISTED-STALK
FOREST**

IDENTIFIER: CEGL005908

NVC Classification

Physiognomic Class	Forest (I)
Physiognomic Subclass	Mixed evergreen-deciduous forest (I.C.)
Physiognomic Group	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.)
Physiognomic Subgroup	Natural/Semi-natural mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.)
Formation	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.a.)
Alliance	<i>Abies lasiocarpa</i> - <i>Populus tremuloides</i> Forest Alliance (A.422)
Alliance (English name)	Subalpine Fir - Quaking Aspen Forest Alliance
Association	<i>Populus tremuloides</i> - <i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Streptopus amplexifolius</i> Forest

Association (English name) Quaking Aspen - Subalpine Fir - Engelmann Spruce / Clasping Twisted-stalk Forest

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)

ELEMENT CONCEPT

GLOBAL SUMMARY: This mesic to subhygric, montane to lower subalpine association is located on cool, moist toeslopes to midslopes on both sides of the Continental Divide of Glacier National Park, Montana. It occurs on mostly moderate to gentle toeslopes and midslopes between 1450 and 1830 m (4760-6000 feet) elevation on the east side of the Continental Divide and near 1120 m (3680 feet) west of the Continental Divide. This type generally occurs on north- and west-facing slopes; it can also occur on south-facing slopes. Soils are well- to somewhat poorly drained silty clay loams that are medium to dark in color and have little rock content. These are also classified as Orthic Grey Luvisols and Orthic Regosols within Waterton Lakes National Park and occur on glacio-fluvial and morainal landforms. Litter comprises 40-75% of the ground cover. This is a moist, mixed evergreen-deciduous wet forest. Tree canopy ranges from 10-70%. *Picea engelmannii*, *Populus tremuloides*, *Populus balsamifera ssp. trichocarpa*, and *Abies lasiocarpa* are the most frequent tree species. *Pinus contorta* and *Betula papyrifera* also occur infrequently in the overstory. Tree height averages 10-20 m, although trees can reach 35 m in height, and stand age ranges from 120 to 160 years. Shrub cover is variable, ranging between 0 and 70%, and includes *Rubus parviflorus*, *Cornus sericea*, *Amelanchier alnifolia*, *Ribes lacustre*, *Lonicera utahensis*, *Acer glabrum*, *Salix geyeriana*, and *Alnus viridis ssp. sinuata*. Other shrubs less frequently encountered include *Symphoricarpos albus*, *Symphoricarpos occidentalis*, *Shepherdia canadensis*, *Spiraea betulifolia*, and *Rosa acicularis*. Herbaceous cover is high, ranging from 40-90%. The diagnostic forb for this association is *Streptopus amplexifolius*, which is always accompanied by other species such as *Senecio triangularis*, *Mitella pentandra*, *Mitella breweri*, *Gymnocarpium dryopteris*, *Angelica arguta*, *Athyrium filix-femina*, *Trautvetteria caroliniensis*, and *Trollius laxus*. Dominant species include *Thalictrum occidentale* and *Heracleum maximum*, although *Actaea rubra*, *Chamerion angustifolium*, *Eucephalus engelmannii*, *Geranium richardsonii*, *Maianthemum racemosum ssp. amplexicaule*, *Fragaria virginiana*, and *Lathyrus ochroleucus* are commonly present. *Maianthemum stellatum*, *Arnica cordifolia*, *Eurybia conspicua* (= *Aster conspicuus*), *Osmorhiza occidentalis*, *Bromus vulgaris*, *Veratrum viride*, and *Viola canadensis* are also relatively common. Nonvascular cover ranges from 5-20%.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This mesic to subhygric, montane to lower subalpine association is located on cool, moist toeslopes to midslopes on both sides of the Continental Divide. It occurs on mostly moderate to gentle toeslopes and midslopes between 1450 and 1830m (4760-6000 feet) elevation on the east side of the Continental Divide and near 1120 m (3680 feet) west of the Continental Divide. This type generally occurs on north- and west-facing slopes; it can also occur on south-facing slopes. Soils are well- to somewhat poorly drained silty clay loams that are medium to dark in color and have little rock content. These are also classified as Orthic Grey Luvisols and Orthic Regosols within Waterton Lakes National Park and occur on glacio-fluvial and morainal landforms. Litter comprises 40-75% of the ground cover.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This is a moist, mixed evergreen-deciduous wet forest. Tree canopy ranges from 10-70%. *Picea engelmannii* (1-20%), *Populus tremuloides* (10-40%), *Populus balsamifera ssp. trichocarpa* (1-30%), and *Abies lasiocarpa* (10-25%) are the most frequent tree species. *Pinus contorta* and *Betula papyrifera* also occur infrequently in the overstory. Tree height averages 10-20 m, although trees can reach 35 m in height, and stand age ranges from 120 to 160 years. Shrubs cover is variable, ranging between 0 and 70%, and includes *Rubus parviflorus*, *Cornus sericea*, *Amelanchier alnifolia*, *Ribes lacustre*, *Lonicera utahensis*, *Acer glabrum*, *Salix geyeriana*, and *Alnus viridis ssp. sinuata*. Other shrubs less frequently encountered include *Symphoricarpos albus* with 3-12 % cover and *Symphoricarpos occidentalis* with 3-30% cover. *Shepherdia canadensis*, *Spiraea betulifolia*, and *Rosa acicularis* may also have conspicuous cover.

Herbaceous cover is high, ranging from 40-90% with heights from <0.5-1 m. The diagnostic forb for this association is *Streptopus amplexifolius*, which is often in association, in varying combinations, with other species, such as *Senecio triangularis*, *Mitella pentandra*, *Mitella breweri*, *Gymnocarpium dryopteris*, *Angelica arguta*, *Athyrium filix-femina*, *Trautvetteria caroliniensis*, and *Trollius laxus*. Dominant species include *Thalictrum occidentale* and *Heracleum maximum* with 8% average cover (ranging from 1-15%), although *Actaea rubra*, *Chamerion angustifolium*, *Eucephalus engelmannii*, *Geranium richardsonii*, *Maianthemum racemosum ssp. amplexicaule*, *Fragaria virginiana*, and *Lathyrus ochroleucus* are commonly present with 1-5% cover. *Maianthemum stellatum*, *Arnica cordifolia*, *Eurybia conspicua* (= *Aster conspicuus*), *Osmorhiza occidentalis*, *Bromus vulgaris*, *Veratrum viride*, and *Viola canadensis* are also relatively common with 5% average cover. Other, lower constancy species include *Bromus carinatus*, *Angelica dawsonii*, *Melica subulata*, *Melica smithii*, and *Symphyotrichum ciliolatum* (= *Aster ciliolatus*). Nonvascular cover ranges from 5-20%.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES**WATERTON-GLACIER INTERNATIONAL PEACE PARK**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Tree canopy	Broad-leaved deciduous tree	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> , <i>Populus tremuloides</i>
Tree subcanopy	Needle-leaved tree	<i>Picea engelmannii</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus parviflorus</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Symphoricarpos albus</i> , <i>Symphoricarpos occidentalis</i>
Herb (field)	Forb	<i>Actaea rubra</i> , <i>Chamerion angustifolium</i> , <i>Heracleum maximum</i> , <i>Thalictrum occidentale</i>
Herb (field)	Graminoid	<i>Bromus carinatus</i> , <i>Bromus vulgaris</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Actaea rubra*, *Angelica arguta*, *Athyrium filix-femina*, *Chamerion angustifolium*, *Gymnocarpium dryopteris*, *Mitella breweri*, *Mitella pentandra*, *Picea engelmannii*, *Populus balsamifera* ssp. *trichocarpa*, *Populus tremuloides*, *Rubus parviflorus*, *Senecio triangularis*, *Streptopus amplexifolius*, *Thalictrum occidentale*, *Trautvetteria caroliniensis*, *Trollius laxus*, *Veratrum viride*

GLOBAL:**OTHER NOTEWORTHY SPECIES**

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Angelica dawsonii*, *Phleum pratense*, *Poa pratensis*, *Taraxacum officinale*

GLOBAL:**CONSERVATION STATUS RANK**

GLOBAL RANK & REASONS: G2G3 (9-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This is a successional forest type, occupying sites classified as the *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Habitat Type, *Streptopus amplexifolius* Phase (Hansen et al. 1995). It is defined by having at least 25% of the canopy cover comprised of either *Populus tremuloides* or *Populus balsamifera* ssp. *trichocarpa*.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Forest (CEGL000336)

GLOBAL RELATED CONCEPTS:**ELEMENT DISTRIBUTION**

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is infrequent but was sampled in Glacier National Park, Waterton Lakes National Park, and on the Blackfoot Reservation. In Glacier National Park, stands were located within the Belly River subdistrict near the Belly River Ranger Station, in the Many Glacier subdistrict near Slide Lake, and in the Lake McDonald subdistrict on the Going-To-The-Sun Road near Haystack Creek. On the Blackfoot Reservation, it has been documented along the east Chief Mountain Road. In Waterton Lakes National Park, this type occurs in the Belly River watershed in Lookout Butte 1ecosite and within the Dungraven Creek watershed in the Lookout Butte 2 ecosite.

GLOBAL RANGE:

NATIONS: CA, US

STATES/PROVINCES: AB, MT

USFS ECOREGIONS: M332C:CC

FEDERAL LANDS: BIA (Blackfeet); NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.134, GLAC.192, GLAC.245, GLAC.2043, WATE.5083, WATE.5148.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Western Ecology Working Group n.d.

II. WOODLAND

II.A.4.N.a. Rounded-crowned temperate or subpolar needle-leaved evergreen woodland

Pinus albicaulis Woodland Alliance

Pinus albicaulis - (*Abies lasiocarpa*) / *Carex geyeri* Woodland

WHITEBARK PINE - (SUBALPINE FIR) / GEYER'S SEDGE WOODLAND

IDENTIFIER: C EGL000754

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
Alliance	<i>Pinus albicaulis</i> Woodland Alliance (A.531)
Alliance (English name)	Whitebark Pine Woodland Alliance
Association	<i>Pinus albicaulis</i> - (<i>Abies lasiocarpa</i>) / <i>Carex geyeri</i> Woodland
Association (English name)	Whitebark Pine - (Subalpine Fir) / Geyer's Sedge Woodland

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Subalpine Woodland and Parkland (CES306.807)

ELEMENT CONCEPT

GLOBAL SUMMARY: This central and northern Rocky Mountain woodland association occurs in northwestern Wyoming, western Montana, Idaho and northeastern Oregon. Stands are found in the upper subalpine zone at 2040 to 2865 m (6685-9400 feet) elevation on dry sites that are typically on steep, upper slopes with southerly or westerly aspects or on ridgetops. It also occurs on less exposed, gentle slopes and benches. Substrates are often rocky coarse-textured soils derived from volcanic (pumice), sedimentary, granitic or granitic-gneiss parent materials. The vegetation is characterized by an open tree canopy of *Pinus albicaulis* that is typically multi-stemmed (and stunted) on exposed, high-elevation sites, sometimes with occasional *Pinus flexilis* trees. On less exposed sites, the upper canopy may include scattered *Pinus contorta*, or *Abies lasiocarpa* may be present with *Abies lasiocarpa* or *Pseudotsuga menziesii* present in the subcanopy and understory. The understory is characterized by a relatively sparse to moderately dense (15-60% cover) herbaceous layer that is typically dominated by *Carex geyeri*. Other common graminoids include *Achnatherum occidentale* (= *Stipa occidentalis*), *Carex rossii*, *Elymus glaucus*, *Festuca idahoensis*, *Poa nervosa*, and *Trisetum spicatum*. Associated forbs, such as *Achillea millefolium*, *Antennaria* spp., *Arnica cordifolia*, *Campanula rotundifolia*, *Erigeron* spp., *Geum triflorum*, *Lupinus argenteus*, *Pedicularis racemosa*, *Solidago multiradiata*, *Valeriana dioica*, or *Xerophyllum tenax*, are often present with relatively low cover. Shrubs do occur in this type but typically have low cover. Occasional species include *Dasiphora fruticosa* ssp. *floribunda*, *Penstemon fruticosus*, *Symphoricarpos* spp., or *Spiraea* spp.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: The information used to describe this association comes from a single plot in Glacier National Park. This woodland occupies steep, dry slopes with southerly aspects. Its position on the slope is typically high. The association is found at an elevation of 2042 m (6689 feet). Stands are usually positioned over colluvial deposits on slopes with rapid drainage. The soil is a well-developed sandy loam with many angular pieces of argillite present in the surface layer. Ground cover is primarily litter, with large rock, small rock, bare soil and wood each contributing up to 10% surface area.

GLOBAL ENVIRONMENT: This woodland association occurs in mountains in the central and northern Rocky Mountains. Stands are found in the upper subalpine zone at 2040 to 2865 m (6685-9400 feet) elevation on dry sites that are typically on steep, upper slopes with southerly or westerly aspects or on ridgetops. It also occurs on less exposed, gentle slopes and benches. Substrates are often rocky, excessively well-drained, coarse-textured soils derived from volcanic (pumice), sedimentary, granitic or granitic-gneiss parent materials. Ground cover is dominated by rock and litter.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The upper tree canopy cover is 10-20% in this association. Tree height is typically 10-15 m with *Pinus albicaulis* and *Abies lasiocarpa* sharing dominance in this layer. Total subcanopy cover is approximately 30% in a layer 2-5 m tall. *Abies lasiocarpa* is more prevalent in the subcanopy, but *Pinus albicaulis* is present and regenerating successfully. *Spiraea splendens* (= *Spiraea densiflora*) and *Penstemon fruticosus* are the most common shrubs, each contributing 3% cover in a layer less than 0.5 m tall. Herbaceous cover is approximately 50% in this association, dominated by *Carex geyeri*. *Eriogonum flavum*, *Selaginella densa*, and *Xerophyllum tenax* are also present, although cover for each of these species is less than 5%.

GLOBAL VEGETATION: The woodland association is characterized by an open tree canopy of *Pinus albicaulis* that is typically multi-stemmed (and stunted) on exposed, high-elevation sites, sometimes with occasional *Pinus flexilis* trees. On less exposed sites, the upper canopy may include scattered *Pinus contorta*, or *Abies lasiocarpa* may be present with *Abies lasiocarpa* or *Pseudotsuga menziesii* present in the subcanopy and understory. Occasional shrubs, such as *Symphoricarpos* spp., *Dasiphora fruticosa* ssp. *floribunda*, or *Spiraea splendens* (= *Spiraea densiflora*), may be present, but the understory is characterized by a relatively sparse to moderately dense (15-60% cover) herbaceous layer that is typically dominated by *Carex geyeri*. Other common graminoids include *Achnatherum occidentale* (= *Stipa occidentalis*), *Carex rossii*, *Elymus glaucus*, *Festuca idahoensis*, *Poa nervosa*, and *Trisetum spicatum*. Associated forbs, such as *Achillea millefolium*, *Antennaria* spp., *Arnica cordifolia*, *Campanula rotundifolia*, *Erigeron* spp., *Geum triflorum*, *Lupinus argenteus*, *Pedicularis racemosa*, *Solidago multiradiata*, *Valeriana dioica*, or *Xerophyllum tenax*, are often present with relatively low cover.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Pinus albicaulis</i>
Tree subcanopy	Needle-leaved tree	<i>Abies lasiocarpa</i>
Herb (field)	Graminoid	<i>Carex geyeri</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Pinus albicaulis</i>
Tree subcanopy	Needle-leaved tree	<i>Abies lasiocarpa</i>
Herb (field)	Graminoid	<i>Carex geyeri</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Carex geyeri*, *Pinus albicaulis*

GLOBAL: *Carex geyeri*, *Pinus albicaulis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2G3 (10-Apr-1999). This moderately widespread association occurs in relatively few, unevenly distributed, isolated stands within the northwestern portion of the Yellowstone Highlands, the Idaho Batholith, and the northeastern portion of the Blue Mountains ecoregional sections. The number of occurrences of the association is not precisely known due to the lack of appropriate inventory work and the remote location of stands. Few recent observations regarding the distribution, abundance, or condition of occurrences have been reported. The condition of occurrences is declining due to *Pinus albicaulis* mortality resulting from the cumulative effects of wildfire exclusion, widespread incidence of white pine blister rust (*Cronartium ribicola*), and associated increased susceptibility to mountain pine beetle (*Dendroctonus ponderosae*) infestation.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Confidence in the classification of this association is strong even though the association has not been fully documented across the entire range. More inventory work is needed.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Carex geyeri* Forest (CEGL000304)
- *Pinus albicaulis* - *Abies lasiocarpa* / *Vaccinium membranaceum* / *Xerophyllum tenax* Woodland (CEGL005837)
- *Pinus albicaulis* - *Abies lasiocarpa* Woodland (CEGL000128)
- *Pinus albicaulis* / *Carex filifolia* Woodland (CEGL003133)
- *Pinus albicaulis* / *Carex rossii* Woodland (CEGL003135)

GLOBAL RELATED CONCEPTS:

- *Pinus albicaulis* - *Carex geyeri* Habitat Type, *Pinus albicaulis* Phase (Cooper 1975) =
- *Pinus albicaulis* / *Carex geyeri* Habitat Type (Steele et al. 1983) B
- *Pinus albicaulis* / *Carex geyeri* Plant Association (Johnston 1987) =
- *Pinus albicaulis* / *Carex geyeri* plant community (Hall 1973) =
- *Pinus albicaulis*/*Carex geyeri* (Bourgeron and Engelking 1994) =
- *Pinus albicaulis* Series (Steele et al. 1981) B
- DRISCOLL FORMATION CODE:II.A.2.a. (Driscoll et al. 1984) B
- Whitebark pine / barren plant community (Schlatterer 1972) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon in Glacier National Park and has not been documented in Waterton Lakes National Park. In Glacier National Park the association lies above the north shore of St. Mary Lake, and probably exists on similar sites in other drainages.

GLOBAL RANGE: This moderately widespread central and northern Rocky Mountain woodland association occurs as unevenly distributed, isolated stands in northwestern Wyoming, western Montana, Idaho and northeastern Oregon.

NATIONS: US

STATES/PROVINCES: ID:S1, MT:S1, OR:S2S3, WY:S2

USFS ECOREGIONS: M331A:CC, M332C:CC, M332D:CC, M332E:CC, M332G:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton, Yellowstone); USFS (Caribou-Targhee, Shoshone)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.209.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: S.K. Rust, mod. K.A. Schulz

REFERENCES: Arno and Weaver 1990, Bourgeron and Engelking 1994, Bowerman et al. 1997, Burns and Honkala 1990a, Cooper 1975, Driscoll et al. 1984, Eyre 1980, Hall 1973, Johnston 1987, Jones and Ogle 2000, MTNHP 2002b, Murray 1996, Nesser et al. 1997, Rust 1998, Schlatterer 1972, Schmidt and McDonald 1990, Steele et al. 1981, Steele et al. 1983, Western Ecology Working Group n.d.

***Pinus albicaulis* - (*Picea engelmannii*) / *Dryas octopetala* Woodland**

WHITEBARK PINE - (ENGELMANN SPRUCE) / EIGHT-PETAL MOUNTAIN-AVENS WOODLAND

IDENTIFIER: CEGL005840

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
Alliance	<i>Pinus albicaulis</i> Woodland Alliance (A.531)
Alliance (English name)	Whitebark Pine Woodland Alliance
Association	<i>Pinus albicaulis</i> - (<i>Picea engelmannii</i>) / <i>Dryas octopetala</i> Woodland
Association (English name)	Whitebark Pine - (Engelmann Spruce) / Eight-petal Mountain-avens Woodland

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Subalpine Woodland and Parkland (CES306.807)

ELEMENT CONCEPT

GLOBAL SUMMARY: This northern Rocky Mountain woodland association is described from mountains in Alberta, Canada. Stands of this woodland association are found at subxeric sites, thinly covered with colluvial deposits. They are located at high elevations, between 2060 and 2290 m (6750-7510 feet), on the upper portions of moderate to steep slopes, and occur on west-, northeast-, and south-facing slopes. Soils tend to be rapidly draining Orthic Regosols comprised of at least 50% small rocks. Ground cover of rock and bare soil is relatively high (50-65%). This woodland association is codominated by a pole to mature, open tree canopy (<20% cover) of *Pinus albicaulis*, *Picea engelmannii*, and *Abies lasiocarpa*. Heights of these species are between 5 and 15 m. The tree regeneration layer consists of *Pinus albicaulis*, *Picea engelmannii*, *Larix lyallii*, and *Abies lasiocarpa* with less than 20% cover. *Juniperus communis* is found in the sparse short-shrub layer, and *Dryas octopetala* dominates the dwarf-shrub layer with an average cover of 30%. The herbaceous layer is represented by a diversity of species that contribute moderate canopy cover (50%) and reflect the subxeric conditions. Common species include *Sedum lanceolatum*, *Anemone multifida*, *Festuca brachyphylla*, and *Saxifraga bronchialis*. Numerous nonvascular species and a few epiphytic species are found in these stands as well and make up <20% total cover. Diagnostic of this associations is the *Pinus albicaulis*-codominated tree canopy with the understory dominated by the dwarf-shrub *Dryas octopetala* and subxeric herbaceous species *Saxifraga bronchialis*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this woodland association are found on subxeric sites, thinly covered with colluvial deposits. They are located at high elevations, between 2060 and 2290 m (6750-7510 feet), on the upper portions of moderate to steep slopes, and occur on west-, northeast-, and south-facing slopes. Soils tend to be rapidly draining Orthic Regosols comprised of at least 50% small rocks. Ground cover is largely rock and bare soil comprising 50-65% with bryoids (5-25%) and litter contributing the remaining cover.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This woodland association is codominated by a pole to mature, open tree canopy (<20% cover) of *Pinus albicaulis*, *Picea engelmannii*, and *Abies lasiocarpa*. Heights of these species are between 5 and 15 m. The tree regeneration layer consists of *Pinus albicaulis*, *Picea engelmannii*, *Larix lyallii*, and *Abies lasiocarpa* with less than 20% cover. *Juniperus communis* is found in the sparse short-shrub layer, and *Dryas octopetala* dominates the dwarf-shrub layer with an average cover of 30%. The herbaceous layer is represented by a diversity of species that contribute moderate canopy cover (50%). Common species include *Sedum lanceolatum*, *Anemone multifida*, *Festuca brachyphylla*, and *Saxifraga bronchialis*. Numerous nonvascular species and a few epiphytic species are found in these stands as well. Nonvascular species (<20% total cover) include *Rhizocarpon geographicum* and *Cetraria islandica*. There is also a trace of epiphytic species that includes *Ahtiana sphaerosporella* and *Letharia columbiana*.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i> , <i>Pinus albicaulis</i>
Herb (field)	Dwarf-shrub	<i>Dryas octopetala</i>
Herb (field)	Forb	<i>Saxifraga bronchialis</i>
Nonvascular	Lichen	<i>Rhizocarpon geographicum</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i> , <i>Pinus albicaulis</i>
Herb (field)	Dwarf-shrub	<i>Dryas octopetala</i>
Herb (field)	Forb	<i>Saxifraga bronchialis</i>
Nonvascular	Lichen	<i>Rhizocarpon geographicum</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Dryas octopetala*, *Picea engelmannii*, *Pinus albicaulis*, *Rhizocarpon geographicum*, *Saxifraga bronchialis*

GLOBAL: *Dryas octopetala*, *Picea engelmannii*, *Pinus albicaulis*, *Rhizocarpon geographicum*, *Saxifraga bronchialis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2G3? (14-Apr-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE:

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: There is relatively high canopy cover of *Abies lasiocarpa* in 2 of 3 Waterton Lakes plots that may be related to *Pinus albicaulis* mortality. These stands contain dead *Pinus albicaulis* trees that were likely killed by white pine blister rust, which continues to reduce canopy cover of that tree. Further investigation and inventory is needed to resolve this classification issue and to determine the full extent of this association that is currently known only from Waterton Lakes National Park.

GLOBAL SIMILAR ASSOCIATIONS:

- *Pinus albicaulis* / *Carex rossii* Woodland (CEGL003135)
- *Pinus albicaulis* / *Festuca idahoensis* Woodland (CEGL000755)
- *Pinus albicaulis* / *Juniperus communis* Woodland (CEGL000756)

GLOBAL RELATED CONCEPTS:

- O31: *Pinus albicaulis* - *Picea engelmannii* / *Dryas octopetala* vegetation type (Achuff et al. 2002a) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from three stands in Waterton Lakes National Park.

GLOBAL RANGE: This northern Rocky Mountain woodland association is described from the subalpine zone in mountains of Waterton Lakes National Park in Alberta, Canada.

NATIONS: CA, US?

STATES/PROVINCES: AB:S2?

USFS ECOREGIONS:

FEDERAL LANDS: PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.4125, WATE.5011, WATE.5108.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Achuff et al. 2002a, Western Ecology Working Group n.d.

Pinus albicaulis - *Abies lasiocarpa* Woodland WHITEBARK PINE - SUBALPINE FIR WOODLAND

IDENTIFIER: CEGL000128

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)

Alliance	<i>Pinus albicaulis</i> Woodland Alliance (A.531)
Alliance (English name)	Whitebark Pine Woodland Alliance
Association	<i>Pinus albicaulis</i> - <i>Abies lasiocarpa</i> Woodland
Association (English name)	Whitebark Pine - Subalpine Fir Woodland

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Subalpine Woodland and Parkland (CES306.807)

ELEMENT CONCEPT

GLOBAL SUMMARY: This patchy or open woodland association occurs in the upper subalpine zone at, or just below, treeline across the central and northern Rocky Mountains. Elevations range from 2180-2870 m (5428-9400 feet). Sites are cold with a short growing season. They range from dry to relatively mesic depending on elevation, slope and aspect as they relate to wind exposure and snow accumulation. Stands occur predominantly on moderately to very steep slopes but also are found on exposed, wind-scoured flats. Substrates are typically rocky, with shallow to moderately deep soils, which are well- to excessively well-drained, gravelly or coarse-sandy loam or clay loam. Parent materials are variable, both calcareous and noncalcareous but are more often igneous or metamorphic, acidic rocks rather than calcareous sedimentary rocks, which seem to favor *Pseudotsuga menziesii* regeneration. This association is characterized by an open canopy (15-40% cover). *Pinus albicaulis* with scattered *Picea engelmannii* and *Abies lasiocarpa* form the overstory with the subcanopy dominated by *Abies lasiocarpa*. Trees may be scattered or clustered in groves and are often wind-deformed and stunted, growing only 6-18 m (20-60 feet) tall or less. Occasionally *Pinus flexilis* or *Pseudotsuga menziesii* may be present, but sites are generally too cold. The undergrowth is variable, depending on relative moisture, and typically depauperate. Shrub cover is highly variable in amount and species composition. *Juniperus communis* often dominates the dwarf-shrub layer (<0.5 m tall, though a short shrub in more optimal habitats) with 5-15% cover; *Arctostaphylos uva-ursi* is often present with low cover. Other shrubs may be present; *Ribes montigenum*, *Ribes lacustre*, and *Vaccinium scoparium* occur scattered. The herbaceous layer is typically sparse (<15% cover). Herbaceous species of moderate to high constancy include *Antennaria* spp., *Arnica cordifolia*, *Carex geyeri*, *Carex rossii*, *Chamerion angustifolium*, *Lupinus argenteus*, *Penstemon virens*, *Sedum lanceolatum*, *Selaginella densa*, *Packera neomexicana* (= *Senecio neomexicanus*), *Thalictrum fendleri*, and *Thermopsis divaricarpa*. Disturbed sites often have higher cover of *Polygonum phytolaccifolium*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This open woodland association occupies moderately steep to steep slopes with southerly aspects. Stand position is most commonly mid to high slope. Elevation ranges from 1655-2180 m (5428-7150 feet). Underlying geologic formations may be calcareous or noncalcareous. The association has been documented on limestone and dolomite rock outcrops. Stands may also develop on siltstone talus slopes. Sites are well-drained or rapidly drained, and the soil texture is commonly a sandy loam or clay loam. Argillite is present in the surface soil in the form of small rock and gravel. Ground cover may be dominated by litter or large rock. Stands overlying rock outcrops may have significant bedrock ground cover.

GLOBAL ENVIRONMENT: This patchy or open woodland association occurs in the upper subalpine zone at, or just below, treeline across the central and northern Rocky Mountains. Elevations range from 2180-2987 m (5428-9800 feet). Sites are cold with a short growing season. They range from dry to relatively mesic depending on elevation, slope and aspect as they relate to wind exposure and snow accumulation. Stands occur predominantly on moderately to very steep slopes but also are found on exposed, wind-scoured flats. Substrates are typically rocky, with shallow to moderately deep soils, which are well- to excessively well-drained, gravelly or coarse-sandy loam or clay loam. Parent materials are variable, both calcareous and noncalcareous but are more often igneous or metamorphic, acidic rocks rather than calcareous sedimentary rocks, which seem to favor *Pseudotsuga menziesii* regeneration (Pfister et al. 1977).

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The forest canopy is open in this association, with canopy cover ranging from 10-20% in a layer 5-10 m tall. *Pinus albicaulis* and *Abies lasiocarpa* dominate the upper tree canopy. *Pseudotsuga menziesii* and *Picea engelmannii* may also be present in some sites. *Abies lasiocarpa* is the primary subcanopy tree species contributing an average of 25% to a total subcanopy cover of 30-60%. Shrub cover is relatively diverse, with most species growing to a maximum height of 1 m. Common shrub species include *Amelanchier alnifolia*, *Juniperus communis*, *Juniperus horizontalis*, and *Paxistima myrsinites*. Herbaceous cover ranges from 10-30%. *Chamerion angustifolium* and *Saxifraga bronchialis* are typically present in amounts ranging from 1-5%.

GLOBAL VEGETATION: This association is characterized by an open canopy (15-40% cover). *Pinus albicaulis* with scattered *Picea engelmannii* and *Abies lasiocarpa* form the overstory with the subcanopy dominated by *Abies lasiocarpa*. Trees may be scattered or clustered in groves and are often wind-deformed and stunted, growing only 6-18 m (20-60 feet) tall or less. Occasionally *Pinus flexilis* or *Pseudotsuga menziesii* may be present, but sites are generally too cold (Pfister et al. 1977). The undergrowth is variable, depending on relative moisture, and typically depauperate. Shrub cover is highly variable in amount and species

composition. *Juniperus communis* can dominate the dwarf-shrub layer (<0.5 m tall, though a short shrub in more optimal habitats) with 5-15% cover; *Arctostaphylos uva-ursi* is often present with low cover. Other shrubs may be present; *Ribes montigenum*, *Ribes lacustre*, *Vaccinium membranaceum*, and *Vaccinium scoparium* occur scattered. The herbaceous layer is typically sparse (<15% cover). Herbaceous species of moderate to high constancy include *Antennaria* spp., *Arnica latifolia*, *Carex geyeri*, *Carex rossii*, *Chamerion angustifolium*, *Ligusticum filicinum*, *Lupinus argenteus*, *Penstemon virens*, *Sedum lanceolatum*, *Senecio crassulus*, *Selaginella densa*, *Solidago multiradiata*, *Thalictrum fendleri*, and *Thermopsis divaricarpa*. Disturbed sites, especially those impacted by sheep grazing, often have a high cover of *Polygonum phytolaccifolium*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus albicaulis</i>
Tree subcanopy	Needle-leaved tree	<i>Abies lasiocarpa</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i>
Herb (field)	Dwarf-shrub	<i>Juniperus communis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Pinus albicaulis</i>
Herb (field)	Dwarf-shrub	<i>Juniperus communis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Chamerion angustifolium*, *Pinus albicaulis*, *Saxifraga bronchialis*

GLOBAL: *Abies lasiocarpa*, *Arctostaphylos uva-ursi*, *Pinus albicaulis*, *Ribes montigenum*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5? (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This type is undoubtedly a concept that includes several associations. It may prove to be particularly depauperate occurrences of the similar associations.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Pinus albicaulis* / *Arctostaphylos uva-ursi* Woodland (CEGL000751)
- *Abies lasiocarpa* - *Pinus albicaulis* / *Vaccinium scoparium* Woodland (CEGL000752)
- *Pinus albicaulis* - (*Abies lasiocarpa*) / *Carex geyeri* Woodland (CEGL000754)
- *Pinus albicaulis* / *Carex rossii* Forest (CEGL000129)
- *Pinus albicaulis* / *Juniperus communis* Woodland (CEGL000756)

GLOBAL RELATED CONCEPTS:

- *Picea engelmannii* - *Abies lasiocarpa* - *Pinus albicaulis* / *Shepherdia canadensis* Vegetation Type (Achuff et al. 2002a) I
- *Pinus albicaulis* - *Abies lasiocarpa* Habitat Type (Pfister et al. 1977) B
- *Pinus albicaulis* - *Abies lasiocarpa* Habitat Type (Steele et al. 1981) B
- *Pinus albicaulis* - *Abies lasiocarpa* Habitat Type (Daubenmire and Daubenmire 1968) B
- *Pinus albicaulis* - *Abies lasiocarpa* Habitat Types (Cooper 1975) B
- *Pinus albicaulis* - *Abies lasiocarpa* Habitat Types (Cooper et al. 1987) B
- *Pinus albicaulis* - *Picea engelmannii* / *Dryas octopetala* Vegetation Type (Achuff et al. 2002a) I
- *Pinus albicaulis*-*Abies lasiocarpa* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is relatively uncommon east of the Continental Divide in Glacier National Park but has not been documented in Waterton Lakes National Park. Specifically the association lies near Gable Pass and along the Dawson Pass trail, near Rising Wolf.

GLOBAL RANGE: This association occurs in the northern Rockies in northwestern Montana, northern Idaho, and western Wyoming.

NATIONS: US

STATES/PROVINCES: ID:S3, MT:S5, WY

USFS ECOREGIONS: M331D:CC, M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton); USFS (Caribou-Targhee)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.238, GLAC.303.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper and K.A. Schulz, mod. G. Kittel

REFERENCES: Achuff et al. 2002a, Bourgeron and Engelking 1994, Burns and Honkala 1990a, Cooper 1975, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Driscoll et al. 1984, Eyre 1980, MTNHP 2002b, Pfister et al. 1977, Schmidt and McDonald 1990, Steele et al. 1981, Steele et al. 1983, Western Ecology Working Group n.d.

Pinus contorta* Woodland Alliance**Pinus contorta* / *Clintonia uniflora* - *Xerophyllum tenax* Woodland****LOGEPOLE PINE / BRIDE'S BONNET - BEAR-GRASS WOODLAND**

IDENTIFIER: CEGL005921

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
Alliance	<i>Pinus contorta</i> Woodland Alliance (A.512)
Alliance (English name)	Lodgepole Pine Woodland Alliance
Association	<i>Pinus contorta</i> / <i>Clintonia uniflora</i> - <i>Xerophyllum tenax</i> Woodland
Association (English name)	Lodgepole Pine / Bride's Bonnet - Bear-grass Woodland

ECOLOGICAL SYSTEM(S): Rocky Mountain Lodgepole Pine Forest (CES306.820)

ELEMENT CONCEPT

GLOBAL SUMMARY: This seral, large-patch to matrix lodgepole pine woodland occupies the relatively cold and dry environments across a number of climax tree series and associated geographic regions. Thus, this mesic type is found throughout the northern Rocky Mountains and may extend as far west as the Cascade Crest on environments characterized as foothills and montane to lower and even mid-subalpine. The association's possible elevation range is from 915 to 1800 m (3000-5900 feet), and consistently occurs on south- through west-facing exposures. It is found on all landforms, though collecting position on slopes, from the midslopes to footslopes are most common. It occurs regularly on higher elevation flat terrain. The range of parent materials is as great as possible types occurring in the northern Rocky Mountains and northernmost middle Rocky Mountains and may include some ultramafics east of the Cascade Crest. The soils are uniformly well-drained and have a low coarse-fragment content, except those sites within the lower to mid-subalpine zone (which have a greater coarse-fragment content). The overstory is dominated by *Pinus contorta* with a number of other tree species possibly present. On warmer sites these include *Thuja plicata*, *Tsuga heterophylla*, and *Abies grandis*, and on colder or higher elevation sites are found *Abies lasiocarpa*, *Tsuga mertensiana*, and *Picea engelmannii*. However, the most frequent canopy codominants or associates are the seral species *Larix occidentalis*, *Pseudotsuga menziesii*, and in a restricted portion of the type's range *Pinus monticola*. The tall-shrub component is relatively unimportant. The short-shrub layer exhibits greater cover and

diversity than the other shrub components with *Vaccinium membranaceum*, *Paxistima myrsinites*, *Rosa gymnocarpa*, *Rubus parviflorus*, and *Spiraea betulifolia* being consistently present. *Linnaea borealis* and *Chimaphila umbellata* have high constancy in the dwarf-shrub layer. *Bromus vulgaris* (or *Bromus ciliatus*) are the only graminoids of note. The diagnostic forbs *Clintonia uniflora*, *Xerophyllum tenax*, and *Tiarella trifoliata* naturally have high constancy and/or cover; however, a number of other forbs also exhibit high constancy, including *Arnica latifolia*, *Aralia nudicaulis*, *Adenocaulon bicolor*, *Coptis occidentalis*, *Cornus canadensis*, *Galium triflorum*, *Goodyera oblongifolia*, *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Pedicularis racemosa*, *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, *Trillium ovatum*, and *Viola orbiculata*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this woodland association are found on middle to low portions of various landforms. These landforms include mountain valleys, slopes, ridges, and benches. Sites are predominately found on southwesterly aspects between the elevations of 975 and 1710 m (3198-5607 feet). These mesic sites are usually situated on various types of glacial deposits. Soils tend to be well-drained sandy or clay loams. The ground surface is mostly covered with litter and duff, and a majority of the sites have minimal cover of moss and lichen. There is evidence of past fire activity or beetle infestation in some stands.

GLOBAL ENVIRONMENT: This seral, large-patch to matrix type occupies relatively cold and dry environments across a number of climax tree series and associated geographic regions; the species defining these series include, but are not limited to, *Thuja plicata*, *Tsuga heterophylla*, *Tsuga mertensiana*, *Abies grandis*, *Abies lasiocarpa*, and *Picea engelmannii*. Thus, this mesic type is found throughout the northern Rocky Mountains and may extend as far west as the Cascade Crest on environments characterized as foothills and montane to lower and even mid-subalpine. The association's possible elevation range is from 915 to 1800 m (3000-5900 feet), and regardless of the climax series in which it is found, it consistently occurs on south- through west-facing exposures. It is found on all landforms, though collecting position on slopes, from the midslopes to footslopes are most common. It occurs regularly on higher elevation flat terrain. The range of parent materials is, with the exception of highly unusual substrates like serpentine, literally as great as possible types occurring in the northern Rocky Mountains and northernmost middle Rocky Mountains and may include some ultramafics east of the Cascade Crest. It is difficult to characterize the soils as well, but they are uniformly well-drained and have a low coarse-fragment content, except those sites within the lower to mid-subalpine zone.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This woodland association is dominated by a pole to mature open tree canopy of *Pinus contorta* (40% average cover). The tree subcanopy is codominated by *Abies lasiocarpa* and *Picea engelmannii*, each having 5% average cover. *Pinus contorta* may also be present. Tree seedlings established in the understory are *Picea engelmannii*, *Abies lasiocarpa*, and *Pseudotsuga menziesii*. The tall- to short-shrub layer, consisting of *Amelanchier alnifolia*, *Vaccinium membranaceum*, and *Spiraea betulifolia*, has moderate (44%) total cover. The dwarf-shrub layer is patchy and includes *Paxistima myrsinites* and *Linnaea borealis*. *Clintonia uniflora*, an indicator species, and *Xerophyllum tenax* are always present in this lush herbaceous layer, and have average covers of 2% and 17%, respectively. Other common species include *Calamagrostis rubescens*, *Thalictrum occidentale*, *Goodyera oblongifolia*, *Fragaria virginiana*, and *Arnica cordifolia*. Most species, in this layer, lack constancy and have less than 5% average cover.

GLOBAL VEGETATION: The overstory is dominated by *Pinus contorta* with a whole host of tree species capable of playing a subordinate role; on warmer sites these include *Thuja plicata*, *Tsuga heterophylla*, and *Abies grandis*, and on colder or higher elevation sites are found *Abies lasiocarpa*, *Tsuga mertensiana*, and *Picea engelmannii*. However, the most frequent canopy codominants or associates are the seral species *Larix occidentalis*, *Pseudotsuga menziesii*, and in a restricted portion of the type's range *Pinus monticola*. The tall-shrub component is relatively unimportant, only *Alnus viridis ssp. sinuata* and *Amelanchier alnifolia* approach 50% constancy (and have low cover values). The short-shrub layer exhibits greater cover and diversity than the other shrub components with *Vaccinium membranaceum*, *Paxistima myrsinites*, *Rosa gymnocarpa*, *Rubus parviflorus*, and *Spiraea betulifolia* being consistently present. *Linnaea borealis* and *Chimaphila umbellata* have high constancy in the dwarf-shrub layer. *Bromus vulgaris* (or *Bromus ciliatus*) are the only graminoids of note. The diagnostic forbs *Clintonia uniflora*, *Xerophyllum tenax*, and *Tiarella trifoliata* naturally have high constancy and/or cover; however, a number of other forbs also exhibit high constancy, including *Arnica latifolia*, *Aralia nudicaulis*, *Adenocaulon bicolor*, *Coptis occidentalis*, *Cornus canadensis*, *Galium triflorum*, *Goodyera oblongifolia*, *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Pedicularis racemosa*, *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, *Trillium ovatum*, and *Viola orbiculata*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Tree subcanopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i> , <i>Pinus contorta</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i> , <i>Vaccinium membranaceum</i>

Herb (field)	Forb	<i>Clintonia uniflora</i> , <i>Xerophyllum tenax</i>
Global		
<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Tree subcanopy	Needle-leaved tree	<i>Abies grandis</i> , <i>Abies lasiocarpa</i> , <i>Picea engelmannii</i> , <i>Thuja plicata</i> , <i>Tsuga heterophylla</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus parviflorus</i> , <i>Spiraea betulifolia</i> , <i>Vaccinium membranaceum</i>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Paxistima myrsinites</i>
Herb (field)	Dwarf-shrub	<i>Chimaphila umbellata</i> , <i>Linnaea borealis</i> , <i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Clintonia uniflora</i> , <i>Goodyera oblongifolia</i> , <i>Thalictrum occidentale</i> , <i>Viola orbiculata</i> , <i>Xerophyllum tenax</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Clintonia uniflora*, *Pinus contorta*

GLOBAL: *Clintonia uniflora*, *Pseudotsuga menziesii*, *Tiarella trifoliata*, *Vaccinium membranaceum*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4G5 (2-Mar-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This association is a seral stage of *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Pfister et al. 1977, Cooper et al. 1987); with succession, *Picea engelmannii* and *Abies lasiocarpa* are projected to become canopy dominants (as they are well-established in the reproductive layer at present).

GLOBAL COMMENTS: With the comparatively recent emphasis on developing descriptions of (and keys to) existing vegetation (Grossman et al. 1998), it has yet to be determined at what coverages one vegetation type will be distinguished from another when, in the case of forest vegetation, the canopy tree species are mostly seral in nature and have a broad environmental range (broad niche). With *Pinus contorta*, which is exclusively seral except with respect to some subspecies on unusual substrates or atypical environments, researchers in Glacier National Park took the position that this very shade-intolerant, stand-replacing fire-adapted species should have several times the cover of the next most abundant canopy species for a *Pinus contorta* type to be recognized. What is really being indicated by this approach are areas that have experienced stand-replacing fires (or similar catastrophic disturbance, e.g., clearcutting). The stands representing this type are climax in a number of different tree series including *Abies lasiocarpa*, *Abies grandis*, *Tsuga heterophylla*, *Tsuga mertensiana*, and *Thuja plicata*.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies grandis* / *Clintonia uniflora* Forest (CEGL000272)
- *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* - *Xerophyllum tenax* Forest (CEGL005892)
- *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Forest (CEGL005912)
- *Picea (engelmannii X glauca, engelmannii)* / *Clintonia uniflora* Forest (CEGL000406)
- *Pseudotsuga menziesii* / *Clintonia uniflora* Forest (CEGL005850)
- *Thuja plicata* / *Clintonia uniflora* Forest (CEGL000474)
- *Tsuga heterophylla* / *Clintonia uniflora* Forest (CEGL000493)
- *Tsuga mertensiana* / *Clintonia uniflora* Forest (CEGL000504)

GLOBAL RELATED CONCEPTS:

- *Abies grandis* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987) I
- *Abies grandis* / *Vaccinium membranaceum* / *Clintonia uniflora* Plant Association (Williams et al. 1995) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Pfister et al. 1977) I
- *Abies lasiocarpa* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987) I
- *Thuja plicata* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987) I
- *Tsuga heterophylla* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987) I

- *Tsuga mertensiana* / *Clintonia uniflora* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987) I
- *Tsuga mertensiana* / *Vaccinium membranaceum* (Lillybridge et al. 1995) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known throughout Glacier National Park predominately west of the Continental Divide. It has been documented from one location in Waterton Lakes National Park.

GLOBAL RANGE: This association occurs from the southern portion of the Idaho Batholith of central Idaho northward to Colville National Forest of northeastern Washington and across northern Idaho and into western Montana, predominantly west of the Continental Divide, and as far eastward as southwestern Alberta. Given the opportunity for a more complete crosswalking, this type could well be documented from British Columbia and the east slope of the Cascades.

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT:S4, OR?, WA?

USFS ECOREGIONS: M242C:PP, M332A:CC, M332B:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes); USFS (Colville NF, Wenatchee)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.1004, GLAC.1021, GLAC.2070, GLAC.2071, GLAC.2090, GLAC.2229, GLAC.2647, GLAC.2660, WATE.5077.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Achuff et al. 2002a, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Grossman et al. 1998, Johnson and Simon 1987, Lillybridge et al. 1995, Pfister et al. 1977, Western Ecology Working Group n.d., Williams et al. 1995

Pinus contorta / *Heracleum maximum* Woodland LODGEPOLE PINE / COW-PARSNIP WOODLAND

IDENTIFIER: C EGL005915

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
Alliance	<i>Pinus contorta</i> Woodland Alliance (A.512)
Alliance (English name)	Lodgepole Pine Woodland Alliance
Association	<i>Pinus contorta</i> / <i>Heracleum maximum</i> Woodland
Association (English name)	Lodgepole Pine / Cow-parsnip Woodland

ECOLOGICAL SYSTEM(S): Rocky Mountain Lodgepole Pine Forest (CES306.820)

ELEMENT CONCEPT

GLOBAL SUMMARY: This lodgepole pine woodland is known from Glacier National Park, Montana, and Waterton Lakes National Park, Alberta. Occurrences are found predominately on middle portions of gentle to steep slopes of various aspects. These mesic sites are usually situated on glacial or thin colluvial deposits between the elevations of 970 and 1720 m (3180-5639 feet). Soils tend to be well-drained Orthic Regosols. The ground surface is mostly covered with litter, duff, and wood. This woodland association is dominated by a pole to mature open tree canopy of *Pinus contorta* (35% average cover); its average height varies between 10 and 15 m. Tree seedlings of *Picea engelmannii* and *Abies lasiocarpa* have low constancy. *Spiraea betulifolia*, *Rubus parviflorus*, and *Symphoricarpos albus* are typically present within the short-shrub layer. The lush herbaceous layer is dominated by a mix of mesic-site indicators of varying constancy, including *Angelica* spp. (*Angelica dawsonii* and *Angelica arguta*), which are nearly always present, and *Galium triflorum*, *Heracleum maximum*, *Osmorhiza occidentalis*, *Streptopus amplexifolius*, and *Actaea rubra*. Numerous graminoids and other forbs contribute cover to this layer, most with inconspicuous cover. Common species include *Chamerion angustifolium*, *Arnica cordifolia*, *Thalictrum occidentale*, *Calamagrostis rubescens*, and *Galium boreale*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this woodland association are found predominately on middle portions of gentle to steep slopes of various aspects. These mesic sites are usually situated on glacial or thin colluvial deposits between the elevations of 970 and 1720 m (3180-5639 feet). Soils tend to be well-drained Orthic Regosols. The ground surface is mostly covered with litter, duff, and wood. There is minimal bare soil and small rock present.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This woodland association is dominated by a pole to mature open tree canopy of *Pinus contorta* (35% average cover); its average height varies between 10 and 15 m. Tree seedlings of *Picea engelmannii* and *Abies lasiocarpa* have low constancy. *Spiraea betulifolia*, *Rubus parviflorus*, and *Symphoricarpos albus* are present within the short-shrub layer with moderate to high constancy. Their respective average covers are 9%, 21%, and 13%. The dwarf-shrub layer is insignificant. The lush herbaceous layer is dominated by a mix of mesic-site indicators of varying constancy, including *Angelica* spp. (*Angelica dawsonii* and *Angelica arguta*), which are nearly always present, and *Galium triflorum*, *Heracleum maximum*, *Osmorhiza occidentalis*, *Streptopus amplexifolius*, and *Actaea rubra*. Though numerous graminoids and forbs contribute cover to this layer, most contribute less than 5%. Common species include *Chamerion angustifolium*, *Veratrum viride*, *Senecio triangularis*, *Calamagrostis rubescens*, and *Galium boreale*. Forbs with 75% or greater constancy and a higher average cover include *Arnica cordifolia* and *Thalictrum occidentale*.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus parviflorus</i> , <i>Spiraea betulifolia</i> , <i>Symphoricarpos albus</i>
Herb (field)	Forb	<i>Actaea rubra</i> , <i>Angelica arguta</i> , <i>Angelica dawsonii</i> , <i>Arnica cordifolia</i> , <i>Heracleum maximum</i> , <i>Thalictrum occidentale</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Angelica dawsonii*, *Galium triflorum*, *Heracleum maximum*, *Pinus contorta*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Phleum pratense*, *Poa pratensis*, *Taraxacum officinale*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3? (2-Mar-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This type is ostensibly a seral stage of *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Forest (CEGL000336), *Abies lasiocarpa* - *Picea engelmannii* / *Galium triflorum* Forest (CEGL000311), or some other closely allied community type.

GLOBAL COMMENTS: This type is a seral stage of *Abies lasiocarpa* - *Picea engelmannii* / *Galium triflorum* Forest (CEGL000311), or some other closely allied community type.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Galium triflorum* Forest (CEGL000311)
- *Pseudotsuga menziesii* / *Heracleum maximum* Forest (CEGL005853)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Galium triflorum* Habitat Type (Pfister et al. 1977) B
- *Abies lasiocarpa* / *Galium triflorum* Habitat Type (Hansen et al. 1995) B
- *Pinus contorta* / *Arnica cordifolia* - *Spiraea betulifolia* Vegetation Type (Achuff et al. 2002a) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from two stands in Glacier National Park. One stand is west of the Continental Divide near lower McDonald Creek, and the other stand is east of the Continental Divide near Belly River. All other stands are located in Waterton Lakes National Park.

GLOBAL RANGE:

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S2S3

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.152, GLAC.2602, WATE.4023, WATE.4025, WATE.4046, WATE.4056, WATE.9022, WATE.4049, WATE.4054.

LOCAL DESCRIPTION AUTHORS: J. Miller, mod. M.S. Reid

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Achuff et al. 2002a, Hansen et al. 1995, Pfister et al. 1977, Western Ecology Working Group n.d.

***Pinus contorta* / *Juniperus communis* Woodland**

LOGEPOLE PINE / COMMON JUNIPER WOODLAND

IDENTIFIER: CEG000764

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
Alliance	<i>Pinus contorta</i> Woodland Alliance (A.512)
Alliance (English name)	Lodgepole Pine Woodland Alliance
Association	<i>Pinus contorta</i> / <i>Juniperus communis</i> Woodland
Association (English name)	Lodgepole Pine / Common Juniper Woodland

ECOLOGICAL SYSTEM(S): Rocky Mountain Poor-Site Lodgepole Pine Forest (CES306.960)

ELEMENT CONCEPT

GLOBAL SUMMARY: This woodland association occurs in the upper montane and subalpine zone throughout much of the Rocky Mountains, although it is more common from along the Continental Divide east where climates are often drier. Sites are warm and dry and occur on nearly level benches, and gentle to very steep slopes. Aspects vary from south at high elevations to north aspect at lower elevations in canyons. Substrates are typically rocky, shallow to moderately deep, well- to excessively well-drained, gravelly or coarse-sandy loam or clay loam. Parent materials are variable, but are more often igneous or metamorphic rocks. The vegetation is characterized by an open to moderately dense (30-70% cover) tree canopy that is often solely dominated by *Pinus contorta*. However, scattered *Abies lasiocarpa*, *Picea engelmannii*, *Pinus albicaulis*, *Pinus flexilis*, *Pseudotsuga menziesii*, or *Populus tremuloides* trees may be present in some stands, especially in the subcanopy. The understory is typically depauperate and dominated by the conspicuous dwarf-shrub *Juniperus communis* with 5-15% cover. *Arctostaphylos uva-ursi* is often present with low cover. Other shrubs may be present in low cover. The herbaceous layer is usually sparse with a few scattered species. Diagnostic of this association is the dominance of *Pinus contorta* in the tree canopy with *Juniperus communis* dominating the understory.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This woodland association is found from 1475 to 1915 m (4840-6281 feet) on moderately steep midslopes and ridges. Aspects are warm (west or south). Substrates are glacial till, sandstone, or colluvial deposits, which have developed well-drained, sandy loam or loamy sand soils. These soils tend to have a high content of small rocks, gravels or sand, and are poorly developed. Litter and duff cover roughly half of the ground surface, with the remainder being bare soil, sand, gravel or small and large rock.

GLOBAL ENVIRONMENT: This woodland association occurs in the upper montane and subalpine zone throughout much of the Rocky Mountains, although it is more common from the Continental Divide east where climate is often drier. Elevations range from 1280 m (4200 feet) in the Little Rocky Mountains of north-central Montana to 3050 m (10,500 feet) in Colorado and northern Utah. Sites are warm and dry and occur on nearly level benches, and gentle to very steep slopes. Aspects vary from south at high elevations to north aspect at lower elevations in canyons. Substrates are typically rocky, shallow to moderately deep, well- to excessively well-drained, gravelly or coarse-sandy loam or clay loam. Parent materials are variable, but are more often igneous or metamorphic, acidic rocks rather than calcareous sedimentary rocks, which seem to favor *Pseudotsuga menziesii* regeneration (Pfister et al. 1977, Roberts 1980, Mauk and Henderson 1984).

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: *Pinus contorta* dominates the tree canopy of this woodland association, with cover varying from very open (<20%) to 40%. The height of the canopy varies from short (2-5 m range) for early-successional stands to 10-15 m for more mature stands. *Abies lasiocarpa*, *Pseudotsuga menziesii*, *Picea engelmannii*, *Populus tremuloides*, and *Pinus albicaulis* can occur as scattered trees, saplings or seedlings. The short-shrub layer is dominated by *Juniperus communis* (average 20% cover, ranging from 5-25% cover), but can include (at low cover) *Shepherdia canadensis*, *Spiraea betulifolia*, *Mahonia repens*, *Juniperus horizontalis*, *Dasiphora fruticosa* ssp. *floribunda*, *Paxistima myrsinites*, *Prunus virginiana*, *Amelanchier alnifolia*, and *Arctostaphylos uva-ursi* (which can be as abundant as the *Juniperus communis*). The herbaceous layer is sparse (<20% cover) and is primarily composed of a diversity of forbs and a few graminoids. *Carex geyeri* is often present with cover ranging from 1-30%. Common herbaceous species may include *Achillea millefolium*, *Sedum lanceolatum*, *Castilleja miniata*, *Arnica cordifolia*, *Eriogonum umbellatum*, *Apocynum androsaemifolium*, *Campanula rotundifolia*, *Hieracium albiflorum*, *Chimaphila umbellata*, *Solidago multiradiata*, *Fragaria virginiana*, *Anemone multifida*, *Chamerion angustifolium*, *Lupinus sericeus*, *Pseudoroegneria spicata*, and *Festuca campestris*.

GLOBAL VEGETATION: This association is characterized by an open to moderately dense (30-70% cover) tree canopy that is often solely dominated by *Pinus contorta*. However, scattered *Abies lasiocarpa*, *Picea engelmannii*, *Pinus albicaulis*, *Pinus flexilis*, *Pseudotsuga menziesii*, or *Populus tremuloides* trees may be present in some stands, especially in the subcanopy. The understory is typically depauperate and dominated by the dwarf-shrub *Juniperus communis* with 5-15% cover. *Arctostaphylos uva-ursi* is often present with low cover. Other shrubs may be present such as scattered *Amelanchier alnifolia*, *Mahonia repens*, *Paxistima myrsinites*, *Rosa woodsii*, *Salix scouleriana*, *Shepherdia canadensis*, and *Arctostaphylos uva-ursi* in Utah. The herbaceous layer is typically sparse (<15% cover). Frequent herbaceous species include *Antennaria* spp., *Arnica cordifolia*, *Carex geyeri*, *Carex rossii*, *Chamerion angustifolium*, *Lupinus argenteus*, *Penstemon virens*, *Sedum lanceolatum*, *Selaginella densa*, *Packera neomexicana* (= *Senecio neomexicanus*), *Thalictrum fendleri*, and *Thermopsis divaricarpa*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Short shrub/sapling	Needle-leaved shrub	<i>Juniperus communis</i>
Herb (field)	Graminoid	<i>Carex geyeri</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Short shrub/sapling	Needle-leaved shrub	<i>Juniperus communis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Juniperus communis*, *Pinus contorta*

GLOBAL: *Juniperus communis*, *Pinus contorta*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: One stand representing this association was an early seral stage.

GLOBAL COMMENTS: Many lower subalpine, spruce-fir and upper montane Douglas-fir forest and woodland stands include *Pinus contorta* trees in a mixed-conifer canopy. To clarify classification, only stands with tree canopies strongly dominated by *Pinus contorta* (usually >2/3 tree canopy) are considered to be *Pinus contorta* woodland and forest associations.

Juniperus communis, the diagnostic understory species of this association has a broad ecological amplitude occurring on dry to relatively mesic sites at montane and subalpine elevations. This woodland association may be confused with *Pinus contorta* / *Arctostaphylos uva-ursi* Forest (CEGL000134) when both *Juniperus communis* and *Arctostaphylos uva-ursi* codominate the understory. Generally, these codominant stands are included in the concept of this association.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Juniperus communis* Woodland (CEGL000919)
- *Picea engelmannii* / *Juniperus communis* Forest (CEGL005925)
- *Pinus aristata* / *Ribes montigenum* Woodland (CEGL000761)
- *Pinus contorta* / *Arctostaphylos uva-ursi* Forest (CEGL000134)
- *Pseudotsuga menziesii* / *Juniperus communis* Forest (CEGL000439)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Juniperus communis* Habitat Type (Steele et al. 1981) B
- *Pinus contorta* / *Juniperus communis* Community Type (Mauk and Henderson 1984) =
- *Pinus contorta* / *Juniperus communis* Community Type (Steele et al. 1983) B
- *Pinus contorta* / *Juniperus communis* Habitat Type (Hess 1981) =
- *Pinus contorta* / *Juniperus communis* Habitat Type (Roberts 1980) =
- *Pinus contorta* / *Juniperus communis* Habitat Type (Johnston 1987) =
- *Pinus contorta* / *Juniperus communis* Habitat Type (Komarkova et al. 1988b) =
- *Pinus contorta* / *Juniperus communis* Habitat Type (Alexander 1986) =
- *Pinus contorta* / *Juniperus communis* Habitat Type (Alexander 1985) =
- *Pinus contorta* / *Juniperus communis* Habitat Type (Wasser and Hess 1982) =
- *Pinus contorta* / *Juniperus communis* Habitat Type (Hess and Alexander 1986) =
- *Pinus contorta* / *Juniperus communis* (Bourgeron and Engelking 1994) =
- *Pinus contorta* Forest (Peet 1981) B
- *Pinus contorta* Forest (Peet 1980) B
- *Pseudotsuga menziesii* / *Juniperus communis* Habitat Type (Pfister et al. 1977) B
- *Pseudotsuga menziesii* / *Juniperus communis* Habitat Type (Steele et al. 1981) B
- DRISCOLL FORMATION CODE:II.A.2.a. (Driscoll et al. 1984) B
- Lodgepole pine forest (Moir 1969a) B
- Xeric *Pinus contorta* - *Pseudotsuga* Forest (Peet 1981) B
- Xeric *Pinus contorta* - *Pseudotsuga* Forest (Peet 1980) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from one area in Waterton Lakes National Park and four locations in Glacier National Park on the east side of the Continental Divide. In Waterton, it is found north of Cameron Lake. In Glacier, it is found on the interfluvium that separates Swiftcurrent Creek and Kennedy Creek, on slopes above Lost Lake, on slopes above Cosley Lake, and along Route 2.

GLOBAL RANGE: This Rocky Mountains woodland association occurs on dry sites in the upper montane and subalpine zone from central Colorado to northern Montana including the Little Rocky Mountains in central Montana.

NATIONS: US

STATES/PROVINCES: CO:S3, ID:S3, MT:S3, NV?, UT:S4?, WY:S3

USFS ECOREGIONS: 331D:CC, 342A:CC, M331A:CC, M331B:CC, M331I:CC, M331J:CC, M332C:CC, M332D:CC, M332E:CC

FEDERAL LANDS: NPS (Glacier, Rocky Mountain); USFS (Bighorn, Medicine Bow, Shoshone)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.201, GLAC.62.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Alexander 1981, Alexander 1985, Alexander 1986, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Cooper 1975, Cooper et al. 1987, Driscoll et al. 1984, Hess 1981, Hess and Alexander 1986, Hess and Wasser 1982, Johnston 1987, Jones and Ogle 2000, Komarkova et al. 1988b, MTNHP 2002b, Marr et al. 1973b, Mauk and Henderson 1984, Moir 1969a, NVNHP 2003, Oswald 1966, Peet 1980, Peet 1981, Pfister et al. 1977, Roberts 1980, Steele et al. 1981, Steele et al. 1983, Wasser and Hess 1982, Western Ecology Working Group n.d.

***Pinus flexilis* Woodland Alliance**

***Pinus flexilis* / *Arctostaphylos uva-ursi* Woodland**

LIMBER PINE / BEARBERRY OR KINIKINNICK WOODLAND

IDENTIFIER: C EGL000802

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
Alliance	<i>Pinus flexilis</i> Woodland Alliance (A.540)
Alliance (English name)	Limber Pine Woodland Alliance
Association	<i>Pinus flexilis</i> / <i>Arctostaphylos uva-ursi</i> Woodland
Association (English name)	Limber Pine / Bearberry or Kinikinnick Woodland

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland (CES306.819)

ELEMENT CONCEPT

GLOBAL SUMMARY: This Rocky Mountain woodland is reported from New Mexico to Alberta. Stands are found on mid to upper to portions of steep to moderate slopes and ridgetops. Elevations range between 1385 and 3050 m (4540-10,000 feet). Sites are windswept and relatively dry, frequently with southerly aspects. Substrates are typically rocky, either bedrock outcrops, glacial till or colluvium. Substrate is often derived from calcareous substrates such as limestone and dolomite in the northern portion of the geographic range. The vegetation is characterized by an open tree canopy dominated or codominated by *Pinus flexilis*. Other tree species that may contribute to the canopy include *Pinus contorta*, *Pseudotsuga menziesii*, *Picea engelmannii*, and occasionally *Populus tremuloides*. The understory is dominated by a dwarf-shrub layer dominated by *Arctostaphylos uva-ursi*. Short-shrub *Juniperus communis* may be codominant to absent. Additional shrubs may be present with low cover. The herbaceous layer is variable in abundance but often is sparse. There is considerable bare ground, gravel and/or rock in this association.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this woodland association are found on upper to mid portions of steep to moderate slopes and gentle interfluvies. These landforms may be bedrock outcrops or are mantled with glacial till and thin colluvial deposits of limestone and dolomite. The stands are located on mesic and subxeric sites, and occur on southwesterly to southeasterly aspects at elevations between 1385 and 2020 m (4540-6624 feet). Water drainage of these Orthic Regosols (Inceptisols) ranges from moderate to rapidly drained. The ground surface rarely has much litter or duff, while bare soil and rock are common. Some stands can have moderate cover of downed woody debris.

GLOBAL ENVIRONMENT: This woodland is reported from the southern and northern Rocky Mountains, apparently in two disjunct regions. Stands are found on mid to upper to portions of steep to moderate slopes and ridgetops. Many of these sites are

windswept and exposed to wind-scouring and snow removal. Elevations range between 1385 and 3050 m (4540-10,000 feet); higher elevation occurrences are found farther south. Sites are windswept and relatively dry, frequently with southerly aspects. Substrates are typically rocky, either bedrock outcrops, glacial till or colluvium often derived from calcareous substrates such as limestone and dolomite. Exposed bedrock is common and many stands have over 50% bare soil.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This woodland is dominated by trees of generally short to stunted stature (always less than 10 m in height and often shorter). The canopy is open (18% average), and *Pinus flexilis* comprises at least 10% of the total tree canopy cover (it is often the dominant or codominant). Other tree species contributing to the canopy are *Pinus contorta* and *Pseudotsuga menziesii*. *Populus tremuloides* can occur in some stands. Seedlings of *Pinus flexilis*, *Pseudotsuga menziesii*, *Populus tremuloides*, or *Abies lasiocarpa* are found in many stands. The shrub layer is generally short or dwarf in stature, and has moderate to even high cover (ranging from 20% to well over 70% cover). *Arctostaphylos uva-ursi* dominates the open dwarf-shrub layer with 34% average cover. Common short shrubs include *Juniperus communis* (18% cover), *Dasiphora fruticosa ssp. floribunda* (4% cover), and *Shepherdia canadensis* (2% cover). The herbaceous layer is variable in abundance, from 5% to close to 100% cover; common undergrowth species include *Achillea millefolium*, *Galium boreale*, *Hedysarum sulphurescens*, *Festuca idahoensis*, and *Festuca campestris*. Nonvascular species, when present, all have insignificant cover.

GLOBAL VEGETATION: This woodland association is characterized by an open tree canopy dominated or codominated by *Pinus flexilis*. Other tree species contributing to the canopy are *Pinus contorta*, *Pseudotsuga menziesii*, *Populus tremuloides*, and *Picea engelmannii*. The understory is characterized by a dwarf-shrub layer dominated by *Arctostaphylos uva-ursi*. The short shrub *Juniperus communis* may be codominant to absent. Additional shrubs may be present with low cover, including *Dasiphora fruticosa ssp. floribunda*, *Amelanchier alnifolia*, *Mahonia repens*, *Rosa* spp., *Ribes* spp., and *Shepherdia canadensis*. The herbaceous layer is variable in abundance but often is sparse. Species include *Achillea millefolium*, *Carex rossii*, *Galium boreale*, *Festuca idahoensis*, *Festuca campestris*, and *Thermopsis divaricarpa*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus flexilis</i> , <i>Pseudotsuga menziesii</i>
Short shrub/sapling	Needle-leaved shrub	<i>Juniperus communis</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Dasiphora fruticosa ssp. floribunda</i>
Herb (field)	Dwarf-shrub	<i>Arctostaphylos uva-ursi</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus flexilis</i> , <i>Pseudotsuga menziesii</i>
Short shrub/sapling	Needle-leaved shrub	<i>Juniperus communis</i>
Herb (field)	Dwarf-shrub	<i>Arctostaphylos uva-ursi</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Arctostaphylos uva-ursi*, *Juniperus communis*, *Pinus flexilis*, *Pseudotsuga menziesii*

GLOBAL: *Arctostaphylos uva-ursi*, *Juniperus communis*, *Pinus flexilis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Bromus inermis*, *Hypericum perforatum*, *Taraxacum officinale*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (23-Feb-1994).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This woodland is similar to *Pseudotsuga menziesii* / *Arctostaphylos uva-ursi* Forest (CEGL000424). Both are found within the same elevation range, on southerly aspects, and share some of the same shrub species in the undergrowth. This association has a higher abundance of *Pinus flexilis*, while *Pseudotsuga*

menziesii / *Arctostaphylos uva-ursi* habitat type is dominated by *Pseudotsuga menziesii*, though *Pinus flexilis* occurs scattered in stands having a limestone parent material (Pfister et al. 1977).

GLOBAL COMMENTS: There is overlap in concept between this association (CEGL000802) and *Pinus flexilis* / *Juniperus communis* Woodland (CEGL000807). Both associations include stands with woodland understory codominated by *Arctostaphylos uva-ursi* and *Juniperus communis*. Rangewide analysis and review of plots classified to both associations is needed to determine if these similar associations should be combined or somehow refined to better represent the vegetation structure of these stands that occur along the Rocky Mountain cordillera. See Achuff et al. (1997, 2002a) and Johnston (1987) for reviews of some of the pertinent literature.

GLOBAL SIMILAR ASSOCIATIONS:

- *Pinus flexilis* / *Festuca campestris* Woodland (CEGL000806)
- *Pinus flexilis* / *Juniperus communis* Woodland (CEGL000807)
- *Pseudotsuga menziesii* / *Arctostaphylos uva-ursi* Forest (CEGL000424)

GLOBAL RELATED CONCEPTS:

- *Pinus flexilis* / *Arctostaphylos uva-ursi* Habitat Type (DeVelice 1983) B
- *Pinus flexilis* / *Arctostaphylos uva-ursi* Habitat Type (DeVelice and Ludwig 1983a) B
- *Pinus flexilis* / *Arctostaphylos uva-ursi* Habitat Type (DeVelice et al. 1986) B
- *Pinus flexilis* / *Arctostaphylos uva-ursi* Plant Association (Baker 1984a) =
- *Pinus flexilis* / *Arctostaphylos uva-ursi* plant association (Stuever and Hayden 1997b) F
- *Pinus flexilis* / *Arctostaphylos uva-ursi* type (Willoughby et al. 1998) F
- *Pinus flexilis*/ *Arctostaphylos uva-ursi* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:II.A.2.a. (Driscoll et al. 1984) B
- O27: *Pinus flexilis* / *Arctostaphylos uva-ursi* vegetation type (Achuff et al. 2002a) F

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from a number of locations in Waterton Lakes National Park and from three stands in Glacier National Park east of the Continental Divide.

GLOBAL RANGE: This Rocky Mountain woodland is reported in a disjunct pattern, from montane and subalpine elevations in New Mexico and Colorado, and Montana extending north into Alberta.

NATIONS: CA, US

STATES/PROVINCES: AB, CO:S2?, MT, NM:S4

USFS ECOREGIONS: 331J:CC, M331F:CC, M331G:CC, M331I:CC, M332C:CC

FEDERAL LANDS: NPS (Glacier, Rocky Mountain); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.197, GLAC.310, GLAC.48, WATE.4042, WATE.4048, WATE.4052, WATE.5002, WATE.5003, WATE.5008.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz, mod. S.L. Neid

REFERENCES: Achuff et al. 1997, Achuff et al. 2002a, Baker 1984a, Bourgeron and Engelking 1994, Burns and Honkala 1990a, CONHP unpubl. data 2003, DeVelice 1983, DeVelice and Ludwig 1983a, DeVelice et al. 1986, Driscoll et al. 1984, Johnston 1987, Jones and Ogle 2000, Larson and Moir 1987, Pfister et al. 1977, Stuever and Hayden 1997b, Western Ecology Working Group n.d., Willoughby et al. 1998

***Pinus flexilis* / *Festuca campestris* Woodland
LIMBER PINE / PRAIRIE FESCUE WOODLAND**

IDENTIFIER: CEGL000806

NVC Classification

Physiognomic Class Woodland (II)
Physiognomic Subclass Evergreen woodland (II.A.)

Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
Alliance	<i>Pinus flexilis</i> Woodland Alliance (A.540)
Alliance (English name)	Limber Pine Woodland Alliance
Association	<i>Pinus flexilis</i> / <i>Festuca campestris</i> Woodland
Association (English name)	Limber Pine / Prairie Fescue Woodland
ECOLOGICAL SYSTEM(S):	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland (CES306.819) Rocky Mountain Foothill Limber Pine-Juniper Woodland (CES306.955)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is a somewhat circumscribed community found in the northern Rocky Mountains from central Montana to southwestern Alberta on dry and often wind-swept slopes. Typically stands are small patches, but some on the Rocky Mountain Front foothills and western extremity of the northwestern Great Plains are extensive. The documented elevation range is from 1400 m (4600 feet) in the Rocky Mountain Front foothills to 1830 m (6000 feet) within the Lewis Range; reconnaissance within this range has placed stands at considerably higher elevations (these sites often occur on west- to southwest-facing slopes impacted by prevailing winds). Though not restricted to calcareous substrates, it frequently occurs on such owing to extensive exposures of Madison limestone within the type's distribution. Substrates are always excessively drained and gravelly with textures ranging from silts to sandy loams. Ground cover is dominated by litter, but moderate amounts of rock (15%) and soil (10%) are found. Tree canopy structure ranges from very open (15-20% cover) to approaching 60% cover. Though *Pinus flexilis* is usually dominant, *Pseudotsuga menziesii* is invariably present and not infrequently shares canopy dominance with *Pinus flexilis*. *Pinus ponderosa* and *Pinus contorta* occur in a small fraction of the stands and usually as minor components. With the exception of locally high coverages of *Juniperus horizontalis*, shrubs are generally a minor component, with those of highest constancy being *Arctostaphylos uva-ursi*, *Shepherdia canadensis*, *Juniperus communis*, *Artemisia frigida*, and *Amelanchier alnifolia*. The herbaceous layer is bunchgrass dominated, with *Festuca campestris* and *Festuca idahoensis* about equally abundant in stands with well-regulated grazing and *Pseudoroegneria spicata* and *Koeleria macrantha* having considerable cover in particular circumstances. Forbs comprise a minor component, with *Allium cernuum*, *Galium boreale*, *Achillea millefolium*, *Lithospermum ruderales*, and *Balsamorhiza sagittata* exhibiting the highest constancy; the last three species sporadically occur with greater than 10% cover. In the case of *Achillea millefolium*, over-grazing is frequently the cause.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: The lone IPP representative of this community occurs on a moderately steep, south-facing slope east of the Continental Divide at 1400 m (6000 feet) elevation on a calcareous substrate.

GLOBAL ENVIRONMENT: This community is found in the northern Rocky Mountains from central Montana to southwestern Alberta on dry and often wind-swept slopes. Typically stands are small patches, but some on the Rocky Mountain Front foothills and western extremity of the northwestern Great Plains are extensive. The documented elevation range is from 1400 m (4600 feet) in the Rocky Mountain Front foothills to 1830 m (6000 feet) within the Lewis Range; reconnaissance within this range has placed stands at considerably higher elevations (these sites often occur on west- to southwest-facing slopes impacted by prevailing winds). Though not restricted to calcareous substrates, it frequently occurs on such owing to extensive exposures of Madison limestone within the type's distribution. Substrates are always excessively drained and gravelly with textures ranging from silts to sandy loams. Ground cover is dominated by litter, but moderate amounts of rock (15%) and soil (10%) are found.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The upper canopy is open (40% cover) and dominated by *Pinus contorta* with *Pinus flexilis* the next most abundant species and *Abies lasiocarpa* present in the reproductive layer. *Amelanchier alnifolia*, *Arctostaphylos uva-ursi*, *Dasiphora fruticosa* ssp. *floribunda*, *Rosa acicularis*, *Spiraea betulifolia*, *Juniperus communis*, and *Juniperus horizontalis* exhibit at least 3% cover; however, graminoids, including *Festuca campestris*, *Carex geyeri*, and *Koeleria macrantha*, with 50% combined cover are clearly preponderant; *Festuca campestris* with 40% cover is by far the dominant herb. *Hedysarum sulphurescens*, *Lupinus sericeus*, and *Chamerion angustifolium* are the most prominent forbs.

GLOBAL VEGETATION: Tree canopy structure ranges from very open (15-20% cover) to approaching 60% cover. Though *Pinus flexilis* is usually dominant, *Pseudotsuga menziesii* is invariably present and not infrequently shares canopy dominance with *Pinus flexilis*. *Pinus ponderosa* and *Pinus contorta* occur in a small fraction of the stands and usually as minor components. With the exception of locally high coverages of *Juniperus horizontalis*, shrubs are generally a minor component, with those of highest constancy being *Arctostaphylos uva-ursi*, *Shepherdia canadensis*, *Juniperus communis*, *Artemisia frigida*, and *Amelanchier alnifolia*. The herbaceous layer is bunchgrass dominated, with *Festuca campestris* and *Festuca idahoensis* about equally abundant in stands with

well-regulated grazing and *Pseudoroegneria spicata* and *Koeleria macrantha* having considerable cover in particular circumstances. Forbs comprise a minor component, with *Allium cernuum*, *Galium boreale*, *Achillea millefolium*, *Lithospermum ruderales*, and *Balsamorhiza sagittata* exhibiting the highest constancy; the last three species sporadically occur with greater than 10% cover. In the case of *Achillea millefolium*, over-grazing is frequently the cause.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i> , <i>Pinus flexilis</i>
Herb (field)	Graminoid	<i>Festuca campestris</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Festuca campestris*, *Pinus flexilis*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: As originally defined (Pfister et al. 1977), this was a climax vegetation type (known as *Pinus flexilis* / *Festuca idahoensis* Habitat Type, *Festuca scabrella* Phase); both *Pinus flexilis* and *Pseudotsuga menziesii* are noted to be present in the canopy and reproductive layers, but *Pinus flexilis* is accorded greater indicator status and the type was designated accordingly. The type concept (as recognized for the IPP) has been broadened considerably to include seral stands potentially dominated by species other than *Pinus flexilis*, including *Pseudotsuga menziesii*, *Abies lasiocarpa*, and *Picea engelmannii*.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Pinus flexilis* / *Arctostaphylos uva-ursi* Woodland (CEGL000802)

GLOBAL RELATED CONCEPTS:

- *Pinus flexilis* / *Festuca idahoensis* Habitat Type, *Festuca scabrella* Phase (Pfister et al. 1977) =
- *Pinus flexilis*/*Festuca scabrella* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:II.A.2.a. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: Only one seral stand confirms this type from east of the Continental Divide in Glacier National Park.

GLOBAL RANGE: This association occurs east of the Continental Divide in and adjacent to the northern Rocky Mountains of Montana and Alberta, as well as in the isolated ranges of central Montana.

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S3

USFS ECOREGIONS: 331D:CC, M332B:CC, M332C:CC, M332D:CC, M332E:C?

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.189.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, MTNHP 2002b, MTNHP unpubl. data, Pfister et al. 1977, Western Ecology Working Group n.d.

***Pinus flexilis* / *Festuca idahoensis* Woodland**

LIMBER PINE / IDAHO FESCUE WOODLAND

IDENTIFIER: CEGL000805

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
Alliance	<i>Pinus flexilis</i> Woodland Alliance (A.540)
Alliance (English name)	Limber Pine Woodland Alliance
Association	<i>Pinus flexilis</i> / <i>Festuca idahoensis</i> Woodland
Association (English name)	Limber Pine / Idaho Fescue Woodland

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland (CES304.790)
 Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland (CES306.819)
 Rocky Mountain Foothill Limber Pine-Juniper Woodland (CES306.955)

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT:

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION:

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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Global		
<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Pseudotsuga menziesii* / *Festuca idahoensis* Woodland (CEGL000900)

GLOBAL RELATED CONCEPTS:

- *Pinus flexilis*/*Festuca idahoensis* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:II.A.2.a. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE:

GLOBAL RANGE:

NATIONS: US

STATES/PROVINCES: ID:S2, MT:S5, WY:S2

USFS ECOREGIONS: 342A:CC, M331A:CC, M332E:CC

FEDERAL LANDS: NPS (Glacier); USFS (Bighorn, Medicine Bow, Shoshone)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS:

LOCAL DESCRIPTION AUTHORS:

GLOBAL DESCRIPTION AUTHORS:

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Johnston 1987, Jones 1992b, Jones and Ogle 2000, MTNHP 2002b, Pfister et al. 1977, Steele et al. 1981, Steele et al. 1983, Western Ecology Working Group n.d.

Pinus flexilis / *Juniperus communis* Woodland

LIMBER PINE / COMMON JUNIPER WOODLAND

IDENTIFIER: CEGL000807

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
Alliance	<i>Pinus flexilis</i> Woodland Alliance (A.540)
Alliance (English name)	Limber Pine Woodland Alliance
Association	<i>Pinus flexilis</i> / <i>Juniperus communis</i> Woodland
Association (English name)	Limber Pine / Common Juniper Woodland

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland (CES304.790)
Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland (CES306.819)
Rocky Mountain Foothill Limber Pine-Juniper Woodland (CES306.955)

ELEMENT CONCEPT

GLOBAL SUMMARY: This limber pine woodland is found in the montane and subalpine zones of the western United States. It occurs on dry, exposed, rocky sites such as rock outcrops, ridges, slope crests, and high flat benches from 2530 to 3390 m (8300-11,100 feet) in elevation in the southern Rocky Mountains and 1400 to 2530 m (4600-8300 feet) in the northern Rocky Mountains. It

also occurs on gentle to moderately steep slopes with variable aspect. Soils are predominantly shallow, coarse-textured, and rapidly drained with high soil-surface temperatures. The tree canopy is generally open in character and comprised predominantly of *Pinus flexilis*. Tree canopy associates include *Pinus contorta* and *Picea engelmannii* at higher elevations and *Pinus ponderosa* at lower elevations, with *Pseudotsuga menziesii* and occasionally *Pinus albicaulis* in the northern portion of the range. A sparse low-shrub layer is present and characterized by *Juniperus communis*. *Arctostaphylos uva-ursi* also has high constancy in this type, although less total cover than *Juniperus communis*. Additional shrubs can include *Jamesia americana*, *Paxistima myrsinites*, *Ribes cereum*, *Symphoricarpos oreophilus*, *Vaccinium* spp., and *Juniperus horizontalis*. The herbaceous layer is likewise sparse. Species commonly occurring include *Achnatherum hymenoides*, *Carex geyeri*, *Carex rossii*, *Festuca brachyphylla*, *Leucopoa kingii*, *Poa fendleriana*, *Antennaria rosea*, *Erigeron flagellaris*, *Lupinus argenteus*, *Arenaria fendleri*, *Frasera speciosa*, *Geranium caespitosum* var. *fremontii* (= *Geranium fremontii*), *Penstemon virens*, *Potentilla fissa*, and *Sedum lanceolatum*. On calcareous substrates in the northern portion of the range, forbs often include *Clematis columbiana* (= *Clematis pseudoalpina*), *Arnica cordifolia*, *Eurybia conspicua* (= *Aster conspicuus*), *Campanula rotundifolia*, *Galium boreale*, and *Astragalus miser*. The ground layer has a high proportion of unvegetated surface that is often composed of gravel and rock.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is documented east of the Continental Divide in Glacier National Park in the subalpine zone at elevations ranging from 1770 to 1950 m (5800-6400 feet); slopes range from moderate to very steep and have southerly exposures facing prevailing winds, with midslopes being the most commonly represented position. Substrates were all fine-textured sedimentary rock. Sites have at least 10% exposed rock or gravel, with the most exposed having upwards of 50% exposed surface (soil, gravel, rock).

GLOBAL ENVIRONMENT: This limber pine woodland is found in the montane and subalpine zones of the western United States. It occurs on dry, exposed, rocky sites such as rock outcrops, ridges, slope crests, and high flat benches from 2530 to 3390 m (8300-11,100 feet) in elevation in the southern Rocky Mountains and 1400 to 2530 m (4600-8300 feet) in the northern Rocky Mountains. It also occurs on gentle to moderately steep slopes with variable aspect. Soils are predominantly shallow, coarse-textured, and rapidly drained with high soil-surface temperatures. The ground layer has a high proportion of unvegetated surface that is often composed of gravel and rock.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: These stands have a very open and immature tree canopy, barely qualifying even as a woodland. *Pinus flexilis* or *Pinus contorta* dominate the very scattered uppermost stratum, but the understory is characterized by *Abies lasiocarpa*, *Picea engelmannii*, *Pinus albicaulis*, and *Pseudotsuga menziesii*, which indicates eventual succession to types other than those characterized by *Pinus flexilis*. The shrub layer is dominated by *Juniperus communis* with 20-30% cover; consistently present in lesser amounts are *Juniperus horizontalis*, *Arctostaphylos uva-ursi*, and *Amelanchier alnifolia*. The herbaceous layer exhibits low cover, with the bunch grasses *Festuca campestris* and *Pseudoroegneria spicata*, though relatively sparse (<10% cover), having a greater contribution than any other herbs.

GLOBAL VEGETATION: The tree canopy of this woodland association is generally open in character and comprised predominantly of *Pinus flexilis*. Tree canopy associates include *Pinus contorta* and *Picea engelmannii* at higher elevations and *Pinus ponderosa* at lower elevations, with *Pseudotsuga menziesii* and occasionally *Pinus albicaulis* in the northern portion of the range. A sparse low-shrub layer is present and characterized by *Juniperus communis*. *Arctostaphylos uva-ursi* also has high constancy in this type, although less total cover than *Juniperus communis*. Additional shrubs can include *Jamesia americana*, *Paxistima myrsinites*, *Ribes cereum*, *Symphoricarpos oreophilus*, *Vaccinium* spp., and *Juniperus horizontalis*. The herbaceous layer is likewise sparse. Species commonly occurring include *Poa fendleriana*, *Achnatherum hymenoides*, *Carex geyeri*, *Carex rossii*, *Festuca brachyphylla*, *Leucopoa kingii*, *Antennaria rosea*, *Erigeron flagellaris*, *Lupinus argenteus*, *Arenaria fendleri*, *Frasera speciosa*, *Geranium caespitosum* var. *fremontii* (= *Geranium fremontii*), *Penstemon virens*, *Potentilla fissa*, and *Sedum lanceolatum*. On calcareous substrates in the northern portion of the range, forbs often include *Clematis columbiana* (= *Clematis pseudoalpina*), *Arnica cordifolia*, *Eurybia conspicua* (= *Aster conspicuus*), *Campanula rotundifolia*, *Galium boreale*, and *Astragalus miser*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Needle-leaved shrub	<i>Juniperus communis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus flexilis</i>
Short shrub/sapling	Needle-leaved shrub	<i>Juniperus communis</i> var. <i>montana</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Arctostaphylos uva-ursi*, *Juniperus communis*, *Juniperus horizontalis*, *Pinus flexilis*

GLOBAL: *Arctostaphylos uva-ursi*, *Carex geyeri*, *Frasera speciosa*, *Juniperus communis* var. *montana*, *Pinus flexilis*, *Symphoricarpos oreophilus*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: As identified and defined within the IPP, this association has been considerably broadened in concept because, even though *Pinus flexilis* characterizes the uppermost tree stratum, it may be subordinate to *Pinus contorta* in cover, and the understory composition signals that *Pinus flexilis* will eventually give way to more shade-tolerant trees, including *Picea engelmannii*, *Abies lasiocarpa*, *Pseudotsuga menziesii*, and even *Pinus albicaulis* (these successional possibilities have not been addressed in the Global Summary or Global Classification comments).

GLOBAL COMMENTS: There is overlap in concept between this association (CEGL000807) and *Pinus flexilis* / *Arctostaphylos uva-ursi* Woodland (CEGL000802). Both associations include stands with woodland understory codominated by *Arctostaphylos uva-ursi* and *Juniperus communis*. Rangelwide analysis and review of plots classified to both associations are needed to determine if these similar associations should be combined or somehow refined to better represent the vegetation structure of these stands that occur along the Rocky Mountain cordillera. See Achuff et al. (1997, 2002a) and Johnston (1987) for reviews of some of the pertinent literature. The northern expressions of this type that occur on calcareous substrates differ floristically from the non-calcareous expressions in the rest of the geographic range. With further data, these may warrant recognition as a different type.

GLOBAL SIMILAR ASSOCIATIONS:

- *Picea engelmannii* / *Juniperus communis* Forest (CEGL005925)
- *Pinus flexilis* / *Arctostaphylos uva-ursi* Woodland (CEGL000802)
- *Pinus ponderosa* / *Juniperus horizontalis* Woodland (CEGL000860)
- *Pseudotsuga menziesii* / *Juniperus communis* Forest (CEGL000439)

GLOBAL RELATED CONCEPTS:

- *Pinus flexilis* / *Juniperus communis* Habitat Type (Hess and Alexander 1986) =
- *Pinus flexilis* / *Juniperus communis* Habitat Type (Pfister et al. 1977) =
- *Pinus flexilis* / *Juniperus communis* Habitat Type (Hoffman and Alexander 1980) =
- *Pinus flexilis* / *Juniperus communis* Habitat Type (Alexander 1986) =
- *Pinus flexilis* / *Juniperus communis* Plant Association (Baker 1984a) =
- *Pinus flexilis* / *Juniperus communis* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:II.A.2.a. (Driscoll et al. 1984) B
- Limber pine / common juniper - Rocks Ecological Type (Johnston et al. 2001) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is found exclusively east of the Continental Divide in Glacier National Park; there is no ostensible reason why the type should not occur in Waterton Lakes National Park (or other locations in southwestern Alberta, Canada).

GLOBAL RANGE: This limber pine woodland association is found in the montane and subalpine zones of the western United States, from Montana, Idaho, and Oregon south to Colorado and Utah. It may also occur in Nevada and California.

NATIONS: CA?, US

STATES/PROVINCES: AB?, CA?, CO:S3, ID:S3, MT:S4, NV?, OR:S1, UT, WY:S2?

USFS ECOREGIONS: 331D:CC, 341F:??, 342A:CC, M331A:CC, M331B:CC, M331E:CC, M331I:CC, M331J:CC, M332C:CC, M332D:CC, M332E:CC

FEDERAL LANDS: NPS (Dinosaur, Glacier, Rocky Mountain); PC (Waterton Lakes?); USFS (Arapaho-Roosevelt, Bighorn, Gunnison, Medicine Bow, Pike-San Isabel, Routt, Shoshone)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: Accuracy Assessment plots: AAGL.252, AAGL.B188, AAGL.B247, AAGL.B252.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: S.L. Neid, mod. J. Coles and M.S. Reid

REFERENCES: Achuff et al. 1997, Achuff et al. 2002a, Alexander 1986, Baker 1984a, Bourgeron and Engelking 1994, Burns and Honkala 1990a, CONHP unpubl. data 2003, Cole 1982, Driscoll et al. 1984, Hess 1981, Hess and Alexander 1986, Hoffman and Alexander 1980, Johnston 1987, Johnston and Hendzel 1985, Johnston et al. 2001, Jones 1992b, Jones and Ogle 2000, Kagan et al. 2000, MTNHP 2002b, NVNHP 2003, Pfister et al. 1977, Steele et al. 1981, Steele et al. 1983, Wasser and Hess 1982, Western Ecology Working Group n.d.

***Pinus ponderosa* Woodland Alliance**

***Pinus ponderosa* / *Festuca campestris* Woodland PONDEROSA PINE / PRAIRIE FESCUE WOODLAND**

IDENTIFIER: CEGL000185

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
Alliance	<i>Pinus ponderosa</i> Woodland Alliance (A.530)
Alliance (English name)	Ponderosa Pine Woodland Alliance
Association	<i>Pinus ponderosa</i> / <i>Festuca campestris</i> Woodland
Association (English name)	Ponderosa Pine / Prairie Fescue Woodland

ECOLOGICAL SYSTEM(S):

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is most prevalent throughout northwestern Montana and the isolated ranges of central Montana, but it also occurs farther west in northern Idaho, eastern Washington, and possibly in interior British Columbia. It occurs primarily as small (to large) stands on south- and west-facing slopes at elevations of less than 1525 m (5000 feet). It is also found on moderate north slopes and benchlands near lower timberline where it transitions to fescue grasslands or *Pinus ponderosa* / *Pseudoroegneria spicata* Woodland (CEGL000865) on drier exposures. It occurs on a broad spectrum of parent materials, including calcareous substrates. Surface soils are generally gravelly, ranging from silts to fine sandy loams. Bare soil is minimal, and there are only moderate amounts of exposed rock. Soils average about 4 cm of duff depth and have a darkened A1 surface horizon, indicative of the strong influence of abundant graminoids and forbs on soil development. Stands are open to approaching a savanna-like condition and uniquely dominated by *Pinus ponderosa* with negligible amounts of *Pinus flexilis* and/or *Juniperus scopulorum*; *Pseudotsuga menziesii* is considered to be an "accidental." The shrub component is depauperate in species and cover, with only *Amelanchier alnifolia* and *Symphoricarpos albus* exhibiting constancy approaching 50%. Bunch grasses dominate the undergrowth (highest coverages approaching 70%, averaging about 55%) with dominance shifting between *Festuca campestris*, *Festuca idahoensis*, *Pseudoroegneria spicata*, *Koeleria macrantha*, *Elymus trachycaulus* (= *Agropyron caninum*), *Achnatherum occidentale* (= *Stipa occidentale*), and *Achnatherum nelsonii* (= *Stipa nelsonii*), depending on disturbance regime (livestock grazing primarily). Forbs of highest constancy include *Achillea millefolium*, *Anemone multifida*, *Balsamorhiza sagittata*, *Lithospermum ruderale*, *Galium boreale*, *Geum triflorum*, and *Potentilla gracilis*; total forb cover seldom exceeds 20%.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Only one stand, on coarse-textured, excessively drained alluvium of a high terrace, documents this association west of the Continental Divide.

GLOBAL ENVIRONMENT: This association is most prevalent throughout northwestern Montana and the isolated ranges of central Montana, but it also occurs farther west in northern Idaho, eastern Washington, and possibly in interior British Columbia. It occurs primarily as small (to large) stands on south- and west-facing slopes at elevations of less than 1525 m (5000 feet). It is also found on moderate north slopes and benchlands near lower timberline where it transitions to fescue grasslands or *Pinus ponderosa* / *Pseudoroegneria spicata* Woodland (CEGL000865) on drier exposures. It occurs on a broad spectrum of parent materials, including calcareous substrates. Surface soils are generally gravelly, ranging from silts to fine sandy loams. Bare soil is minimal, and there are only moderate amounts of exposed rock. Soils average about 4 cm of duff depth and have a darkened A1 surface horizon, indicative of the strong influence of abundant graminoids and forbs on soil development.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This stand, with one glaring exception, approaches the modal condition, with *Pinus ponderosa* the sole canopy tree of an open structure (30% cover), shrubs being unrepresented, more than 50% cover of mesic bunch grasses (including *Festuca campestris*, *Achnatherum nelsonii*, *Achnatherum richardsonii* (= *Stipa richardsonii*), *Bromus marginatus*, *Elymus trachycaulus*, *Danthonia intermedia*, *Carex hoodii*, and *Koeleria macrantha*), and an appreciable diversity of forbs, among which those with greatest cover include *Achillea millefolium*, *Fragaria virginiana*, *Geranium viscosissimum*, *Lithospermum ruderales*, and *Penstemon confertus*. The exception to modal conditions involves *Pinus monticola* successfully establishing on this site.

GLOBAL VEGETATION: Stands are open to approaching a savanna-like condition and uniquely dominated by *Pinus ponderosa* with negligible amounts of *Pinus flexilis* and/or *Juniperus scopulorum*; *Pseudotsuga menziesii* is considered to be an "accidental." The shrub component is depauperate in species and cover, with only *Amelanchier alnifolia* and *Symphoricarpos albus* exhibiting constancy approaching 50%. Bunch grasses dominate the undergrowth (highest coverages approaching 70%, averaging about 55%) with dominance shifting between *Festuca campestris*, *Festuca idahoensis*, *Pseudoroegneria spicata*, *Koeleria macrantha*, *Elymus trachycaulus* (= *Agropyron caninum*), *Achnatherum occidentale* (= *Stipa occidentale*), and *Achnatherum nelsonii* (= *Stipa nelsonii*), depending on disturbance regime (livestock grazing primarily). Forbs of highest constancy include *Achillea millefolium*, *Anemone multifida*, *Balsamorhiza sagittata*, *Lithospermum ruderales*, *Galium boreale*, *Geum triflorum*, and *Potentilla gracilis*; total forb cover seldom exceeds 20%.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus ponderosa</i>
Herb (field)	Graminoid	<i>Danthonia intermedia</i> , <i>Elymus trachycaulus</i> , <i>Festuca campestris</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Festuca campestris*, *Pinus ponderosa*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: The one plot of this type recognized from the IPP has appreciable *Pinus monticola* present and most likely represents a site potentially capable of being occupied by *Pseudotsuga menziesii* (being that *Pinus monticola* has greater moisture requirements than *Pseudotsuga*) As speculated elsewhere in this document, virtually all westside IPP sites, certainly in terms of the precipitation regime, are sufficiently mesic that *Pinus ponderosa*

could not function as a climax dominant. This plot putatively represents a stochastic anomaly, especially in light of the fact that *Pinus monticola* is relatively rare in Glacier National Park and *Pseudotsuga* is exceedingly common.

GLOBAL COMMENTS: As described and documented by Pfister et al. (1977), this is a climax plant association (habitat type) at the dry end of the moisture gradient of sites capable of supporting tree-dominated vegetation. As originally conceived, *Pinus ponderosa* (and to a limited degree *Pinus flexilis* and *Juniperus scopulorum*) should be the only trees capable of establishing on such xeric sites. However, the International Vegetation Classification (IVC) recognizes no distinction between types defined by potential versus those representing existing vegetation, which means stands with other conifer species in the subcanopy or reproductive layers (most likely *Pseudotsuga*) will classify to this type until the more shade-tolerant species assume dominance.

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

- *Pinus ponderosa*/*Festuca scabrella* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.b. (Driscoll et al. 1984) B

OTHER COMMENTS

OTHER COMMENTS: Both *Poa pratensis* and *Phleum pratense* are well-established in this stand and constitute a threat to undergrowth diversity.

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE:

GLOBAL RANGE: This association is most prevalent throughout northwestern Montana and the isolated ranges of central Montana but occurs farther west in northern Idaho and eastern Washington. It may also occur in interior British Columbia.

NATIONS: CA?, US

STATES/PROVINCES: BC?, ID:S1, MT:S3, WA:S1

USFS ECOREGIONS: 331A:CC, 342I:CC, M333A:CC

FEDERAL LANDS: NPS (Glacier); USFS (Kootenai)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.D1347.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Bourgeron and Engelking 1994, Cooper 2003, Driscoll et al. 1984, MTNHP 2002b, MTNHP unpubl. data, McLean 1970, Pfister et al. 1977, WNHP unpubl. data, Western Ecology Working Group n.d.

***Pinus ponderosa* / *Vaccinium caespitosum* Woodland**
PONDEROSA PINE / DWARF BLUEBERRY WOODLAND

IDENTIFIER: C EGL005841

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
Alliance	<i>Pinus ponderosa</i> Woodland Alliance (A.530)
Alliance (English name)	Ponderosa Pine Woodland Alliance
Association	<i>Pinus ponderosa</i> / <i>Vaccinium caespitosum</i> Woodland
Association (English name)	Ponderosa Pine / Dwarf Blueberry Woodland

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is found in the montane zone of the central and northern Rocky Mountains from western Montana, Idaho and northeastern Washington. Elevations range from 700-1370 m (2300-4500 feet) extending to 1950 (6400 feet) east of the Continental Divide. Sites are relatively warm and moist, typically with cold nights, often occurring where cold air accumulates causing high diurnal temperature fluctuations, high daily maximum temperatures and frequent summer frosts. Topography is flat to gently undulating or moderately sloping terrain typically occurring on valley bottoms, terraces, lower slopes, and benches on all aspects. Soils are typically excessively well-drained, moderately deep, acidic, gravelly, sandy loam or loam, derived from a variety of noncalcareous parent materials, especially glacial till. Ground cover is mostly tree litter, often with duff over 4 cm deep. The vegetation is characterized by an open to moderately dense tree canopy that is dominated by *Pinus ponderosa*. In some stands scattered *Pseudotsuga menziesii*, *Larix occidentalis*, *Populus tremuloides*, *Picea engelmannii*, or *Pinus contorta* trees may be present. *Vaccinium caespitosum* and *Arctostaphylos uva-ursi* (indicator species) are common to dominant in the patchy to continuous dwarf-shrub layer. Other shrubs and dwarf-shrubs may include low cover of *Amelanchier alnifolia*, *Linnaea borealis* (on more mesic sites), *Mahonia repens*, *Paxistima myrsinites*, *Ribes* spp., *Rosa woodsii*, *Spiraea betulifolia*, or *Symphoricarpos albus*. The herbaceous layer is sparse to moderately dense (to 30% cover) and is typically dominated or codominated by perennial graminoids in the openings such as *Calamagrostis rubescens*, *Carex geyeri*, or *Festuca* spp. Forbs generally have sparse cover but may be diverse and include *Arnica cordifolia*, *Balsamorhiza sagittata*, *Fragaria virginiana*, *Heuchera cylindrica*, *Maianthemum racemosum*, *Tiarella trifoliata*, and *Thalictrum occidentale*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This mesic, montane association occurs on gentle to moderate, south-facing ridges and benches at elevations near 1100 to 1130 m (3600-3700 feet). Soils are well-drained loams or silt loams that are derived from glacial till or drift. Litter comprises 90% of the ground surface. One of the sampled plots was burned in the 1996 Anaconda Fire.

GLOBAL ENVIRONMENT: This association is found in the montane zone of the central and northern Rocky Mountains. Elevations range from 700-1370 m (2300-4500 feet) extending to 1950 (6400 feet) east of the Continental Divide. Sites are relatively warm and moist, typically with cold nights, often occurring where cold air accumulates causing high diurnal temperature fluctuations often with frequent summer frosts and high daily maximum temperatures. Topography is flat to gently undulating or moderately sloping terrain typically occurring on valley bottoms, terraces, lower slopes, and benches on all aspects. Soils are typically excessively well-drained, moderately deep, acidic, gravelly, sandy loam or loam, derived from a variety of noncalcareous parent materials, especially glacial till. Ground cover is mostly tree litter, often with duff over 4 cm deep.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This open-canopy, evergreen forest usually occurs as a result of ground fires that remove many *Pseudotsuga menziesii* and *Pinus contorta* trees and ground cover. The open nature of the canopy may also be a result of mountain pine beetle kill, since one sampled area had numerous downed *Pinus ponderosa* trees. Tree canopy cover averages 30% with heights ranging from 20-50 m. *Pinus ponderosa* almost exclusively dominates the canopy layer with 30% cover. A few *Pinus contorta*, *Larix occidentalis*, and *Populus tremuloides* trees are scattered throughout the canopy with low cover. Occasionally a tree subcanopy is present with 5% cover and heights between 2-5 m. *Populus tremuloides*, *Pseudotsuga menziesii*, and *Picea engelmannii* are sometimes present in the subcanopy layer with low cover.

Dwarf-shrubs have the highest cover of all shrub layers with 20-40% cover. *Vaccinium caespitosum* dominates the dwarf-shrub layer with 15-35% cover. *Arctostaphylos uva-ursi* and *Linnaea borealis* may also be present with 7% cover and 1% cover, respectively. Short shrubs are also common with 10-20% cover and heights ranging between >0.5-1 m. *Spiraea betulifolia* dominates this layer with 10-15% cover. *Rosa woodsii* and *Symphoricarpos albus* are also usually present with 1-7% cover. Tall-shrub cover ranges between 10-15% and is dominated by *Amelanchier alnifolia* that is 1-2 m in height.

Overall herbaceous cover ranges from 80-100% with heights less than 0.5 m. *Calamagrostis rubescens* clearly dominates this layer with approximately 75% cover. Other high-constancy forbs and grasses in the herbaceous layer that have 1-4% cover include *Symphotrichum laeve* (= *Aster laevis*), *Achillea millefolium*, *Fragaria vesca*, *Phleum pratense*, *Elymus glaucus*, *Fragaria virginiana*, and *Galium boreale*. *Eurybia conspicua* (= *Aster conspicuus*), *Geranium viscosissimum*, *Vicia americana*, *Chamerion angustifolium*, and *Picea engelmannii* seedlings are lower constancy species that may have conspicuous cover.

GLOBAL VEGETATION: This association is characterized by an open to moderately dense tree canopy that is dominated by *Pinus ponderosa*. In some stands scattered *Pseudotsuga menziesii*, *Larix occidentalis*, *Populus tremuloides*, *Picea engelmannii*, or *Pinus contorta* trees may be present. *Vaccinium caespitosum* and *Arctostaphylos uva-ursi* (indicator species) are common to dominant in the patchy to continuous dwarf-shrub layer. Other shrubs and dwarf-shrubs may include low cover of *Amelanchier alnifolia*, *Linnaea borealis* (on more mesic sites), *Mahonia repens*, *Paxistima myrsinites*, *Ribes* spp., *Rosa woodsii*, *Spiraea betulifolia*, or

Symphoricarpos albus. The herbaceous layer is sparse to moderately dense (to 30% cover) and is typically dominated or codominated by perennial graminoids in the openings such as *Calamagrostis rubescens*, *Carex geyeri*, or *Festuca* spp. Forbs generally have sparse cover but may be diverse and include *Arnica cordifolia*, *Balsamorhiza sagittata*, *Fragaria virginiana*, *Heuchera cylindrica*, *Maianthemum racemosum*, *Tiarella trifoliata*, and *Thalictrum occidentale*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus ponderosa</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rosa woodsii</i> , <i>Spiraea betulifolia</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium caespitosum</i>
Herb (field)	Forb	<i>Eurybia conspicua</i> , <i>Geranium viscosissimum</i> , <i>Symphotrichum laeve</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus ponderosa</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rosa woodsii</i> , <i>Spiraea betulifolia</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium caespitosum</i>
Herb (field)	Forb	<i>Eurybia conspicua</i> , <i>Geranium viscosissimum</i> , <i>Symphotrichum laeve</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Achillea millefolium*, *Amelanchier alnifolia*, *Calamagrostis rubescens*, *Elymus glaucus*, *Fragaria vesca*, *Fragaria virginiana*, *Galium boreale*, *Phleum pratense*, *Pinus ponderosa*, *Populus tremuloides*, *Rosa woodsii*, *Spiraea betulifolia*, *Symphoricarpos albus*, *Symphotrichum laeve*, *Vaccinium caespitosum*

GLOBAL: *Pinus ponderosa*, *Vaccinium caespitosum*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Calochortus apiculatus*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3? (14-Apr-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Stands of this *Pinus ponderosa*-dominated woodland association were included in concepts of *Pseudotsuga menziesii* / *Vaccinium caespitosum* habitat types described in Cooper et al. (1987, 1991), Pfister et al. (1977), and Steele et al. (1981) and the *Pseudotsuga menziesii* / *Vaccinium caespitosum* plant association (Williams et al. 1995).

GLOBAL SIMILAR ASSOCIATIONS:

- *Larix occidentalis* / *Vaccinium caespitosum* Forest (CEGL005882)
- *Pinus contorta* / *Vaccinium caespitosum* Forest (CEGL000168)
- *Pseudotsuga menziesii* / *Vaccinium caespitosum* Forest (CEGL000465)

GLOBAL RELATED CONCEPTS:

- *Pseudotsuga menziesii* / *Vaccinium caespitosum* Habitat Type (Cooper et al. 1987) B
- *Pseudotsuga menziesii* / *Vaccinium caespitosum* Habitat Type (Pfister et al. 1977) B
- *Pseudotsuga menziesii* / *Vaccinium caespitosum* Habitat Type (Steele et al. 1981) B

- *Pseudotsuga menziesii* / *Vaccinium caespitosum* plant association (Williams et al. 1995) F

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon on the west side of Glacier National Park, only located in low-elevation areas that have had periodic ground fires within the North Fork subdistrict. It has been documented in a few areas south of the Logging Creek Ranger Station.

GLOBAL RANGE: This association is found in the montane zone of the central and northern Rocky Mountains from western Montana, Idaho and northeastern Washington.

NATIONS: US

STATES/PROVINCES: ID, MT:S2S3, WA

USFS ECOREGIONS: M333A:CP, M333B:CP, M333C:CC, M333D:CP

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2254, GLAC.2259.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Cooper et al. 1987, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d., Williams et al. 1995

II.A.4.N.b. Conical-crowned temperate or subpolar needle-leaved evergreen woodland

Pseudotsuga menziesii Woodland Alliance

Pseudotsuga menziesii / *Calamagrostis rubescens* Woodland DOUGLAS-FIR / PINEGRASS WOODLAND

IDENTIFIER: CEGL000429

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.b.)
Alliance	<i>Pseudotsuga menziesii</i> Woodland Alliance (A.552)
Alliance (English name)	Douglas-fir Woodland Alliance
Association	<i>Pseudotsuga menziesii</i> / <i>Calamagrostis rubescens</i> Woodland
Association (English name)	Douglas-fir / Pinegrass Woodland

ECOLOGICAL SYSTEM(S): Middle Rocky Mountain Montane Douglas-fir Forest and Woodland (CES306.959)
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)

ELEMENT CONCEPT

GLOBAL SUMMARY: This lower to mid montane woodland association occurs in the central and northern Rocky Mountains from western Montana to northeastern Washington and British Columbia, and south to western Wyoming, Idaho and eastern Oregon. Elevations range from 825 to 2400 m (2700-7900 feet). Stands occur on cool, dry sites on mid to upper slopes and benches on all aspects at middle elevations. At lowest elevations stands are restricted to north aspects, and at upper elevations stands are found on warm and dry southerly exposures. Substrates are variable (sandy to clayey), but are generally well-drained, coarser-textured gravelly soils and derived from a variety of noncalcareous, acid, parent materials. Surface rock usually is low to moderate, and litter cover high. The typically open tree canopy is dominated by *Pseudotsuga menziesii* alone or codominated by *Pinus ponderosa* or *Larix occidentalis*. Large *Pinus albicaulis* or *Pinus contorta* trees may be present in the upper tree canopy. The subcanopy is *Pseudotsuga*

menziesii. Scattered shrubs such as *Amelanchier alnifolia*, *Paxistima myrsinites*, *Sorbus scopulina*, and *Symphoricarpos oreophilus* and dwarf-shrubs such as *Arctostaphylos uva-ursi* and *Mahonia repens* may also be present. The dense to moderately dense (20-60% cover) perennial graminoid layer characteristically dominates the understory. *Calamagrostis rubescens* typically is the dominant, with *Carex geyeri*, *Festuca idahoensis*, and *Pseudoroegneria spicata* often present to codominant. There is often a high diversity of forbs, but typically all have low cover. Forb species present are highly variable, but the most common forb species are *Achillea millefolium*, *Antennaria* spp., *Arnica cordifolia*, *Balsamorhiza sagittata*, *Eurybia conspicua*, *Fragaria virginiana*, *Geranium viscosissimum*, and *Geum triflorum*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This woodland association occupies warm, upland slopes with a gentle to moderate grade. Slopes usually face the south or southwest. Elevations range from 1100-1750 m (3608-5740 feet), with upper elevation stands occupying southerly exposures. Parent material is highly variable, ranging from glacial deposits to sedimentary limestone and siltstone. Soil is equally variable. Sites are well-drained with sand, sandy loam and clay loam soils having up to 50% gravel. This association is also common on sites with 10-30% exposed bedrock. Ground surfaces are predominantly covered with litter, with large to small rock also common in amounts ranging from 1-10%.

GLOBAL ENVIRONMENT: This lower to mid montane woodland association occurs in central and northern Rocky Mountains. Elevations range from 825 to 2400 m (2700-7900 feet). Stands occur on cool, dry sites on mid to upper slopes and benches on all aspects at middle elevations. At lowest elevations stands are restricted to north aspects, and at upper elevations stand are found on warm and dry southerly exposures. Substrates are variable (sandy to clayey) but are generally well-drained, coarser-textured gravelly soils and derived from a variety of noncalcareous, acidic parent materials including andesite, basalt, granites, quartzite, quartz monzonite, and glacial drift. Surface rock usually is low to moderate, and litter cover is high. Some stands can have up to 30% exposed bedrock.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The total tree canopy cover is typically around 40% in this association, giving these stands an open, often woodland-like appearance. The upper canopy is dominated by *Pseudotsuga menziesii*, ranging in height from 10-35 m. It is successfully reproducing, evidenced by the presence of seedlings and pole-sized trees. Other seral species present may be *Pinus contorta* and *Pinus ponderosa*, the latter at lower elevations or on warmer aspects. *Abies lasiocarpa* and *Picea engelmannii* may also be present and reproducing successfully. Tall shrubs and saplings are common, with approximately 20% canopy cover coming from species such as *Amelanchier alnifolia* and *Sorbus scopulina*. Short and dwarf-shrubs are sparse. The most dominant species in the herbaceous layer is *Calamagrostis rubescens*, which creates a uniform carpet over much of the ground. *Carex geyeri* is also a strong component of the undergrowth, but much less so than *Calamagrostis rubescens*. Forb diversity is high. *Eurybia conspicua* (= *Aster conspicuus*) and *Chamerion angustifolium* (= *Epilobium angustifolium*) are typically present and more abundant than other species.

GLOBAL VEGETATION: This association typically has an open tree canopy that is dominated by *Pseudotsuga menziesii* alone or codominated by *Pinus ponderosa* or *Larix occidentalis*. Large *Pinus albicaulis* or *Pinus contorta* trees may be present in the upper tree canopy. The subcanopy is *Pseudotsuga menziesii*. Scattered shrubs such as *Amelanchier alnifolia*, *Paxistima myrsinites*, *Sorbus scopulina*, and *Symphoricarpos oreophilus* and dwarf-shrubs such as *Arctostaphylos uva-ursi* and *Mahonia repens* may also be present. The dense to moderately dense (20-60% cover) perennial graminoid layer characteristically dominates the understory. *Calamagrostis rubescens* typically is the dominant, with *Carex geyeri*, *Festuca idahoensis*, and *Pseudoroegneria spicata* often present to codominant. Although some stands may have only *Calamagrostis rubescens*. There is often a high diversity of forbs, but typically all have low cover. The most common forb species are *Achillea millefolium*, *Antennaria* spp., *Arnica cordifolia*, *Balsamorhiza sagittata*, *Eurybia conspicua*, *Fragaria virginiana*, *Geranium viscosissimum*, and *Geum triflorum*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i> , <i>Sorbus scopulina</i>
Herb (field)	Forb	<i>Chamerion angustifolium</i> , <i>Eurybia conspicua</i> , <i>Fragaria virginiana</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i> , <i>Carex geyeri</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Calamagrostis rubescens*, *Pseudotsuga menziesii*

GLOBAL: *Calamagrostis rubescens*, *Carex geyeri*, *Pseudotsuga menziesii*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: One plot sampled west of the Continental Divide, in the North Fork valley, represents the warm extreme of this association. It lies at low elevation with a southwesterly exposure. The overstory canopy is dominated by *Pinus ponderosa*, but *Pseudotsuga menziesii* is a strong overstory component and is successfully reproducing in the understory.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Calamagrostis rubescens* Forest (CEGL000301)
- *Picea engelmannii* / *Maianthemum stellatum* Forest (CEGL000415)
- *Pinus contorta* / *Calamagrostis rubescens* Forest (CEGL000139)
- *Pinus contorta* / *Spiraea betulifolia* Forest (CEGL000164)
- *Pseudotsuga menziesii* / *Arctostaphylos uva-ursi* Forest (CEGL000424)
- *Pseudotsuga menziesii* / *Carex geyeri* Forest (CEGL000430)
- *Pseudotsuga menziesii* / *Spiraea betulifolia* Forest (CEGL000457)
- *Pseudotsuga menziesii* / *Symphoricarpos albus* Forest (CEGL000459)

GLOBAL RELATED CONCEPTS:

- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Community Type (Cole 1982) F
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Habitat Type (Pfister et al. 1977) B
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Habitat Type (Mauk and Henderson 1984) B
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Habitat Type (Cooper et al. 1987) B
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Habitat Type (Steele et al. 1983) B
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Habitat Type (Steele et al. 1981) B
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Plant Association (Johnston 1987) F
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Plant Association (Johnson and Simon 1987) =
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Plant Association (Johnson and Clausnitzer 1992) =
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Plant Association (Williams and Smith 1990) F
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Plant Association (Williams et al. 1990b) F
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Plant Association (Williams and Lillybridge 1983) F
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* Plant Association (Williams and Lillybridge 1985) F
- *Pseudotsuga menziesii* / *Calamagrostis rubescens* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: All plots sampled were in Glacier National Park, on warm slopes in St. Mary's and Two Medicine valleys east of the Continental Divide. West of the Continental Divide this association was documented in the North Fork valley.

GLOBAL RANGE: This lower to mid montane woodland association occurs in the central and northern Rocky Mountains from western Montana to northeastern Washington and British Columbia, and south to western Wyoming, Idaho and eastern Oregon.

NATIONS: CA, US

STATES/PROVINCES: BC:S3?, ID:S4?, MT:S5, OR:S3, UT:S2?, WA:S5, WY:S4?

USFS ECOREGIONS: 331D:CC, 342B:CC, 342C:CC, M242C:CC, M331A:CC, M331B:CC, M331D:CC, M331J:C?, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton); USFS (Bridger-Teton, Caribou-Targhee, Shoshone, Wallowa-Whitman, Wenatchee)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.168, GLAC.2080, GLAC.211, GLAC.227.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz, mod. G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Clausnitzer and Zamora 1987, Cole 1977b, Cole 1982, Collins et al. 1984, Cooper et al. 1987, Daubenmire 1952, Daubenmire and Daubenmire 1968, Driscoll et al. 1984, Hall 1973, Horton 1971, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Johnston 1987, Jones and Ogle 2000, Kagan et al. 2000, MTNHP 2002b, Mauk and Henderson 1984, McLean 1970, Ogilvie 1962, Pfister et al. 1977, Steele et al. 1981, Steele et al. 1983, Terwilliger et al. 1979a, WNHP unpubl. data, Western Ecology Working Group n.d., Williams and Lillybridge 1983, Williams and Lillybridge 1985, Williams and Smith 1990, Williams et al. 1990b, Zamora 1983

Pseudotsuga menziesii / *Festuca idahoensis* Woodland

DOUGLAS-FIR / IDAHO FESCUE WOODLAND

IDENTIFIER: C EGL000900

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Conical-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.b.)
Alliance	<i>Pseudotsuga menziesii</i> Woodland Alliance (A.552)
Alliance (English name)	Douglas-fir Woodland Alliance
Association	<i>Pseudotsuga menziesii</i> / <i>Festuca idahoensis</i> Woodland
Association (English name)	Douglas-fir / Idaho Fescue Woodland

ECOLOGICAL SYSTEM(S): Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)
Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030)
Middle Rocky Mountain Montane Douglas-fir Forest and Woodland (CES306.959)

ELEMENT CONCEPT

GLOBAL SUMMARY: This lower montane woodland association occurs in the central and northern Rocky Mountains from western Montana to northeastern Washington and south to western Wyoming. Elevations range from 915 to 2440 m (3000-8000 feet). Stands occur on mid to low slopes and benches on all aspects near lower tree line or on warm and dry sites at higher elevations. Soils are variable and range from silty loam to gravelly sandy loam derived from a variety of calcareous and noncalcareous parent materials. Surface rock usually is less than 10% but may be as high as 30% cover. The typically open tree canopy is dominated by *Pseudotsuga menziesii* alone or codominated by *Pinus ponderosa*. The tree canopy varies from savanna to closed and may include scattered *Juniperus scopulorum*, *Pinus contorta*, or *Pinus flexilis* trees. *Artemisia tridentata* shrubs are often prominent, but seldom have over 10% cover. Scattered *Amelanchier alnifolia* and *Ribes cereum* are often present. The dense to moderately dense perennial graminoid layer characteristically dominates the understory. *Festuca idahoensis* and *Pseudoroegneria spicata* codominate with *Carex geyeri*, *Carex rossii*, or *Leucopoa kingii* (= *Festuca kingii*) sometimes prominent. There is often a high diversity of forbs, but typically all have low cover except *Balsamorhiza sagittata*. The most common forb species are *Achillea millefolium*, *Antennaria microphylla*, *Arnica cordifolia*, *Fragaria virginiana*, and *Geum triflorum*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This woodland association occupies dry valley slopes with a moderate to somewhat steep grade. Aspects range from southeast to southwest, or may be easterly on sunny, exposed

sites. A poorly developed shrub layer contributes to the open, high insolation environment that characterizes this woodland. Elevations range from 1300-1520 m (4264-4986 feet). Parent material is highly variable, originating from glacio-fluvial deposits in some locations and sedimentary limestone and siltstone in others. Soils are undeveloped, well-drained sandy loams with abundant gravel and small rock. The association may also occupy a thin layer of poorly developed soil over bedrock. Ground cover is primarily litter, but rock may account for 1-25%.

GLOBAL ENVIRONMENT: This lower montane woodland association is known from the central and northern Rocky Mountains. Elevations range from 300 to 2440 m (3000-8000 feet). Stands occur on a mid to low slopes and benches on all aspects near lower tree line or on warm and dry sites at higher elevations. Soils are variable and range from silty loam to gravelly sandy loam derived from a variety of calcareous and noncalcareous parent materials including granites, quartzite, various volcanic and sedimentary rock. Surface rock usually is less than 10% but may be as high as 30% cover.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The tree canopy is characteristically very open in this woodland association, dominated by *Pseudotsuga menziesii* with a canopy cover of 10-20%. *Pseudotsuga menziesii* is also present in the regeneration layer. Seral tree species, such as *Pinus contorta*, may be present in small amounts. Short- and dwarf-shrub cover is sparse, with highly browsed *Amelanchier alnifolia* providing the greatest cover (roughly 10-15%). Herbaceous diversity and cover are typically high, with cover ranging from 20-60%. *Festuca idahoensis* is the dominant herbaceous species, with average cover usually 15-25%. Other grasses and sedges, such as *Pseudoroegneria spicata* and *Carex geyeri*, are also usually present. A wide variety of forbs contribute to the overall diversity with none dominant; however, *Eriogonum umbellatum*, *Penstemon confertus*, and *Selaginella densa* var. *scopulorum* were consistently present in all plots.

GLOBAL VEGETATION: This woodland association typically has an open tree canopy that is dominated by *Pseudotsuga menziesii* alone or codominated by *Pinus ponderosa*. The tree canopy varies from savanna to closed and may include scattered *Juniperus scopulorum*, *Pinus contorta*, or *Pinus flexilis* trees. *Artemisia tridentata* shrubs are often prominent, but seldom have over 10% cover. Scattered *Amelanchier alnifolia* and *Ribes cereum* are often present. The dense to moderately dense perennial graminoid layer characteristically dominates the understory. *Festuca idahoensis* and *Pseudoroegneria spicata* codominate with *Carex geyeri*, *Carex rossii*, or *Leucopoa kingii* (= *Festuca kingii*) sometimes prominent. There is often a high diversity of forbs, but typically all have low cover except *Balsamorhiza sagittata*. The most common forbs species are *Achillea millefolium*, *Antennaria microphylla*, *Arnica cordifolia*, *Eriogonum* spp., *Fragaria virginiana*, and *Geum triflorum*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i>
Herb (field)	Graminoid	<i>Carex geyeri</i> , <i>Festuca idahoensis</i> , <i>Pseudoroegneria spicata</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i>
Herb (field)	Graminoid	<i>Carex geyeri</i> , <i>Festuca idahoensis</i> , <i>Pseudoroegneria spicata</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Eriogonum umbellatum*, *Festuca idahoensis*, *Penstemon confertus*, *Pseudotsuga menziesii*

GLOBAL: *Festuca idahoensis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: More research is needed to clarify the extent of this association in the southern Rocky Mountains [see Johnston (1987)] and the Pacific Northwest.

GLOBAL SIMILAR ASSOCIATIONS:

- *Pinus contorta* / *Festuca idahoensis* Woodland (CEGL000149)
- *Pinus flexilis* / *Festuca idahoensis* Woodland (CEGL000805)
- *Pseudotsuga menziesii* / *Pseudoroegneria spicata* Woodland (CEGL000908)

GLOBAL RELATED CONCEPTS:

- *Pseudotsuga menziesii* / *Festuca idahoensis* Habitat Type (Pfister et al. 1977) B
- *Pseudotsuga menziesii* / *Festuca idahoensis* Habitat Type (Steele et al. 1983) B
- *Pseudotsuga menziesii* / *Festuca idahoensis* Plant Association (Johnston 1987) B
- *Pseudotsuga menziesii*/*Festuca idahoensis* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:II.A.2.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association occupies dry slopes east of the Continental Divide along broad valleys in Glacier National Park and on the Blackfeet Reservation. Specifically, it was documented in Waterton and St. Mary's valleys.

GLOBAL RANGE: This lower montane woodland association occurs in the central and northern Rocky Mountains from western Montana to northeastern Washington and south to western Wyoming.

NATIONS: US

STATES/PROVINCES: ID:S3, MT:S4, WA:S2, WY:S1

USFS ECOREGIONS: 342C:CC, M331A:CC, M332A:CC, M332C:CC, M332E:CC, M332F:CC, M332G:CC, M333D:CC

FEDERAL LANDS: BIA (Blackfeet); NPS (Glacier); USFS (Medicine Bow, Shoshone)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.140, GLAC.158, GLAC.179, GLAC.214.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Johnston 1987, Jones and Ogle 2000, MTNHP 2002b, Pfister et al. 1977, Steele et al. 1983, Western Ecology Working Group n.d.

II.A.4.N.c. Cylindrical-crowned temperate or subpolar needle-leaved evergreen woodland

Abies lasiocarpa Woodland Alliance

Abies lasiocarpa - *Picea engelmannii* / *Luzula glabrata* var. *hitchcockii* Woodland

SUBALPINE FIR - ENGELMANN SPRUCE / HITCHCOCK'S SMOOTH WOODRUSH WOODLAND

IDENTIFIER: CEGL000317

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.c.)
Alliance	<i>Abies lasiocarpa</i> Woodland Alliance (A.559)
Alliance (English name)	Subalpine Fir Woodland Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Luzula glabrata</i> var. <i>hitchcockii</i> Woodland

Association (English name) Subalpine Fir - Engelmann Spruce / Hitchcock's Smooth Woodrush Woodland

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is a minor one, occurring as small-patch occurrences at the highest subalpine elevations within the northern Rocky Mountains, southern portion of the Canadian Rockies and west to the eastern slope of the Cascade Range. Across the core area of its distribution its known elevational range is 1830 to 2500 m (6000-8200 feet). It occupies cold sites that receive snow in excess of what is received by surrounding topography and also retains the snow cache late into summer. Sites may occur on all aspects and degrees of slope so long as snowpack is long-persisting. Parent materials are various, including extrusive and intrusive volcanics (primarily granitics), sedimentary colluvium and morainal detritus; regardless of parent material, kind/source soils weather to coarse-textured, extremely acid soils (usually less than pH of 4.2). Stands are usually very open with short-stature *Abies lasiocarpa* and *Picea engelmannii* dominating the canopy. Scattered seral tree species include *Pinus albicaulis* and *Pinus contorta*. The shrub component is generally depauperate with thin patches of a variable mix of *Vaccinium scoparium*, *Vaccinium membranaceum* (dwarfed in size to less than 0.2 m), *Lonicera utahensis*, *Ribes montigenum*, and *Phyllodoce empetriformis*. The forb component is strongly dominated by *Luzula glabrata*, which can occur as a dense sward (cover approaching 100%) to the near exclusion of other herbs. *Arnica latifolia* is universally the most abundant and constant forb in a very depauperate layer.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This woodland association occupies cool, moderately steep, north-facing slopes at elevations near 2030 m (6658 feet). Snow accumulation is high, and snowmelt occurs late in the growing season. Parent material is derived from noncalcareous colluvium. Soil is a well-drained sandy loam, and is not well-developed. Ground surfaces are primarily covered with litter, and wood may account for 10-20% ground cover.

GLOBAL ENVIRONMENT: This association is a minor one, occurring as small- or infrequently as large-patch occurrences at the highest subalpine elevations within the northern Rocky Mountains and southern portion of the Canadian Rockies. Across the core area of its distribution its known elevational range is 1830 to 2500 m (6000-8200 feet); outliers of the association are found in Wyoming's Teton Range at 2990 m (9800 feet) and higher. It occupies cold sites that receive snow in excess of what is received by surrounding topography and also retains the snow cache late into summer. Sites may occur on all aspects and degrees of slope so long as snowpack is long-persisting. Parent materials are various, including extrusive and intrusive volcanics (primarily granitics), sedimentary colluvium and morainal detritus; regardless of parent material, kind/source soils weather to coarse-textured, extremely acid soils (usually less than pH of 4.2) with a high gravel content, reflected in the considerable amount displayed on the surface. Soils are poorly developed (Inceptisols, Entisols) with virtually no horizonation.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The tree canopy, dominated by *Abies lasiocarpa*, is made up of an open layer 5-10 m tall with a total cover around 40%. Scattered *Picea engelmannii* and *Pinus albicaulis* may contribute up to 10% cover. A shorter layer of regenerating *Abies lasiocarpa*, 2-5 m in height, typically contributes approximately 10% cover. *Abies lasiocarpa* is successfully reproducing, with seedlings contributing 35% cover in a layer <0.5 m tall. Short-shrub cover is 10-20%, dominated by *Vaccinium membranaceum*. *Ribes lacustre* and *Lonicera utahensis* may also be present in trace amounts. Total herbaceous cover is 70%, of which *Luzula glabrata* var. *hitchcockii*, growing in patches across the slope, contributes 35%. *Arnica cordifolia* and *Thalictrum occidentale* are also common, interspersed with other high-elevation, moist-site forbs such as *Valeriana sitchensis* and *Ranunculus eschscholtzii*.

GLOBAL VEGETATION: Stands are usually very open with short-stature *Abies lasiocarpa* and *Picea engelmannii* dominating the canopy. Scattered seral tree species include *Pinus albicaulis* and *Pinus contorta*. The shrub component is generally depauperate with thin patches of a variable mix of *Vaccinium scoparium*, *Vaccinium myrtillus*, *Vaccinium membranaceum* (dwarfed in size to less than 0.2 m), *Lonicera utahensis*, *Sambucus racemosa*, *Ribes montigenum*, and *Phyllodoce empetriformis*. The forb component is strongly dominated by *Luzula glabrata*, which can occur as a dense sward (cover approaching 100%) to the near exclusion of other herbs; most studies report an average cover between 20 and 40%. Other graminoids present vary by region with *Juncus parryi*, *Carex rossii*, and *Carex geyeri* being most prevalent in central and northern Idaho where the type is ostensibly most extensive. *Arnica latifolia* is universally the most abundant and constant forb in a very depauperate layer. In Idaho *Chionophila tweedyi*, *Pedicularis contorta*, *Polemonium pulcherrimum*, and *Valeriana sitchensis* are the species with highest constancy; with the exception of *Chionophila tweedyi*, the same expression is found on the east slope of the Cascades (Lillybridge et al. 1995). In Montana *Arnica latifolia*, *Hieracium gracile*, *Viola orbiculata*, and *Xerophyllum tenax* tend to be consistently present, though only the first and last named attain high coverages. In Grand Teton National Park, forbs include *Pedicularis racemosa*, *Sibbaldia procumbens*, *Arnica latifolia*, *Ligusticum filicinum*, *Erigeron* spp., *Eucephalus engelmannii*, and *Lupinus* sp.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i>
Herb (field)	Forb	<i>Thalictrum occidentale</i>
Herb (field)	Graminoid	<i>Luzula glabrata</i> var. <i>hitchcockii</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Herb (field)	Graminoid	<i>Luzula glabrata</i> var. <i>hitchcockii</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Luzula glabrata* var. *hitchcockii*, *Picea engelmannii*, *Thalictrum occidentale*

GLOBAL: *Abies lasiocarpa*, *Arnica latifolia*, *Carex geyeri*, *Juncus parryi*, *Luzula glabrata* var. *hitchcockii*, *Picea engelmannii*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Xerophyllum tenax* - *Luzula glabrata* var. *hitchcockii* Woodland (CEGL005898)
- *Abies lasiocarpa* / *Phyllodoce empetriformis* Woodland (CEGL000920)
- *Abies lasiocarpa* / *Valeriana sitchensis* Forest (CEGL000345)
- *Pinus albicaulis* - *Abies lasiocarpa* / *Vaccinium scoparium* / *Luzula glabrata* var. *hitchcockii* Woodland (CEGL005839)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Luzula hitchcockii* (Lillybridge et al. 1995) =
- *Abies lasiocarpa* / *Luzula hitchcockii* Habitat Type (Cooper et al. 1987) =
- *Abies lasiocarpa* / *Luzula hitchcockii* Habitat Type, *Luzula hitchcockii* Phase (Steele et al. 1981) =
- *Abies lasiocarpa* / *Luzula hitchcockii* Habitat Type, *Luzula hitchcockii* Phase (Steele et al. 1983) =
- *Abies lasiocarpa* / *Luzula hitchcockii* Habitat Type, *Vaccinium scoparium* Phase (Pfister et al. 1977) =
- *Abies lasiocarpa* / *Luzula glabrata* var. *hitchcockii* (Bourgeron and Engelking 1994) =
- *Picea engelmannii* - *Abies lasiocarpa* - *Larix lyallii* / *Luzula wahlenbergii* Habitat Type (Ogilvie 1969) I
- *Pinus albicaulis* - *Abies lasiocarpa* / *Luzula hitchcockii* - *Vaccinium myrtillus* Vegetation Type (Achuff et al. 2002a) I
- DRISCOLL FORMATION CODE:I.A.9.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association has been documented on high, north-facing slopes in Waterton Lakes National Park and can be expected in similar environments in Glacier National Park.

GLOBAL RANGE: This association is a minor one, occurring as small- or infrequently as large-patch occurrences at the highest subalpine elevations within the northern Rocky Mountains and southern portion of the Canadian Rockies. Documented outliers occur in the Teton Range of Wyoming.

NATIONS: CA, US

STATES/PROVINCES: AB, ID:S5, MT:S5, WA:S2, WY:S1

USFS ECOREGIONS: M331A:CC, M331D:CC, M332A:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier?, Grand Teton); PC (Waterton Lakes); USFS (Wenatchee)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.5010.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper, mod. G. Kittel

REFERENCES: Achuff et al. 2002a, Bourgeron and Engelking 1994, Cooper et al. 1987, Driscoll et al. 1984, Lillybridge et al. 1995, MTNHP 2002b, Ogilvie 1969, Pfister et al. 1977, Steele et al. 1981, Steele et al. 1983, Western Ecology Working Group n.d., Williams and Smith 1990

Abies lasiocarpa - *Picea engelmannii* / *Menziesia ferruginea* / *Luzula glabrata* var. *hitchcockii* Woodland

SUBALPINE FIR - ENGELMANN SPRUCE / FOOL'S-HUCKLEBERRY / HITCHCOCK'S SMOOTH WOODRUSH WOODLAND

IDENTIFIER: CEG005896

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.c.)
Alliance	<i>Abies lasiocarpa</i> Woodland Alliance (A.559)
Alliance (English name)	Subalpine Fir Woodland Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Menziesia ferruginea</i> / <i>Luzula glabrata</i> var. <i>hitchcockii</i> Woodland
Association (English name)	Subalpine Fir - Engelmann Spruce / Fool's-huckleberry / Hitchcock's Smooth Woodrush Woodland

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is a major upper subalpine woodland type in northwestern Montana (primarily west of the Continental Divide), Idaho, from the Idaho Batholith country northward, and southwestern Alberta, occurring primarily as a large-patch community but, also as a small-patch to matrix community type. It occurs as an open woodland. It generally forms a zone extending about 215 m (700 feet) vertically from various base elevations, which decrease with increasing latitude; in west-central Montana it ranges from 2075 to 2320 m, in northwestern Montana it ranges from 1830 to 2075 m. It usually occurs on moderate to steep slopes, just below the ridgeline or slope shoulder, with aspects ranging from just west of north-facing to east-facing. At its upper distributional limits it may occur on warmer aspects and flatter ground, often associated with the heads of cirque basins or shallow to deep swales. These are cold, relatively harsh sites where snowpack may persist long into the growing season. Soils are derived from a broad range of parent materials including Idaho Batholith granitics, calcareous and noncalcareous sedimentary, and metamorphic mica schists. Ground surfaces are usually litter-covered, but the soil generally contains a high fraction of coarse material, averaging about 30% and content increasing with depth. Vegetation structure is distinctly that of a woodland with widely spaced individual trees or a clumped distribution thereof to produce a total canopy cover of less than 50% dominated by *Abies lasiocarpa* with lesser representation by *Picea engelmannii*. *Pinus contorta* has a very limited presence; however, *Larix lyallii* may have 30% or greater cover, but its presence is rather unpredictable. The shrub component is dominated by *Menziesia ferruginea*, which ranges in height from 0.7 to 1.5 m (far less than its potential of 3+ m). Though the cover of *Luzula glabrata* (average about 8%) is much less than in *Abies lasiocarpa* - *Picea engelmannii* / *Luzula glabrata* var. *hitchcockii* Woodland (CEGL000317), it is still sufficient to be indicative of this cold and snowpacked environment. The forb component has several consistently present species, including *Xerophyllum tenax*, *Arnica latifolia*, *Orthilia secunda* (= *Pyrola secunda*), and *Viola orbiculata*; only the first two named contribute more than trace amounts of cover in what is a depauperate layer.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Data from only 2 plots were used to describe this open-canopied association: one stand in Glacier National Park and one in Waterton Lakes National Park. The association lies at a mid- to high-slope position on steep mountain slopes and ridges. It has been documented on slopes with an easterly and northwesterly aspect, but may occur at other aspects. Elevations in documented stands ranged from 2000-2070 m (6560-6790 feet), but the association may occupy a wider zone, extending slightly above and below these elevations. Parent material is usually sedimentary limestone and dolomite, but may be derived from other noncalcareous sedimentary material. Soil is typically a well-drained silt loam. Ground cover is primarily litter. Wood and bare soil may account for 1-10% of surface cover.

GLOBAL ENVIRONMENT: This association is a major upper subalpine woodland type in northwestern Montana (primarily west of the Continental Divide), Idaho, from the Idaho Batholith country northward, and southwestern Alberta, occurring primarily as a large-patch community but, also as a small-patch to matrix community type. It occurs as an open woodland. It generally forms a zone extending about 215 m (700 feet) vertically from various base elevations, which of course decrease with increasing latitude; in west-central Montana it ranges from 2075 to 2320 m (6800-7600 feet), in northwestern Montana it ranges from 1830 to 2075 m (6000-6800 feet) (Pfister et al. 1977). It usually occurs on moderate to steep slopes, just below the ridgeline or slope shoulder, with aspects ranging from just west of north-facing to east-facing. At its upper distributional limits it may occur on warmer aspects and flatter ground, often associated with the heads of cirque basins or shallow to deep swales. These are cold, relatively harsh sites where snowpack may persist long into the growing season. Soils are derived from a broad range of parent materials, including Idaho Batholith granitics, calcareous and noncalcareous sedimentary, and metamorphic mica schists. Ground surfaces are usually litter covered but the soil generally contains a high fraction of coarse material, averaging about 30% and content increasing with depth.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Total tree canopy and subcanopy cover is typically less than 40% in this association, giving these stands an open, woodland-like structure. *Abies lasiocarpa* and *Picea engelmannii* are usually the only tree species present, though dead or dying *Pinus albicaulis* may occasionally occur in small amounts. The upper tree canopy height varies from 15-35 m, while the subcanopy is typically 5-10 m tall. Shrub cover ranges from 50-70% and is dominated by *Menziesia ferruginea* in a layer 0.5-2 m tall. *Vaccinium membranaceum* is usually present. Dwarf-shrub cover, dominated by *Vaccinium myrtillus*, ranges from 10-20%. Total cover for herbaceous species is 70-90%. *Luzula glabrata* var. *hitchcockii* and *Xerophyllum tenax* are well-represented, with average covers of 13% and 30%, respectively. *Arnica latifolia* and *Erythronium grandiflorum* may contribute over 10% canopy cover in some stands.

GLOBAL VEGETATION: Vegetation structure is distinctly that of a woodland with widely spaced individual trees or a clumped distribution thereof to produce a total canopy cover of less than 50% dominated by *Abies lasiocarpa* with lesser representation by *Picea engelmannii*. Seral tree species generally do poorly here with only *Pinus albicaulis* constituting a consistent component with appreciable cover. *Pinus contorta* has a very limited presence; however, *Larix lyallii* may have 30% or greater cover, but its presence is rather unpredictable, occurring in some drainages and not others with equally favorable habitat. The shrub component is dominated by *Menziesia ferruginea*, which ranges in height from 0.7 to 1.5 m (2.5-5 feet), far less than its potential of 3+ m (10+ feet); *Vaccinium membranaceum* and *Vaccinium scoparium* have high constancy and coverages mostly exceeding 10%, whereas *Alnus viridis* ssp. *sinuata* and *Rhododendron albiflorum* are inconsistently present, though their coverages may be appreciable. Though the cover of *Luzula glabrata* (average about 8%) is much less than in *Abies lasiocarpa* - *Picea engelmannii* / *Luzula glabrata* var. *hitchcockii* Woodland (CEGL000317), it is still sufficient to be indicative of this cold and snowpacked environment. Though there are no other graminoids of note, the forb component has several consistently present species including *Xerophyllum tenax*, *Arnica latifolia*, *Orthilia secunda* (= *Pyrola secunda*), and *Viola orbiculata*; only the first two named contribute more than trace amounts of cover in what is a depauperate layer.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Menziesia ferruginea</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Forb	<i>Xerophyllum tenax</i>
Herb (field)	Graminoid	<i>Luzula glabrata</i> var. <i>hitchcockii</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Menziesia ferruginea</i> , <i>Rhododendron albiflorum</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Forb	<i>Arnica latifolia</i> , <i>Xerophyllum tenax</i>

Herb (field)

Graminoid

Luzula glabrata var. *hitchcockii*

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Luzula glabrata* var. *hitchcockii*, *Menziesia ferruginea*, *Picea engelmannii*, *Xerophyllum tenax*

GLOBAL: *Abies lasiocarpa*, *Luzula glabrata* var. *hitchcockii*, *Picea engelmannii*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4? (10-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association has resulted from elevating a couple of phase levels of habitat types that appeared to define unique environments. The association defined here is not so broad as the *Abies lasiocarpa* / *Luzula glabrata* Habitat Type, *Menziesia ferruginea* Phase of Pfister et al. (1977) because it does not include stands with other seral tree species having appreciable cover, nor does this concept accept *Pinus albicaulis* as an alternative indicator to *Luzula glabrata*, where this latter species is lacking (Pfister et al. 1977). Stands with an appreciable cover (5%) of *Pinus albicaulis* have been placed into a separate association due to their unique ecology in light of blister rust (*Cronartium ribicola*) induced mortality. There is apparently much environmental overlap between *Rhododendron albiflorum* and *Menziesia ferruginea* but some distinct distributional differences; where the two geographically overlap intensive analysis and crosswalking need to be conducted to produce a seamless classification across geopolitical boundaries.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* Forest (CEGL000319)
- *Abies lasiocarpa* / *Rhododendron albiflorum* Woodland (CEGL000330)
- *Tsuga mertensiana* / *Luzula glabrata* var. *hitchcockii* Forest (CEGL000505)
- *Tsuga mertensiana* / *Rhododendron albiflorum* Forest (CEGL000508)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Luzula hitchcockii* Habitat Type, *Menziesia ferruginea* Phase (Pfister et al. 1977) I
- *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type, *Luzula hitchcockii* Phase (Cooper et al. 1987) =
- *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type, *Luzula hitchcockii* Phase (Steele et al. 1981) =
- *Abies lasiocarpa* / *Rhododendron albiflorum* - *Xerophyllum tenax* Plant Association (Williams et al. 1995) I
- *Picea engelmannii* - *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type (Ogilvie 1962) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is relatively uncommon in the IPP. It has been documented on high mountain slopes in Middle Fork Flathead River of Glacier National Park, and in Waterton Lakes National Park.

GLOBAL RANGE: This type is a very common at mid to predominantly upper subalpine zones from the Idaho Batholith northward to the southwestern portion of the Canadian Rockies, with a much stronger presence west of the Continental Divide.

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT, WA?

USFS ECOREGIONS: M332A:CC, M332B:CC, M332C:CP, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2635, WATE.4117.

LOCAL DESCRIPTION AUTHORS: S. Kimball**GLOBAL DESCRIPTION AUTHORS:** S.V. Cooper**REFERENCES:** Achuff et al. 2002a, Cooper et al. 1987, Ogilvie 1962, Pfister et al. 1977, Steele et al. 1981, Steele et al. 1983, Western Ecology Working Group n.d., Williams et al. 1995***Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Streptopus amplexifolius*
Woodland****SUBALPINE FIR - ENGELMANN SPRUCE / FOOL'S-HUCKLEBERRY / CLASPING TWISTED-STALK WOODLAND****IDENTIFIER:** C EGL005897**NVC Classification**

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.c.)
Alliance	<i>Abies lasiocarpa</i> Woodland Alliance (A.559)
Alliance (English name)	Subalpine Fir Woodland Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Menziesia ferruginea</i> / <i>Streptopus amplexifolius</i> Woodland
Association (English name)	Subalpine Fir - Engelmann Spruce / Fool's-huckleberry / Claspig Twisted-stalk Woodland

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)**ELEMENT CONCEPT**

GLOBAL SUMMARY: This association has been described primarily as a linear to small-patch type within the northern Rocky Mountains of the U.S. and Canada. It is found from the Clearwater National Forest northward into British Columbia and Alberta, though perhaps it is best developed within northern Idaho and northwestern Montana. Virtually the only site parameter characteristic of all sampled stands is a seasonally high water table, yielding a hygric to subhydryc moisture regime. This association is found from mid to upper subalpine sites with elevations ranging from 1340 to 2075 m. It is found on all degrees of slope, in all slope positions and occupying all aspects, with no particular condition considered modal. It should be inferred from the dense canopy of *Menziesia ferruginea* (accompanied by *Rhododendron albiflorum* in northern Idaho-eastern Washington) that these sites are also relatively cold. Parent materials run the gamut from sedimentary to intrusive igneous to glacial till and drift with compaction layers. Throughout much of this association's range a high ash content is present when the type occurs on north- and east-facing slopes. The tree canopy is relatively open, seldom exceeding 60% combined cover and dominated by a combination of *Picea engelmannii* and *Abies lasiocarpa*, that can vary between the extremes of nearly monospecific dominance of either species. The undergrowth is dominated by a dense shrub layer, often exceeding 60% canopy cover, in which *Menziesia ferruginea* is diagnostic and *Vaccinium membranaceum* approaches 100% constancy. Other shrubs consistently present include *Alnus viridis* ssp. *sinuata*, *Rubus parviflorus*, *Ribes lacustre*, and *Sorbus* spp. (predominantly *Sorbus sitchensis*). The graminoid component is decidedly sparse with only *Bromus vulgaris* and *Luzula glabrata* var. *hitchcockii* being present in more than a third of the sampled stands. Other graminoids present only occasionally, but indicative of a high moisture status, include *Cinna latifolia*, *Calamagrostis canadensis*, *Vahlodea atropurpurea* (= *Deschampsia atropurpurea*), and *Carex disperma*. The forb layer is generally quite species-rich with dominance shifting between any number of species indicative of mesic to relatively wet conditions. The relatively tall forb species considered diagnostic for the type include *Athyrium filix-femina* (considerably less robust, however, than when occurring in the *Thuja plicata* alliance), *Angelica arguta*, *Angelica dawsonii*, *Streptopus amplexifolius*, *Senecio triangularis*, *Erigeron peregrinus*, *Mertensia ciliata*, *Mertensia paniculata*, *Aconitum columbianum*, *Ligusticum canbyi*, *Veratrum viride*, *Heracleum maximum*, and *Trautvetteria caroliniensis*; diagnostic forbs of shorter stature include *Gymnocarpium dryopteris*, *Mitella breweri*, *Mitella pentandra*, and *Viola glabella*.

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This woodland association occupies cool, gentle to steep slopes bordering narrow and broad valleys east of the Continental Divide. Topographical position ranges from high slope to basin floor, although it is usually midslope or lower. The association occurs at all aspects, at elevations ranging from 1550-1970 m (5084-6462 feet). Parent material is variable. Stands have been documented on colluvium overlying bedrock, glacial till, and morainal deposits. The association has also been documented on toeslope glacial-fluvial deposits. Soil is a moderately well-drained to well-drained sandy loam to clay loam, and is not well-developed.

GLOBAL ENVIRONMENT: This association has been described primarily as a linear to small-patch type within the northern Rocky Mountains of the U.S. and Canada. It is found from the Clearwater National Forest northward into British Columbia and Alberta, though perhaps it is best developed within northern Idaho and northwestern Montana. Virtually the only site parameter characteristic of all sampled stands, and therefore inferred to be the primary ecological driver, is a seasonally high water table, yielding a hygric to subhydryc moisture regime. This association is found from mid to upper subalpine sites with elevations ranging from 1340 to 2075 m (4400-6800 feet), though in any Bailey section elevational range is on the order of 475 m (1800 feet) and in a geographic circumscribed area (e.g., Glacier-Waterton International Peace Park) elevation ranges are mostly in the range of 240 to 365 m (800-1200 feet). It is found on all degrees of slope and occupies all aspects, with collecting positions (lower slopes, toeslopes, footslopes, swales) being the norm. It should be inferred from the dense canopy of *Menziesia ferruginea* (accompanied by *Rhododendron albiflorum* in northern Idaho-eastern Washington) that these sites are also relatively cold. Effective rooting depths are relatively shallow (average only 36 cm (14 inches) in northern Idaho), which may reflect not only the presence of high water tables and saturated soils but also cold soils. Parent materials run the gamut from sedimentary (both calcareous and noncalcareous) to intrusive igneous (granites of Idaho Batholith) to glacial till and drift with compaction layers. Throughout much of this association's range, a high ash content is present when the type occurs on north- and east-facing slopes. Adjacent, relatively drier sites usually support *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (CEGL005893) or *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* Forest (CEGL000319).

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The forest canopy is dominated by *Abies lasiocarpa* with *Picea engelmannii* a codominant in most stands. Total canopy cover is 40-60% in a layer 20-35 m tall. In some stands the tall-tree layer is shorter (10-15 m). The tree subcanopy is dominated by regenerating *Abies lasiocarpa* and *Picea engelmannii* in a layer 2-5 m high. Tall-shrub density is highly variable. Some stands have a thick layer of *Menziesia ferruginea* and/or *Alnus viridis* ssp. *sinuata* growing in a virtual monoculture. Equally common is a sparse, short-shrub layer (0.5-2 m tall) with a variety of species, such as the aforementioned *Sorbus scopulina* and *Vaccinium membranaceum*, contributing 5-20% cover. Dwarf-shrub cover was nonexistent in all sampled plots. The herbaceous layer is usually dense, approaching 90-100% in many cases. Herbaceous cover may be lower (20-40%) in stands where high shrub cover (80-100%) limits light penetration to the forest floor. Forb composition is very diverse, with a wide variety of mesic species present with only 0.5-5% cover. Species indicative of the subhygric to subhydryc moisture regime include *Streptopus amplexifolius*, *Veratrum viride*, *Galium triflorum*, and *Gymnocarpium dryopteris*. *Gymnocarpium dryopteris* may have cover as high as 25% in some stands. *Thalictrum occidentale* and *Arnica cordifolia* had almost 100% constancy and relatively high cover (7% and 13%, respectively) in sampled plots.

GLOBAL VEGETATION: The tree canopy is relatively open, seldom exceeding 60% combined cover, and dominated by a combination of *Picea engelmannii* and *Abies lasiocarpa*, that can vary between the extremes of nearly monospecific dominance of either species. Other tree species apparently do poorly here as seral associates with only *Abies grandis*, *Pseudotsuga menziesii*, *Pinus contorta*, and *Pinus monticola* having so much as 10% canopy cover. The undergrowth is dominated by a dense shrub layer, often exceeding 60% canopy cover, in which *Menziesia ferruginea* is diagnostic and *Vaccinium membranaceum* approaches 100% constancy. The height of *Menziesia* exhibits a notable association with regional climates; in northern Idaho where the maritime influence is considerable it grows in excess of 8 feet tall, whereas on the eastern fringes of the northern Rockies (more Continental regime) it does not much exceed 3 feet. Other shrubs consistently present include *Alnus viridis* ssp. *sinuata*, *Rubus parviflorus*, *Ribes lacustre*, and *Sorbus* spp. (predominantly *Sorbus sitchensis*); only infrequently do they constitute as much as 10% cover individually. *Rhododendron albiflorum* is a common and occasionally high-cover associate in upper elevation stands northward within the association. The graminoid component is decidedly sparse with only *Bromus vulgaris* and *Luzula glabrata* var. *hitchcockii* being present in more than a third of the sampled stands. Other graminoids present only occasionally, but indicative of a high moisture status, include *Cinna latifolia*, *Calamagrostis canadensis*, *Vahlodea atropurpurea*, and *Carex disperma*. The forb layer is generally quite species-rich with dominance shifting between any number of species indicative of mesic to relatively wet (subhydryc) conditions. The relatively tall forb species considered diagnostic for the type include *Athyrium filix-femina* (considerably less robust, however, than when occurring in the *Thuja plicata* alliance), *Angelica arguta*, *Angelica dawsonii*, *Streptopus amplexifolius*, *Senecio triangularis*, *Erigeron peregrinus*, *Mertensia ciliata*, *Mertensia paniculata*, *Aconitum columbianum*, *Ligusticum canbyi*, *Veratrum viride*, *Heracleum maximum*, and *Trautvetteria caroliniensis*; diagnostic forbs of shorter stature include *Gymnocarpium dryopteris*, *Mitella breweri*, *Mitella pentandra*, and *Viola glabella*. Of the foregoing forbs many are regionally restricted. Comprising forbs of high constancy and occasionally dominance are *Arnica latifolia* (or *Arnica cordifolia*), *Thalictrum occidentale* (or *Thalictrum fendleri* to the south), *Galium triflorum*, *Clintonia uniflora*, *Tiarella trifoliata*, *Viola orbiculata*, and *Xerophyllum tenax* (the latter four species found in the association only from central Idaho northward).

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Alnus viridis</i> ssp. <i>sinuata</i> , <i>Menziesia ferruginea</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Thalictrum occidentale</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Alnus viridis</i> ssp. <i>sinuata</i> , <i>Menziesia ferruginea</i> , <i>Rhododendron albiflorum</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Ribes lacustre</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Forb	<i>Arnica latifolia</i> , <i>Clintonia uniflora</i> , <i>Thalictrum occidentale</i> , <i>Tiarella trifoliata</i> , <i>Veratrum viride</i> , <i>Xerophyllum tenax</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Angelica arguta*, *Angelica dawsonii*, *Athyrium filix-femina*, *Galium triflorum*, *Gymnocarpium dryopteris*, *Heracleum maximum*, *Menziesia ferruginea*, *Mitella breweri*, *Mitella pentandra*, *Picea engelmannii*, *Senecio triangularis*, *Streptopus amplexifolius*, *Trautvetteria caroliniensis*, *Trollius laxus*, *Veratrum viride*, *Viola glabella*

GLOBAL: *Abies lasiocarpa*, *Alnus viridis* ssp. *sinuata*, *Angelica arguta*, *Angelica dawsonii*, *Athyrium filix-femina*, *Galium triflorum*, *Gymnocarpium dryopteris*, *Heracleum maximum*, *Menziesia ferruginea*, *Mitella breweri*, *Mitella pentandra*, *Picea engelmannii*, *Rhododendron albiflorum*, *Senecio triangularis*, *Streptopus amplexifolius*, *Trautvetteria caroliniensis*, *Trollius laxus*, *Viola glabella*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4 (10-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This association occurs on valley slopes east of the Continental Divide, in both Glacier National Park and Waterton Lakes National Park. Specifically, the association has been documented in the Two Medicine drainage in Glacier National Park, and in the Boundary Creek drainage in Waterton Lakes National Park.

GLOBAL COMMENTS: This association was previously recognized as the *Menziesia ferruginea* Phase of the *Abies lasiocarpa* / *Streptopus amplexifolius* Habitat Types. Structurally, compositionally and environmentally this assemblage of stands is sufficiently distinctive to constitute a unique association. It occurs predominantly on upslope positions that are subirrigated and possessing a robust shrub component rather than on subirrigated alluvial bottoms and toeslopes exclusively forb-dominated (or at least lacking the tall-shrub component whose composition is indicative of higher elevation and ostensibly colder sites).

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Forest (CEGL005912)
- *Abies lasiocarpa* - *Picea engelmannii* / *Galium triflorum* Forest (CEGL000311)
- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* Forest (CEGL000319)
- *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Forest (CEGL000336)
- *Abies lasiocarpa* / *Gymnocarpium dryopteris* Forest (CEGL002611)
- *Abies lasiocarpa* / *Rhododendron albiflorum* / *Senecio triangularis* Woodland (CEGL002613)
- *Abies lasiocarpa* / *Rhododendron albiflorum* Woodland (CEGL000330)
- *Abies lasiocarpa* / *Trautvetteria caroliniensis* Forest (CEGL000339)
- *Tsuga mertensiana* / *Luzula glabrata* var. *hitchcockii* Forest (CEGL000505)
- *Tsuga mertensiana* / *Rhododendron albiflorum* Forest (CEGL000508)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Rhododendron albiflorum* Plant Association (Williams et al. 1995) I
- *Abies lasiocarpa* / *Streptopus amplexifolius* Habitat Type, *Menziesia ferruginea* Phase (Cooper et al. 1987) =
- *Abies lasiocarpa* / *Streptopus amplexifolius* Habitat Type, *Menziesia ferruginea* Phase (Hansen et al. 1995) F
- *Picea engelmannii* - *Abies lasiocarpa* - (*Pinus contorta*) / *Menziesia ferruginea* / *Arnica cordifolia* - *Rubus parviflorus* Vegetation Type (Achuff et al. 2002a) I
- *Picea engelmannii* - *Abies lasiocarpa* / *Menziesia ferruginea* - *Tiarella unifoliata* Habitat Type (Ogilvie 1962) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association occurs on valley slopes east of the Continental Divide, in both Glacier National Park and Waterton Lakes National Park. Specifically, the association has been documented in the Two Medicine drainage in Glacier National Park, and in the Boundary Creek drainage in Waterton Lakes National Park.

GLOBAL RANGE: This association has been described primarily as a linear or small- to large-patch type within the northern Rocky Mountains of the U.S. and the southwestern corner of the Canadian Rocky Mountains. It is found from the Clearwater National Forest of Idaho northward into Alberta and ostensibly British Columbia, though perhaps it is best developed within northern Idaho and northwestern Montana.

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT, WA?

USFS ECOREGIONS: M332A:CC, M332B:CC, M332C:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes); USFS (Clearwater)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.278, GLAC.283, GLAC.37, WATE.4075, WATE.4099, WATE.4119, GLAC.47, WATE.5113, WATE.9007, WATE.9032, WATE.9036.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Achuff et al. 2002a, Clausnitzer and Zamora 1987, Cooper et al. 1987, Hansen et al. 1995, Kovalchik 1993, Ogilvie 1962, Western Ecology Working Group n.d., Williams and Lillybridge 1983, Williams et al. 1990b, Williams et al. 1995

***Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* - *Luzula glabrata* var. *hitchcockii* Woodland**

SUBALPINE FIR - ENGELMANN SPRUCE / CLASPING TWISTED-STALK - HITCHCOCK'S SMOOTH WOODRUSH WOODLAND

IDENTIFIER: CEG005920

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.c.)
Alliance	<i>Abies lasiocarpa</i> Woodland Alliance (A.559)
Alliance (English name)	Subalpine Fir Woodland Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Streptopus amplexifolius</i> - <i>Luzula glabrata</i> var. <i>hitchcockii</i> Woodland
Association (English name)	Subalpine Fir - Engelmann Spruce / Claspings Twisted-stalk - Hitchcock's Smooth Woodrush Woodland

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is relatively common on high-elevation slopes throughout Glacier National Park, Montana, and Waterton Lakes National Park, Alberta. This woodland association occupies moist, gentle to steep slopes at almost all aspects, and its position on the slope ranges from mid to high slope. Elevation is typically 1910-2230 m (6265-7314 feet). Slopes are composed of morainal or colluvial deposits over calcareous or noncalcareous bedrock, and soils are typically well-drained to rapidly drained with a sandy loam texture. Occasionally stands will develop on gently sloped fluvial fans, with somewhat poorly drained soils. Litter contributes the majority of ground cover in most stands, while bare soil and wood each contribute 10-25% cover. Species composition suggests that these sites have long-persisting snowpacks and soils that are saturated for much of the growing season. The upper tree

canopy is open and woodland-like, with cover ranging from 10-30%. Tree height in the upper stratum is usually 5-20 m, dominated by *Abies lasiocarpa*. *Pinus contorta* may dominate the upper canopy in seral stands, in a layer 20-35 m tall. Other stands may have shorter trees (2-5 m) with no discernible subcanopy. The subcanopy, when visible, is 2-10 m tall and is also dominated by *Abies lasiocarpa*. Tall-shrub cover is sparse; common species include *Lonicera involucrata* and *Salix sitchensis*. *Vaccinium membranaceum* is the most common short shrub, however, this species was only present in 50% of sampled stands. Dwarf-shrubs are uncommon. When present, *Vaccinium myrtillus* and *Vaccinium scoparium* and/or *Dryas octopetala* are usually abundant with 10-25% cover. The herbaceous layer is diverse and variable, with a wide variety of moist-site and dry-site forbs contributing 1-25% cover. *Thalictrum occidentale* had 100% constancy in sampled stands, though cover for this species averaged only 7%. Other forbs with greater than 85% constancy include *Luzula glabrata* var. *hitchcockii* (average cover 18%), *Valeriana sitchensis* (average cover 13%), and *Chamerion angustifolium*. *Xerophyllum tenax* may contribute up to 20% cover in stands with drier aspects.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This woodland association occupies moist, gentle to steep slopes at almost all aspects. Stands have not been documented on easterly slopes, but are expected to occur there. Its position on the slope ranges from mid to high slope. Elevation is typically 1910-2230 m (6265-7314 feet). Slopes are composed of morainal or colluvial deposits over calcareous or noncalcareous bedrock, and soils are typically well-drained to rapidly drained with a sandy loam texture. Occasionally stands will develop on gently sloped fluvial fans, with somewhat poorly drained soils. In these positions the soil may have higher silt and clay content. Litter contributes the majority of ground cover in most stands, while bare soil and wood each contribute 10-25% cover. Ground surface cover may be dominated by small rock in some stands.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The upper tree canopy is open and woodland-like, with cover ranging from 10-30%. Tree height in the upper stratum is usually 5-20 m, dominated by *Abies lasiocarpa*. *Pinus contorta* may dominate the upper canopy in seral stands, in a layer 20-35 m tall. Other stands may have shorter trees (2-5 m) with no discernible subcanopy. The subcanopy, when visible, is 2-10 m tall and is also dominated by *Abies lasiocarpa*. Tall-shrub cover is sparse, ranging from 5-10% cover in most stands. Common tall-shrub species include *Lonicera involucrata* and *Salix sitchensis*. *Vaccinium membranaceum* is the most common and dominant short shrub in this association, with an average of 20% cover. However, this species was only present in 50% of sampled stands. Dwarf-shrubs are uncommon. When present, *Vaccinium myrtillus* and *Vaccinium scoparium* and/or *Dryas octopetala* are usually abundant with 10-25% cover. The herbaceous layer is diverse and variable, with a wide variety of moist-site and dry-site forbs contributing 1-25% cover. *Thalictrum occidentale* had 100% constancy in sampled stands, though cover for this species averaged only 7%. Other forbs with greater than 85% constancy include *Luzula glabrata* var. *hitchcockii* (average cover 18%), *Valeriana sitchensis* (average cover 13%), and *Chamerion angustifolium*. *Xerophyllum tenax* may contribute up to 20% cover in stands with drier aspects.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i>
Herb (field)	Forb	<i>Valeriana sitchensis</i> , <i>Xerophyllum tenax</i>
Herb (field)	Graminoid	<i>Luzula glabrata</i> var. <i>hitchcockii</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Chamerion angustifolium*, *Luzula glabrata* var. *hitchcockii*, *Thalictrum occidentale*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2G3 (11-Mar-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Valeriana sitchensis* - *Pedicularis bracteosa* - *Thalictrum occidentale* Vegetation Type (Achuff et al. 2002a) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is relatively common on high-elevation slopes throughout the IPP. It has been documented in several locations in Waterton Lakes National Park. In Glacier National Park the association primarily lies near and east of the Continental Divide. East of the divide the association has been documented near Lee Ridge and Browns Pass. West of the divide it occurs along the Highline Trail.

GLOBAL RANGE:

NATIONS: CA, US

STATES/PROVINCES: AB, ID?, MT:S2?

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2024, GLAC.218, GLAC.234, WATE.4096, WATE.4113, WATE.5112, WATE.5061.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Achuff et al. 2002a, Western Ecology Working Group n.d.

***Abies lasiocarpa* - *Picea engelmannii* / *Valeriana sitchensis* Woodland SUBALPINE FIR - ENGELMANN SPRUCE / SITKA VALERIAN WOODLAND**

IDENTIFIER: CEG005823

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.c.)
Alliance	<i>Abies lasiocarpa</i> Woodland Alliance (A.559)
Alliance (English name)	Subalpine Fir Woodland Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Valeriana sitchensis</i> Woodland
Association (English name)	Subalpine Fir - Engelmann Spruce / Sitka Valerian Woodland

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is relatively uncommon in Glacier National Park, Montana, and Waterton Lakes National Park, Alberta. This woodland association occupies moderately steep to steep slopes with northerly to westerly aspects. Stands may be located at low, middle or high positions along mountain slopes. Elevation ranges from 1770-2155 m (5806-7068 feet). The association may develop over talus and scree slopes, on pockets of soil above exposed ridges, or on colluvial deposits that overlie bedrock. Parent material is typically derived from sedimentary siltstone, with evidence present in the form of argillite in surface soils. Soil is poorly developed in most stands and is characterized as a sandy loam. Sites are moderately well-drained to rapidly drained. Ground cover is dominated by litter in most stands, although large and small rock may cover significant surface area in stands that develop on talus and scree. Stands within this association have one of two physiognomic characters. The association may be composed of erect, widely spaced trees, 5-10 m tall, with an upper canopy cover of up to 30% and a sparse subcanopy. The association may also exhibit a shrubby, krummholz growth form, with mature trees ranging in height from 2-5 m and no discernible subcanopy. *Abies lasiocarpa* and *Picea engelmannii* are the most common species in both the upper and subcanopy. *Pinus contorta* may be well-represented in stands impacted by fire within the last 50 years. Shrub cover is sparse. *Vaccinium caespitosum* may be well-represented in stands positioned in frost pockets or with cold-air drainage. Herbaceous cover ranges from 40-90%. Common forbs with at least 10% cover include *Arnica latifolia*, *Valeriana sitchensis*, and *Thalictrum occidentale*. *Pedicularis bracteosa* may have high cover (near 30%) in some stands.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This woodland association occupies moderately steep to steep slopes with northerly to westerly aspects. Stands may be located at low, middle or high position along mountain slopes. Elevation ranges from 1770-2155 m (5806-7068 feet). The association may develop over talus and scree slopes, on pockets of soil above exposed ridges, or on colluvial deposits that overlie bedrock. Parent material is typically derived from sedimentary siltstone, with evidence present in the form of argillite in surface soils. Soil is poorly developed in most stands and is characterized as a sandy loam. Sites are moderately well-drained to rapidly drained. Ground cover is dominated by litter in most stands, although large and small rock may cover significant surface area in stands that develop on talus and scree.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Stands within this association have one of two physiognomic characters. The association may be composed of erect, widely spaced trees, 5-10 m tall, with an upper canopy cover of up to 30% and a sparse subcanopy. The association may also exhibit a shrubby, krummholz growth form, with mature trees ranging in height from 2-5 m and no discernible subcanopy. *Abies lasiocarpa* and *Picea engelmannii* are the most common species in both the upper and subcanopy. *Pinus contorta* may be well-represented in stands impacted by fire within the last 50 years. Shrubs cover is sparse. *Vaccinium caespitosum* may be well-represented in stands positioned in frost pockets or with cold-air drainage. Herbaceous cover ranges from 40-90%. Common forbs with at least 10% cover include *Arnica latifolia*, *Valeriana sitchensis*, and *Thalictrum occidentale*. *Pedicularis bracteosa* may have high cover (near 30%) in some stands.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i>
Herb (field)	Forb	<i>Arnica latifolia</i> , <i>Pedicularis bracteosa</i> , <i>Thalictrum occidentale</i> , <i>Valeriana sitchensis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Arnica latifolia*, *Valeriana sitchensis*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2? (11-Mar-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This woodland association appears to be very similar to *Abies lasiocarpa* / *Valeriana sitchensis* Forest (CEGL000345) which occurs in the Cascades and Olympics of Washington. The Washington type also is found at high subalpine elevations, but has *Vaccinium deliciosum* in the shrub layer, and *Luzula glabrata* in the herbaceous layer, neither of which occur in this woodland association. This woodland type seems to be associated with rocky, talusy, substrates or on colluvial slopes.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* / *Valeriana sitchensis* Forest (CEGL000345)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Valeriana sitchensis* - *Pedicularis bracteosa* - *Thalictrum occidentale* Vegetation Type (Achuff et al. 2002a) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is relatively uncommon throughout the IPP on moist, high-elevation slopes east of the Continental Divide. In Glacier National Park it has been documented near Preston Park and Stoney Indian Lake.

GLOBAL RANGE:

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S2?

USFS ECOREGIONS: M332C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.107, GLAC.148, WATE.5012, WATE.5025.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Achuff et al. 2002a, Western Ecology Working Group n.d.

Abies lasiocarpa - *Picea engelmannii* / *Xerophyllum tenax* - *Luzula glabrata* var. *hitchcockii*

Woodland

SUBALPINE FIR - ENGELMANN SPRUCE / BEAR-GRASS - HITCHCOCK'S SMOOTH WOODRUSH WOODLAND

IDENTIFIER: CEGL005898

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.c.)
Alliance	<i>Abies lasiocarpa</i> Woodland Alliance (A.559)
Alliance (English name)	Subalpine Fir Woodland Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Xerophyllum tenax</i> - <i>Luzula glabrata</i> var. <i>hitchcockii</i> Woodland

Association (English name) Subalpine Fir - Engelmann Spruce / Bear-grass - Hitchcock's Smooth Woodrush Woodland

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is broadly distributed throughout the mid to upper subalpine zones of the northern Rocky Mountains, concentrated in northern Idaho and western Montana and extending into the Canadian Rockies of southwestern Alberta. The demonstrated elevation range is from 1555 to 2135 m in the northern portion of its distribution and 1740 to 2380 m in its southern occurrence. It is strongly associated with moderate to steep warm slopes, usually having a southeast- through south- to west-facing exposure, usually occurring from midslopes upwards to slope shoulders and occasionally extending to high-elevation benchlands as well. It is characterized by having relatively heavy snowpack that persists well into the growing season. These sites have well-drained soils derived from a host of parent materials, including volcanics (granitics, andesite, rhyolite) sedimentaries (limestone, dolomite, siltstone), metamorphics (quartzite, argillite, gneiss, mica-schist) and metasediments. The range in soil surface texture is broad, from silty clays to sandy loams with the gravel content averaging about 30% near the surface and increasing markedly with depth. These are very open woodland sites with the tree component often occurring as scattered clumps and, at the highest and coldest extremes, approaching a krummholz form with trees as short as 5.5 m (18 feet) in height when mature. The canopy is generally strongly dominated by *Abies lasiocarpa* followed distantly in order of decreasing average cover by *Pinus albicaulis*, *Pinus contorta*, and *Picea engelmannii* (this order may change slightly by region and is undoubtedly due to differences in type and severity of disturbance). The undergrowth component is species-poor. Tall shrubs are virtually unrepresented, and the short shrubs *Vaccinium membranaceum* and *Lonicera utahensis* have high constancy but only the former has coverage exceeding 5%. The dwarf-shrub component has only two constant species, *Vaccinium scoparium* and *Vaccinium myrtillus*, only one of which exhibits high cover in a given location; *Phyllodoce empetriformis* may be a conspicuous component but its presence is very inconsistent. The graminoid component is singularly dominated by *Luzula glabrata* with a cover of 5 to 20% (extremes to 50 or 60%, where *Xerophyllum tenax* cover is low); *Carex geyeri* is a common component only in central Idaho representation of the type. *Xerophyllum tenax* is almost invariably the dominant herb, joined by a number of other forbs, none of which express high constancy.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This woodland association occupies somewhat steep to steep slopes with southern and eastern aspects. Its position on the slope ranges from low to high. Elevation is typically 1940-2160 m (6363-7085 feet). Slopes are composed of morainal or colluvial deposits over bedrock. Soils are well-drained to rapidly drained and are derived from a variety of calcareous and noncalcareous sedimentary material. The soil is usually rocky with a sandy loam texture. Litter contributes 35-90% ground cover. Stands with low litter cover may have significant amounts (20-25% each) of small rock and bare soil.

GLOBAL ENVIRONMENT: This association is broadly distributed throughout the mid to upper subalpine zones of the northern Rocky Mountains, concentrated in northern Idaho and western Montana and extending into the Canadian Rockies of southwestern Alberta. The demonstrated elevation range is from 1555 to 2135 m (5100-7000 feet) in the northern portion of its distribution and 1740 to 2380 m (5700-7800 feet) in its southern occurrence. It is strongly associated with moderate to steep warm slopes, usually having a southeast- through south- to west-facing exposure, usually occurring from midslopes upwards to slope shoulders and occasionally extending to high-elevation benchlands as well. The appreciable cover of *Luzula glabrata* is inferred to be indicative of relatively heavy snowpack that persists well into the growing season; these two environmental parameters are postulated to be the primary drivers of species composition and structure. These sites have well-drained soils derived from a host of parent materials, including volcanics (granitics, andesite, rhyolite), sedimentaries (limestone, dolomite, siltstone), metamorphics (quartzite, argillite, gneiss, mica-schist) and metasediments. The range in soil surface texture is broad, from silty clays to sandy loams with the gravel content averaging about 30% near the surface and increasing markedly with depth.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The upper tree canopy is open in this association, with cover of 30-40%. Tree height in the upper stratum is usually 10-15 m. Some stands exhibit stunted, krummholz-like structure, with canopy cover near 5% and tree height less than 10 m. The tree subcanopy is also open, with 5-10% cover in a layer 5-10 m tall. Krummholz stands often have no discernable subcanopy. *Abies lasiocarpa* is the most common and abundant species in both the upper canopy and subcanopy. *Vaccinium membranaceum* is the most abundant shrub in this association, with an average of 33% cover. The dwarf-shrub *Vaccinium myrtillus* may also be well-represented. The herbaceous layer is dominated by *Xerophyllum tenax*, with an average cover of 55%. *Luzula glabrata* var. *hitchcockii* is also a characteristic component of these stands, always present and contributing an average of 13% cover.

GLOBAL VEGETATION: These are very open woodland sites with the tree component often occurring as scattered clumps and, at the highest and coldest extremes, approaching a krummholz form with trees as short as 5.5 m (18 feet) in height when mature. Considerable site index data corroborate the interpretation of these being marginal sites for tree production; among common subalpine

forest/woodland plant associations of the northern Rocky Mountains only *Abies lasiocarpa* - *Picea engelmannii* / *Luzula glabrata* var. *hitchcockii* Woodland (CEGL000317) has slower growing trees. The canopy is generally strongly dominated by *Abies lasiocarpa* followed distantly in order of decreasing average cover by *Pinus albicaulis*, *Pinus contorta*, and *Picea engelmannii* (this order may change slightly by region and is undoubtedly due to differences in type and severity of disturbance). These sites are above the cold limits of *Pseudotsuga menziesii*. The undergrowth component is almost invariably species-poor. Tall shrubs are virtually unrepresented, and the short shrubs *Vaccinium membranaceum* and *Lonicera utahensis* have high constancy, but only the former has coverage exceeding 5%. The dwarf-shrub component has only two constant species, *Vaccinium scoparium* and *Vaccinium myrtillus*, only one of which exhibits high cover in a given location; *Phyllodoce empetriformis* may be a conspicuous component but its presence is very inconsistent. The graminoid component is singularly dominated by *Luzula glabrata* with a cover of 5 to 20% (extremes to 50 or 60%, where *Xerophyllum tenax* cover is low); *Carex geyeri* is a common component only in central Idaho representation of the type. *Xerophyllum tenax* is almost invariably the dominant herb, joined by a number of other forbs none of which express high constancy.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Vaccinium membranaceum</i>
Herb (field)	Forb	<i>Xerophyllum tenax</i>
Herb (field)	Graminoid	<i>Luzula glabrata</i> var. <i>hitchcockii</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Lonicera utahensis</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Dwarf-shrub	<i>Phyllodoce empetriformis</i> , <i>Vaccinium myrtillus</i> , <i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Xerophyllum tenax</i>
Herb (field)	Graminoid	<i>Luzula glabrata</i> var. <i>hitchcockii</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Luzula glabrata* var. *hitchcockii*, *Xerophyllum tenax*

GLOBAL: *Abies lasiocarpa*, *Luzula glabrata* var. *hitchcockii*, *Picea engelmannii*, *Xerophyllum tenax*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4G5 (10-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This type has been variously defined and identified throughout the middle and northern Rocky Mountains. Both *Abies lasiocarpa* and *Picea engelmannii* may be canopy dominants and almost invariably dominate the reproductive layers as well. The presence of significant amounts of *Luzula glabrata* var. *hitchcockii* (greater than 3% approximately) is considered indicative of these upper subalpine habitats that receive a long-persisting snowload. The phase level communities previously identified (Steele et al. 1981, Cooper et al. 1987) were considered significantly distinct environmentally and compositionally to be accorded association status.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Luzula glabrata* var. *hitchcockii* Woodland (CEGL000317)
- *Tsuga mertensiana* / *Luzula glabrata* var. *hitchcockii* Forest (CEGL000505)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Luzula hitchcockii* (Lillybridge et al. 1995) I
- *Abies lasiocarpa* / *Luzula hitchcockii* Habitat Type, *Vaccinium scoparium* Phase (Pfister et al. 1977) B
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Luzula hitchcockii* Phase (Cooper et al. 1987) =
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Luzula hitchcockii* Phase (Steele et al. 1981) =
- *Picea engelmannii* - *Abies lasiocarpa* - *Larix lyallii* / *Luzula wahlenbergii* Habitat Type (Ogilvie 1969) I
- *Picea engelmannii* - *Abies lasiocarpa* / *Luzula hitchcockii* - Herb Vegetation Type (Achuff et al. 2002a) I
- *Picea engelmannii* - *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type (Ogilvie 1962) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is relatively common in Waterton Lakes National Park but has not been documented in Glacier National Park. In Waterton Lakes National Park the association has been documented southeast of Carthew Summit.

GLOBAL RANGE: This association is found from the northern portion of the middle Rocky Mountains of Idaho to the northern Rocky Mountains and documented well into the southeastern portion of the Canadian Rockies; it may extend as far north as Jasper and Banff national parks of Canada, if one accepts *Luzula wahlenbergii* as an ecological analogue of *Luzula glabrata* var. *hitchcockii*.

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT, WA

USFS ECOREGIONS: M332A:CC, M332B:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: PC (Banff?, Jasper?, Waterton Lakes); USFS (Wenatchee)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.5104, WATE.5106, WATE.9033.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Achuff et al. 2002a, Bourgeron and Engelking 1994, Cooper et al. 1987, Lillybridge et al. 1995, Ogilvie 1962, Ogilvie 1969, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d., Williams et al. 1995

***Pinus albicaulis* - *Abies lasiocarpa* Woodland Alliance**

***Pinus albicaulis* - *Abies lasiocarpa* / *Menziesia ferruginea* / *Xerophyllum tenax* Woodland WHITEBARK PINE - SUBALPINE FIR / FOOL'S-HUCKLEBERRY / BEAR-GRASS WOODLAND**

IDENTIFIER: CEGL005836

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.c.)
Alliance	<i>Pinus albicaulis</i> - <i>Abies lasiocarpa</i> Woodland Alliance (A.560)
Alliance (English name)	Whitebark Pine - Subalpine Fir Woodland Alliance
Association	<i>Pinus albicaulis</i> - <i>Abies lasiocarpa</i> / <i>Menziesia ferruginea</i> / <i>Xerophyllum tenax</i> Woodland
Association (English name)	Whitebark Pine - Subalpine Fir / Fool's-huckleberry / Bear-grass Woodland

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Subalpine Woodland and Parkland (CES306.807)

ELEMENT CONCEPT

GLOBAL SUMMARY: This minor small- to large-patch community is found primarily in mid to upper subalpine habitats throughout the Nez Perce and Clearwater national forests, north into Idaho's panhandle and west into west-central Montana. East of the Continental Divide it extends northward to the Canadian Rockies of southwestern Alberta. Its distribution ranges in elevation from 1495 to 2195 m (4900-7200 feet). The lower elevation occurrences are associated with frost-pocket conditions. It usually occupies neutral to collecting positions from toeslopes to ridge shoulders and including ridgetops; it can be found on well-drained benches in cold-air drainages. Degree of slope is highly variable, but cold aspects (from northeast- through east-facing) are predominant. Parent

materials are various, from intrusive volcanics of the Idaho Batholith to extrusive volcanics (andesite and basalt) to various sedimentary and metamorphic species, including quartzite, argillite, siltstone, sandstone and schist. Soils are acidic, well-drained, and soil texture is usually on the finer end of the spectrum (loams and silt loams being common). Exposed rock and soil are generally less than 5%, and the rock content in the profile often exceeds 5%, increasing markedly with depth. The overstory is usually an open canopy (less than 50% cover) dominated by a variable mix of *Abies lasiocarpa*, *Picea engelmannii*, *Pinus contorta*, and the indicator species *Pinus albicaulis*, which must have at least 5% cover for this type to be recognized as distinctive from *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Xerophyllum tenax* Forest (CEGL005895) or the *Pinus contorta*-dominated version of this community. The undergrowth may be quite dense with a layer of short *Menziesia ferruginea* overtopping tussocks of *Xerophyllum tenax*. *Vaccinium membranaceum* is highly constant and though subordinate in height (and usually in cover) to *Menziesia* is still regarded a dominant short shrub. The only dwarf-shrub consistently present, *Vaccinium scoparium*, occurs as scattered patches; if present with greater than 15% cover, then another association is indicated. The combined cover of these four species often constitutes a continuous undulating layer. *Spiraea betulifolia* and *Lonicera utahensis* are consistently scattered in the short-shrub layer. There are no graminoids regularly present. Other than the abundance of the diagnostic *Xerophyllum tenax*, the forb layer has low cover and is comparatively depauperate with only *Arnica latifolia*, *Anemone piperi*, *Goodyera oblongifolia*, *Orthilia secunda* (= *Pyrola secunda*), and *Viola orbiculata* having a consistent presence. On moister sites and where the shrub layer is not overwhelming, *Valeriana sitchensis* and/or *Thalictrum occidentale* are consistently present with more than 5% cover.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This woodland association occupies moderately steep to steep slopes with variable aspects. Its position is most often low to midslope. Elevation ranges from 1790 to 2030 m (5871-6658 feet). Soils are typically well-drained and derived from noncalcareous sedimentary material. Most stands occupy colluvial deposits over bedrock ridges. Argillite is present in the surface soil in the form of small rock and gravel. The soil is usually shallow, rocky and not well-developed. Soil texture is commonly a sand or loamy sand. Ground cover is primarily litter, but bare soil, small rock and wood may contribute a significant amount of surface cover in some stands.

GLOBAL ENVIRONMENT: This minor small- to large-patch community is found primarily in mid to upper subalpine habitats throughout the Nez Perce and Clearwater national forests, north into Idaho's panhandle and west into west-central Montana; east of the Continental Divide it extends northward to the Canadian Rockies of southwestern Alberta. In the southern portion of its distribution elevations range from 1555 to 2105 m (5100-6900 feet), whereas in the north it ranges between 1495 to 1830 m (4900-6000 feet) and is really only regularly present above 1800 m (5900 feet), the lower elevation occurrences being associated with frost-pocket conditions. In Montana it is found primarily between 1675 and 2195 m (5500-7200 feet). It usually occupies neutral to collecting positions from toeslopes to ridge shoulders and including ridgetops; it can be found on well-drained benches in cold-air drainages. Degree of slope is highly variable, but cold aspects (from northeast- through east-facing) are predominant. Parent materials are various, from intrusive volcanics of the Idaho Batholith to extrusive volcanics (andesite and basalt) to various sedimentary and metamorphic species, including quartzite, argillite, siltstone, sandstone and schist. Soils are acidic (mean pH in 4.6 to 4.9 range), well-drained, and soil texture is usually on the finer end of the spectrum (loams and silt loams being common). Exposed rock and soil are generally less than 5%, and the rock content in the profile often exceeds 5% and increases markedly with depth.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The forest canopy is relatively open in this association, with canopy cover ranging from 30-50% in a layer 10-20 m tall. *Pinus albicaulis* dominates the upper canopy. *Abies lasiocarpa* is well-represented with approximately 10% canopy cover. *Abies lasiocarpa* is the primary subcanopy tree species, contributing about 10% to a total subcanopy cover of up to 20%. Tall shrubs (2-5 m) are sparse, with less than 10% cover. The short-shrub layer (0.5-1 m) is quite dense, with up to 70% cover, dominated by *Menziesia ferruginea* and *Vaccinium membranaceum*. Dwarf-shrubs are uncommon or absent in this association. Herbaceous cover is variable, ranging from 30-80%, and species diversity is low. *Xerophyllum tenax* was the only herb with 100% constancy in sampled stands, with an average cover of 18%. Other forbs commonly found in trace amounts in this association include *Arnica X diversifolia*, *Goodyera oblongifolia*, *Orthilia secunda*, and *Pedicularis bracteosa*.

GLOBAL VEGETATION: The overstory is usually an open canopy (less than 50% cover) dominated by a variable mix of *Abies lasiocarpa*, *Picea engelmannii*, *Pinus contorta*, and the indicator species *Pinus albicaulis*, which must have at least 5% cover for this type to be recognized as distinctive from *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Xerophyllum tenax* Forest (CEGL005895) or the *Pinus contorta*-dominated version of this community. The undergrowth may be quite dense with a layer of *Menziesia ferruginea* (short-shrub height category in this restrictive environment) overtopping tussocks of *Xerophyllum tenax*. *Vaccinium membranaceum* is highly constant and though subordinate in height (and usually in cover) to *Menziesia* is still regarded as a dominant short shrub. In northern Idaho *Rhododendron albiflorum* may be a conspicuous component by virtue of its height (verging on tall-shrub category) and large white blossoms. The only dwarf-shrub consistently present, *Vaccinium scoparium*, occurs as scattered patches; if present with greater than 15% cover, then another association is indicated. The combined cover of these four species often constitutes a continuous undulating layer. *Spiraea betulifolia* and *Lonicera utahensis* are consistently scattered in the

short-shrub layer. There are no graminoids regularly present. Other than the abundance of the diagnostic *Xerophyllum tenax*, the forb layer has low cover and is comparatively depauperate with only *Arnica latifolia*, *Anemone piperi*, *Goodyera oblongifolia*, *Orthilia secunda* (= *Pyrola secunda*), and *Viola orbiculata* having a consistent presence. On moister sites and where the shrub layer is not overwhelming, *Valeriana sitchensis* and/or *Thalictrum occidentale* are consistently present with more than 5% cover.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Pinus albicaulis</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Menziesia ferruginea</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Forb	<i>Xerophyllum tenax</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i> , <i>Pinus albicaulis</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Lonicera utahensis</i> , <i>Menziesia ferruginea</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Forb	<i>Arnica latifolia</i> , <i>Thalictrum occidentale</i> , <i>Valeriana sitchensis</i> , <i>Xerophyllum tenax</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Pinus albicaulis*, *Xerophyllum tenax*

GLOBAL: *Abies lasiocarpa*, *Menziesia ferruginea*, *Picea engelmannii*, *Pinus albicaulis*, *Xerophyllum tenax*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3? (10-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Many to most of the stands within this association are merely seral representatives of *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Xerophyllum tenax* Forest (CEGL005895); the association under consideration is recognized, at least in the Glacier-Waterton International Peace Park vegetation keys, as having at least 5% canopy cover of *Pinus albicaulis*. Recognition of a type based on a very minimal cover of a seral tree species (*Pinus albicaulis*) of broad distribution should provoke questions; the intent of this broadly inclusive type was to capture stands (specifically their locations, particularly in mapping efforts) wherein this highly threatened species occurs or will have once occurred.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Xerophyllum tenax* Forest (CEGL005895)
- *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* Forest (CEGL000319)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type, *Xerophyllum tenax* Phase (Cooper et al. 1987) I
- *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type (Pfister et al. 1977) I
- *Picea engelmannii* - *Abies lasiocarpa* / *Menziesia ferruginea* Habitat Type (Ogilvie 1962) I
- C27: *Picea engelmannii* - *Abies lasiocarpa* / *Menziesia ferruginea* / *Vaccinium membranaceum* - *Xerophyllum tenax* Vegetation Type (Achuff et al. 2002a) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is somewhat common in Waterton Lakes National Park, known from several locations on mountain slopes. In Glacier National Park the association is uncommon, known only from one location east of the Continental Divide. Specifically, the association has been documented in the Two Medicine valley of Glacier National Park.

GLOBAL RANGE: This minor small- to large-patch community is found primarily in mid to upper subalpine habitats throughout the Nez Perce and Clearwater national forests, north into Idaho's panhandle and west into west-central Montana. East of the Continental Divide it extends northward to the Canadian Rockies of southwestern Alberta.

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT

USFS ECOREGIONS: M332A:CC, M332B:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes); USFS (Clearwater, Nez Perce)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.282, WATE.5092, WATE.5093, WATE.5109.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Achuff et al. 2002a, Cooper et al. 1987, Ogilvie 1962, Pfister et al. 1977, Western Ecology Working Group n.d.

Pinus albicaulis - *Abies lasiocarpa* / *Vaccinium membranaceum* / *Xerophyllum tenax*

Woodland

WHITEBARK PINE - SUBALPINE FIR / SQUARE-TWIG BLUEBERRY / BEAR-GRASS WOODLAND

IDENTIFIER: CEGL005837

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.c.)
Alliance	<i>Pinus albicaulis</i> - <i>Abies lasiocarpa</i> Woodland Alliance (A.560)
Alliance (English name)	Whitebark Pine - Subalpine Fir Woodland Alliance
Association	<i>Pinus albicaulis</i> - <i>Abies lasiocarpa</i> / <i>Vaccinium membranaceum</i> / <i>Xerophyllum tenax</i> Woodland
Association (English name)	Whitebark Pine - Subalpine Fir / Square-twig Blueberry / Bear-grass Woodland

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Subalpine Woodland and Parkland (CES306.807)

ELEMENT CONCEPT

GLOBAL SUMMARY: This small- to large-patch type is manifested as a seral type from central Idaho north to northern Idaho, eastern Washington and western Montana (northern Rocky Mountains) and southwestern Alberta (Canadian Rockies), and it very probably will be identified for British Columbia as well. This association is most prominent in west-central and central Montana forests. This association's elevation range is rather broad, ranging from 1030 to 2015 m (3100-6600 feet). It is much more prevalent within the upper elevation range. It occupies primarily south- through west-facing, moderate to steep slopes and is usually found on midslope to slope shoulder positions. It also occurs on benches associated with broad ridges. Soils are well-drained and derived from a broad spectrum of parent materials, including glacial till and drift, both calcareous and noncalcareous sedimentary types, intrusive and extrusive igneous rock and metamorphic types, particularly quartzite. Ground surfaces have little or no bare soil or rock exposed. The canopy structure ranges from moderately open to closed (>60% cover) with *Picea engelmannii* and *Abies lasiocarpa* dominant but in which *Pinus albicaulis* is a significant component (at least 5% canopy cover). These sites often have lesser amounts of *Larix occidentalis*, *Pseudotsuga menziesii*, and *Pinus contorta*. Even should *Abies lasiocarpa* and *Picea engelmannii* be minor components of the overstory, they are always major components of the subcanopy. Unthrifty *Pinus albicaulis* specimens may be members of this layer too, but all indications are that they will not make the canopy (especially given the ubiquity of white pine blister rust). The short-shrub layer dominates the undergrowth with *Vaccinium membranaceum* being dominant, often exceeding 50% canopy cover; *Spiraea betulifolia*, *Lonicera utahensis*, *Paxistima myrsinites*, *Amelanchier alnifolia*, and *Rosa gymnocarpa* are the other high-constancy species of this layer. Dwarf-shrub layer species that occur with consistency include only *Vaccinium scoparium* and *Mahonia repens* (= *Berberis repens*). The herbaceous layer is generally relatively depauperate with the diagnostic species *Xerophyllum tenax* being strongly dominant (average cover reported by various studies ranging from 25 to 61%). Only two graminoids occur consistently and

are well-represented, *Calamagrostis rubescens* and *Carex geyeri*. Other forbs with moderate to high constancy include *Arnica cordifolia*, *Arnica latifolia*, *Chimaphila umbellata*, *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, and *Viola orbiculata*; not all of these forbs have high constancy throughout the range of the type.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This woodland association occupies moderately steep to steep slopes with southerly aspects. Its position may be high to low slope. The association also occurs on gentle toeslopes at the base of tall cirque headwalls. These toeslopes have southerly aspects. Elevation ranges from 1740-2055 m (5707-6740 feet). Soils are typically well-drained to rapidly drained and derived from noncalcareous sedimentary material. Most stands develop over glacial till or colluvial deposits. Argillite is present in the surface soil in the form of small rock and gravel. The soil is usually shallow, rocky and not well-developed. Soil texture is commonly a sandy loam or silt loam. Ground cover is primarily litter, with trace amounts of bare soil, small rock and wood. Ground cover in some stands may be dominated by small rock.

GLOBAL ENVIRONMENT: This small- to large-patch type is manifested as a seral type from central Idaho north to northern Idaho, eastern Washington and western Montana (northern Rocky Mountains) and southwestern Alberta (Canadian Rockies), and it very probably will be identified for British Columbia as well. This association is most prominent in west-central and central Montana forests. This association's elevation range is rather broad, ranging from 1030 to 2015 m (3100-6600 feet). It is much more prevalent within the upper elevation range. It occupies primarily south- through west-facing, moderate to steep slopes and is usually found on midslope to slope shoulder positions. It also occurs on benches associated with broad ridges. Soils are well-drained and derived from a broad spectrum of parent materials including glacial till and drift, both calcareous and noncalcareous sedimentary types, intrusive and extrusive igneous rock and metamorphic types, particularly quartzite. In one study soil texture ranged from gravelly sandy loams to silts, and a yet greater range in texture can be expected across the type's distribution. Ground surfaces have little or no bare soil or rock exposed.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The forest canopy is relatively open in this association, with canopy cover ranging from 20-50% in a layer 10-20 m tall. The upper canopy may be as low as 5-10 m tall in some stands. *Pinus albicaulis* dominates the upper canopy. *Abies lasiocarpa* and *Picea engelmannii* may be well-represented. *Abies lasiocarpa* is the primary subcanopy tree species, contributing about 10% to a total subcanopy cover of up to 30%. Tall shrubs (2-5 m) are sparse or absent in this association. The short-shrub layer (0.5-1 m) is quite dense, with up to 70% cover, dominated by *Vaccinium membranaceum*. Dwarf-shrubs such as *Paxistima myrsinites* and *Vaccinium scoparium* are present in trace amounts. Herbaceous cover is variable, ranging from 20-60%. *Xerophyllum tenax* was the only herbaceous species with 100% constancy in sampled stands, with an average cover of 30%. Other forbs commonly found in trace amounts in this association include *Carex geyeri* and *Pedicularis bracteosa*.

GLOBAL VEGETATION: The canopy structure ranges from moderately open to closed (>60% cover) with *Picea engelmannii* and *Abies lasiocarpa* dominant but in which *Pinus albicaulis* is a significant component (at least 5% canopy cover). These sites often have lesser amounts of *Larix occidentalis*, *Pseudotsuga menziesii*, and *Pinus contorta* (sites are beyond the cold limits of *Pinus ponderosa* for the most part). Even should *Abies lasiocarpa* and *Picea engelmannii* be minor components of the overstory, they are always major components of the subcanopy. Unthrifty *Pinus albicaulis* specimens may be members of this layer too, but all indications are that they will not make the canopy (especially given the ubiquity of white pine blister rust). A tall-shrub layer is absent and even scattered individuals are rare. The short-shrub layer dominates the undergrowth with *Vaccinium membranaceum* being dominant, often exceeding 50% canopy cover; *Spiraea betulifolia*, *Lonicera utahensis*, *Paxistima myrsinites*, *Amelanchier alnifolia*, and *Rosa gymnocarpa* are the other high-constancy species of this layer. Dwarf-shrub layer species that occur with consistence include only *Vaccinium scoparium* and *Mahonia repens* (= *Berberis repens*). The herbaceous layer is generally relatively depauperate with the diagnostic species *Xerophyllum tenax* being strongly dominant (average cover reported by various studies ranging from 25 to 61%). Only two graminoids occur consistently and are well-represented, *Calamagrostis rubescens* and *Carex geyeri*. Other forbs with moderate to high constancy include *Arnica cordifolia*, *Arnica latifolia*, *Chimaphila umbellata*, *Orthilia secunda* (= *Pyrola secunda*), *Thalictrum occidentale*, and *Viola orbiculata*; not all of these forbs have high constancy throughout the range of the type.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Pinus albicaulis</i>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Vaccinium membranaceum</i>
Herb (field)	Forb	<i>Xerophyllum tenax</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Pinus albicaulis</i>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Vaccinium membranaceum</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Arnica latifolia</i> , <i>Xerophyllum tenax</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Pinus albicaulis*, *Vaccinium membranaceum*, *Xerophyllum tenax*

GLOBAL: *Abies lasiocarpa*, *Pinus albicaulis*, *Vaccinium membranaceum*, *Xerophyllum tenax*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3? (10-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Virtually all of the stands within this association are merely seral representatives of *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest (CEGL005917). The association under consideration is recognized, at least in the Glacier-Waterton International Peace Park vegetation keys, as having at least 5% canopy cover of *Pinus albicaulis*. Recognition of a type based on a very minimal cover of a seral tree species (*Pinus albicaulis*) of broad distribution should provoke questions; the intent of this broadly inclusive type was to capture stands (specifically their locations, particularly in mapping efforts) wherein this highly threatened species occurs or will have once occurred.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest (CEGL005917)
- *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium membranaceum* Rocky Mountain Forest (CEGL000341)
- *Abies lasiocarpa* / *Xerophyllum tenax* Forest (CEGL000346)
- *Pinus albicaulis* - (*Abies lasiocarpa*) / *Carex geyeri* Woodland (CEGL000754)
- *Pinus albicaulis* / *Calamagrostis rubescens* Woodland (CEGL000753)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium membranaceum* Phase (Pfister et al. 1977) =
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium membranaceum* Phase (Cooper et al. 1987) =
- *Picea engelmannii* - *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type (Ogilvie 1962) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is relatively uncommon in Glacier National Park and has not been documented in Waterton Lakes National Park. In Glacier National Park the association occurs east of the Continental Divide in the Two Medicine valley. West of the Divide the association has been documented near Numa Ridge.

GLOBAL RANGE: This association is found from the northern portion of the middle Rocky Mountains of Idaho to the northern Rocky Mountains and documented well into the southeastern portion of the Canadian Rockies. It is somewhat surprising that this association has not yet been documented as a seral type on the Colville National Forest of northeastern Washington (as stands within Williams et al.'s (1995) *Abies lasiocarpa* / *Xerophyllum tenax* Plant Association) and less surprising that it has not been sampled on the Wenatchee National Forest (Lillybridge et al. 1995); all characteristic species are found on these forests, but perhaps their distributions are not overlapping.

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT, WA?

USFS ECOREGIONS: M332A:CC, M332B:CC, M332C:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); USFS (Colville NF?, Wenatchee?)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.118, GLAC.284, GLAC.2636.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Achuff et al. 2002a, Cooper et al. 1987, Lillybridge et al. 1995, Ogilvie 1962, Pfister et al. 1977, Western Ecology Working Group n.d., Williams et al. 1995

***Pinus albicaulis* - *Abies lasiocarpa* / *Vaccinium scoparium* / *Luzula glabrata* var. *hitchcockii*
Woodland****WHITEBARK PINE - SUBALPINE FIR / GROUSEBERRY / HITCHCOCK'S SMOOTH
WOODRUSH WOODLAND****IDENTIFIER: CEGL005839****NVC Classification**

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.c.)
Alliance	<i>Pinus albicaulis</i> - <i>Abies lasiocarpa</i> Woodland Alliance (A.560)
Alliance (English name)	Whitebark Pine - Subalpine Fir Woodland Alliance
Association	<i>Pinus albicaulis</i> - <i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> / <i>Luzula glabrata</i> var. <i>hitchcockii</i> Woodland
Association (English name)	Whitebark Pine - Subalpine Fir / Grouseberry / Hitchcock's Smooth Woodrush Woodland

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Subalpine Woodland and Parkland (CES306.807)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is broadly distributed throughout the mid to upper subalpine zones of the northern Rocky Mountains, concentrated in northern Idaho and western Montana and extending into the Canadian Rockies of southwestern Alberta. Its elevation ranges from 1555 to 2380 m (5100-7800 feet). It is strongly associated with moderate to steep warm slopes, usually having a southeast- through south- to west-facing exposure; it consistently occurs from midslopes upwards to slope shoulders and occasionally extending to high-elevation benchlands as well. It is characterized as having relatively heavy snowpack that persists well into the growing season. These sites have well-drained soils derived from a host of parent materials, including volcanics (granitics, andesite, rhyolite), sedimentaries (limestone, dolomite, siltstone), metamorphics (quartzite, argillite, gneiss, mica-schist) and metasediments. The range in soil surface texture is broad, from silty clays to sandy loams with the gravel content averaging about 30% near the surface and increasing markedly with depth. These are very open woodland sites with the tree component often occurring as scattered clumps and, at the highest and coldest extremes, approaching a krummholz form with trees as short as 5.5 m (18 feet) in height when mature. The canopy is generally strongly dominated by *Abies lasiocarpa* followed distantly in order of decreasing average cover by *Pinus albicaulis*, *Pinus contorta*, and *Picea engelmannii* (this order may change slightly by region and is undoubtedly due to differences in type and severity of disturbance). The undergrowth component is almost invariably species-poor. Tall shrubs are virtually unrepresented, and the short shrubs *Vaccinium membranaceum* and *Lonicera utahensis* have high constancy, but only the former has coverages exceeding 5%. The dwarf-shrub component has only two constant species, *Vaccinium scoparium* and *Vaccinium myrtilloides*, only one of which exhibits high cover in a given location; *Phyllodoce empetriformis* may be a conspicuous component but its presence is very inconsistent. The graminoid component is singularly dominated by *Luzula glabrata* with a cover of 5 to 20% (extremes to 50 or 60%, where *Xerophyllum tenax* cover is low); *Carex geyeri* is a common component only in central Idaho representation of the type. *Xerophyllum tenax* is almost invariably the dominant herb, joined by a number of other forbs none of which express high constancy.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:**WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT:** This woodland association occupies moderately steep to steep slopes with westerly to southwesterly aspects. Stand position is most commonly high slope. Elevation ranges

from 2040-2260 m (6691-7413 feet). Underlying geologic formations are typically colluvial deposits over bedrock ridges. Sites are well-drained or rapidly drained, and the soil texture is commonly a sandy loam or silt loam. Argillite is present in the surface soil in the form of small rock and gravel. Ground cover may be dominated by litter, small rock or bare soil. Stands with heavy treefall may have significant wood ground cover in the form of coarse woody debris.

GLOBAL ENVIRONMENT: This association is broadly distributed throughout the mid to upper subalpine zones of the northern Rocky Mountains, concentrated in northern Idaho and western Montana and extending into the Canadian Rockies of southwestern Alberta. The demonstrated elevation range is from 1555 to 2135 m (5100-7000 feet) in the northern portion of its distribution and 1740 to 2380 m (5700-7800 feet) in its southern occurrence. It is strongly associated with moderate to steep warm slopes, usually having a southeast- through south- to west-facing exposure; it consistently occurs from midslopes upwards to slope shoulders and occasionally extending to high-elevation benchlands as well. It is characterized as having relatively heavy snowpack that persists well into the growing season. These sites have well-drained soils derived from a host of parent materials, including volcanics (granitics, andesite, rhyolite), sedimentaries (limestone, dolomite, siltstone), metamorphics (quartzite, argillite, gneiss, mica-schist) and metasediments. The range in soil surface texture is broad, from silty clays to sandy loams with the gravel content averaging about 30% near the surface and increasing markedly with depth.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The forest canopy is relatively open in this association, with canopy cover ranging from 20-40% in a layer 5-15 m tall. Wind scouring on exposed sites may result in the formation of shrubby, krummholz forest structure. In krummholz stands there may be no discernable subcanopy. *Pinus albicaulis* dominates the upper tree canopy. *Abies lasiocarpa* and *Picea engelmannii* are also well-represented. *Abies lasiocarpa* is the primary subcanopy tree species when a subcanopy is apparent. Shrub cover is sparse. Dwarf-shrubs dominate the shrub layer, with *Vaccinium scoparium* and *Vaccinium myrtillus* the most common species. Total dwarf-shrub cover is approximately 10%. Herbaceous cover is variable, ranging from 40-90%. *Luzula glabrata* var. *hitchcockii* is the most common and abundant herbaceous species, with 100% constancy and an average cover of 25%. Other forbs commonly found in amounts ranging from 1-5% include *Xerophyllum tenax*, *Solidago multiradiata*, and *Arnica cordifolia*.

GLOBAL VEGETATION: These are very open woodland sites with the tree component often occurring as scattered clumps and, at the highest and coldest extremes, approaching a krummholz form with trees as short as 5.5 m (18 feet) in height when "mature." The canopy is generally strongly dominated by *Abies lasiocarpa* followed distantly in order of decreasing average cover by *Pinus albicaulis*, *Pinus contorta*, and *Picea engelmannii* (this order may change slightly by region and is undoubtedly due to differences in type and severity of disturbance). The undergrowth component is almost invariably species-poor. Tall shrubs are virtually unrepresented, and the short shrubs *Vaccinium membranaceum* and *Lonicera utahensis* have high constancy, but only the former has coverages exceeding 5%. The dwarf-shrub component has only two constant species, *Vaccinium scoparium* and *Vaccinium myrtillus*, only one of which exhibits high cover in a given location; *Phyllodoce empetrififormis* may be a conspicuous component but its presence is very inconsistent. The graminoid component is singularly dominated by *Luzula glabrata* var. *hitchcockii* with a cover of 5 to 20% (extremes to 50 or 60%, where *Xerophyllum tenax* cover is low); *Carex geyeri* is a common component only in central Idaho representation of the type. *Xerophyllum tenax* is almost invariably the dominant herb, joined by a number of other forbs none of which express high constancy.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus albicaulis</i>
Tree subcanopy	Needle-leaved tree	<i>Abies lasiocarpa</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium myrtillus</i> , <i>Vaccinium scoparium</i>
Herb (field)	Graminoid	<i>Luzula glabrata</i> var. <i>hitchcockii</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus albicaulis</i>
Tree subcanopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium myrtillus</i> , <i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Arnica latifolia</i> , <i>Xerophyllum tenax</i>
Herb (field)	Graminoid	<i>Luzula glabrata</i> var. <i>hitchcockii</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Luzula glabrata* var. *hitchcockii*, *Pinus albicaulis*, *Vaccinium myrtillus*, *Vaccinium scoparium*

GLOBAL: *Abies lasiocarpa*, *Luzula glabrata* var. *hitchcockii*, *Pinus albicaulis*, *Vaccinium myrtillus*, *Vaccinium scoparium*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3? (10-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Many to most of the stands within this association are merely seral representatives of *Abies lasiocarpa* - *Picea engelmannii* / *Luzula glabrata* var. *hitchcockii* Woodland (CEGL000317); the association under consideration is recognized, at least in Glacier-Waterton International Peace Park, as having at least 5% canopy cover of *Pinus albicaulis*. Recognition of a type based on a very minimal cover of a seral tree species (*Pinus albicaulis*) of broad distribution should provoke questions; the intent of this broadly inclusive type was to capture stands (specifically their locations, particularly in mapping efforts) wherein this highly threatened species occurs or will have once occurred.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Luzula glabrata* var. *hitchcockii* Woodland (CEGL000317)
- *Tsuga mertensiana* / *Luzula glabrata* var. *hitchcockii* Forest (CEGL000505)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Luzula hitchcockii* Habitat Type, *Vaccinium scoparium* Phase (Pfister et al. 1977) B
- *Abies lasiocarpa* / *Vaccinium scoparium* / *Luzula hitchcockii* (Lillybridge et al. 1995) B
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Luzula hitchcockii* Phase (Cooper et al. 1987) I
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Luzula hitchcockii* Phase (Steele et al. 1981) I
- *Picea engelmannii* - *Abies lasiocarpa* - *Larix lyallii* / *Luzula wahlenbergii* Habitat Type (Ogilvie 1969) I
- *Picea engelmannii* - *Abies lasiocarpa* / *Luzula hitchcockii* - Herb Vegetation Type (Achuff et al. 2002a) I
- *Picea engelmannii* - *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type (Ogilvie 1962) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is relatively common in Waterton Lakes National Park. The association has not been documented in Glacier National Park.

GLOBAL RANGE: This association is broadly distributed throughout the mid to upper subalpine zones of the northern Rocky Mountains, concentrated in northern Idaho and western Montana and extending into the Canadian Rockies of southwestern Alberta.

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT, WY?

USFS ECOREGIONS: M331A:CC, M332A:CC, M332B:CC, M332C:CP, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier?); PC (Waterton Lakes); USFS (Wenatchee)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.4102, WATE.4105, WATE.4106, WATE.4128.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Achuff et al. 2002a, Cooper et al. 1987, Lillybridge et al. 1995, Ogilvie 1962, Ogilvie 1969, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d., Williams et al. 1995

***Pinus albicaulis* - *Abies lasiocarpa* / *Vaccinium scoparium* / *Xerophyllum tenax* Woodland
WHITEBARK PINE - SUBALPINE FIR / GROUSEBERRY / BEAR-GRASS WOODLAND**

IDENTIFIER: C EGL005838**NVC Classification**

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Cylindrical-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.c.)
Alliance	<i>Pinus albicaulis</i> - <i>Abies lasiocarpa</i> Woodland Alliance (A.560)
Alliance (English name)	Whitebark Pine - Subalpine Fir Woodland Alliance
Association	<i>Pinus albicaulis</i> - <i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> / <i>Xerophyllum tenax</i> Woodland
Association (English name)	Whitebark Pine - Subalpine Fir / Grouseberry / Bear-grass Woodland

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Subalpine Woodland and Parkland (CES306.807)

ELEMENT CONCEPT

GLOBAL SUMMARY: This minor small- to large-patch community is found primarily in upper subalpine habitats throughout the northern Rocky Mountains from central Idaho north and east into west-central Montana, and northward to the Canadian Rockies of southwestern Alberta. It ranges in elevation from 1585 to 2530 m (5200-8300 feet). The lower elevation occurrences are mostly associated with frost-pocket conditions. It usually occupies moisture-shedding sites from midslope to ridge shoulders and ridgetops; it can be found on well-drained benches in cold-air drainages. Degree of slope is highly variable, but warm aspects (from east-facing through west-facing) are predominant. Parent materials are various, from intrusive volcanics of the Idaho Batholith to extrusive volcanics (andesite and basalt) to various sedimentary and metamorphic species, including quartzite, argillite, siltstone, sandstone and schist. Soils are acidic, well-drained, and soil texture is usually on the coarser end of the spectrum (gravelly sandy loams and loams being common). Exposed rock and soil are generally less than 10%, but rock content in the profile often exceeds 20%. The overstory is usually an open canopy (less than 50% cover) dominated by a variable mix of *Abies lasiocarpa*, *Picea engelmannii*, *Pinus contorta*, and the indicator species *Pinus albicaulis*, which must have at least 5% cover for this type to be recognized. The undergrowth may be quite dense with a layer of *Vaccinium scoparium* surrounding clumps of *Xerophyllum tenax* with a thinly distributed *Vaccinium membranaceum* superimposed; the combined cover of these three species often exceeds 80%. Tall shrubs, if present, could be characterized as accidentals. *Spiraea betulifolia* and *Lonicera utahensis* are consistently scattered in the short-shrub layer. *Carex geyeri* and *Calamagrostis rubescens* are the only graminoids regularly present, and their cover seldom exceeds 10%. Other than the abundance of the diagnostic *Xerophyllum tenax*, the forb layer has low cover and is comparatively depauperate with only *Arnica latifolia*, *Anemone piperi*, *Goodyera oblongifolia*, *Orthilia secunda* (= *Pyrola secunda*), and *Viola orbiculata* having a consistent presence.

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This woodland association occupies moderately steep to steep slopes with variable aspects. Stands most often develop on southerly or southwesterly slopes. The association has also been documented on a northeasterly slope. Stand position may be high to midslope. Elevation ranges from 1735-2930 m (5691-6986 feet). Underlying geologic formations include glacial moraine, colluvial deposits over bedrock, and bedrock outcrops. Soils are typically well-drained or rapidly drained and primarily derived from noncalcareous sedimentary material. Argillite is present in the surface soil in the form of small rock and gravel. Soil texture is commonly a sandy loam or silt loam. Ground cover may be dominated by litter, small rock or bare soil. Stands with heavy treefall may have significant wood ground cover in the form of coarse woody debris.

GLOBAL ENVIRONMENT: This minor small- to large-patch community is found primarily in upper subalpine habitats throughout the northern portion of central Idaho and northward to the Nez Perce and Clearwater national forests and west into west-central Montana (where it is areally most extensive); east of the Continental Divide it extends northward to the Canadian Rockies of southwestern Alberta. In the southern portion of its distribution elevations range from 1980 to 2530 m (6500-8300 feet), whereas in the north it ranges between 1585 and 2105 m (5200-6900 feet) and is really only regularly present above 1800 m (5900 feet), the lower elevation occurrences being associated with frost-pocket conditions. It usually occupies moisture-shedding sites from midslope to ridge shoulders and ridgetops; it can be found on well-drained benches in cold-air drainages. Degree of slope is highly variable, but warm aspects (from east-facing through west-facing) are predominant. Parent materials are various, from intrusive volcanics of the Idaho Batholith to extrusive volcanics (andesite and basalt) to various sedimentary and metamorphic species, including quartzite, argillite, siltstone, sandstone and schist. Soils are acidic (mean pH in 4.4 to 4.6 range), well-drained, and soil texture is usually on the coarser end of the spectrum (gravelly sandy loams and loams being common). Exposed rock and soil are generally less than 10%, but rock content in the profile often exceeds 20%.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The forest canopy is relatively open in this association, with canopy cover ranging from 10-40% in a layer 5-15 m tall. The upper canopy may be as low as 2-5 m high in stands where wind scouring has resulted in the formation of shrubby, krummholz forest. In krummholz stands there may be no discernable subcanopy. *Pinus albicaulis* and *Abies lasiocarpa* dominate the upper canopy. Scattered *Picea engelmannii*, *Pinus contorta*, and *Pseudotsuga menziesii* may also be present. *Abies lasiocarpa* is the primary subcanopy tree species when a subcanopy is apparent. Shrub cover is highly variable. Tall shrubs are sparse, with less than 20% cover in a layer 1-2 m tall. The short-shrub layer (0.5-1 m) is also sparse with up to 20% cover, dominated by *Vaccinium membranaceum*. Dwarf-shrubs such as *Vaccinium scoparium* and *Vaccinium myrtillus* contribute up to 40% cover. Herbaceous cover is variable, ranging from 10-60%. *Xerophyllum tenax* and *Carex geyeri* were the only herbaceous species with 100% constancy in sampled stands. *Xerophyllum tenax* is the most dominant herb, with an average cover of 22%. Other forbs commonly found in trace amounts in this association include *Achillea millefolium* and *Hieracium albiflorum*.

GLOBAL VEGETATION: Exposed rock and soil are generally less than 10%, but rock content in the profile often exceeds 20%. The overstory is usually an open canopy (less than 50% cover) dominated by a variable mix of *Abies lasiocarpa*, *Picea engelmannii*, *Pinus contorta*, and the indicator species *Pinus albicaulis*, which must have at least 5% cover for this type to be recognized as distinctive from *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* / *Xerophyllum tenax* Forest (CEGL005914) or the *Pinus contorta*-dominated version of this community. The undergrowth may be quite dense with a layer of *Vaccinium scoparium* surrounding clumps of *Xerophyllum tenax* with a thinly distributed *Vaccinium membranaceum* superimposed; the combined cover of these three species often exceeds 80%. Tall shrubs, if present, could be characterized as accidentals. *Spiraea betulifolia* and *Lonicera utahensis* are consistently scattered in the short-shrub layer. *Carex geyeri* and *Calamagrostis rubescens* are the only graminoids regularly present, and their cover seldom exceeds 10%. Other than the abundance of the diagnostic *Xerophyllum tenax*, the forb layer has low cover and is comparatively depauperate with only *Arnica latifolia*, *Anemone piperi*, *Goodyera oblongifolia*, *Orthilia secunda* (= *Pyrola secunda*), and *Viola orbiculata* having a consistent presence.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Pinus albicaulis</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium myrtillus</i> , <i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Xerophyllum tenax</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Pinus albicaulis</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium myrtillus</i> , <i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Xerophyllum tenax</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Pinus albicaulis*, *Vaccinium membranaceum*, *Vaccinium myrtillus*, *Vaccinium scoparium*, *Xerophyllum tenax*

GLOBAL: *Abies lasiocarpa*, *Pinus albicaulis*, *Vaccinium membranaceum*, *Vaccinium myrtillus*, *Vaccinium scoparium*, *Xerophyllum tenax*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3? (10-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association was largely subsumed within the *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium scoparium* Phase (Pfister et al. 1977, Steele et al. 1981, Cooper et al. 1987), in both Idaho and Montana. In accordance

with the recent emphasis on creating existing vegetation plant associations, many of the plots used to substantiate the habitat type name cited above would now be classified as *Pinus contorta* / *Vaccinium scoparium* / *Xerophyllum tenax* Forest (CEGL005924) or *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* / *Xerophyllum tenax* Forest (CEGL005914), and a small number have been identified as belonging to the type under consideration. Recognition of a type based on a very minimal cover of a seral tree species (*Pinus albicaulis*) of broad distribution should provoke questions; the intent of this broadly inclusive type was to capture stands (specifically their locations, particularly in mapping efforts) wherein this highly threatened species occurs or will have once occurred. Considering *Vaccinium scoparium* and *Vaccinium myrtillus* as ecological analogues for classification purposes could also create problems, as the ecology of *Vaccinium myrtillus* is not so well known.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* / *Valeriana sitchensis* Forest (CEGL000345)
- *Abies lasiocarpa* / *Xerophyllum tenax* Forest (CEGL000346)
- *Pinus albicaulis* / *Vaccinium scoparium* Forest (CEGL000131)
- *Pinus contorta* / *Vaccinium scoparium* / *Xerophyllum tenax* Forest (CEGL005924)
- *Pinus contorta* / *Xerophyllum tenax* Forest (CEGL000175)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium scoparium* Phase (Pfister et al. 1977) I
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium scoparium* Phase (Cooper et al. 1987) I
- *Abies lasiocarpa* / *Xerophyllum tenax* Habitat Type, *Vaccinium scoparium* Phase (Steele et al. 1981) I
- *Tsuga mertensiana* / *Xerophyllum tenax* Habitat Type (Pfister et al. 1977) I
- *Tsuga mertensiana* / *Xerophyllum tenax* Habitat Type, *Vaccinium scoparium* Phase (Cooper et al. 1987) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is relatively common in the IPP. In Glacier National Park the association occurs east of the Continental Divide in the Two Medicine valley. West of the Divide the association has been documented near Numa Ridge and Elk Mountain Ridge.

GLOBAL RANGE:

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT, WA?

USFS ECOREGIONS: M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M333A:CC, M333B:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Banff?, Jasper?, Waterton Lakes); USFS (Clearwater, Nez Perce)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.274, GLAC.2637, GLAC.2653, GLAC.306, WATE.4123.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Achuff et al. 2002a, Cooper et al. 1987, Ogilvie 1962, Ogilvie 1969, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d., Williams et al. 1995

II.A.4.N.d. Temporarily flooded temperate or subpolar needle-leaved evergreen woodland

***Picea engelmannii* Temporarily Flooded Woodland Alliance**

***Picea engelmannii* / *Cornus sericea* Woodland**

ENGELMANN SPRUCE / RED-OSIER DOGWOOD WOODLAND

IDENTIFIER: CEGL002677

NVC Classification

Physiognomic Class Woodland (II)

Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Temporarily flooded temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.d.)
Alliance	<i>Picea engelmannii</i> Temporarily Flooded Woodland Alliance (A.566)
Alliance (English name)	Engelmann Spruce Temporarily Flooded Woodland Alliance
Association	<i>Picea engelmannii</i> / <i>Cornus sericea</i> Woodland
Association (English name)	Engelmann Spruce / Red-osier Dogwood Woodland

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)

ELEMENT CONCEPT

GLOBAL SUMMARY: This woodland is found on cool, moist sites in the mountains of the central and northern Rockies west into Oregon and Washington, at elevations ranging from 820 to 2300 m. This community is restricted to flat or gently sloping alluvial terraces or benches and, less frequently, moist toeslopes or margins of fens or marshes. Stands may be temporarily flooded in the spring, and due to its location in riparian zones, the water table is usually within 1 m of the surface. Water flow and aeration in the rooting zone is usually good. Substrates are typically poorly drained, alluvial soils. Soil texture is variable ranging from coarse-loamy to clayey depending on alluvium, and sometimes organic. The overstory canopy is dominated by *Picea engelmannii* or *Picea engelmannii* X *glauca* hybrids. Other conifers or *Populus* spp. are often present. Shrub cover is typically high, with *Cornus sericea* usually the dominant shrub, although other species like *Alnus incana* or *Ribes lacustre* are often present. Forb species richness is high but cover is low.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This woodland association occurs on colluvial lowslopes and floodplain terraces within valley bottoms and on broad, alluvial fans. The topography is flat with gentle undulations. The association often occurs at the edge of a wet meadow or stream channel and is flooded early in the growing season. Elevations range from 960-1375 m (3149-4510 feet). Geologic parent material is typically colluvium, alluvium, and glacial fluvial deposits. The soil is quite variable, but usually contains enough clay to sustain moist conditions most of the growing season. The texture may also be a sandy or silt loam. Soils with more clay are somewhat poorly drained, while those with more sand and silt are moderately well-drained.

GLOBAL ENVIRONMENT: This woodland is found on cool, moist sites in the mountains of the northern Rockies west into Oregon and Washington. This association occurs from 820-2300 m (2690-7600 feet) in elevation across its range. This community is restricted to flat, undulating or gently sloping alluvial terraces or benches and, less frequently, moist toeslopes or margins of fens or marshes. Stands may be temporarily flooded in the spring, and due to its location in riparian zones, the water table is usually within 1 m of the surface. Water flow and aeration in the rooting zone is usually good. Substrates are typically poorly drained, alluvial soils. Soil texture is variable, ranging from coarse-loamy to clayey depending on alluvium, and sometimes organic. Geologic parent material is typically alluvium, colluvium, and glacio-fluvial deposits.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The forest canopy is typically dominated by *Picea engelmannii*, however, *Abies lasiocarpa* or *Pseudotsuga menziesii* may be a codominant in some stands. Tree canopy cover ranges from 30-60% in a layer 20-50 m tall. Other tree species often present in lesser amounts include *Pinus contorta*, *Betula papyrifera*, and *Larix occidentalis*. The tree subcanopy is less dense (5-20%), dominated by a mix of *Abies lasiocarpa* and *Picea engelmannii*. Short-shrub cover is at least 30%, and may be as high as 90% in some stands. This layer is 1-2 m high and very diverse, with highest cover contributed by *Cornus sericea*, *Symphoricarpos albus*, and *Rubus parviflorus*. *Cornus sericea* has the potential to be a tall shrub but is ubiquitously and usually severely browsed. Dwarf-shrub cover is variable. In stands with moderate dwarf-shrub cover (10-30%), *Linnaea borealis* and *Mahonia repens* are usually most abundant. Herbaceous cover ranges from 30-80% and is characterized by moist-site species such as *Equisetum arvense*, *Maianthemum stellatum*, and *Osmorhiza berteroi*. This layer is diverse, with many species providing less than 10% cover. *Viola glabella* was present in all sampled plots with an average cover of 12%.

GLOBAL VEGETATION: This woodland association is characterized by an open to dense overstory tree canopy that is dominated by *Picea engelmannii* or *Picea engelmannii* X *glauca* hybrids with the understory typically dominated by *Cornus sericea*. Other conifers may be present to codominant including *Larix occidentalis*, *Picea pungens*, *Pinus contorta*, *Pseudotsuga menziesii*, and occasionally *Abies lasiocarpa* (on drier microsites or with low vigor). Other tree species may be present such as *Populus tremuloides*, *Populus balsamifera* ssp. *trichocarpa*, and *Betula papyrifera* (usually in subcanopy). Shrub cover is typically high, usually dominated by *Cornus sericea*, with several other shrub species such as *Alnus incana*, *Alnus viridis* ssp. *sinuata*, *Amelanchier alnifolia*, *Linnaea borealis*, *Rhododendron albiflorum*, *Ribes lacustre*, *Rosa woodsii*, *Rubus parviflorus*, *Symphoricarpos albus*, and various *Salix* spp. such as *Salix bebbiana*, *Salix boothii*, *Salix candida*, *Salix drummondiana*, or *Salix scouleriana*. The herbaceous layer is generally

sparse because of the dense shrub layer and is dominated by forbs. Occasionally there will be significant cover of graminoids, including *Calamagrostis rubescens* or species of *Carex* or *Poa*. Forb-species richness is high with low cover of many moist-site species such as *Actaea rubra*, *Clintonia uniflora*, *Equisetum arvense*, *Fragaria virginiana*, *Galium triflorum*, *Geranium richardsonii*, *Maianthemum stellatum*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Senecio triangularis*, *Streptopus amplexifolius*, *Galium* spp., *Thalictrum occidentale*, and *Viola glabella*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Cornus sericea</i> , <i>Symphoricarpos albus</i>
Herb (field)	Forb	<i>Viola glabella</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Picea engelmannii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Cornus sericea</i> , <i>Symphoricarpos albus</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Clintonia uniflora*, *Cornus sericea*, *Equisetum arvense*, *Picea engelmannii*

GLOBAL: *Picea engelmannii*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3 (18-Jan-2000). This community has a broad range, and the environmental conditions capable of supporting the community (i.e., alluvial terraces) are not uncommon. Although it has been impacted by human activities like logging and stream channelization, it is nevertheless a relatively common riparian type in areas where lack of disturbance has allowed succession from cottonwood to spruce dominated communities. In addition, this type is the result of merging two G3 associations, and should be maintained until more range information is available.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: *Picea engelmannii* and/or *Picea engelmannii* X *glauca* (hybrids) are the diagnostic overstory species in this woodland plant association. Former *Picea* (*engelmannii* X *glauca*, *engelmannii*) / *Cornus sericea* Forest (CEGL000407) in Montana has been merged with former *Picea engelmannii* / *Cornus sericea* Woodland (CEGL000892) into a single entity which could include pure *Picea engelmannii* and the *Picea engelmannii* X *glauca* hybrid, or both. This type was described in Montana as *Picea* spp. / *Cornus stolonifera* habitat type by Hansen et al. (1995); and in eastern Idaho and western Wyoming as *Picea* spp. / *Cornus stolonifera* habitat type by Youngblood et al. (1985b). Hansen et al. (1995) explained that the frequent absence of mature cones, similar morphology, and ecological amplitudes led them to lump *Picea engelmannii* and *Picea glauca* (hybrids) into a single type. Youngblood et al. (1985b) reported that the similar ecological amplitudes led them to lump *Picea engelmannii* and *Picea pungens* into a single type.

GLOBAL SIMILAR ASSOCIATIONS:

- *Picea pungens* / *Cornus sericea* Woodland (CEGL000388)
- *Pinus contorta* / *Cornus sericea* Woodland (CEGL005929)
- *Populus balsamifera* ssp. *trichocarpa* - *Populus tremuloides* - Conifer / *Cornus sericea* Forest (CEGL005905)
- *Populus balsamifera* ssp. *trichocarpa* / *Cornus sericea* Forest (CEGL000672)
- *Populus tremuloides* / *Cornus sericea* Forest (CEGL000582)
- *Pseudotsuga menziesii* / *Cornus sericea* Woodland (CEGL000899)

GLOBAL RELATED CONCEPTS:

- *Picea* / *Cornus stolonifera* Habitat Type (Hall and Hansen 1997) B

- *Picea engelmannii* / *Cornus stolonifera* (Crowe and Clausnitzer 1997) =
- *Picea engelmannii* / *Symphoricarpos albus* Association (Kovalchik 1993) =
- *Picea engelmannii* / *Alnus incana* - *Cornus sericea* ssp. *sericea* Association (Crowe et al. 2004) =
- *Picea engelmannii* / *Cornus sericea* Association (Kovalchik 1993) =
- *Picea engelmannii* / *Cornus stolonifera* plant association (Kovalchik 1993) =
- *Picea engelmannii*/ *Cornus sericea* (Bourgeron and Engelking 1994) =
- *Picea* spp. / *Cornus stolonifera* Habitat Type (Hansen et al. 1995) B
- *Picea* spp. / *Cornus stolonifera* Habitat Type (Youngblood et al. 1985b) B
- *Picea* spp./ *Cornus sericea* (Bourgeron and Engelking 1994) =
- Conifer / *Cornus sericea* Community Type (Padgett et al. 1989) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association occurs in Glacier National Park, in moist alluvial valley bottoms. Specifically, west of the Continental Divide it was documented along Lower McDonald Creek, near Ford Creek, and in the Kintla Lake drainage. The association is much less common east of the divide, documented only once, near the inlet of Waterton Lake.

GLOBAL RANGE: This woodland is found on cool, moist sites in the mountains of the central and northern Rocky Mountains west into eastern Oregon and Washington. Stands are reported from as far south as the northern Wasatch in Utah extending into northwestern Montana and likely extending into Canada.

NATIONS: CA?, US

STATES/PROVINCES: AB?, CO:SU, ID:S2, MT:S3, OR:S1, UT?, WA:S2?, WY:S3?

USFS ECOREGIONS: M331A:CC, M331B:C?, M331D:CC, M332B:CC, M332C:CC, M332E:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); USFS (Bighorn, Wallowa-Whitman)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2243, GLAC.2293, GLAC.2295, GLAC.2517, GLAC.2531, GLAC.2532, GLAC.2627, GLAC.88.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: J. Greenlee, mod. K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Crowe and Clausnitzer 1997, Crowe et al. 2004, Hall and Hansen 1997, Hansen et al. 1995, IDCDC 2005, Jones and Ogle 2000, Kagan et al. 2000, Kovalchik 1993, MTNHP 2002b, Padgett et al. 1989, Western Ecology Working Group n.d., Youngblood et al. 1985a, Youngblood et al. 1985b

***Pinus contorta* Temporarily Flooded Woodland Alliance**

***Pinus contorta* / *Cornus sericea* Woodland**

LOGEPOLE PINE / RED-OSIER DOGWOOD WOODLAND

IDENTIFIER: C EGL005929

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Temporarily flooded temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.d.)
Alliance	<i>Pinus contorta</i> Temporarily Flooded Woodland Alliance (A.562)
Alliance (English name)	Lodgepole Pine Temporarily Flooded Woodland Alliance
Association	<i>Pinus contorta</i> / <i>Cornus sericea</i> Woodland
Association (English name)	Lodgepole Pine / Red-osier Dogwood Woodland

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)

ELEMENT CONCEPT

GLOBAL SUMMARY: This woodland association is found on cool, moist sites in the mountains of the northern Rocky Mountains of western Montana and southern Alberta. This community occurs from 823 to 1628 m (2700-5340 feet) in elevation across its range. It is restricted to flat or gently sloping alluvial terraces or benches and, less frequently, moist toeslopes. Stands may be temporarily flooded in the spring, and due to the location in riparian zones, the water table is usually within 1 m of the surface. Water flow and aeration in the rooting zone are usually good. The vegetation is characterized by an overstory tree canopy dominated by *Pinus contorta*. *Populus tremuloides*, *Populus balsamifera ssp. trichocarpa*, or *Betula papyrifera* are often present in the canopy. *Picea engelmannii* may be present in the understory but does not form a significant part of the tree canopy. Shrub cover is typically high, with *Cornus sericea* usually the dominant shrub. Other shrubs such as *Acer glabrum*, *Alnus incana*, *Amelanchier alnifolia*, *Linnaea borealis*, *Ribes lacustre*, *Rosa woodsii*, *Rubus parviflorus*, various *Salix* spp., *Shepherdia canadensis*, and *Symphoricarpos albus* are often present. Herbaceous cover is low, but forb species richness is often high. Common forbs include *Fragaria virginiana*, *Galium* spp., *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Maianthemum stellatum*, *Senecio triangularis* and *Thalictrum occidentale*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this woodland association are found at 1080 m (3540 feet) on moderately sloped southeasterly ridges of argillite, or at 1450 m (4754 feet) on southwesterly steep slopes of thin morainal deposits. Soils tend to be well-drained silty loams or Lithic Orthic Eutric Brunisols. The foregoing environmental parameters are counter-indicative of a vegetation type that is hypothesized to be mesic to subhygric in moisture status (based on vegetation composition); another factor such as subirrigation would have to be invoked to explain the presence of this type on sites with such parameters.

GLOBAL ENVIRONMENT: This woodland is found on cool, moist sites in the mountains of the northern Rocky Mountains. This community occurs from 823 to 1628 m (2700-5340 feet) in elevation across its range. It is restricted to flat or gently sloping alluvial terraces or benches and, less frequently, moist toeslopes. The alluvial soils are usually finer-textured with high organic content and gleying and mottling. Stands may be temporarily flooded in the spring, and due to its location in riparian zones, the water table is usually within 1 m of the surface. Water flow and aeration in the rooting zone are usually good.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This woodland association is dominated by a pole to mature open tree canopy of *Pinus contorta* (38% average cover). *Betula papyrifera* is also found within this layer and dominates the tree subcanopy layer. An uneven-aged layer of *Cornus sericea* is found throughout the tall- to short-shrub layer, with 10% average cover and 100% constancy. All other species within the shrub layers have only 50% constancy (but only 2 stands were sampled). Shrubs include *Acer glabrum*, *Amelanchier alnifolia*, *Shepherdia canadensis*, and *Rubus parviflorus*. Variance in shrub height is a result of uneven-aged shrubs or ungulate browsing. *Mahonia repens* is always present in the dwarf-shrub layer but has insignificant cover. The herbaceous layer is an array of scattered forbs and graminoids, including *Pteridium aquilinum*, *Prosartes trachycarpa* (= *Disporum trachycarpum*), and *Clintonia uniflora*. The only species in this layer with 100% constancy is *Apocynum androsaemifolium*, an indicator of disturbance.

GLOBAL VEGETATION: This woodland is characterized by an overstory tree canopy dominated by *Pinus contorta*. *Populus tremuloides*, *Populus balsamifera ssp. trichocarpa*, or *Betula papyrifera* are often present in the canopy. *Picea engelmannii* may be present in the understory but does not form a significant part of the tree canopy. These sites are typically too low in elevation to have much presence of *Abies lasiocarpa*. Shrub cover is typically high, with *Cornus sericea* usually the dominant shrub. Other shrubs such as *Acer glabrum*, *Alnus incana*, *Amelanchier alnifolia*, *Linnaea borealis*, *Ribes lacustre*, *Rosa woodsii*, *Rubus parviflorus*, various *Salix* spp., *Shepherdia canadensis*, and *Symphoricarpos albus* are often present. Herbaceous cover is low, but forb species richness is often high. Common forbs include *Fragaria virginiana*, *Galium* spp., *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Prosartes trachycarpa* (= *Disporum trachycarpum*), *Maianthemum stellatum*, *Pteridium aquilinum*, *Senecio triangularis*, and *Thalictrum occidentale*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Cornus sericea</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus parviflorus</i> , <i>Shepherdia canadensis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus contorta</i>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Alnus incana</i> , <i>Cornus sericea</i>

Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Ribes lacustre</i> , <i>Rubus parviflorus</i> , <i>Shepherdia canadensis</i>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Linnaea borealis</i>
Herb (field)	Forb	<i>Maianthemum stellatum</i> , <i>Osmorhiza berteroi</i> , <i>Thalictrum occidentale</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Pinus contorta*

GLOBAL: *Cornus sericea*, *Pinus contorta*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2G3 (5-Apr-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This seral *Pinus contorta* association was included in concepts of *Picea / Cornus stolonifera* Habitat Type (Hansen et al. 1995). The Sierra Nevada *Pinus contorta / Cornus stolonifera* Forest stand described by Manning and Padgett (1995) is possibly a different association. The *Picea / Cornus stolonifera* Community Type reported by Youngblood et al. (1985a) for eastern Idaho and western Wyoming does not include any sampled stands with *Pinus contorta* as a seral component.

This association appears to be a relatively dry riparian association. Flooding does not seem to be an important factor for its occurrence, but high water tables are important. For now, this type is placed in the *Pinus contorta* Woodland Alliance (A.512) pending additional inventory.

GLOBAL SIMILAR ASSOCIATIONS:

- *Picea engelmannii / Cornus sericea* Woodland (CEGL002677)
- *Pseudotsuga menziesii / Cornus sericea* Woodland (CEGL000899)

GLOBAL RELATED CONCEPTS:

- *Picea / Cornus stolonifera* Habitat Type (Hansen et al. 1995) B
- Conifer / *Cornus sericea* Community Type (Manning and Padgett 1995) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from one stand in Glacier National Park, west of the Continental Divide near the southeast end of the Apgar Mountains. The other stand is known from Waterton Lakes National Park.

GLOBAL RANGE: This riparian woodland association occurs in the northern Rocky Mountains of western Montana and extends north into Alberta, Canada.

NATIONS: CA, US

STATES/PROVINCES: AB, CA?, MT:S2S3

USFS ECOREGIONS: M332C:CC, M333B:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2299, WATE.5129.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Hansen et al. 1995, Manning and Padgett 1995, Western Ecology Working Group n.d., Youngblood et al. 1985a

***Pseudotsuga menziesii* Temporarily Flooded Woodland Alliance**

***Pseudotsuga menziesii* / *Cornus sericea* Woodland DOUGLAS-FIR / RED-OSIER DOGWOOD WOODLAND**

IDENTIFIER: C EGL000899

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Temporarily flooded temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.d.)
Alliance	<i>Pseudotsuga menziesii</i> Temporarily Flooded Woodland Alliance (A.568)
Alliance (English name)	Douglas-fir Temporarily Flooded Woodland Alliance
Association	<i>Pseudotsuga menziesii</i> / <i>Cornus sericea</i> Woodland
Association (English name)	Douglas-fir / Red-osier Dogwood Woodland

ECOLOGICAL SYSTEM(S): Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (CES306.825)
Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

ELEMENT CONCEPT

GLOBAL SUMMARY: This Rocky Mountain montane riparian woodland association is known from Montana, Idaho and Colorado. Elevations range from 1100 to 2590 m (3600-8500 feet). Stands occur on floodplains and benches along drainages and adjacent lower hill slopes in narrow valleys. Stream channels are typically narrow and steep, but also include major streams and rivers. Substrates are usually well-drained soils with clay loam to sandy loam textures derived from various alluvial or colluvial parent materials. Ground surface has high cover of litter. The vegetation is characterized by the overstory tree canopy dominated by *Pseudotsuga menziesii* with *Cornus sericea* prominent in the shrub understory. Other tree species present include *Abies concolor*, *Abies lasiocarpa*, *Acer negundo*, *Juniperus scopulorum*, *Picea engelmannii*, *Picea pungens*, *Populus angustifolia*, *Populus balsamifera* ssp. *trichocarpa* or *Populus tremuloides*. The lush shrub layer is dominated or codominated by *Cornus sericea* with 10-75% cover. Other common shrubs include *Acer glabrum*, *Amelanchier alnifolia*, *Alnus incana*, *Mahonia repens*, *Prunus virginiana*, *Quercus gambelii*, *Rosa woodsii*, *Salix exigua*, *Spiraea betulifolia*, and *Symphoricarpos* spp. The herbaceous layer is sometimes sparse due to the dense shrub canopy, but when the shrub canopy is disturbed graminoids such as *Poa pratensis*, *Calamagrostis rubescens*, or *Elymus glaucus* dominate. Forb diversity is typically high with common forbs including *Actaea rubra*, *Fragaria virginiana*, *Geranium* spp., *Heracleum maximum*, *Maianthemum* spp., *Osmorhiza* spp., and *Thalictrum occidentale*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Sites supporting this woodland association occur in relatively moist conditions. It occurs on benches near drainage bottoms and on toeslope seeps. Slopes are gentle to moderate and have a westerly to northerly aspect. Elevation ranges from 980-1525 m (3214-5002 feet). Parent material is usually glacio-fluvial, and soils vary from silty clay loam to sandy loam. The soil is typically well-drained throughout most of the area. Subirrigation, seepage and pockets of clay may be present in microsites within these stands. Ground cover is usually at least 90% litter, with trace amounts of rock, moss and lichen.

GLOBAL ENVIRONMENT: This montane riparian woodland association is known from throughout the Rocky Mountains. Elevations range from 1100 to 2600 m (3600-8500 feet). Stands occur on floodplains and benches along drainages and adjacent lower hill slopes in narrow valley. Stream channels are typically narrow and steep, but also include major streams and rivers. Substrates are usually well-drained soils with clay loam to sandy loam textures derived from various alluvial or colluvial parent materials. Ground surface has high cover of litter.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The tree canopy is characteristically open in this woodland association, dominated by *Pseudotsuga menziesii*. Seral tree species, such as *Pinus contorta* and *Larix occidentalis*, may also be present. *Abies lasiocarpa* and *Picea engelmannii* are usually present in the understory. The dominant tall-shrub species is *Cornus sericea*, with an average cover of approximately 15%. Overall tall-shrub cover ranges from 30-80%, with *Spiraea betulifolia*, *Symphoricarpos albus*, and *Amelanchier alnifolia* contributing significant canopy cover. The short- and dwarf-shrub layers usually

account for less than 20% cover. Herbaceous diversity is high, with cover ranging from 30-50%. *Calamagrostis rubescens* and *Elymus glaucus* are the most common grasses found in this association, though they do not account for a significant portion of the overall herbaceous cover. The forbs *Maianthemum stellatum*, *Galium boreale*, and *Thalictrum occidentale* are usually present in this association, also with relatively low cover.

GLOBAL VEGETATION: This woodland association is characterized by an overstory tree canopy dominated by *Pseudotsuga menziesii* with *Cornus sericea* prominent in the shrub understory. Other tree species present include *Abies concolor*, *Abies lasiocarpa*, *Acer negundo*, *Juniperus scopulorum*, *Picea engelmannii*, *Picea pungens*, *Populus angustifolia*, *Populus balsamifera ssp. trichocarpa*, or *Populus tremuloides*. The lush tall-shrub layer is dominated or codominated by *Cornus sericea* with 10-75% cover. Other common tall, short and dwarf-shrubs include *Acer glabrum*, *Amelanchier alnifolia*, *Alnus incana*, *Mahonia repens*, *Prunus virginiana*, *Quercus gambelii*, *Rosa woodsii*, *Salix exigua*, *Spiraea betulifolia*, *Symphoricarpos oreophilus*, or *Symphoricarpos albus*. Herbaceous layer is sparse except when shrub canopy is disturbed, and graminoids such as *Poa pratensis*, *Calamagrostis rubescens*, or *Elymus glaucus* dominate. Forb diversity is typically high with common forbs including *Actaea rubra*, *Fragaria virginiana*, *Galium boreale*, *Geranium spp.*, *Heracleum maximum*, *Maianthemum racemosum*, *Maianthemum stellatum*, *Osmorhiza spp.*, and *Thalictrum occidentale*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Cornus sericea</i>
Herb (field)	Forb	<i>Maianthemum stellatum</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Cornus sericea</i>
Herb (field)	Forb	<i>Maianthemum stellatum</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Aralia nudicaulis*, *Clintonia uniflora*, *Pseudotsuga menziesii*

GLOBAL: *Cornus sericea*, *Pseudotsuga menziesii*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: More research to determine the full range extent of this association as it relates to Bailey's sections is needed.

GLOBAL SIMILAR ASSOCIATIONS:

- *Picea engelmannii* / *Cornus sericea* Woodland (CEGL002677)
- *Picea pungens* / *Cornus sericea* Woodland (CEGL000388)
- *Pinus contorta* / *Cornus sericea* Woodland (CEGL005929)
- *Populus angustifolia* / *Cornus sericea* Woodland (CEGL002664)
- *Populus balsamifera ssp. trichocarpa* - *Populus tremuloides* - Conifer / *Cornus sericea* Forest (CEGL005905)
- *Populus balsamifera ssp. trichocarpa* / *Cornus sericea* Forest (CEGL000672)
- *Populus tremuloides* / *Cornus sericea* Forest (CEGL000582)
- *Pseudotsuga menziesii* / *Acer negundo* Woodland (CEGL002754)

GLOBAL RELATED CONCEPTS:

- *Pseudotsuga menziesii* / *Cornus sericea* Woodland (Carsey et al. 2003a) =
- *Pseudotsuga menziesii* / *Cornus stolonifera* Habitat Type (Hall and Hansen 1997) =
- *Pseudotsuga menziesii* / *Cornus stolonifera* Habitat Type (Hansen et al. 1995) =
- *Pseudotsuga menziesii*/*Cornus sericea* (Bourgeron and Engelking 1994) =
- *Pseudotsuga menziesii*/*Cornus sericea* (Kittel et al. 1999b) =
- DRISCOLL FORMATION CODE:II.A.2.b. (Driscoll et al. 1984) B
- Douglas fir /red-osier dogwood (*Pseudotsuga menziesii* / *Cornus sericea*) Plant Association (Kittel et al. 1999a) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association occupies lands along the eastern edge of Glacier National Park, at elevations from 980-1280 m (3214-4200 feet). West of the Continental Divide the association can be found in the Flathead River drainage, at 1370-1525 m (4494-5002 feet).

GLOBAL RANGE: This Rocky Mountain montane riparian woodland association is known from Montana, Idaho and Colorado.

NATIONS: US

STATES/PROVINCES: CO:S2, ID:S4, MT:S3

USFS ECOREGIONS: 341B:CC, M331G:CC, M331H:CC, M332C:CC, M332D:CP, M333C:CC, M341B:CC

FEDERAL LANDS: BIA (Blackfeet); NPS (Glacier); USFS (San Juan)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.165, GLAC.2646.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Driscoll et al. 1984, Hall and Hansen 1997, Hansen et al. 1990, Hansen et al. 1991, Hansen et al. 1995, IDCDC 2005, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1999a, Kittel et al. 1999b, MTNHP 2002b, Richard et al. 1996, Western Ecology Working Group n.d.

II.A.4.N.e. Seasonally flooded temperate or subpolar needle-leaved evergreen woodland

***Picea engelmannii* Seasonally Flooded Woodland Alliance**

***Picea engelmannii* / *Salix drummondiana* Woodland**

ENGELMANN SPRUCE / DRUMMOND'S WILLOW WOODLAND

IDENTIFIER: C EGL005843

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Evergreen woodland (II.A.)
Physiognomic Group	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
Formation	Seasonally flooded temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.e.)
Alliance	<i>Picea engelmannii</i> Seasonally Flooded Woodland Alliance (A.572)
Alliance (English name)	Engelmann Spruce Seasonally Flooded Woodland Alliance
Association	<i>Picea engelmannii</i> / <i>Salix drummondiana</i> Woodland
Association (English name)	Engelmann Spruce / Drummond's Willow Woodland

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is uncommon in the montane and lower subalpine zones on the east side of Glacier National Park, Montana, restricted to the edges of lakes and creeks. Stands are located in bottomland floodplains along lakes, ponds,

streams, and creeks. These sites occur at low to moderate elevations up to 1525 m (5000 feet) on flat terrain. Soils are variable, ranging from poorly drained, very dark silty clay loam to rapidly drained, very gravelly sand. This variability is due to the location of stands, which occur on sandy creek beds and semipermanently flooded lowlands. Soil is derived from glacio-fluvial deposits and can contain red, green, and tan argillite. Ground cover is variable as well. Litter covers 30-60% of the ground surface, but water may be as high as 20% cover in some areas, while rock and sand may be 50% cover in other areas. This is a subhygric to hydric evergreen woodland that is dominated by *Picea engelmannii* or *Picea engelmannii X glauca* hybrids in the overstory and *Salix drummondiana* in the understory. Tree cover is generally sparse, ranging from 5-20%. Mature *Picea engelmannii*, measuring 15-20 m, may occur scattered within the dense shrub cover, or medium-sized *Picea engelmannii*, measuring 5-10 m, may occur with higher cover as more of a woodland. *Abies lasiocarpa* trees and *Picea engelmannii* seedlings can also be common. Shrub cover is very high at 60-80%, dominated almost exclusively by *Salix drummondiana* with heights of 1-2 m. A few other shrubs are present with low cover. Herbaceous cover ranges from 10-30% and is dominated by *Calamagrostis canadensis*, *Elymus glaucus*, and *Geum macrophyllum*. Other high-constancy forbs include *Epilobium ciliatum* and *Galium triflorum*. *Cicuta douglasii*, *Carex utriculata*, *Petasites frigidus* var. *sagittatus* (= *Petasites sagittatus*), and *Equisetum hyemale* may be present with conspicuous cover. Stand age was measured at 45 years in one plot and 95 years in another.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands are located in bottomland floodplains along lakes, ponds, streams, and creeks. These sites occur at low to moderate elevations up to 1525 m (5000 feet) on flat terrain. Soils are variable, ranging from poorly drained, very dark silty clay loam to rapidly drained, very gravelly sand. This variability is due to the location of stands, which occur on sandy creek beds and semipermanently flooded lowlands. Soil is derived from glacio-fluvial deposits and can contain red, green, and tan argillite. Ground cover is variable as well. Litter covers 30-60% of the ground surface, but water may be as high as 20% cover in some areas, while rock and sand may be 50% cover in other areas.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This is generally a montane and lower subalpine, subhygric to hydric evergreen woodland that is dominated by *Picea engelmannii* or *Picea engelmannii X glauca* hybrids in the overstory and *Salix drummondiana* in the understory. Tree cover is generally sparse, ranging from 5-20%. Mature *Picea engelmannii*, measuring 15-20 m, may occur scattered within the dense shrub cover, or medium-sized *Picea engelmannii*, measuring 5-10 m, may occur with higher cover as more of a woodland. *Abies lasiocarpa* trees and *Picea engelmannii* seedlings can also be common. Shrub cover is very high at 60-80%, dominated almost exclusively by *Salix drummondiana* with heights of 1-2 m. A few other shrubs are present with low cover. Herbaceous cover ranges from 10-30% and is dominated by *Calamagrostis canadensis*, *Elymus glaucus*, and *Geum macrophyllum*. Other high constancy forbs include *Epilobium ciliatum* and *Galium triflorum*. *Cicuta douglasii*, *Carex utriculata*, *Petasites frigidus* var. *sagittatus* (= *Petasites sagittatus*), and *Equisetum hyemale* may be present with conspicuous cover. Stand age was measured at 45 years in one plot and 95 years in another.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Picea engelmannii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Salix drummondiana</i>
Herb (field)	Forb	<i>Geum macrophyllum</i>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i> , <i>Elymus glaucus</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Calamagrostis canadensis*, *Epilobium ciliatum*, *Galium triflorum*, *Geum macrophyllum*, *Picea engelmannii*, *Salix drummondiana*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2G3 (17-Mar-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This community has not been recognized elsewhere and its documentation could use significant bolstering by plot information. Jen Asebrook (pers. comm.), Glacier Biological Technician, notes that this type seems to be similar to *Salix drummondiana* / *Carex utriculata* Shrubland (CEGL002631) or *Salix drummondiana* / *Calamagrostis canadensis* Shrubland (CEGL002667) (which can have low tree cover) that are very common in northwestern Montana. With that in mind, *Picea engelmannii* / *Salix drummondiana* Woodland [Provisional] (CEGL005843) could be present on the west side of Glacier National Park.

GLOBAL COMMENTS: *Picea engelmannii* and/or *Picea engelmannii* X *glauca* (hybrids) are both likely to occur in this plant association, and thus we have included them both as the diagnostic overstory species. Stands can include pure *Picea engelmannii* and *Picea engelmannii* X *glauca* hybrid, or both. Hansen et al. (1995) explained that the frequent absence of mature cones, similar morphology, and ecological amplitudes led them to lump *Picea engelmannii* and *Picea glauca* (hybrids) into a single type, as did Pfister et al. (1977).

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Salix drummondiana* Forest (CEGL000327)
- *Salix drummondiana* / *Calamagrostis canadensis* Shrubland (CEGL002667)
- *Salix drummondiana* / *Carex utriculata* Shrubland (CEGL002631)

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon on the east side of Glacier National Park, restricted to the edges of lakes and creeks. This type was documented along Kootenai Lakes in the Waterton Valley in the Goat Haunt subdistrict and along Cataract Creek in the Many Glacier subdistrict.

GLOBAL RANGE:

NATIONS: CA?, US

STATES/PROVINCES: AB?, MT:S2?

USFS ECOREGIONS: M332C:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.86, GLAC.267, AAGL.1038, AAGL.1248, AAGL.1251, AAGL.1255, AAGL.1259, AAGL.1268, AAGL.B214, AAGL.B237.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Asebrook pers. comm., Hansen et al. 1995, Pfister et al. 1977, Western Ecology Working Group n.d.

II.B.2.N.a. Cold-deciduous woodland

Betula papyrifera Woodland Alliance

Betula papyrifera - Conifer / *Clintonia uniflora* Woodland

PAPER BIRCH - CONIFER / BRIDE'S BONNET WOODLAND

IDENTIFIER: CEGL005904

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Deciduous woodland (II.B.)
Physiognomic Group	Cold-deciduous woodland (II.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
Formation	Cold-deciduous woodland (II.B.2.N.a.)
Alliance	<i>Betula papyrifera</i> Woodland Alliance (A.603)
Alliance (English name)	Paper Birch Woodland Alliance
Association	<i>Betula papyrifera</i> - Conifer / <i>Clintonia uniflora</i> Woodland
Association (English name)	Paper Birch - Conifer / Bride's Bonnet Woodland
ECOLOGICAL SYSTEM(S):	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is locally common on moderate to steep slopes on the west side of Glacier National Park, Montana. This mesic, montane association is located on moderately steep to very steep toeslopes to midslopes with mostly south and east aspects. Elevations range between 1000 and 1190 m (3300-3900 feet). Soils are moderately well- to well-drained sandy or silty loams or clay loams. Litter comprises 40-90% of the ground cover. This mixed conifer-deciduous forest occurs as a result of disturbance, either fire or avalanche. Total tree canopy cover ranges from 5-60% with heights between 5-35 m; some emergent trees may reach heights of 50 m. *Betula papyrifera* and *Pseudotsuga menziesii* codominate the canopy layer, each with 3-30% cover. Trees tend to range in age from 30 to 65 years. *Larix occidentalis* may also be common, while *Pinus contorta* and *Picea engelmannii* remain scattered in the overstory with low constancy. Tall-shrub cover is high, ranging from 20-50% with heights mostly measuring 1-5 m. *Acer glabrum* and *Amelanchier alnifolia* dominate the tall-shrub layer with 1-20% cover. *Rubus parviflorus* and *Cornus sericea* are also common; other common shrubs with lower cover include *Lonicera utahensis*, *Salix scouleriana*, and *Holodiscus discolor*. *Taxus brevifolia*, *Ribes lacustre*, and *Sorbus scopulina* may be present in certain areas with moderate to high cover. Short-shrub cover ranges from 1-30% with heights from less than 0.5 to 1m. *Symphoricarpos albus* and *Paxistima myrsinites* are the most common short shrubs, while *Spiraea betulifolia*, *Vaccinium membranaceum*, and *Shepherdia canadensis* are often also present with low cover. The herbaceous cover ranges from 10-50%. The presence of *Clintonia uniflora* is the indicator for this association, even if other herbaceous species have higher cover. Other common forbs include *Aralia nudicaulis*, *Prosartes hookeri* (= *Disporum hookeri*), and *Viola orbiculata* with 1-25% cover. Other high-constancy species include *Adenocaulon bicolor*, *Bromus vulgaris*, *Fragaria vesca*, *Osmorhiza berteroi*, and *Elymus glaucus* with 1-3% cover. Nonvascular cover is low (0-5%).

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This mesic, montane association is located on moderately steep to very steep toeslopes to midslopes with mostly south and east aspects. Elevations range between 1000 and 1190 m (3300-3900 feet). Soils are moderately well- to well-drained sandy or silty loams or clay loams. Litter comprises 40-90% of the ground cover.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This mixed conifer-deciduous forest occurs as a result of disturbance, either fire or avalanche. Stands are codominated by *Betula papyrifera* and *Pseudotsuga menziesii*. Total tree canopy cover ranges from 5-60% with heights between 5-35 m; some emergent trees may reach heights of 50 m. *Betula papyrifera* and *Pseudotsuga menziesii* dominate the canopy layer, each with 3-30% cover. Trees tend to range in age from 30 to 65 years. *Larix occidentalis* may also be common with 3-30% cover, while *Pinus contorta* and *Picea engelmannii* remain scattered in the overstory with low constancy.

Tall-shrub cover is high, ranging from 20-50% with heights mostly measuring 1-5 m. *Acer glabrum* and *Amelanchier alnifolia* dominate the tall-shrub layer with 1-20% cover. *Rubus parviflorus* and *Cornus sericea* are also common with an average of 4% cover. Other common shrubs with lower cover include *Lonicera utahensis*, *Salix scouleriana*, and *Holodiscus discolor*. *Taxus brevifolia*, *Ribes lacustre*, and *Sorbus scopulina* may be present in certain areas with moderate to high cover. Short-shrub cover ranges from 1-30% with heights from less than 0.5 to 1 m. *Symphoricarpos albus* and *Paxistima myrsinites* are the most common short shrubs with 1-30% cover and 1-10% cover, respectively. *Spiraea betulifolia*, *Vaccinium membranaceum*, and *Shepherdia canadensis* are often also present with low cover. *Rosa acicularis* and *Rosa woodsii* are infrequent but can occur with high cover.

The herbaceous cover ranges from 10-50%. The presence of *Clintonia uniflora* is the indicator for this association, even if other herbaceous species have higher cover. Other common forbs include *Aralia nudicaulis*, *Prosartes hookeri* (= *Disporum hookeri*), and *Viola orbiculata* with 1-25% cover. Other high-constancy species include *Adenocaulon bicolor*, *Bromus vulgaris*, *Fragaria vesca*, *Osmorhiza berteroi*, and *Elymus glaucus* with 1-3% cover. *Picea engelmannii*, *Thuja plicata*, and *Abies lasiocarpa* seedlings,

Maianthemum racemosum ssp. *amplexicaule*, *Symphytotrichum laeve* (= *Aster laevis*), *Chimaphila umbellata*, *Viola canadensis*, *Calamagrostis rubescens*, *Chamerion angustifolium*, and *Thalictrum occidentale* were present on approximately half the sampled areas with 1-5% cover. Nonvascular cover is low (0-5%).

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix occidentalis</i> , <i>Pseudotsuga menziesii</i>
Tree canopy	Broad-leaved deciduous tree	<i>Betula papyrifera</i>
Tree subcanopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Betula papyrifera</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Acer glabrum</i> , <i>Amelanchier alnifolia</i> , <i>Cornus sericea</i> , <i>Rubus parviflorus</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Symphoricarpos albus</i> , <i>Vaccinium membranaceum</i>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Paxistima myrsinites</i>
Herb (field)	Dwarf-shrub	<i>Mahonia repens</i>
Herb (field)	Forb	<i>Aralia nudicaulis</i> , <i>Clintonia uniflora</i> , <i>Prosartes hookeri</i> , <i>Viola orbiculata</i>
Herb (field)	Graminoid	<i>Bromus vulgaris</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Acer glabrum*, *Adenocaulon bicolor*, *Amelanchier alnifolia*, *Aralia nudicaulis*, *Betula papyrifera*, *Clintonia uniflora*, *Cornus sericea*, *Paxistima myrsinites*, *Prosartes hookeri*, *Pseudotsuga menziesii*, *Rubus parviflorus*, *Symphoricarpos albus*, *Vaccinium membranaceum*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Centaurea biebersteinii*, *Penstemon albertinus*, *Taraxacum officinale*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4 (9-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Betula papyrifera* / *Acer glabrum* Woodland (CEGL005844)

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is locally common on moderate to steep slopes in the Lake McDonald subdistrict on the west side of Glacier National Park. These areas have either burned within the last 100 years or have frequent slope disturbance such as avalanches. Sampled stands occur along the western portion of the South Boundary Trail, along the Going-To-The-Sun Road near Packers Roost, near Avalanche Creek, and near Quarter Circle Bridge.

GLOBAL RANGE:

NATIONS: CA?, US

STATES/PROVINCES: AB?, ID, MT:S3?

USFS ECOREGIONS: M333C:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2034, GLAC.2035, GLAC.2203, GLAC.2212, GLAC.2508, GLAC.2623.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Western Ecology Working Group n.d.

Betula papyrifera / *Acer glabrum* Woodland

PAPER BIRCH / ROCKY MOUNTAIN MAPLE WOODLAND

IDENTIFIER: CEG005844

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Deciduous woodland (II.B.)
Physiognomic Group	Cold-deciduous woodland (II.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
Formation	Cold-deciduous woodland (II.B.2.N.a.)
Alliance	<i>Betula papyrifera</i> Woodland Alliance (A.603)
Alliance (English name)	Paper Birch Woodland Alliance
Association	<i>Betula papyrifera</i> / <i>Acer glabrum</i> Woodland
Association (English name)	Paper Birch / Rocky Mountain Maple Woodland

ECOLOGICAL SYSTEM(S):

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is locally common on the west side of Glacier National Park, Montana. It occurs on steep to very steep, mostly south-facing slopes at elevations between 1000 and 1200 m (3300-3900 feet). Soils are well-drained sandy loams or loams on colluvial landforms of argillite, including talus slopes. Generally these soils contain angular green argillite cobbles. Litter dominates the ground surface with 40-95% cover. All sampled areas have burned in natural wildfires in the last 100 years. This association is a montane, mesic, mixed evergreen-deciduous woodland that occurs as a result of hot, stand-replacing fires followed by precipitation events that erode much of the soil mantle from the slope. Consequently, few conifers establish, allowing *Betula papyrifera* to dominate. The upper tree canopy ranges from 30-60% cover with heights of 10-15 m. The tree subcanopy ranges from 5-60% cover. *Betula papyrifera* dominates with 20-50% cover. Other tree species that may be present include *Pseudotsuga menziesii*, *Populus tremuloides*, *Larix occidentalis*, and *Pinus monticola*. The tall-shrub layer ranges from 10-60% cover with heights 1-5 m. *Acer glabrum* and *Amelanchier alnifolia* are dominant; *Rubus parviflorus* is also common. *Betula papyrifera* and *Pseudotsuga menziesii* saplings, *Philadelphus lewisii*, *Prunus virginiana*, *Salix scouleriana*, and *Holodiscus discolor* may be present with moderate to high cover. *Symphoricarpos albus* and *Paxistima myrsinites* are the most common short shrubs. *Mahonia repens* can dominate the dwarf-shrub layer. The herbaceous cover is low, ranging from 5-20%. *Aralia nudicaulis* is the most dominant forb. Other high-constancy species include *Elymus glaucus*, *Chamerion angustifolium*, *Symphotrichum laeve* (= *Aster laevis*), and *Penstemon albertinus*. Nonvascular cover ranges from 0-10%.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs on steep to very steep, mostly south-facing slopes at elevations between 1000 and 1200 m (3300-3900 feet). Soils are well-drained sandy loams or loams on colluvial landforms of argillite, including talus slopes. Generally these soils contain angular green argillite cobbles. Litter dominates the ground surface with 40-95% cover. All sampled areas have burned in natural wildfires in the last 100 years.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This association is a montane, mesic, mixed evergreen-deciduous woodland that occurs as a result of hot, stand-replacing fires followed by precipitation events that erode much of the soil mantle from the slope. Consequently, few conifers establish, allowing *Betula papyrifera* to dominate. The upper tree canopy ranges from 30-60% cover with heights of 10-15 m. The tree subcanopy ranges from 5-60% cover, with heights between 1-10 m. *Betula papyrifera* dominates with 20-50% cover. Other tree species that may be present include *Pseudotsuga menziesii*, *Populus tremuloides*, *Larix occidentalis*, and *Pinus monticola*.

The tall-shrub layer ranges from 10-60% cover with heights 1-5 m. *Acer glabrum* and *Amelanchier alnifolia* are dominant with 1-20% cover; *Rubus parviflorus* is also common with an average 5% cover. *Betula papyrifera* and *Pseudotsuga menziesii* saplings, *Philadelphus lewisii*, *Prunus virginiana*, *Salix scouleriana*, and *Holodiscus discolor* may be present with moderate to high cover. Short-shrub layer ranges from 5-20% cover with heights less than 0.5 m. *Symphoricarpos albus* and *Paxistima myrsinites* are the most common short shrubs with 3-10% cover and 1-3% cover, respectively. *Rosa woodsii*, *Spiraea betulifolia*, *Shepherdia canadensis*, and *Ribes viscosissimum* are often also present with low to moderate cover. *Mahonia repens* can dominate the dwarf-shrub layer with 1-10% cover.

The herbaceous cover is low, ranging from 5-20%, with heights between <0.5-1 m. *Aralia nudicaulis* is the most dominant forb with 1-25% cover. Other high-constancy species include *Elymus glaucus*, *Chamerion angustifolium*, *Symphotrichum laeve* (= *Aster laevis*), and *Penstemon albertinus* with 1-3% cover. *Pseudotsuga menziesii* seedlings, *Apocynum androsaemifolium*, *Calamagrostis rubescens*, *Fragaria virginiana*, *Hieracium albiflorum*, *Pseudoroegneria spicata*, *Viola adunca*, and *Picea engelmannii* seedlings were present on approximately half the sampled areas with low cover. Nonvascular cover ranges from 0-10%.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Betula papyrifera</i>
Tree subcanopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Betula papyrifera</i> , <i>Populus tremuloides</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Acer glabrum</i> , <i>Amelanchier alnifolia</i> , <i>Betula papyrifera</i> , <i>Rubus parviflorus</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rosa woodsii</i> , <i>Symphoricarpos albus</i>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Paxistima myrsinites</i>
Herb (field)	Dwarf-shrub	<i>Mahonia repens</i>
Herb (field)	Forb	<i>Aralia nudicaulis</i>
Herb (field)	Graminoid	<i>Elymus glaucus</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Acer glabrum*, *Amelanchier alnifolia*, *Aralia nudicaulis*, *Betula papyrifera*, *Chamerion angustifolium*, *Mahonia repens*, *Penstemon albertinus*, *Pseudotsuga menziesii*, *Rubus parviflorus*, *Symphoricarpos albus*, *Symphotrichum laeve*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Agrostis stolonifera*, *Medicago lupulina*, *Poa compressa*, *Poa pratensis*, *Taraxacum officinale*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2G3 (23-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Betula papyrifera* - Conifer / *Clintonia uniflora* Woodland (CEGL005904)

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is locally common on burned areas in the Lake McDonald subdistrict on the west side of Glacier National Park. Stands sampled are located along the Going-to-the-Sun Road near Packer's Roost, and on south-facing slopes of the Belton Hills northeast of West Glacier.

GLOBAL RANGE:

NATIONS: US

STATES/PROVINCES: MT

USFS ECOREGIONS: M333C:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2036, GLAC.2059, GLAC.2504, GLAC.2207.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Western Ecology Working Group n.d.

***Larix lyallii* Woodland Alliance**

***Larix lyallii* / *Vaccinium membranaceum* / *Luzula glabrata* var. *hitchcockii* Woodland
SUBALPINE LARCH / SQUARE-TWIG BLUEBERRY / HITCHCOCK'S SMOOTH WOODRUSH
WOODLAND**

IDENTIFIER: CEGL005884

NVC Classification

Physiognomic Class	Woodland (II)
Physiognomic Subclass	Deciduous woodland (II.B.)
Physiognomic Group	Cold-deciduous woodland (II.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
Formation	Cold-deciduous woodland (II.B.2.N.a.)
Alliance	<i>Larix lyallii</i> Woodland Alliance (A.631)
Alliance (English name)	Subalpine Larch Woodland Alliance
Association	<i>Larix lyallii</i> / <i>Vaccinium membranaceum</i> / <i>Luzula glabrata</i> var. <i>hitchcockii</i> Woodland
Association (English name)	Subalpine Larch / Square-twig Blueberry / Hitchcock's Smooth Woodrush Woodland

ECOLOGICAL SYSTEM(S):

ELEMENT CONCEPT

GLOBAL SUMMARY: This association has been described from only the northern Rocky Mountains of Montana and their continuation into Alberta (as the Canadian Rockies). It occurs on mesic to hygric sites at the highest extents of the subalpine zone (6660-7300 feet) on slopes of all degrees of inclination, with moderate to steep (30-70%) lee slopes (east- and north-facing) predominating. Colluvial landforms with well-drained soils are the norm. These sites are hypothesized to be snow-accumulation positions and because of their cool aspects melt-off of the deep snowpack occurs late in the growing season. Stand structure is generally quite open, with the upper tree canopy cover varying from 15% to slightly greater than 50% and tree heights generally not exceeding 40 feet. *Larix lyallii* is the dominant tree and sometimes only tree represented (considered diagnostic at 5% or greater

cover), though common associates are *Abies lasiocarpa* and *Picea engelmannii*; in the subcanopy *Abies lasiocarpa* may often have greater cover than *Larix lyallii*. *Vaccinium membranaceum* is highly constant, though its cover and stature are much reduced from that recorded from lower subalpine sites; it is sufficiently diminutive to be confused with *Vaccinium myrtillus*, which is only about 20% constant with around 5% average cover. The cover of the undergrowth diagnostic *Luzula glabrata* var. *hitchcockii* ranges widely, 10-70%, and it is generally the undergrowth dominant as well; its high cover is indicative of deep and late-persisting snowpack. A number of herbaceous species associated with mesic to hygric moisture regimes have relatively high constancy, including *Senecio triangularis*, *Erigeron peregrinus*, *Mitella breweri*, *Veratrum viride*, and *Valeriana sitchensis*. *Arnica X diversifolia* and *Pedicularis bracteosa* are also commonly occurring forbs. Bryophytes and lichen are generally sparse both on the ground and as epiphytes.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This woodland association occupies mountain slopes with a moderate to steep grade. Occasionally stands will develop on the gently sloped margins of shallow hanging valleys. Aspect is variable, but the association is typically found on north- to west-facing slopes. Position on the slope may be low, middle or high. Elevation ranges from 1980-2360 m (6494-7741 feet). Parent material is calcareous or noncalcareous and sedimentary in origin. Stands typically form on a colluvial or morainal veneer that has been deposited over bedrock ridges by glacial action. Soils are sandy loams or silt loams and are well-drained. Litter makes up most of the ground cover in this association. Small rock and wood may contribute up to 20% and 10% ground cover, respectively.

GLOBAL ENVIRONMENT: This association has been described from only the northern Rocky Mountains of Montana and their continuation into Alberta (as the Canadian Rockies). It occurs on mesic to hygric sites at the highest extents of the subalpine zone (6660-7300 feet) on slopes of all degrees of inclination, with moderate to steep (30-70%) lee slopes (east- and north-facing) predominating. Colluvial landforms with well-drained soils are the norm. These sites are hypothesized to be snow-accumulation positions and because of their cool aspects melt-off of the deep snowpack occurs late in the growing season. According to Arno and Habeck (1972) *Larix lyallii* is closely restricted to the outer fringe of the Pacific Northwest maritime mountain climate zones. It also has a nearly constant association with cool aspects and heavily glaciated, acidic, rocky sites.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This association is characterized by an open tree canopy in the upper stratum, with tree height of 10-15 m. Canopy cover in this layer is typically 20-40% and is dominated by *Larix lyallii*. Average canopy cover in the subcanopy varies from 5-20%, but may be as high as 40%. *Larix lyallii* and *Abies lasiocarpa* are the most common subcanopy species. The shrub layer is usually sparse, with less than 30% cover in most stands. The most common shrub species is *Vaccinium membranaceum*, though *Vaccinium myrtillus* may be well-represented in some stands. Herbaceous species are dense in this association, with cover of 70-100%. *Luzula glabrata* var. *hitchcockii* had 100% constancy in sampled stands, with cover ranging from 40-50%. Other species with high constancy include *Valeriana sitchensis*, *Pedicularis bracteosa*, *Arnica X diversifolia*, and *Erigeron peregrinus*. Cover for these forbs is usually 5-10%.

GLOBAL VEGETATION: Stand structure is generally quite open with the upper tree canopy cover varying from 15% to slightly greater than 50% and tree heights generally not exceeding 40 feet. *Larix lyallii* is the dominant tree and sometimes only tree represented (considered diagnostic at 5% or greater cover), though common associates are *Abies lasiocarpa* and *Picea engelmannii*; in the subcanopy *Abies lasiocarpa* may often have greater cover than *Larix lyallii*. *Vaccinium membranaceum* is highly constant, though its cover and stature are much reduced from that recorded from lower subalpine sites; it is sufficiently diminutive to be confused with *Vaccinium myrtillus*, which is only about 20% constant with around 5% average cover. The cover of the undergrowth diagnostic *Luzula glabrata* var. *hitchcockii* ranges widely, 10-70 %, and it is generally the undergrowth dominant as well; its high cover is indicative of deep and late-persisting snowpack. No other graminoids of even moderate constancy or cover occur. A number of herbaceous species associated with mesic to hygric moisture regimes have relatively high constancy, including *Senecio triangularis*, *Erigeron peregrinus*, *Mitella breweri*, *Veratrum viride*, and *Valeriana sitchensis*. *Arnica X diversifolia* and *Pedicularis bracteosa* are also commonly occurring forbs. Bryophytes and lichen are generally sparse both on the ground and as epiphytes.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix lyallii</i>
Tree subcanopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Larix lyallii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Vaccinium membranaceum</i>
Herb (field)	Graminoid	<i>Luzula glabrata</i> var. <i>hitchcockii</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Larix lyallii</i>

Short shrub/sapling Needle-leaved shrub *Vaccinium membranaceum*

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Larix lyallii*

GLOBAL: *Larix lyallii*, *Vaccinium membranaceum*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2G3 (14-Jan-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: The association described here is very similar to, perhaps the same as, *Larix lyallii* / *Vaccinium scoparium* / *Luzula glabrata* var. *hitchcockii* Woodland (CEGL000951) of the North Cascades of Washington and British Columbia (and speculated to occur in Idaho and Montana). However, due to what is presumed to be the stochastic operation of plant distribution, *Vaccinium scoparium* is not present to any extent for long stretches on the east slope of the northern Rocky Mountains. *Vaccinium myrtilloides* is somewhat of an ecological analogue of *Vaccinium scoparium* but is not found in sites as cold and stressful and is present with generally less than 5% cover in this type. The fact that *Vaccinium membranaceum*, not *Vaccinium scoparium* or *Vaccinium myrtilloides*, is the dominant shrub in this association and that mesic to hygric forbs are plentiful argues for considering this a separate association until more information is accumulated. The fact that tree species, other than *Larix lyallii*, are considered at the extreme limits of their distribution, present in stunted form in the North Cascades association also argues for these being harsher sites. The *Larix lyallii* / *Luzula hitchcockii* association of Williams and Smith (1990) for the Wenatchee National Forest is included in *Larix lyallii* / *Vaccinium scoparium* / *Luzula glabrata* var. *hitchcockii* Woodland (CEGL000951) of the NVC.

GLOBAL SIMILAR ASSOCIATIONS:

- *Larix lyallii* - *Abies lasiocarpa* Forest [Placeholder] (CEGL000521)
- *Larix lyallii* / *Vaccinium deliciosum* Woodland (CEGL000952)
- *Larix lyallii* / *Vaccinium scoparium* / *Luzula glabrata* var. *hitchcockii* Woodland (CEGL000951)
- *Pinus albicaulis* / *Luzula glabrata* var. *hitchcockii* Woodland (CEGL000758)

GLOBAL RELATED CONCEPTS:

- *Larix lyallii* - *Abies lasiocarpa* Habitat Type (Pfister et al. 1977) B
- *Larix lyallii* / *Luzula hitchcockii* Vegetation Type (Achuff et al. 2002a) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is abundant in Waterton Lakes National Park but uncommon in Glacier National Park. In Glacier National Park the association has been documented in Preston Park, east of the Continental Divide.

GLOBAL RANGE: This association has been described from only the northern Rocky Mountains of northwestern Montana and their continuation into Alberta (as the Canadian Rockies).

NATIONS: CA, US

STATES/PROVINCES: AB, ID?, MT:S2S3

USFS ECOREGIONS: M332C:CC, M333B:CP, M333C:CC, M333D:CP

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes); USFS (Wenatchee)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.150, WATE.4036, WATE.4080, WATE.4081, WATE.4095, WATE.4097, WATE.4100, WATE.4121, WATE.5062, WATE.5080, WATE.5091, WATE.5099, WATE.5100, WATE.5111.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Achuff et al. 2002a, Arno and Habeck 1972, Pfister et al. 1977, Western Ecology Working Group n.d., Williams and Smith 1990

III. SHRUBLAND

III.A.3.N.a. Needle-leaved evergreen shrubland

Abies lasiocarpa - *Picea engelmannii* - *Pinus flexilis* Krummholz Shrubland Alliance

Abies lasiocarpa - *Picea engelmannii* Krummholz Shrubland

SUBALPINE FIR - ENGELMANN SPRUCE KRUMMHOLZ SHRUBLAND

IDENTIFIER: C EGL000985

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Evergreen shrubland (III.A.)
Physiognomic Group	Needle-leaved evergreen shrubland (III.A.3.)
Physiognomic Subgroup	Natural/Semi-natural needle-leaved evergreen shrubland (III.A.3.N.)
Formation	Needle-leaved evergreen shrubland (III.A.3.N.a.)
Alliance	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> - <i>Pinus flexilis</i> Krummholz Shrubland Alliance (A.811)
Alliance (English name)	Subalpine Fir - Engelmann Spruce - Limber Pine Krummholz Shrubland Alliance
Association	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> Krummholz Shrubland
Association (English name)	Subalpine Fir - Engelmann Spruce Krummholz Shrubland

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Subalpine Woodland and Parkland (CES306.807)
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)

ELEMENT CONCEPT

GLOBAL SUMMARY: These dwarf-tree shrublands occur in the upper treeline areas of the Rocky Mountains. Elevations range from 3600 m in Colorado down to 2000 m in northern Montana and Canada. Climate is cold, temperate, often with heavy winter snow, and short cool summers. Sites are nearly level to steeply sloping. Stands are often extensive on more mesic north aspects. Sites are windswept most of the year by prevailing westerly winds. Winter winds are especially intense, desiccate and kill needles and stems, and deform branches that are above the snowpack. Soils are shallow, lithic, gravelly or sandy loams, and rock outcrops are common. Stands form a mosaic of dense patches of dwarfed evergreen conifer trees (usually less than 2 m tall, with occasional taller wind-flagged individuals) in alpine meadows or fell-fields. The woody canopy is dominated by stunted *Abies lasiocarpa* and *Picea engelmannii*. *Pinus albicaulis*, *Pinus flexilis*, or *Pinus aristata* may be present to codominant. Occasional *Pinus contorta* or *Larix lyallii* may be present in some stands. *Picea engelmannii* is more prominent on more xeric sites in more southern latitudes, and *Abies lasiocarpa* is more prominent on mesic sites and in the north. Other woody species may be present, including shrubs and dwarf-shrubs such as *Phyllodoce glanduliflora*, *Kalmia polifolia*, *Ribes montigenum*, *Vaccinium membranaceum*, and *Vaccinium scoparium*. The herbaceous layer is sparse under dense shrub canopies, or may be dense turf where the shrub canopy is open and where soil is not limiting. It is often dominated by mesic or xeric alpine forb and graminoid species but may include subalpine species especially in protected areas.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This mesic, subalpine association is located on somewhat-steep to steep midslopes and high upper slopes at elevations near 2250 m (7380 feet). Soils are well-drained loamy sands, classified as Lithic Orthic Regosols in Waterton Lakes National Park. These soils are developed on colluvial, or more specifically talus, landforms. Litter, exposed soil, and small rocks comprise a large percentage of the ground surface.

GLOBAL ENVIRONMENT: These dwarf-tree shrublands occur in the upper treeline areas of the Rocky Mountains. Elevations range from 3600 m in Colorado down to 2000 m in northern Montana and Canada. Climate is cold, temperate, often with heavy winter snow, and short cool summers. Sites are nearly level to steeply sloping. Stands are often extensive on more mesic north aspects. Sites are windswept most of the year by prevailing westerly winds. Winter winds are especially intense, desiccate and kill needles and stems, and deform branches that are exposed above the snowpack. Soils typically are shallow, lithic, gravelly or sandy loams typically derived from granite or schist. Soils formed in colluvium and glacial till can be deep and well-drained. Rock outcrop is common.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Wind-stunted *Abies lasiocarpa* krummholz trees, measuring 1-5 m in height, dominate this evergreen shrubland. Tall-shrub cover averages 90% with *Abies lasiocarpa* dominating this layer. *Pinus albicaulis* and *Larix lyallii* are sometimes present with low cover. *Ribes lacustre* and *Vaccinium membranaceum* may also be present in the short-shrub layer with low cover. Overall herbaceous cover ranges from 5-40% with heights less than 0.5 m. High-constancy species include *Orthilia secunda* and *Luzula glabrata*, each with 1-2% cover. Other species that may be present include *Arnica cordifolia* with 20% cover, *Thalictrum occidentale* with 10% cover, *Streptopus amplexifolius* with 5% cover, and *Chamerion angustifolium*, *Senecio triangularis*, and *Arnica latifolia* with 2-3% cover. *Aquilegia flavescens*, *Carex geyeri*, *Erigeron peregrinus*, *Gentiana calycosa*, *Heracleum maximum*, *Poa alpina*, *Valeriana sitchensis*, and *Veratrum viride* may also be present with low cover. Cover of nonvascular species is very low.

GLOBAL VEGETATION: Stands form a mosaic of dense patches of dwarfed evergreen conifer trees (usually less than 2 m tall, with occasional taller wind-flagged individuals) in alpine meadows and turf or fell-fields. The woody canopy is dominated or codominated by stunted *Abies lasiocarpa* and *Picea engelmannii*. Occasional *Pinus albicaulis*, *Pinus flexilis*, *Pinus aristata*, *Pinus contorta*, or *Larix lyallii* may be present to codominant. *Picea engelmannii* is more prominent on more xeric sites and in more southern latitudes, and *Abies lasiocarpa* is more prominent on more mesic sites and in the north. Other woody species, including shrubs and dwarf-shrubs such as *Phyllodoce glanduliflora*, *Kalmia polifolia*, *Ribes montigenum*, *Vaccinium membranaceum*, and *Vaccinium scoparium*, may be present. The herbaceous layer is sparse under dense shrub canopy, or may be dense turf where the shrub canopy is open and where soil is not limiting. It is often dominated by mesic or xeric alpine forb and graminoid species but may include subalpine species especially in protected areas. Common species may include the forbs *Antennaria* spp., *Arenaria fendleri*, *Arnica* spp., *Artemisia scopulorum*, *Astragalus kentrophyta*, *Erigeron peregrinus*, *Erigeron rydbergii*, *Draba oligosperma*, *Geum rossii*, *Minuartia obtusiloba*, *Phlox pulvinata*, *Polemonium pulcherrimum*, *Orthilia secunda*, *Potentilla diversifolia*, *Sedum lanceolatum*, *Sibbaldia procumbens*, *Silene acaulis*, *Smelowskia calycina*, *Streptopus amplexifolius*, *Thalictrum occidentale*, *Trifolium dasyphyllum*, *Valeriana sitchensis*, *Veratrum viride*, and the graminoids *Calamagrostis purpurascens*, *Carex elynoides*, *Carex rupestris* var. *drummondiana*, *Carex heteroneura*, *Festuca brachyphylla*, *Kobresia myosuroides*, *Luzula glabrata*, *Luzula spicata*, *Phleum alpinum*, *Poa alpina*, and *Trisetum spicatum*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Needle-leaved shrub	<i>Abies lasiocarpa</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Orthilia secunda</i> , <i>Streptopus amplexifolius</i> , <i>Thalictrum occidentale</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Herb (field)	Forb	<i>Erigeron peregrinus</i> , <i>Geum rossii</i> , <i>Orthilia secunda</i> , <i>Polemonium pulcherrimum</i> , <i>Streptopus amplexifolius</i> , <i>Thalictrum occidentale</i>
Herb (field)	Graminoid	<i>Calamagrostis purpurascens</i> , <i>Festuca brachyphylla</i> , <i>Kobresia myosuroides</i> , <i>Luzula glabrata</i> var. <i>hitchcockii</i> , <i>Trisetum spicatum</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Luzula glabrata* var. *hitchcockii*, *Orthilia secunda*

GLOBAL: *Abies lasiocarpa*, *Luzula glabrata* var. *hitchcockii*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association has only been described from Colorado, northwestern Montana and Alberta, but occurs elsewhere in the Rocky Mountains. Differences in understory composition in southern Rocky Mountain stands and northern Rocky Mountain stands may justify creating new associations. More survey and classification work are needed.

GLOBAL SIMILAR ASSOCIATIONS:

- *Abies lasiocarpa* - *Picea engelmannii* / *Salix (brachycarpa, glauca)* Krummholz Shrubland (CEGL000986)
- *Abies lasiocarpa* - *Picea engelmannii* Ribbon Forest (CEGL000328)
- *Abies lasiocarpa* - *Picea engelmannii* Tree Island Forest (CEGL000329)

GLOBAL RELATED CONCEPTS:

- *Abies lasiocarpa* (Krummholz) (Bourgeron and Engelking 1994) =
- Cushion Krummholz (Wardle 1968) =
- DRISCOLL FORMATION CODE:III.A.2.a. (Driscoll et al. 1984) B
- Krummholz Community (Hartman and Rottman 1988) =
- Mesic Krummholz (G1) (Peet 1981) I
- S22: *Abies lasiocarpa* / *Arnica cordifolia* Vegetation Type (Achuff et al. 2002a) I
- Xeric Krummholz (G2) (Peet 1981) F

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is relatively common in Glacier National Park and uncommon in Waterton Lakes National Park along treeline at higher elevations. It has been documented within the Lunch Creek basin in the Saint Mary subdistrict in Glacier National Park and within the Sofa Creek watershed in the RW1 ecosite in Waterton Lakes National Park.

GLOBAL RANGE: These shrublands occur near upper treeline in the Rocky Mountains. Stands have only been described from Colorado, Montana and Alberta, but likely occur in similar habitats in adjacent states.

NATIONS: CA, US

STATES/PROVINCES: AB, CO, MT:S4, UT?, WY

USFS ECOREGIONS: M331A:CC, M331D:CC, M331F:CP, M331G:CP, M331H:CP, M331I:CC, M332B:CC, M332C:CC, M332D:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton, Rocky Mountain); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.247, WATE.4112.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Achuff et al. 2002a, Bourgeron and Engelking 1994, Driscoll et al. 1984, Habeck and Choate 1963, Hartman and Rottman 1988, Knight 1994, Komarkova 1986, MTNHP 2002b, Peet 1975, Peet 1981, Wardle 1968, Western Ecology Working Group n.d., Zwinger and Willard 1996

III.B.2.N.a. Temperate cold-deciduous shrubland

***Acer glabrum* Shrubland Alliance**

***Acer glabrum* Avalanche Chute Shrubland**

ROCKY MOUNTAIN MAPLE AVALANCHE CHUTE SHRUBLAND

IDENTIFIER: CEGL001061

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temperate cold-deciduous shrubland (III.B.2.N.a.)

Alliance	<i>Acer glabrum</i> Shrubland Alliance (A.915)
Alliance (English name)	Rocky Mountain Maple Shrubland Alliance
Association	<i>Acer glabrum</i> Avalanche Chute Shrubland
Association (English name)	Rocky Mountain Maple Avalanche Chute Shrubland

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Avalanche Chute Shrubland (CES306.801)

ELEMENT CONCEPT

GLOBAL SUMMARY: This deciduous shrubland has been described from subalpine avalanche paths in the northern Rocky Mountains. Elevations range from 950 to 2306 m (3100-7600 feet). Stands are located in avalanche tracks and runout zones, on slopes ranging from 15-60%. These communities can occur on any aspect, but are more common where unstable snowpack conditions frequently occur. Soils are rapidly to well-drained loamy sands, sandy loams, or silt loams. They tend to be dark, weakly developed soils on colluvial and glacio-fluvial landforms with high gravel and rock content. Sites are often mesic because avalanche paths are often in stream gullies. Stands have a moderately dense woody canopy characterized by flexible, deciduous small trees and shrubs, dominated by *Acer glabrum*. Other common woody plants include *Paxistima myrsinites*, *Sorbus scopulina*, *Alnus viridis ssp. sinuata*, *Alnus incana*, *Rubus parviflorus*, *Prunus virginiana*, *Symphoricarpos albus*, *Symphoricarpos oreophilus*, *Salix planifolia*, *Salix scouleriana*, and *Crataegus douglasii*. In addition to shrub species, several trees are usually present, these rarely attaining heights above that of the shrubs due to the frequent disturbance. Tree species are those from the surrounding forested slopes and include *Picea engelmannii*, *Abies lasiocarpa*, *Populus tremuloides*, *Populus balsamifera ssp. trichocarpa*, *Pseudotsuga menziesii*, and *Betula papyrifera*. The ground cover is moderately dense to dense and composed of many graminoids and forbs. *Chamerion angustifolium* and *Thalictrum occidentale* are common. Other species include *Lomatium dissectum*, *Heracleum maximum*, *Xerophyllum tenax*, *Carex geyeri*, *Castilleja* spp., *Agastache urticifolia*, *Eucephalus engelmannii*, *Erythronium grandiflorum*, *Myosotis asiatica* (= *Myosotis alpestris*), *Veratrum viride*, and *Xerophyllum tenax*. Mosses and ferns are often present.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This mesic, montane to lower subalpine association occurs on moderate to steep slopes at elevations between 1430 and 1740 m (4700-5700 feet). This type is generally located at the bottom of avalanche chutes on south- and east-facing slopes, on north-facing slopes and on higher elevation midslopes. Soils are rapidly to well-drained loamy sands, sandy loams, or silt loams. They tend to be dark, weakly developed soils on colluvial and glacio-fluvial landforms with high gravel and rock content of red and green argillite. Litter and rock comprise over 50% of the ground surface.

GLOBAL ENVIRONMENT: These shrublands have been described from subalpine avalanche paths in the Rocky Mountains. Elevations range from 950-2306 m (3100-7600 feet). Climate is temperate with extremely cold winters and cool summers. Mean annual precipitation ranges from 50-70 cm and occurs mostly as snow. Stands are located in avalanche tracks and runout zones. Slopes range from 15-60%. These communities can occur on any aspect, but are more common where unstable snowpack conditions frequently occur, such as southeast aspects where snow cornices develop because of prevailing northwesterly winds, and south- to southwest-facing slopes because of sun crust formation. Sites are often mesic because avalanche paths are often in stream gullies. Soils are rapidly to well-drained loamy sands, sandy loams, or silt loams. They tend to be dark, weakly developed soils on colluvial and glacio-fluvial landforms with high gravel and rock content. Substrate is variable depending on parent materials but is typically shallow and rocky. Adjacent vegetation may include subalpine forests dominated by *Abies lasiocarpa*, *Picea engelmannii*, or *Pseudotsuga menziesii*, and subalpine meadows.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Violent snow movement within avalanche chutes maintains the shrubby structure of this deciduous shrubland. A diverse array of shrubs dominates this type with 60-100% cover and heights averaging 1-2 m. *Acer glabrum* dominates the tall-shrub layer with 10-50% cover, and *Amelanchier alnifolia*, *Rubus parviflorus*, *Sorbus scopulina*, and *Prunus virginiana* are very common with average cover between 5-10%. Short-shrub cover is typically 5-10% with heights less than 0.5 m. Common short shrubs include *Ribes lacustre* with 1-10% cover and *Symphoricarpos albus* with 1-20% cover. Other low-constancy shrubs that may have high cover include *Prunus emarginata*, *Salix planifolia*, *Crataegus douglasii*, and *Ribes inerme*. Dwarf-shrubs are sometimes present with approximately 5% cover. *Clematis columbiana* is the most common dwarf-shrub. About half the sampled areas contain emergent trees that form a scattered canopy with 5-10% cover or subcanopy with 5-30% cover. *Abies lasiocarpa* is the most common tree with 1-30% cover. *Populus tremuloides*, *Populus balsamifera ssp. trichocarpa*, *Pseudotsuga menziesii*, *Picea engelmannii*, and *Pinus contorta* trees can also be scattered throughout the stand.

The herbaceous cover ranges from 20-50%. *Chamerion angustifolium* and *Thalictrum occidentale* are the most common species, each with 1-10% cover. Other common forbs and sedges include *Lomatium dissectum*, *Heracleum maximum*, *Xerophyllum tenax*, and *Carex geyeri*, each 1-10% cover. *Abies lasiocarpa* seedlings, *Heuchera cylindrica*, *Achillea millefolium*, and *Cryptogramma acrostichoides* (= *Cryptogramma crispa*) are also often present with low cover. Other lower constancy herbaceous species that may

have high cover include *Urtica dioica*, *Eriogonum umbellatum*, *Pseudoroegneria spicata*, *Prosartes trachycarpa* (= *Disporum trachycarpum*), *Galium triflorum*, and *Viola glabella*. Cover of nonvascular species averages 5-10%.

GLOBAL VEGETATION: Stands have a moderately dense woody canopy characterized by flexible, deciduous small trees and shrubs, dominated by *Acer glabrum*. Other common woody plants include *Paxistima myrsinites*, *Sorbus scopulina*, *Alnus viridis ssp. sinuata*, *Alnus incana*, *Rubus parviflorus*, *Prunus virginiana*, *Symphoricarpos albus*, *Symphoricarpos oreophilus*, *Salix planifolia*, *Salix scouleriana*, and *Crataegus douglasii*. In addition to shrub species, several trees are usually present, these rarely attaining heights above that of the shrubs due to the frequent disturbance. Tree species are those from the surrounding forested slopes and include *Picea engelmannii*, *Abies lasiocarpa*, *Populus tremuloides*, *Populus balsamifera ssp. trichocarpa*, *Pseudotsuga menziesii*, and *Betula papyrifera*. The ground cover is moderately dense to dense and composed of many graminoids and forbs. *Chamerion angustifolium* and *Thalictrum occidentale* are common. Other species include *Lomatium dissectum*, *Heracleum maximum*, *Xerophyllum tenax*, *Carex geeyeri*, *Castilleja* spp., *Agastache urticifolia*, *Eucephalus engelmannii*, *Erythronium grandiflorum*, *Myosotis asiatica* (= *Myosotis alpestris*), and *Veratrum viride*. Mosses and ferns are often present.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Acer glabrum</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i> , <i>Rubus parviflorus</i> , <i>Sorbus scopulina</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Ribes lacustre</i> , <i>Symphoricarpos albus</i>
Herb (field)	Forb	<i>Carex geeyeri</i> , <i>Chamerion angustifolium</i> , <i>Heracleum maximum</i> , <i>Lomatium dissectum</i> , <i>Thalictrum occidentale</i> , <i>Xerophyllum tenax</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Acer glabrum</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Acer glabrum*, *Amelanchier alnifolia*, *Chamerion angustifolium*, *Ribes lacustre*, *Rubus parviflorus*, *Sorbus scopulina*, *Symphoricarpos albus*, *Thalictrum occidentale*

GLOBAL: *Abies lasiocarpa*, *Acer glabrum*, *Carex geeyeri*, *Chamerion angustifolium*, *Erythronium grandiflorum*, *Heracleum maximum*, *Lomatium dissectum*, *Paxistima myrsinites*, *Prunus virginiana*, *Rubus parviflorus*, *Salix planifolia*, *Sorbus scopulina*, *Symphoricarpos albus*, *Thalictrum occidentale*, *Veratrum viride*, *Xerophyllum tenax*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Calochortus apiculatus*, *Penstemon albertinus*, *Penstemon lyallii*, *Taraxacum officinale*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association is the product of disturbance by avalanche.

GLOBAL SIMILAR ASSOCIATIONS:

- *Alnus viridis ssp. sinuata* / *Athyrium filix-femina* - *Cinna latifolia* Shrubland (CEGL001156)
- *Alnus viridis ssp. sinuata* / Mesic Forbs Shrubland (CEGL002633)

GLOBAL RELATED CONCEPTS:

- *Acer glabrum* (Avalanche Chute) (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:III.B.3.a. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is very common within avalanche chutes on the east side of Glacier National Park. Sampled stands occur within the Many Glacier subdistrict along Lake Josephine,

above Red Rock Lake along the Grinnell Lake Trail, within the Two Medicine subdistrict northwest of Two Medicine Lake near Upper Two Medicine Lake, along the Pitamakan Pass Trail within the Goat Haunt subdistrict along the Boulder Pass Trail, and within the St. Mary subdistrict above Lost Lake.

GLOBAL RANGE: This shrubland has been described from subalpine avalanche chutes in northwestern Montana and northwestern Wyoming.

NATIONS: US

STATES/PROVINCES: MT:S5, WY

USFS ECOREGIONS: M331A:CC, M331D:CC, M332B:CC, M332C:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.25, GLAC.26, GLAC.61, GLAC.137, GLAC.202, GLAC.260, GLAC.277, GLAC.307, GLAC.321, GLAC.322.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Butler 1979, Driscoll et al. 1984, MTNHP 2002b, Western Ecology Working Group n.d.

***Amelanchier alnifolia* Shrubland Alliance**

***Amelanchier alnifolia* / (Mixed Grass, Forb) Shrubland**

SASKATOON SERVICEBERRY / (MIXED GRASS, FORB) SHRUBLAND

IDENTIFIER: C EGL005885

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temperate cold-deciduous shrubland (III.B.2.N.a.)
Alliance	<i>Amelanchier alnifolia</i> Shrubland Alliance (A.913)
Alliance (English name)	Saskatoon Serviceberry Shrubland Alliance
Association	<i>Amelanchier alnifolia</i> / (Mixed Grass, Forb) Shrubland
Association (English name)	Saskatoon Serviceberry / (Mixed Grass, Forb) Shrubland

ECOLOGICAL SYSTEM(S): Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)
Northern Rocky Mountain Montane-Foothill Deciduous Shrubland (CES306.994)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is currently known only from Glacier National Park and Waterton Lakes National Park. It is found on moderate to steep slopes and flat benches. They are located at moderate elevations between 1300 and 1781 m (4262-5840 feet) predominately on southerly to easterly aspects. Soils tend to be moderately to well-drained sandy or clay loams or, occasionally, a rapidly drained Orthic Regosol. Sites are usually situated on glacial-fluvial or till deposits. Most of the ground surface is covered with litter and duff. This mixed-age shrubland is characterized by the presence of *Amelanchier alnifolia*, which occurs in all shrub canopy layers with 100% constancy and an average cover of 32%. Other shrubs include *Symphoricarpos albus*, *Holodiscus discolor*, *Acer glabrum*, *Rubus parviflorus*, and *Spiraea betulifolia*, with 10% average cover. Shrub height is variable due to heavy browsing or periodic avalanche disturbance, or both. The moderate to dense (70% average cover) herbaceous layer is diverse with over 100 species recorded in 23 stands. Common forb species include *Fragaria virginiana*, *Achillea millefolium*, and *Galium boreale*. Graminoids consist primarily of *Carex geyeri* and *Calamagrostis rubescens*; each has moderate constancy and an average cover of 14% and 24%, respectively. Other grasses present include both native and exotic species, such as *Festuca idahoensis*, *Bromus carinatus*, *Poa pratensis*, and *Phleum pratense*. All have 50% constancy or higher. Nonvascular cover is insignificant.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this shrubland association are found on moderate to steep slopes and flat benches. They are located at moderate elevations between 1300 and 1781 m (4262-5840 feet) predominately on southerly to easterly aspects. Soils tend to be moderately to well-drained sandy or clay loams or occasionally, a rapidly drained Orthic Regosol. Sites are usually situated on glacial-fluvial or till deposits. Most of the ground surface is covered with litter and duff, and one half of the stands have a moderate to low percentage of rocks.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This mixed-age shrubland is characterized by the presence of *Amelanchier alnifolia*, which occurs in all shrub canopy layers with 100% constancy and an average cover of 32%. Other shrubs include *Symphoricarpos albus*, *Holodiscus discolor*, *Acer glabrum*, *Rubus parviflorus*, and *Spiraea betulifolia*, with 10% average cover. Shrub height is variable due to heavy browsing or periodic avalanche disturbance, or both. Slightly less than one-third of sampled stands have a sparse tree canopy. Tree species include *Populus tremuloides*, *Abies lasiocarpa*, *Pinus albicaulis*, *Pinus ponderosa*, and *Pinus contorta*. The moderate to dense (70% average cover) herbaceous layer is diverse with over 100 species recorded in 23 stands. Common forb species include *Fragaria virginiana*, *Achillea millefolium*, and *Galium boreale*. Graminoids consist primarily of *Carex geyeri* and *Calamagrostis rubescens*; each has moderate constancy and an average cover of 14% and 24%, respectively. Other grasses present include both native and exotic species, such as *Festuca idahoensis*, *Bromus carinatus*, *Poa pratensis*, and *Phleum pratense*. All have 50% constancy or higher. Nonvascular cover is insignificant.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i> , <i>Symphoricarpos albus</i>
Herb (field)	Dwarf-shrub	<i>Mahonia repens</i>
Herb (field)	Forb	<i>Achillea millefolium</i> , <i>Fragaria virginiana</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i> , <i>Carex geyeri</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Bromus inermis*, *Cirsium arvense*, *Dactylis glomerata*, *Hypericum perforatum*, *Phleum pratense*, *Poa compressa*, *Poa pratensis*, *Taraxacum officinale*, *Tragopogon dubius*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: GNR (21-Apr-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This *Amelanchier alnifolia* shrubland association represents early succession on forests.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Amelanchier alnifolia* / *Pseudoroegneria spicata* - Bunchgrass Shrubland (CEGL001065)
- *Amelanchier alnifolia* Shrubland (CEGL002183)

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is known throughout Glacier National Park and Waterton Lakes National Park.

GLOBAL RANGE:

NATIONS: CA, US

STATES/PROVINCES: AB, MT

USFS ECOREGIONS:

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2209, GLAC.2237, GLAC.2238, GLAC.1002, GLAC.167, GLAC.30, GLAC.38, GLAC.64, GLAC.76, GLAC.2624, GLAC.2659, WATE.4089, WATE.5021, WATE.9001, WATE.9010, WATE.9011.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Western Ecology Working Group n.d.

***Amelanchier alnifolia* / *Pseudoroegneria spicata* - Bunchgrass Shrubland**

SASKATOON SERVICEBERRY / BLUEBUNCH WHEATGRASS - BUNCHGRASS SHRUBLAND

IDENTIFIER: C EGL001065

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temperate cold-deciduous shrubland (III.B.2.N.a.)
Alliance	<i>Amelanchier alnifolia</i> Shrubland Alliance (A.913)
Alliance (English name)	Saskatoon Serviceberry Shrubland Alliance
Association	<i>Amelanchier alnifolia</i> / <i>Pseudoroegneria spicata</i> - Bunchgrass Shrubland
Association (English name)	Saskatoon Serviceberry / Bluebunch Wheatgrass - Bunchgrass Shrubland

ECOLOGICAL SYSTEM(S): Northwestern Great Plains Mixedgrass Prairie (CES303.674)
Northwestern Great Plains Shrubland (CES303.662)
Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)

ELEMENT CONCEPT

GLOBAL SUMMARY: This community is found in the mountains of northwestern Montana and in the northwestern Great Plains on moderately deep to deep fine loam soils which often have a high percentage of rock fragments. It is dominated by short shrubs and mid grasses. *Amelanchier alnifolia* is the most common shrub. Others include *Artemisia tridentata*, *Purshia tridentata*, *Spiraea betulifolia*, *Symphoricarpos* spp., *Rhus trilobata*, *Cercocarpus montanus*, and *Prunus virginiana*. In the higher elevation stands, occasionally *Pseudotsuga menziesii*, *Pinus ponderosa*, *Picea engelmannii*, and *Betula papyrifera* are present within a young tree canopy, but these have insignificant cover. Typical grasses (mostly bunch grasses) are *Festuca idahoensis*, *Pseudoroegneria spicata*, *Leucopoa kingii* (= *Festuca kingii*), *Achnatherum nelsonii* ssp. *dorei* (= *Stipa columbiana*), *Carex rossii*, and *Carex geyeri*. Forbs include *Achillea millefolium*, *Penstemon confertus*, and *Eriogonum flavum*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This shrubland can be found on moderate to steep slopes and ridgetops on colluvial and glacial deposits. Occasionally, they occur on limestone and dolomite. Stands are primarily

on south and southwest aspects between 1330 and 1829 m (4361-5996 feet). Soils tend to be rapidly drained to well-drained sandy or silty loams. The ground surface is mostly covered with litter and duff.

GLOBAL ENVIRONMENT: This small-patch association has been documented from Wyoming and Montana and extends northward along the Rocky Mountain Front and foothills well into Alberta, at elevations between 1330 and 1829 m (4361-5996 feet). It is associated with somewhat different environmental parameters depending on locality. In Wyoming it is found in plains landscapes on deep and relatively fine-textured soils with a high rock component. To the north it has been described from sites as disparate as the foothill's mosaic of grasslands, shrublands and forest openings, a gravelly alluvial fan at foothills/mountains transition, to an upper subalpine site that has experienced a hot burn in the last 50 years. The bulk of hard data come from Glacier-Waterton International Peace Park where this type is largely successional, having resulted from stand-replacing fire. Sites here are on primarily south-through west-facing, moderate to steep slopes, often on spur ridges or wind-buffeted slope shoulders. These sites probably have shallow soils before burning, and there are indications (e.g., pedicelling) that soil loss occurred following the fires and continues to this day. There is considerable exposed substrate and rock, not infrequently exceeding 20% on northern range examples of this association. These sites are well- to rapidly drained.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This mixed-age shrubland is characterized by the presence of *Amelanchier alnifolia* with 100% constancy and an average 21% cover. Other shrubs include *Acer glabrum*, *Prunus virginiana*, *Rosa woodsii*, *Spiraea betulifolia*, *Symphoricarpos albus*, and *Mahonia repens*. Each has moderate to low constancy and ranges in cover from 1-40%. The variance in shrub height is likely a result of heavy browsing. Occasionally *Pseudotsuga menziesii*, *Pinus ponderosa*, *Picea engelmannii*, and *Betula papyrifera* are present within a young tree canopy, but these have insignificant cover. The herbaceous layer is moderate and dominated by *Pseudoroegneria spicata*, with 87% constancy and 27% average cover. Other common species include *Carex geyeri*, *Achillea millefolium*, *Penstemon confertus*, and *Festuca idahoensis*. Nonvascular and exotic species are present with insignificant constancy and cover.

GLOBAL VEGETATION: The shrub layer is dominated by *Amelanchier alnifolia* and/or *Prunus virginiana* either of which are considered diagnostic and whose combined cover often exceeds 50%. Other shrubs consistently present, though not exhibiting coverages much in excess of 5%, are *Symphoricarpos* spp., *Spiraea betulifolia*, *Dasiphora fruticosa* ssp. *floribunda*; in the plains and southern portion of the type's distribution *Rhus trilobata*, *Artemisia tridentata*, and *Purshia tridentata* may be common. *Arctostaphylos uva-ursi* is more common in the northern representation of this type. In the higher elevation stands, occasionally *Pseudotsuga menziesii*, *Pinus ponderosa*, *Picea engelmannii*, and *Betula papyrifera* are present within a young tree canopy, but these have insignificant cover. The graminoid component, though dominated by those of tussock form, also differs slightly by region with *Festuca campestris*, *Carex geyeri*, and *Bromus carinatus* being more important to the north and *Pseudoroegneria spicata*, *Leucopoa kingii* (= *Festuca kingii*), *Achnatherum nelsonii* ssp. *dorei* (= *Stipa columbiana*), and *Carex rossii* more important to the south; *Festuca idahoensis* is constant at low coverages throughout the association. There are no diagnostic forbs but a number with high constancy that also occur in mesic grasslands/open forests include *Galium boreale*, *Eurybia conspicua* (= *Aster conspicuus*), *Balsamorhiza sagittata*, *Campanula rotundifolia*, *Eriogonum flavum*, *Eriogonum umbellatum*, *Geranium viscosissimum*, *Lithospermum ruderale*, *Lomatium dissectum*, *Potentilla gracilis*, *Potentilla glandulosa*, and *Penstemon confertus*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Acer glabrum</i> , <i>Prunus virginiana</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i> , <i>Symphoricarpos albus</i>
Herb (field)	Dwarf-shrub	<i>Mahonia repens</i>
Herb (field)	Graminoid	<i>Pseudoroegneria spicata</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Acer glabrum</i> , <i>Prunus virginiana</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i>
Herb (field)	Graminoid	<i>Pseudoroegneria spicata</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Pseudoroegneria spicata*

GLOBAL: *Pseudoroegneria spicata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Arabis glabra*, *Bromus inermis*, *Cirsium arvense*, *Hypericum perforatum*, *Phleum pratense*, *Poa compressa*, *Poa pratensis*, *Taraxacum officinale*, *Tragopogon dubius*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4Q (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: It has been proposed to rename this type *Amelanchier alnifolia* / Bunchgrass Shrubland to recognize that the graminoid component of this type is variable, although site parameters are similar across its range. *Pseudoroegneria spicata* is a good indicator species for this type's name, so for now we will retain the current nomenclature.

GLOBAL SIMILAR ASSOCIATIONS:

- *Amelanchier alnifolia* / (Mixed Grass, Forb) Shrubland (CEGL005885)
- *Amelanchier alnifolia* / *Artemisia tridentata* / *Festuca idahoensis* Shrubland (CEGL001064)
- *Amelanchier alnifolia* Shrubland (CEGL002183)
- *Amelanchier utahensis* / *Pseudoroegneria spicata* Shrubland (CEGL001069)

GLOBAL RELATED CONCEPTS:

- *Amelanchier alnifolia* / *Agropyron spicatum* Community Type (Harvey 1980) =
- *Amelanchier alnifolia*/*Pseudoroegneria spicata* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:III.B.3.a. (Driscoll et al. 1984) B
- S23: *Amelanchier alnifolia* - *Prunus virginiana* Vegetation Type (Achuff et al. 2002a) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known throughout Glacier National Park and Waterton Lake National Park.

GLOBAL RANGE: This small-patch association has been documented from Wyoming and Montana and extends northward along the Rocky Mountain Front and foothills well into Alberta.

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S2?, WY:S3S4

USFS ECOREGIONS: 331H:CC, 342F:CC, 342G:CC, M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2214, GLAC.2224, GLAC.2505, GLAC.2512, GLAC.2518, GLAC.2522, GLAC.161, GLAC.2, GLAC.204, GLAC.212, GLAC.216, GLAC.2625, GLAC.2626, GLAC.2641, GLAC.2651, GLAC.2657, GLAC.2658, WATE.4014, WATE.4059, WATE.5030, WATE.5131, WATE.5133, WATE.9027.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: J. Drake, mod. G. Kittel

REFERENCES: Achuff et al. 2002a, Bourgeron and Engelking 1994, Driscoll et al. 1984, Harvey 1980, Jones 1992b, MTNHP 2002b, Western Ecology Working Group n.d.

Populus tremuloides / *Amelanchier alnifolia* Avalanche Chute Shrubland QUAKING ASPEN / SASKATOON SERVICEBERRY AVALANCHE CHUTE SHRUBLAND

IDENTIFIER: CEGL005886

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temperate cold-deciduous shrubland (III.B.2.N.a.)
Alliance	<i>Amelanchier alnifolia</i> Shrubland Alliance (A.913)
Alliance (English name)	Saskatoon Serviceberry Shrubland Alliance
Association	<i>Populus tremuloides</i> / <i>Amelanchier alnifolia</i> Avalanche Chute Shrubland
Association (English name)	Quaking Aspen / Saskatoon Serviceberry Avalanche Chute Shrubland

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Avalanche Chute Shrubland (CES306.801)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is scattered infrequently on avalanche chutes and other steep slopes in Glacier National Park in Montana, Waterton Lakes National Park in Alberta, and Grand Teton National Park in Wyoming. This mesic, montane to lower subalpine association is present within avalanche chutes at a broad range of elevations, from 1130 to 2396 m (3720-7860 feet) on moderate to steep, south- and east-facing midslopes. Soils are rapidly to well-drained sandy loams, characterized as Orthic and Cumulic Regosols developed on fluvial and colluvial landforms. These are generally weakly developed, strongly acidic to neutral soils that are coarse-textured. Litter dominates the ground surface with 40-85% cover. Frequent avalanches maintain the shrubby structure of this deciduous shrubland. Tall shrubs are dominant and some stands have a more pronounced short-tree layer, ranging from 1-5 m in height. *Populus tremuloides* dominates both the tall-shrub and tree layer. *Pseudotsuga menziesii* may also be present, sometimes becoming emergent over other vegetation. *Picea engelmannii*, *Abies lasiocarpa*, and *Pinus ponderosa* trees are also sometimes scattered in the canopy. Total short-shrub cover is 20-70%, and common shrubs are *Amelanchier alnifolia*, *Acer glabrum*, *Spiraea betulifolia*, *Shepherdia canadensis*, *Sorbus scopulina*, *Prunus pensylvanica*, *Rubus parviflorus*, *Lonicera utahensis*, *Symphoricarpos albus*, *Mahonia repens*, *Paxistima myrsinites*, and *Arctostaphylos uva-ursi*. Total herbaceous cover ranges from 20-100% and high-constancy species include *Chamerion angustifolium*, *Eurybia conspicua* (= *Aster conspicuus*), *Carex geyeri*, *Elymus glaucus*, *Populus tremuloides* seedlings, *Thalictrum occidentale*, *Calamagrostis rubescens*, and *Calamagrostis canadensis*.

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This mesic, montane to lower subalpine association is present within avalanche chutes at a broad range of elevations, from 1130 to 1710 m (3720-5600 feet) on moderate to steep, south-facing midslopes. Soils are rapidly to well-drained sandy loams, characterized as Orthic and Cumulic Regosols developed on fluvial and colluvial landforms. These are generally weakly developed, strongly acidic to neutral soils that are coarse-textured. Litter dominates the ground surface with 40-85% cover.

GLOBAL ENVIRONMENT: This mesic, montane to lower subalpine association is present within avalanche chutes at a broad range of elevations, from 1130 to 2396 m (3720-7860 feet) on moderate to steep, south- and east-facing midslopes. Soils are rapidly to well-drained sandy loams, characterized as Orthic and Cumulic Regosols developed on fluvial and colluvial landforms. These are generally weakly developed, strongly acidic to neutral soils that are coarse-textured. Litter dominates the ground surface with 40-85% cover. Frequent avalanches maintain the shrubby structure of this deciduous shrubland.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Frequent avalanches maintain the shrubby structure of this deciduous shrubland. Tall shrubs, with 10-60% cover, are dominant and some stands have a more pronounced tree subcanopy with 30-50% cover, ranging from 1-5 m in height. *Populus tremuloides* dominates both the tall-shrub layer with 10-55% and the tree subcanopy layer with 20% cover. *Pseudotsuga menziesii* may also be present with 20% cover, sometimes becoming emergent over other vegetation with 5% cover and heights reaching 5-10 m. *Picea engelmannii*, *Abies lasiocarpa*, and *Pinus ponderosa* trees are also sometimes scattered in the canopy. Total short-shrub cover is 20-70% with heights 0.5-1 m. Common shrubs are *Amelanchier alnifolia* with 15-35% cover and *Acer glabrum* with 7-10% cover. Other shrubs that may be present include *Spiraea betulifolia*, *Shepherdia canadensis*, *Prunus pensylvanica*, *Rubus parviflorus*, *Lonicera utahensis*, *Symphoricarpos albus*, *Mahonia repens*, *Paxistima myrsinites*, and *Arctostaphylos uva-ursi*.

Total herbaceous cover ranges from 20-100% with heights less than 0.5 m. Consistently (80-100%) present species include *Chamerion angustifolium*, *Eurybia conspicua* (= *Aster conspicuus*), *Carex geyeri*, *Populus tremuloides* seedlings, *Thalictrum occidentale*, and *Calamagrostis rubescens* each with 1-20% cover. Other forbs with <1% cover include *Maianthemum racemosum* ssp. *amplexicaule*, *Fragaria virginiana*, *Galium boreale*, *Achillea millefolium*, and *Clematis occidentalis*. *Xerophyllum tenax*, *Symphyotrichum ciliolatum* (= *Aster ciliolatus*), *Symphyotrichum laeve* (= *Aster laevis*), *Pseudotsuga menziesii* seedlings, *Festuca campestris*, and *Geranium viscosissimum* have low constancy but can have high cover. Cover of nonvascular species averages 5%.

GLOBAL VEGETATION: Tall shrubs are dominant, and some stands have a more pronounced short-tree layer, ranging from 1-5 m in height. *Populus tremuloides* dominates both the tall-shrub and tree layer. *Pseudotsuga menziesii* may also be present, sometimes becoming emergent over other vegetation. *Picea engelmannii*, *Abies lasiocarpa*, and *Pinus ponderosa* trees are also sometimes scattered in the canopy. Total short-shrub cover is 20-70%, and common shrubs are *Amelanchier alnifolia*, *Acer glabrum*, *Spiraea betulifolia*, *Shepherdia canadensis*, *Sorbus scopulina*, *Prunus pensylvanica*, *Rubus parviflorus*, *Lonicera utahensis*, *Symphoricarpos albus*, *Mahonia repens*, *Paxistima myrsinites*, and *Arctostaphylos uva-ursi*. Total herbaceous cover ranges from 20-100%, and high-constancy species include *Chamerion angustifolium*, *Eurybia conspicua* (= *Aster conspicuus*), *Carex geyeri*, *Elymus glaucus*, *Populus tremuloides* seedlings, *Thalictrum occidentale*, *Calamagrostis rubescens*, and *Calamagrostis canadensis*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree subcanopy	Needle-leaved tree	<i>Pseudotsuga menziesii</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Populus tremuloides</i>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Acer glabrum</i> , <i>Populus tremuloides</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Shepherdia canadensis</i> , <i>Spiraea betulifolia</i>
Herb (field)	Dwarf-shrub	<i>Mahonia repens</i> , <i>Paxistima myrsinites</i>
Herb (field)	Forb	<i>Chamerion angustifolium</i> , <i>Eurybia conspicua</i> , <i>Thalictrum occidentale</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i> , <i>Carex geyeri</i>
Herb (field)	Other herbaceous	<i>Populus tremuloides</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Populus tremuloides</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i>
Herb (field)	Graminoid	<i>Carex geyeri</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Amelanchier alnifolia*, *Chamerion angustifolium*, *Eurybia conspicua*, *Fragaria virginiana*, *Mahonia repens*, *Maianthemum racemosum* ssp. *amplexicaule*, *Populus tremuloides*, *Pseudotsuga menziesii*, *Spiraea betulifolia*

GLOBAL: *Amelanchier alnifolia*, *Calamagrostis canadensis*, *Chamerion angustifolium*, *Elymus glaucus*, *Paxistima myrsinites*, *Populus tremuloides*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Angelica dawsonii*, *Calochortus apiculatus*, *Hedysarum sulphurescens*, *Penstemon lyallii*, *Phleum pratense*, *Poa pratensis*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3? (20-Jan-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE:

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is scattered infrequently on avalanche chutes and other steep slopes on the east and west sides of Glacier National Park and within Waterton Lakes National Park. In Glacier, it occurs near the Akokala trailhead in the North Fork subdistrict and on the Dawson Pass Trail below Rising Wolf in the Two

Medicine subdistrict. In Waterton Lakes National Park, this type has been found on the north side of the Boundary Creek valley in the Ruby 4 ecosite, north of Cameron Creek in the Hell-Roaring 1 ecosite, and in the Blakiston Creek watershed in the Bauerman 2 ecosite.

GLOBAL RANGE: This association has only been documented in Glacier National Park, Montana, Waterton Lakes National Park, Alberta, and Grand Teton National Park, Wyoming.

NATIONS: CA, US

STATES/PROVINCES: AB, MT, WY

USFS ECOREGIONS: M331D:CC, M333B:CP, M333C:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.304, GLAC.2245, WATE.5149, WATE.9009, WATE.9040.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Western Ecology Working Group n.d.

***Spiraea betulifolia* Shrubland Alliance**

***Spiraea betulifolia* Shrubland**

SHINYLEAF MEADOWSWEET SHRUBLAND

IDENTIFIER: C EGL005835

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temperate cold-deciduous shrubland (III.B.2.N.a.)
Alliance	<i>Spiraea betulifolia</i> Shrubland Alliance (A.2636)
Alliance (English name)	Shinyleaf Meadowsweet Shrubland Alliance
Association	<i>Spiraea betulifolia</i> Shrubland
Association (English name)	Shinyleaf Meadowsweet Shrubland

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Montane-Foothill Deciduous Shrubland (CES306.994)
Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822)

ELEMENT CONCEPT

GLOBAL SUMMARY: The association is known from Glacier National Park and the Blackfoot Indian Reservation, on both sides of the Continental Divide in Montana. Stands of this shrubland association are found on mid to lower portions, including toeslopes, of moderate to steep slopes and bedrock outcrops. They occur on all aspects in siltstone and colluvial and glacier-fluvial deposits. The elevation ranges between 1770 and 1973 m (5805-6472 feet). The soil tends to be a rapidly to well-drained sandy or clay loam that contains an abundance of gravel and rock. Ground surface cover is variable, but tends towards very rocky or bedrock outcrops, and significant portions of bare soil. There is moderate cover of litter and duff in most stands, as well as moderate bryophyte cover in some stands. This shrubland association is dominated by a sparse, short-shrub canopy of *Spiraea betulifolia* (38% average cover). Numerous shrub species can be present, including *Rubus parviflorus*, *Juniperus communis*, *Sambucus racemosa*, and *Vaccinium scoparium*, but all have low to insignificant cover and constancy. Tree seedlings and saplings of *Abies lasiocarpa*, *Pinus contorta*, and *Populus tremuloides* can be present, but not abundant. The moderate to dense herbaceous layer (64% average cover) is diverse with graminoids and forb species. Common species include *Carex geyeri*, *Chamerion angustifolium*, *Thalictrum occidentale*, *Arnica cordifolia*, and *Achillea millefolium*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this shrubland association are found on mid to lower portions, including toeslopes, of moderate to steep slopes and bedrock outcrops. They occur on all cardinal aspects in siltstone and colluvial and glacier-fluvial deposits. The elevation ranges between 1770 and 1973 m (5805-6472 feet). The soil tends to be a rapidly to well-drained sandy or clay loam that contains an abundance of gravel and rock. Ground surface cover is variable, but tends towards very rocky or bedrock outcrops, and significant portions of bare soil. There is moderate cover of litter and duff in most stands, as well as moderate bryophyte cover in some stands.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This shrubland association is dominated by a sparse, short-shrub canopy of *Spiraea betulifolia* (38% average cover). Numerous shrub species can be present, including *Rubus parviflorus*, *Juniperus communis*, *Sambucus racemosa*, and *Vaccinium scoparium*, but all have low to insignificant cover and constancy. Tree seedlings and saplings of *Abies lasiocarpa*, *Pinus contorta*, and *Populus tremuloides* can be present, but not abundant. The moderate to dense herbaceous layer (64% average cover) is diverse with graminoids and forb species. Common species include *Carex geyeri*, *Chamerion angustifolium*, *Thalictrum occidentale*, *Arnica cordifolia*, and *Achillea millefolium*.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i>
Herb (field)	Forb	<i>Chamerion angustifolium</i>
Herb (field)	Graminoid	<i>Carex geyeri</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex geyeri*, *Spiraea betulifolia*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Taraxacum officinale*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3? (28-Jan-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This community is composed of early-successional shrublands. Some stands may contain tree regeneration, but cover of tree species will be less than 15-20% for the stand to fit in this type.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from Glacier National Park and the Blackfoot Indian Reservation, on both sides of the Continental Divide.

GLOBAL RANGE:

NATIONS: CA?, US

STATES/PROVINCES: AB?, MT:S3

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: BIA (Blackfoot); NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.182, GLAC.195, GLAC.2033, GLAC.276, GLAC.300.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Western Ecology Working Group n.d.

***Symphoricarpos albus* Shrubland Alliance**

***Symphoricarpos albus* Shrubland COMMON SNOWBERRY SHRUBLAND**

IDENTIFIER: C EGL005890

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temperate cold-deciduous shrubland (III.B.2.N.a.)
Alliance	<i>Symphoricarpos albus</i> Shrubland Alliance (A.925)
Alliance (English name)	Common Snowberry Shrubland Alliance
Association	<i>Symphoricarpos albus</i> Shrubland
Association (English name)	Common Snowberry Shrubland

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Montane-Foothill Deciduous Shrubland (CES306.994)

ELEMENT CONCEPT

GLOBAL SUMMARY: The association is known from the west side of the Continental Divide in Glacier National Park. It is found primarily on flat to gentle benches with south aspects but may also occur on valley floors, alluvial terraces, ridges, and slopes. Most sites are situated on glacial-fluvial or till deposits between elevations of 1043 and 1129 m (3419-3700 feet). The soils tend to be well-drained silt, sand, or clay loams with a negligible percentage of various sized rocks. There is moderate cover of litter and duff, and low cover of wood and bare soil. This shrubland is characterized by the presence of *Symphoricarpos albus* throughout the shrub canopy layers. The height of this species is 1 m or less. Immature or browsed forms of *Salix scouleriana*, *Amelanchier alnifolia*, and *Prunus virginiana* are often present. Each has moderate constancy and low average cover. Other shrub species present are *Rosa woodsii*, *Spiraea betulifolia*, and *Mahonia repens*. The moderate to high (69% average cover) herbaceous layer is comprised of common forbs and graminoids, including *Symphyotrichum laeve* (= *Aster laevis*), *Galium boreale*, *Phleum pratense*, *Chamerion angustifolium*, *Fragaria virginiana*, *Lathyrus ochroleucus*, and *Achillea millefolium*. Each species has high constancy and less than 10% average cover.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This mesic shrubland is found primarily on flat to gentle benches with south aspects and may also occur on valley floors, alluvial terraces, ridges, and slopes. Most sites are situated on glacial-fluvial or till deposits between elevations of 1043 and 1129 m (3419-3700 feet). The soils tend to be well-drained silt, sand, or clay loams with a negligible percentage of various sized rocks. There is moderate cover of litter and duff, and low cover of wood and bare soil. Five of the seven stands sampled were previously disturbed in 1988 or 1996 by fire.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This shrubland is characterized by the presence of *Symphoricarpos albus* throughout the shrub canopy layers. The height of this species is 1 m or less. Immature or browsed forms of

Salix scouleriana, *Amelanchier alnifolia*, and *Prunus virginiana* are often present. Each has moderate constancy and low average cover. Other shrub species present are *Rosa woodsii*, *Spiraea betulifolia*, and *Mahonia repens*. The moderate to high (69% average cover) herbaceous layer is comprised of common forbs and graminoids, including *Symphyotrichum laeve* (= *Aster laevis*), *Galium boreale*, *Phleum pratense*, *Chamerion angustifolium*, *Fragaria virginiana*, *Lathyrus ochroleucus*, and *Achillea millefolium*. Each species has high constancy and less than 10% average cover.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i> , <i>Symphoricarpos albus</i>
Herb (field)	Dwarf-shrub	<i>Mahonia repens</i> , <i>Symphoricarpos albus</i>
Herb (field)	Forb	<i>Fragaria virginiana</i> , <i>Galium boreale</i> , <i>Symphyotrichum laeve</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Bromus inermis*, *Cirsium arvense*, *Medicago lupulina*, *Phleum pratense*, *Poa compressa*, *Taraxacum officinale*, *Tragopogon dubius*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4? (21-Jan-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association from Glacier National Park is very similar to *Symphoricarpos albus* - *Rosa nutkana* Shrubland (CEGL001130) of Idaho, Oregon and Washington. The western Montana occurrences are richer in shrubs species diversity, and have a higher abundance and somewhat different composition of herbaceous species. Further review of previous studies and data is needed to determine if these two associations should be merged.

GLOBAL SIMILAR ASSOCIATIONS:

- *Symphoricarpos albus* - *Rosa nutkana* Shrubland (CEGL001130)
- *Symphoricarpos occidentalis* Shrubland (CEGL001131)

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from the west side of the Continental Divide in Glacier National Park.

GLOBAL RANGE:

NATIONS: US

STATES/PROVINCES: MT:S4?

USFS ECOREGIONS: M333C:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2208, GLAC.2263, GLAC.2012, GLAC.2083, GLAC.2101, GLAC.2247, GLAC.2252.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Western Ecology Working Group n.d.

III.B.2.N.b. Subalpine or subpolar cold-deciduous shrubland

***Menziesia ferruginea* Shrubland Alliance**

***Menziesia ferruginea* / *Xerophyllum tenax* Shrubland FOOL'S-HUCKLEBERRY / BEAR-GRASS SHRUBLAND**

IDENTIFIER: C EGL005888

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Subalpine or subpolar cold-deciduous shrubland (III.B.2.N.b.)
Alliance	<i>Menziesia ferruginea</i> Shrubland Alliance (A.2633)
Alliance (English name)	Fool's-huckleberry Shrubland Alliance
Association	<i>Menziesia ferruginea</i> / <i>Xerophyllum tenax</i> Shrubland
Association (English name)	Fool's-huckleberry / Bear-grass Shrubland

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Subalpine Deciduous Shrubland (CES306.961)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is uncommon on both the east side of Glacier National Park in Montana and in Waterton Lakes National Park in Alberta. This is a mesic, subalpine association located on somewhat-steep to steep lowslopes and midslopes at elevations near 1850 m (6070 feet) on variable aspects. Soils are well-drained to rapidly drained loamy sands that are developed on colluvial landforms, including talus. Litter dominates the ground surface with 20-40% cover, although downed wood, exposed soil, and rock are also common. This cold-deciduous, low to moderately diverse shrubland is dominated by tall shrubs that have 20-80% cover and heights between 0.5-5 m. *Menziesia ferruginea* often dominates the shrub layer with 10-55% cover and is sometimes observed extending downslope in bands. Other common shrubs include *Vaccinium membranaceum*, *Lonicera utahensis*, and *Sorbus scopulina*. Other tall shrubs that may be present include *Rubus parviflorus*, *Acer glabrum*, *Amelanchier alnifolia*, and *Ribes lacustre*. Short- and dwarf-shrub cover is low, with *Spiraea betulifolia* and *Vaccinium myrtillus* sometimes present. Herbaceous cover ranges from 50-60% with heights from <0.5-1 m. *Xerophyllum tenax* and *Abies lasiocarpa* seedlings dominate this layer with 20-40% and 10-20% cover, respectively. *Veratrum viride* and *Arnica cordifolia* are also consistently common. *Chamerion angustifolium* and *Thalictrum occidentale* may also be present.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This mesic, subalpine association is located on somewhat-steep to steep lowslopes and midslopes at elevations near 1850 m (6070 feet) on variable aspects. Soils are well-drained to rapidly drained loamy sands that are developed on colluvial landforms, including talus. Litter dominates the ground surface with 20-40% cover, although downed wood, exposed soil, and rock are also common.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This cold-deciduous, low to moderately diverse shrubland is dominated by tall shrubs that have 20-80% cover and heights between 0.5-5 m. *Menziesia ferruginea* is often the dominant of the shrub layer with 10-55% cover and is sometimes observed extending downslope in bands. Other common shrubs include *Vaccinium membranaceum* with 10-15% cover, *Lonicera utahensis* and *Sorbus scopulina* each with 1-3% cover, and *Abies lasiocarpa* saplings that can take the form of tall shrubs or small trees with 10-15% cover. Other tall shrubs that may be present

include *Rubus parviflorus* with 20% cover and *Acer glabrum*, *Amelanchier alnifolia*, and *Ribes lacustre*, each with 3% cover. Short- and dwarf-shrub cover is low. *Spiraea betulifolia* is sometimes present in the short-shrub layer with 3% cover, and *Vaccinium myrtillus* may be found in the dwarf-shrub layer with 5% cover. Herbaceous cover ranges from 50-60% with heights from <0.5-1 m. *Xerophyllum tenax* and *Abies lasiocarpa* seedlings dominate this layer with 20-40% and 10-20% cover, respectively. *Veratrum viride* with 3-5% cover and *Arnica cordifolia* with 1-3% cover are also consistently common. *Chamerion angustifolium* and *Thalictrum occidentale*, each averaging 10% cover, may also be present. Additional forbs, grasses, and sedges provide only low cover.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree subcanopy	Needle-leaved tree	<i>Abies lasiocarpa</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Menziesia ferruginea</i> , <i>Rubus parviflorus</i> , <i>Vaccinium membranaceum</i>
Herb (field)	Forb	<i>Chamerion angustifolium</i> , <i>Thalictrum occidentale</i> , <i>Xerophyllum tenax</i>
Herb (field)	Other herbaceous	<i>Abies lasiocarpa</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Abies lasiocarpa*, *Arnica cordifolia*, *Lonicera utahensis*, *Menziesia ferruginea*, *Sorbus scopulina*, *Veratrum viride*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4 (20-Jan-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon on both the east side of Glacier National Park and in Waterton Lakes National Park. In Glacier National Park, it has been documented on subalpine, rocky slopes east of Logan Pass below the Going-To-The-Sun Road. In Waterton Lakes National Park, it has been located in the Bauerman Creek watershed at the HG1 ecosite.

GLOBAL RANGE: While currently documented only from the International Peace Park of Montana and Alberta, this shrubland is likely to be more widespread in the northern Rockies.

NATIONS: CA, US

STATES/PROVINCES: AB, ID?, MT:S3, WA?

USFS ECOREGIONS: M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.253, WATE.4109.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Western Ecology Working Group n.d.

Rubus parviflorus* Shrubland Alliance**Rubus parviflorus* / *Chamerion angustifolium* - *Heracleum maximum* Shrubland
THIMBLEBERRY / FIREWEED - COW-PARSNIP SHRUBLAND**

IDENTIFIER: C EGL001127

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Subalpine or subpolar cold-deciduous shrubland (III.B.2.N.b.)
Alliance	<i>Rubus parviflorus</i> Shrubland Alliance (A.931)
Alliance (English name)	Thimbleberry Shrubland Alliance
Association	<i>Rubus parviflorus</i> / <i>Chamerion angustifolium</i> - <i>Heracleum maximum</i> Shrubland
Association (English name)	Thimbleberry / Fireweed - Cow-parnsnip Shrubland

ECOLOGICAL SYSTEM(S): North Pacific Montane Shrubland (CES204.087)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is a subalpine shrubland association currently known from northwestern Montana, and from the north Cascades of western Washington. It occurs on toeslope, lowslope and midslope landforms with moderately steep to steep grades. It can be found at all aspects, and in northwestern Montana often occupies avalanche chutes and other areas where snow movement prohibits tree establishment or dislodges taller, established specimens. In the Cascades it is reported to occur below the timberline zone, on sites where the snow-free season is long, typically starting in April-May. Slopes are moderately to rapidly well-drained. In Glacier National Park elevations range from 1375-2010 m (4510-6593 feet). Parent material is derived from a variety of glacial substrates. Ground cover is primarily litter, with 1-25% rock of various sizes, and bare soil. This is a diverse, dense, shrubby meadow association. Total cover of the shrub layer ranges from 30% to well over 90%, and the herbaceous layer is equally abundant. The tall shrub *Rubus parviflorus* is dominant in most of these shrublands, with an average of 30-60% cover. Other tall shrubs can include *Spiraea betulifolia*, *Sorbus scopulina*, *Symphoricarpos albus*, *Acer glabrum*, *Lonicera* spp., *Ribes* spp., *Vaccinium* spp. *Prunus emarginata*, and *Sorbus sitchensis*; one or more of these may have moderate cover in some areas. Stunted, shrubby *Abies lasiocarpa*, *Abies amabilis*, or *Abies concolor* may be present. The forb component is often very diverse, and mesic forbs prevail. *Chamerion angustifolium* (= *Epilobium angustifolium*) was present in all plots, a good indicator of periodic disturbance that characterizes this association. Other common to abundant species include *Heracleum maximum*, *Pteridium aquilinum*, *Valeriana sitchensis*, *Veratrum viride*, *Thalictrum occidentale*, *Solidago canadensis*, *Erythronium grandiflorum*, *Artemisia ludoviciana*, *Osmorhiza occidentalis*, *Angelica arguta*, and *Galium triflorum*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This shrubland association occurs on toeslope, lowslope and midslope landforms with moderately steep to steep grades. It can be found at all aspects, and often occupies avalanche chutes and other areas where snow movement prohibits tree establishment or dislodges taller, established specimens. Slopes are moderately to rapidly well-drained, at elevations ranging from 1375-2010 m (4510-6593 feet). Parent material is derived from a variety of glacial substrates, including till and fluvial deposits, and colluvium. The association has also been documented on weathered-in-place sedimentary limestone. Soils are typically sandy loams or sandy clay loams exhibiting various degrees of development. In the plots sampled, most soil contained 30-50% gravel and cobbles. Ground cover is primarily litter, with 1-25% rock of various sizes, and bare soil.

GLOBAL ENVIRONMENT: This is a subalpine shrubland association occurring on toeslope, lowslope and midslope landforms with moderately steep to steep grades. It can be found at all aspects, and in northwestern Montana often occupies avalanche chutes and other areas where snow movement prohibits tree establishment or dislodges taller, established specimens. In the Cascades it is reported to occur below the timberline zone, on sites where the snow-free season is long, typically starting in April-May (Franklin and Dyrness 1973). Slopes are moderately to rapidly well-drained. In Glacier National Park elevations range from 1375-2010 m (4510-6593 feet). Parent material is derived from a variety of glacial substrates, including till and fluvial deposits, and colluvium. The association has also been documented on weathered-in-place sedimentary limestone. Soils are typically sandy loams or sandy clay loams exhibiting various degrees of development. In the stands sampled in Glacier National Park, most soil contained 30-50% gravel and cobbles. Ground cover is primarily litter, with 1-25% rock of various sizes, and bare soil.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The tall shrub *Rubus parviflorus* is dominant in most of these shrublands, with an average of 30-60% cover. Other tall shrubs, including *Prunus emarginata* and *Sorbus sitchensis*, may contribute high cover in some areas. Stunted, shrubby *Abies lasiocarpa* may be present. *Spiraea betulifolia* and *Symphoricarpos albus* are often present, with a cover of 10-25%. Total cover in the herbaceous layer ranges from 30-70%. Moist-site forbs prevail, with *Heracleum maximum*, *Osmorhiza occidentalis*, *Angelica arguta*, and *Galium triflorum* present in most plots. *Chamerion angustifolium* (= *Epilobium angustifolium*) was present in all plots, a good indicator of periodic disturbance that characterizes this association.

GLOBAL VEGETATION: This is a diverse, dense, shrubby meadow association. Douglas (1972) reports 70 species as occurring in the Cascadian examples, with an average of 32 per stand. Occurrences in northwestern Montana are equally as diverse and lush. Total cover of the shrub layer ranges from 30% to well over 90%, and the herbaceous layer is equally abundant. The tall shrub *Rubus parviflorus* is dominant in most of these shrublands, with an average of 30-60% cover. Other tall shrubs can include *Spiraea betulifolia*, *Sorbus scopulina*, *Symphoricarpos albus*, *Acer glabrum*, *Lonicera* spp., *Ribes* spp., *Vaccinium* spp. *Prunus emarginata*, and *Sorbus sitchensis*; one or more of these may have moderate cover in some areas. Stunted, shrubby *Abies lasiocarpa*, *Abies amabilis*, or *Abies concolor* may be present. The forb component is often very diverse, and mesic forbs prevail. *Chamerion angustifolium* (= *Epilobium angustifolium*) was present in all plots, a good indicator of periodic disturbance that characterizes this association. Other common to abundant species include *Heracleum maximum*, *Pteridium aquilinum*, *Valeriana sitchensis*, *Veratrum viride*, *Thalictrum occidentale*, *Solidago canadensis*, *Erythronium grandiflorum*, *Artemisia ludoviciana*, *Osmorhiza occidentalis*, *Angelica arguta*, and *Galium triflorum*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus parviflorus</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i> , <i>Symphoricarpos albus</i>
Herb (field)	Forb	<i>Chamerion angustifolium</i> , <i>Heracleum maximum</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus parviflorus</i>
Herb (field)	Forb	<i>Chamerion angustifolium</i> , <i>Heracleum maximum</i>
Herb (field)	Fern or fern ally	<i>Pteridium aquilinum</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Angelica arguta*, *Chamerion angustifolium*, *Heracleum maximum*, *Osmorhiza occidentalis*

GLOBAL: *Chamerion angustifolium*, *Rubus parviflorus*, *Valeriana sitchensis*, *Veratrum viride*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

- *Rubus parviflorus* - *Epilobium angustifolium* Community (Douglas 1972) =
- *Rubus parviflorus* - *Epilobium angustifolium* Community (Franklin and Dyrness 1973) =
- *Rubus parviflorus/Epilobium angustifolium* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:III.B.3.a. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This shrubland association is common east of the Continental Divide in Glacier National Park. It has been documented at various locations on slopes in the Two Medicine, St. Mary, Many Glacier and Waterton valleys. West of the Continental Divide this association has been documented near the divide at Logan Pass. There is no obvious reason why it has not been documented for Waterton Lakes National Park.

GLOBAL RANGE: This shrubby, subalpine meadow association is currently known from northwestern Montana in Glacier National Park, and from the north Cascades of western Washington. It is likely to occur in subalpine mountainous regions of much of the northern Rocky Mountains.

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S3, WA:S4

USFS ECOREGIONS: M242B:CC, M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier, Mount Rainier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.124, GLAC.142, GLAC.186, GLAC.2046, GLAC.220, GLAC.262, GLAC.299, GLAC.301, GLAC.328, GLAC.95.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Douglas 1972, Driscoll et al. 1984, Franklin and Dyrness 1973, WNHP unpubl. data, Western Ecology Working Group n.d.

***Vaccinium membranaceum* Shrubland Alliance**

***Vaccinium membranaceum* / *Xerophyllum tenax* Shrubland
SQUARE-TWIG BLUEBERRY / BEAR-GRASS SHRUBLAND**

IDENTIFIER: C EGL005891

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Subalpine or subpolar cold-deciduous shrubland (III.B.2.N.b.)
Alliance	<i>Vaccinium membranaceum</i> Shrubland Alliance (A.2632)
Alliance (English name)	Square-twig Blueberry Shrubland Alliance
Association	<i>Vaccinium membranaceum</i> / <i>Xerophyllum tenax</i> Shrubland
Association (English name)	Square-twig Blueberry / Bear-grass Shrubland

ECOLOGICAL SYSTEM(S): North Pacific Montane Shrubland (CES204.087)
Northern Rocky Mountain Subalpine Deciduous Shrubland (CES306.961)

ELEMENT CONCEPT

GLOBAL SUMMARY: This community type is found throughout Glacier National Park in Montana and is also documented from a single record for Waterton Lakes National Park, Alberta. This dwarf-shrubland occurs in small to large patches at mid to upper subalpine elevations, from 1600 to 2020 m (5250-6630 feet). It is found primarily on steep (to 70%), southeast- through south- to southwest-facing slopes. Topographic situation is variable and includes all slope positions, but upper slopes and slope shoulders are quite commonly represented. It develops on both calcareous and noncalcareous substrates, usually red and green argillites. Soils are moderately to well-drained with loamy textures predominating. The litter layer is nearly continuous. This vegetation type is largely interpreted to be an early-seral expression of burned subalpine forests, usually those potentially dominated by *Abies lasiocarpa* and *Picea engelmannii*. Variable combinations of *Abies lasiocarpa*, *Picea engelmannii*, and *Pinus contorta* are common in the seedling and sapling size classes. The shrub layer dominant *Vaccinium membranaceum* averages 35% cover (10-80%). Other shrubs of high constancy include *Paxistima myrsinites*, *Spiraea betulifolia*, and *Sorbus scopulina*; *Rubus parviflorus* is present in lower elevation plots and low coverage of *Vaccinium scoparium* (or *Vaccinium myrtillus*) is characteristic of higher elevation sites. *Xerophyllum tenax* almost invariably dominates the forb layer, averaging 40% cover. *Carex geyeri* and *Luzula glabrata* have high constancy. The remainder of the forb component varies depending on moisture status, with *Valeriana sitchensis*, *Veratrum viride*, *Erigeron peregrinus*, and *Eucephalus engelmannii* being regularly present in moister sites. Increaser species such as *Arnica cordifolia*, *Arnica latifolia*, *Chamerion angustifolium* (= *Epilobium angustifolium*) and *Erythronium grandiflorum* are present across the range of sites.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This dwarf-shrubland occurs in small to large patches at mid to upper subalpine elevations, from 1600 to 2020 m (5250-6630 feet). It is found primarily on steep (to 70%), southeast- through south- to southwest-facing slopes. Topographic situation is variable and includes all slope positions, but upper slopes and slope shoulders are quite commonly represented. It develops on both calcareous and noncalcareous substrates, usually red and green argillites. Soils are moderately to well-drained with loamy textures predominating. The litter layer is nearly continuous with only 20% exposed rock in the most extreme cases (and no soil exposed).

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This vegetation type is largely interpreted to be an early-seral, but not infrequently long-persisting, expression of burned subalpine forests, usually those potentially dominated by *Abies lasiocarpa* and *Picea engelmannii* (though often *Pseudotsuga menziesii*-, *Larix occidentalis*- or *Pinus contorta*-dominated at the time of burning). It is quite common to find stumps and log remains as much as 50 years following fire. Variable combinations of *Abies lasiocarpa*, *Picea engelmannii*, and *Pinus contorta* are common in the seedling and sapling size classes. In the highest elevation examples of the type, *Pinus albicaulis* is found very scattered; these sites are potentially woodland, but their shrub and herbaceous vegetation differs little from the lower elevation expressions. The shrub layer dominant *Vaccinium membranaceum*, which averages 35% cover (10-80%) and usually thought of as a mid-sized shrub (>0.5 m tall), is, as a result of site severity (southerly exposures, partial loss of soil mantle), a dwarf-shrub in at least half the stands examined (average height 0.45 m). Other shrubs of high constancy, but whose cover seldom exceeds 5%, include *Paxistima myrsinites*, *Spiraea betulifolia*, and *Sorbus scopulina*; *Rubus parviflorus* is present in lower elevation plots, and low coverage of *Vaccinium scoparium* (or *Vaccinium myrtillus*) is characteristic of higher elevation sites. *Carex geyeri* and *Luzula glabrata* have high constancy, but only *Carex geyeri* is present with greater than 5% cover (up to 30%). *Xerophyllum tenax* almost invariably dominates the forb layer, averaging 40% cover (1-75% range); the remainder of the forb component varies depending on moisture status, with *Valeriana sitchensis*, *Veratrum viride*, *Erigeron peregrinus*, and *Eucephalus engelmannii* being regularly present in moister sites. Increaser species, such as *Arnica cordifolia*, *Arnica latifolia*, *Chamerion angustifolium* (= *Epilobium angustifolium*) and *Erythronium grandiflorum*, are present across the range of sites.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Needle-leaved tree	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus parviflorus</i> , <i>Sorbus scopulina</i>
Herb (field)	Dwarf-shrub	<i>Spiraea betulifolia</i> , <i>Vaccinium membranaceum</i> , <i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Arnica cordifolia</i> , <i>Chamerion angustifolium</i> , <i>Erythronium grandiflorum</i> , <i>Xerophyllum tenax</i>
Herb (field)	Graminoid	<i>Carex geyeri</i> , <i>Luzula glabrata</i> var. <i>hitchcockii</i>

Global

Stratum

Lifeform

Species

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Xerophyllum tenax*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Pinus albicaulis*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3? (21-Jan-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: Damm (2001) classified several plots having appreciable amounts (>10%) of *Vaccinium membranaceum* and *Xerophyllum tenax* into his *Xerophyllum tenax* vegetation type; these plots were reallocated to this type.

GLOBAL COMMENTS: Henderson (1973) reports a *Vaccinium membranaceum* / *Xerophyllum tenax* community type in his dichotomous key, occurring in the north Cascades in Mount Rainier National Park. However, he does not present any descriptions or data to substantiate his type. He does report, however, that the occurrence of his *Vaccinium membranaceum* / *Xerophyllum tenax* community is tied to fire history, occurring as an early-successional, post-fire community (Henderson 1973). It is likely that the association reported here for Glacier National Park is synonymous with Henderson's.

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

- *Xerophylletum tenacis* Association (Damm 2001) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This community type is found throughout Glacier National Park. The only immediately obvious reason why this type would not be equally abundant in Waterton Lakes is a difference in fire regime or intensity of burns.

GLOBAL RANGE:

NATIONS: CA?, US

STATES/PROVINCES: AB:SU, ID?, MT:S3?, WA

USFS ECOREGIONS: M333B:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2003, GLAC.2004, GLAC.2038, GLAC.2050, GLAC.249, GLAC.259, GLAC.269, GLAC.327, CD595, CD596, CD521, CD594.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Damm 2001, Henderson 1973, Western Ecology Working Group n.d.

III.B.2.N.d. Temporarily flooded cold-deciduous shrubland

Alnus incana* Temporarily Flooded Shrubland Alliance**Alnus incana* / *Calamagrostis canadensis* Shrubland
SPECKLED ALDER / BLUEJOINT SHRUBLAND****IDENTIFIER: C EGL001143****NVC Classification**

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
Alliance	<i>Alnus incana</i> Temporarily Flooded Shrubland Alliance (A.950)
Alliance (English name)	Speckled Alder Temporarily Flooded Shrubland Alliance
Association	<i>Alnus incana</i> / <i>Calamagrostis canadensis</i> Shrubland
Association (English name)	Speckled Alder / Bluejoint Shrubland

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)**ELEMENT CONCEPT**

GLOBAL SUMMARY: Preliminary data suggest that this type occurs on lower depositional bars along montane streams of moderate gradient (0.8%) at elevations of around 2620 m (8600 feet). Sites are probably flooded anywhere from yearly to every ten years. Soils are reported as loamy Mollic Fluvaquents, reflecting the grassy dominance. This type is characterized by an open canopy of *Alnus incana* ssp. *tenuifolia*, and a grassy herbaceous layer dominated by *Calamagrostis canadensis* with *Glyceria striata* (= *Glyceria elata*) or *Glyceria striata* as well-represented to abundant associates. In the herbaceous layer an additional 22 native wetland indicators have been recorded for the type, of which the most abundant are *Carex microptera*, *Carex stipata*, *Equisetum arvense*, *Equisetum laevigatum*, *Heracleum maximum*, *Rudbeckia laciniata*, *Veratrum californicum*, and *Viola missouriensis*.

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:** Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This lone IPP representative of the type occurs at 1525 m (5010 feet) elevation on sandy alluvium of a relatively youthful, ostensibly subirrigated bench, somewhat removed from the streambank (flooded in only exceptional high water years).

GLOBAL ENVIRONMENT:**VEGETATION DESCRIPTION**

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The incomplete global description makes comparison of the IPP stand moot, but almost certainly the IPP example is out of character with the notable presence of tree species, including *Abies lasiocarpa*, *Pseudotsuga menziesii*, *Pinus contorta*, and *Populus balsamifera* ssp. *trichocarpa*. The tall- and mid-shrub layers contribute at least 50% canopy cover with the most prevalent species being *Alnus incana*, *Alnus viridis* ssp. *sinuata*, *Cornus sericea*, *Ribes lacustre*, and *Salix drummondiana*. The herbaceous layer is dominated by *Calamagrostis canadensis*; other moist- to wet-site indicators include *Angelica arguta*, *Athyrium filix-femina*, *Heracleum maximum*, and *Urtica dioica*.

GLOBAL VEGETATION:**MOST ABUNDANT SPECIES****WATERTON-GLACIER INTERNATIONAL PEACE PARK**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Alnus incana</i> , <i>Alnus viridis</i> ssp. <i>sinuata</i>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES**WATERTON-GLACIER INTERNATIONAL PEACE PARK:** *Calamagrostis canadensis*, *Heracleum maximum***GLOBAL:**

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3Q (23-Feb-1994).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: The IPP stand representing this type and that designated as *Alnus incana* / *Cornus sericea* Shrubland (CEGL001145) are quite similar in composition and environment, the biggest difference being that the *Calamagrostis canadensis* site is dominated in the undergrowth by said species and is associated with lotic, rather than lentic, waters. The key to IPP vegetation types attributed greater indicator value to significant cover of *Calamagrostis canadensis* as opposed to that of *Cornus sericea*. This approach was taken because regional vegetative keys (Hansen et al. 1995) to various tree-dominated types have consistently taken the same approach. However, it is instructive to note that Hansen et al. (1995), with more than 50 plots representing *Alnus incana*-characterized plots, more than half of which have *Cornus sericea* exhibiting an average cover of 20% and slightly more than a quarter with *Calamagrostis canadensis* with an average cover of 30% and a appreciable overlap of plots having significant amounts of both species; they could find no pattern of environmental descriptors associated with floristic differences that would permit recognition of distinct types within the *Alnus incana* plots.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Alnus incana* / *Cornus sericea* Shrubland (CEGL001145)
- *Alnus incana* / Mesic Graminoids Shrubland (CEGL001148)

GLOBAL RELATED CONCEPTS:

- *Alnus incana* / *Calamagrostis canadensis* (Crowe and Clausnitzer 1997) =
- *Alnus incana* / *Calamagrostis canadensis* Association (Kovalchik 1993) =
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

OTHER COMMENTS

OTHER COMMENTS: Tree population structure indicates that at least some percentage of stands of this type will develop into other vegetation types characterized by this component.

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association has been documented only from the westside (of the Continental Divide), but there are no apparent reasons (floristic or environmental) that it could not occur on the eastside as well.

GLOBAL RANGE: This association is found in the Pecos basin in north-central New Mexico, as well as in Colorado, Montana, Oregon, and Washington.

NATIONS: US

STATES/PROVINCES: CO, ID, MT:S3, NM:S1?, OR:S1, WA:S2, WY

USFS ECOREGIONS: M332:C, M333:C

FEDERAL LANDS: NPS (Glacier); USFS (Hells Canyon, Wallowa-Whitman)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.B248.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: CONHP unpubl. data 2003, Crowe and Clausnitzer 1997, Driscoll et al. 1984, Hansen et al. 1995, IDCDC 2005, Jones 1992b, Kagan et al. 2000, Kovalchik 1993, MTNHP 2002b, Muldavin et al. 2000a, Western Ecology Working Group n.d.

Alnus incana / *Cornus sericea* Shrubland

SPECKLED ALDER / RED-OSIER DOGWOOD SHRUBLAND

IDENTIFIER: C EGL001145

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
Alliance	<i>Alnus incana</i> Temporarily Flooded Shrubland Alliance (A.950)
Alliance (English name)	Speckled Alder Temporarily Flooded Shrubland Alliance
Association	<i>Alnus incana</i> / <i>Cornus sericea</i> Shrubland
Association (English name)	Speckled Alder / Red-osier Dogwood Shrubland

ECOLOGICAL SYSTEM(S): Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland (CES304.045)
North Pacific Montane Riparian Woodland and Shrubland (CES204.866)
Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

ELEMENT CONCEPT

GLOBAL SUMMARY: This riparian, tall-shrub association is present throughout Idaho and Montana, eastern Oregon and Washington, and the mountains of Colorado. It is considered a minor type throughout Utah and north-northeastern Nevada and is largely restricted to the higher, more northerly mountains of California. This type is predominantly present in narrow V-shaped canyons between 1219 and 2438 m (4000-8000 feet) elevation on gentle undulating, low to moderate-height terraces of various aspects. Stands primarily occupy streambanks but may also be found on floodplains and alluvial bars. Soils are of a sandy loam formed by fluvial deposits. *Alnus incana* dominates the low tree overstory with a dense shrub layer of *Cornus sericea*. Common shrubs usually intermixed within this layer include *Amelanchier alnifolia*, *Lonicera involucrata*, *Ribes hudsonianum*, *Rosa* spp., *Salix* spp., and *Symphoricarpos oreophilus*. The density of the shrub layer determines the presence of the herbaceous understory. When present, common species include *Agrostis stolonifera*, *Angelica arguta*, *Calamagrostis canadensis*, *Equisetum arvense*, *Galium* spp. and *Maianthemum stellatum* (= *Smilacina stellata*).

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: The sole stand documenting this association occurs in a palustrine, valley floor setting at 1070 m (3510 feet) elevation. The substrate is high in organics and subirrigated by an adjacent water body, the water level of which exhibits marked seasonal fluctuations. This stands environment somewhat expands the described parameters of the type.

GLOBAL ENVIRONMENT: It is predominantly present in narrow V-shaped canyons between 1219 and 2438 m (4000-8000 feet) elevation on gentle undulating, low to moderate-height terraces of various aspects. Stands primarily occupy streambanks but may also be found on floodplains and alluvial bars. Soils are of a sandy loam formed by fluvial deposits.

In New Mexico, this community is a major riparian shrubland that occurs in narrow valleys and canyons of mountainous regions along moderate-sized streams. It occurs at upper elevations ranging from 2350 to 2690 m (7725-8825 feet). Typically, it occurs along banks of bedrock-controlled, moderate-gradient streams (0.8 to 2%) that alternate between rapids and deep pools that are created by bedrock and large boulders and cobbles that line the riverbed and banks. Depositional features are limited through steeper reaches, but vegetated bars and terraces can develop to a limited extent as the river channel cuts through wider canyons and the gradient flattens. Small overflow channels can dissect the larger bars. Sites are frequently flooded, commonly on a yearly basis up to five years. Woody debris carried by high-energy flows often become lodged among boulders, the streambanks, or on bars. Alluvial sediments are generally very coarse and sandy, and soils are characterized by coarse-loamy layers over sandy layers, with deeper skeletal layers of cobbles and gravel. The soil matrix may have as much as 80% rock fragment. Soils may at some point in the season be dry at the surface but tend to be moist at shallow depths and through the top 10 to 50 cm (4-20 inches) of the soil profile during most years.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This stand is fairly consistent with the global description with *Alnus incana* and *Crataegus douglasii* dominating (60% combined cover) the tall-shrub stratum; however, the presence of *Picea engelmannii* is considerable in the reproductive layer and scattered as an immature canopy component. Shrubs with a mesic to hydric affinity are numerous, including in declining order of cover *Cornus sericea*, *Lonicera involucrata*, *Rhamnus*

alnifolia, *Ribes lacustre*, and *Ribes hudsonianum*. *Glyceria striata* strongly dominates the herbaceous layer and is accompanied by other wet-site herbs, including *Carex disperma*, *Galium triflorum*, *Geum macrophyllum*, *Equisetum arvense*, and *Equisetum fluviatile*.

GLOBAL VEGETATION: In this type *Alnus incana* ssp. *tenuifolia* forms dense shrubby thickets with canopies from 50 to 90% cover or more, and heights of 3 to 5 m (9-15 feet). Stands are codominated by *Cornus sericea* ssp. *sericea*, a shorter thicket-forming shrub that often sprawls among other shrubs. Young *Populus angustifolia* or *Picea pungens* may be present, but mature trees are infrequent. *Salix* spp. may be present, but they usually are poorly represented. Other common associated shrubs include *Lonicera involucrata*, *Ribes inerme*, *Ribes lacustre*, *Rubus deliciosus*, *Rosa woodsii*, *Rubus idaeus* ssp. *strigosus* (= *Rubus strigosus*), and *Salix exigua*. A well-developed and diverse herbaceous layer can be present beneath the shrub canopy (over 90 herbaceous species have been recorded for the type). Native forbs are more consistently represented than graminoids and include 24 wetland indicators. These include *Aconitum columbianum*, *Symphotrichum foliaceum* (= *Aster foliaceus*), *Epilobium ciliatum*, *Equisetum arvense*, *Equisetum laevigatum*, *Geum macrophyllum*, *Heracleum maximum*, *Maianthemum stellatum*, *Mertensia franciscana*, *Oxypolis fendleri*, *Prunella vulgaris*, *Ranunculus inamoenus*, and *Rudbeckia laciniata*. Exotic grasses such as *Agrostis gigantea*, *Poa palustris*, or *Lolium pratense* (= *Festuca pratensis*) are often abundant invaders of the undergrowth.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Alnus incana</i> ssp. <i>tenuifolia</i> , <i>Cornus sericea</i>
Herb (field)	Graminoid	<i>Glyceria striata</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Alnus incana</i> ssp. <i>tenuifolia</i> , <i>Cornus sericea</i>
Herb (field)	Forb	<i>Aconitum columbianum</i> , <i>Geum macrophyllum</i> , <i>Heracleum maximum</i> , <i>Rudbeckia laciniata</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Alnus incana* ssp. *tenuifolia*, *Cornus sericea*, *Geum macrophyllum*, *Glyceria striata*, *Lonicera involucrata*, *Picea engelmannii*

GLOBAL: *Aconitum columbianum*, *Alnus incana* ssp. *tenuifolia*, *Cornus sericea*, *Geum macrophyllum*, *Heracleum maximum*, *Rudbeckia laciniata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4 (24-Feb-2004). This is a widespread riparian association found in narrow V-shaped canyons throughout Idaho, eastern Oregon and Washington, and western Colorado. It is considered a minor type throughout Utah and north-northeastern Nevada and is largely restricted to the higher, more northerly mountains of California. It primarily occurs on gentle undulating streambanks of various aspects but may also be found on floodplains and alluvial bars. Soils are of a sandy loam formed by fluvial deposits. Approximately 50 stands have been sampled throughout the range of the association, however, the estimated total number of extant stands is higher. A primary threat to the viability of these stands is the alteration of stream hydrology due to excess of sedimentation from outside of the system. Excess sedimentation can be a result of road construction, cutbanks, livestock trailing, clubbing, and grazing, and other miscellaneous activities leading to erosion. The introduction of exotic species and noxious weeds is also an increasing threat and concern in these occurrences.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: The verifying stand for this type exhibits sufficient *Pinus engelmannii* cover, especially the reproductive layer, to speculate the stand will ultimately become a wet-site *Pinus engelmannii*-characterized type, possibly *Picea engelmannii* / *Carex disperma* Forest (CEGL000358) or *Picea engelmannii* / *Cornus sericea* Woodland (CEGL002677). There are a number of *Alnus incana*-characterized associations, including *Alnus incana* / *Athyrium filix-femina* Shrubland (CEGL002628), *Alnus incana* / *Calamagrostis canadensis* Shrubland (CEGL001143), *Alnus incana* / *Cornus sericea* Shrubland (CEGL001145), and *Alnus incana* Shrubland (CEGL001141), that seem to be superficially to substantially different floristically, but they appear to not differ in any appreciable, or even ostensibly trivial, manner regarding their environmental

parameters. In the Glacier National Park example documenting this type, *Glyceria striata* strongly dominates the undergrowth, which would be typical of *Alnus incana* / *Calamagrostis canadensis* Shrubland (CEGL001143), which also occurs on sites that are subirrigated and saturated to the surface. Perhaps a more intensive environmental characterization is required to differentiate the associations.

GLOBAL COMMENTS: Vegetation overhangs the banks somewhat, providing valuable cover for fish habitat. The type relies on an intact hydrological regime for reproduction, growth, and maintenance. Seasonally high water tables allow continued reproduction of the alders and dogwood and associated shrubs and herbs. Minimal recreation and livestock disturbance maintain the biodiversity and good condition of the community. Severe alterations of stream hydrology or upland conditions can contribute to loss of valuable habitat.

Adjacent floodplains can be very narrow along the river. The coniferous tree *Picea pungens* becomes more dominant at upper elevations and mixes with *Alnus incana* ssp. *tenuifolia* on the streambanks. In wider valleys at lower elevations, *Populus angustifolia* becomes more prevalent and will dominate higher and drier terraces. In these stands, shrubs generally decrease, although junipers or introduced grasses from nearby hay meadows increase. Uplands are typically dominated by mixed coniferous forests of spruce and fir on cooler north-facing aspects or *Pinus ponderosa* on drier slopes.

This type is reported from all the western states except Arizona and described in detail for the Rocky Mountains by Kittel and Lederer (1993), Kittel et al. (1995, 1996), Manning and Padgett (1995), Muldavin et al. (1993a), and Padgett et al. (1989). Hansen et al. (1990) describe a major *Alnus incana* community type that is present throughout Montana in which *Cornus sericea* (= *Cornus stolonifera*) has an average cover of 15% in half of a 60-plot sample.

GLOBAL SIMILAR ASSOCIATIONS:

- *Alnus incana* / *Athyrium filix-femina* Shrubland (CEGL002628)
- *Alnus incana* / *Calamagrostis canadensis* Shrubland (CEGL001143)

GLOBAL RELATED CONCEPTS:

- *Alnus incana* - *Cornus stolonifera* / Mesic Forb (Crowe and Clausnitzer 1997) =
- *Alnus incana* / *Cornus sericea* Community Type (Manning and Padgett 1995) =
- *Alnus incana* / *Cornus sericea* Community Type (Padgett et al. 1989) =
- *Alnus incana* / *Cornus stolonifera* Community Type (Tuhy and Jensen 1982) =
- *Alnus incana* ssp. *tenuifolia* / *Swida sericea* Plant Association (Komarkova 1986) =
- *Alnus incana*/ *Cornus sericea* (Bourgeron and Engelking 1994) =
- *Alnus incana* / Mesic Forb Association (Kovalchik 1993) =
- *Alnus incana* Community Type (Hansen et al. 1995) I
- *Alnus incana* ssp. *tenuifolia* - *Cornus sericea* Shrubland (Carsey et al. 2003a) =
- *Alnus incana* ssp. *tenuifolia* / *Swida sericea* Plant Association (Johnston 1987) =
- *Cornus stolonifera* Association (Kovalchik 1993) I
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B
- Thinleaf alder-red-osier dogwood (*Alnus incana* ssp. *tenuifolia*-*Cornus sericea*) Plant Association (Kittel et al. 1999a) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association has been documented only from the westside (of the Continental Divide), but there are no ostensible reason (floristic or environmental) that it could not occur on the eastside as well.

GLOBAL RANGE: This tall-shrub association is widely distributed in the western United States and is present throughout Idaho, Montana, eastern Oregon and Washington, western Colorado (one occurrence east of the Continental Divide), California (northern half of state), New Mexico (from the upper watersheds of the Pecos, Little Colorado, and Rio Grande in northern New Mexico), and is considered a minor type throughout Utah and north-northeastern Nevada.

NATIONS: US

STATES/PROVINCES: CA:S2?, CO:S3, ID:S3, MT:S3S4, NM:S3S4, NV, OR:S3, UT:S2S3, WA:S3, WY

USFS ECOREGIONS: 311:C, 331I:CC, 342B:CC, 342C:CC, 342D:CC, M242C:CC, M261A:CC, M261D:CC, M261E:CC, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332E:CC, M332F:CC, M332G:CC

FEDERAL LANDS: NPS (Curecanti, Glacier); USFS (Medicine Bow, San Juan, Shoshone)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.D18.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: E. Muldavin et al., mod. K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Cooper and Cottrell 1990, Crowe and Clausnitzer 1997, Driscoll et al. 1984, Durkin et al. 1994b, Hansen et al. 1990, Hansen et al. 1995, IDCDC 2005, Johnston 1987, Jones 1992b, Kagan et al. 2000, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1996, Kittel et al. 1999a, Kittel et al. 1999b, Komarkova 1986, Kovalchik 1993, MTNHP 2002b, Manning and Padgett 1995, Muldavin et al. 1993a, Muldavin et al. 2000a, NVNHP 2003, Padgett et al. 1988b, Padgett et al. 1989, Richard et al. 1996, Tuhy and Jensen 1982, Western Ecology Working Group n.d., Youngblood et al. 1985a

***Alnus incana* Shrubland**
SPECKLED ALDER SHRUBLAND

IDENTIFIER: C EGL001141

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
Alliance	<i>Alnus incana</i> Temporarily Flooded Shrubland Alliance (A.950)
Alliance (English name)	Speckled Alder Temporarily Flooded Shrubland Alliance
Association	<i>Alnus incana</i> Shrubland
Association (English name)	Speckled Alder Shrubland

ECOLOGICAL SYSTEM(S): North Pacific Montane Riparian Woodland and Shrubland (CES204.866)
 Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

ELEMENT CONCEPT

GLOBAL SUMMARY:

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT:

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION:

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Global		
<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: GNRQ (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

- *Alnus incana* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE:

GLOBAL RANGE:

NATIONS: US

STATES/PROVINCES: CA:S3S4, ID:S3, MT:S3, UT:S3, WA:S3S4, WY:S3

USFS ECOREGIONS: M242C:CC, M261A:CC, M261B:CC, M261C:CC, M261D:CC, M261E:CC, M331A:CC, M331B:CC, M331D:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS:

LOCAL DESCRIPTION AUTHORS:

GLOBAL DESCRIPTION AUTHORS:

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Evans 1989a, Hansen et al. 1990, Hansen et al. 1991, Hansen et al. 1995, IDCDC 2005, Jones 1992b, MTNHP 2002b, WNHP unpubl. data, Western Ecology Working Group n.d.

***Alnus viridis* ssp. *sinuata* Temporarily Flooded Shrubland Alliance**

***Alnus viridis* ssp. *sinuata* / *Athyrium filix-femina* - *Cinna latifolia* Shrubland
SITKA ALDER / COMMON LADYFERN - SLENDER WOODREED SHRUBLAND**

IDENTIFIER: C EGL001156

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
Alliance	<i>Alnus viridis</i> ssp. <i>sinuata</i> Temporarily Flooded Shrubland Alliance (A.966)
Alliance (English name)	Sitka Alder Temporarily Flooded Shrubland Alliance
Association	<i>Alnus viridis</i> ssp. <i>sinuata</i> / <i>Athyrium filix-femina</i> - <i>Cinna latifolia</i> Shrubland
Association (English name)	Sitka Alder / Common Ladyfern - Slender Woodreed Shrubland

ECOLOGICAL SYSTEM(S): North Pacific Montane Riparian Woodland and Shrubland (CES204.866)
Northern Rocky Mountain Avalanche Chute Shrubland (CES306.801)
Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is found in cool and moist mountainous regions between about 1022-1837 m (3350-6012 feet) elevation, ranging from northern California, along the eastern slope of the Cascades to southern British Columbia, through northeastern Oregon, Washington and Montana and north into the Canadian Rockies. It usually occurs as narrow stringers in moderate to steep, V-shaped valleys in areas of deep or long-lasting snowpacks. Such habitats include floodplains and streambanks of small streams (orders 1 and 2), avalanche chutes, and occasionally springs. These areas often flood during snowmelt and remain wet throughout the summer. Soils vary, but are typically thin silt or sandy loams over alluvial cobble and gravel. *Alnus viridis ssp. sinuata* forms dense, 3- to 5-m tall thickets with 60 to nearly 100% cover, but less dense stands are also known. Conifers, especially *Abies grandis* and *Picea engelmannii*, are sometimes present and may indicate a successional trend toward conifer-dominated associations. Periodic severe flood or avalanche disturbance may be necessary for maintaining the long-term dominance of *Alnus viridis ssp. sinuata*. The only understory shrubs with greater than 50% constancy (but usually low cover), are *Ribes* spp. (*Ribes hudsonianum* or *Ribes lacustre*), *Salix drummondiana*, and *Rubus parviflorus*. *Athyrium filix-femina*, 30-90 cm tall, is always present in the understory, typically with 20-80% cover, while another fern, *Gymnocarpium dryopteris*, is sometimes subdominant. *Cinna latifolia* is often present, but averages only 5% cover (and less than *Athyrium filix-femina*). Tall forbs, most commonly *Maianthemum stellatum*, *Senecio triangularis*, *Chamerion angustifolium*, *Prosartes* spp. (= *Disporum* spp.), and *Streptopus amplexifolius*, have high constancy but usually have less than 10% cover, although they can occasionally be quite abundant, with as much as 50% canopy cover. A lush ground layer composed of species including, but not limited to, *Boykinia major*, *Circaea alpina*, *Claytonia cordifolia*, *Galium triflorum*, and *Mitella* spp., is often present beneath the taller *Athyrium filix-femina* canopy.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is known from steep draws, ravines, and avalanche chutes on low to middle slopes of glacial troughs and mountain stream valleys. Elevation ranges from 1441 to 1837 m (4725-6012 feet). Stands have a variety of soil types, from well-developed loam found on well-drained glacial till to poorly developed sandy and gravelly loam found on rapidly drained colluvial deposits. Most stands are disturbed by snow avalanching.

GLOBAL ENVIRONMENT: This association is apparently limited to moist, mid- to high-elevation mountainous areas with deep or long-lasting snowpacks between about 1022-1837 m (3350-6012 feet) elevation (Crowe and Clausnitzer 1997, Crowe et al. 2002). In these areas the association most frequently develops as narrow stringers in moderate to steep, V-shaped valleys along small streams (orders 1 and 2) and avalanche chutes. Although sediments must remain stable and moist enough to support initial establishment of both *Alnus viridis ssp. sinuata* and *Athyrium filix-femina* (Crowe and Clausnitzer 1997), the association may need periodic severe flood or avalanche disturbance to reduce tree invasion and maintain *Alnus viridis ssp. sinuata* dominance (Hansen et al. 1995, MTNHP 2002). *Alnus viridis ssp. sinuata* readily sprouts after severe disturbance and is long-lived.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This association is characterized by a tall-shrub overstory of variable height with a shorter shrub understory composed of species such as *Ribes lacustre*, *Alnus viridis ssp. sinuata*, *Rubus parviflorus*, and *Vaccinium membranaceum*. *Alnus viridis ssp. sinuata* clearly dominates the shrub canopy with an average cover of 68%. *Salix drummondiana* can be abundant (20-30% cover) on very steep slopes that are very wet. In another example, *Oplopanax horridus* dominates with *Alnus viridis ssp. sinuata* and *Athyrium filix-femina* in one avalanche chute, but is absent in the other stands sampled. *Athyrium filix-femina* can be quite patchy, forming dense mats in some areas. Its cover ranges from 10 to 20%, but in some stands it is less abundant compared to other forbs, such as *Chamerion angustifolium* and *Prosartes* species (= *Disporum* species). These latter two species each have a range of cover from 1 to 50%, and each appear in at least 50% of stands. The only graminoid of significance is *Elymus glaucus*, with 10% cover but low constancy. Mosses are nearly absent, and the ground cover is primarily litter and duff.

GLOBAL VEGETATION: *Alnus viridis ssp. sinuata* forms dense, 3- to 5-m tall, thickets with 60% to nearly 100% cover, but less dense stands are also known. Conifers, especially *Abies grandis* and *Picea engelmannii*, are sometimes present and may indicate a successional trend toward conifer-dominated associations. Periodic severe flood or avalanche disturbance may be necessary for maintaining the long-term dominance of *Alnus viridis ssp. sinuata*. The only understory shrubs with greater than 50% constancy (but usually low cover), are *Ribes* spp. (*Ribes hudsonianum* or *Ribes lacustre*) and *Rubus parviflorus*. *Athyrium filix-femina*, 30-90 cm tall, is always present in the understory, typically with 20-80% cover, while another fern, *Gymnocarpium dryopteris*, is sometimes subdominant. *Cinna latifolia* is often present, but averages only 5% cover (and less than *Athyrium filix-femina*). Tall forbs, most commonly *Maianthemum stellatum*, *Senecio triangularis*, and *Streptopus amplexifolius*, have high constancy but usually have less than 10% cover each. A lush forb ground layer composed of species including, but not limited to, *Boykinia major*, *Circaea alpina*, *Claytonia cordifolia*, *Galium triflorum*, and *Mitella* spp., is often present beneath the taller *Athyrium filix-femina* canopy.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

Stratum

Tall shrub/sapling
 Short shrub/sapling
 Herb (field)
 Herb (field)
 Herb (field)

Lifeform

Broad-leaved deciduous tree
 Broad-leaved deciduous shrub
 Forb
 Graminoid
 Fern or fern ally

Species

Alnus viridis ssp. *sinuata*, *Salix drummondiana*
Oplopanax horridus, *Rubus parviflorus*
Chamerion angustifolium
Elymus glaucus
Athyrium filix-femina

Global**Stratum**

Tall shrub/sapling
 Herb (field)
 Herb (field)
 Herb (field)

Lifeform

Broad-leaved deciduous tree
 Forb
 Graminoid
 Fern or fern ally

Species

Alnus viridis ssp. *sinuata*
Maianthemum stellatum, *Streptopus amplexifolius*
Cinna latifolia
Athyrium filix-femina, *Gymnocarpium dryopteris*

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Alnus viridis* ssp. *sinuata*, *Athyrium filix-femina*, *Galium triflorum*, *Ribes lacustre*, *Sambucus racemosa*, *Vaccinium membranaceum*, *Veratrum viride*

GLOBAL: *Alnus viridis* ssp. *sinuata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Agrostis stolonifera*, *Poa palustris*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (18-Oct-2002). This association is a wide-ranging but irregularly distributed association. It mostly occurs as small patches in relatively steep drainages and avalanche chutes of higher elevation moist climatic zones with deep snowpacks. The association is relatively abundant, currently known from at least 67 plots in eastern Washington, eastern Oregon, central and northern Idaho, northwestern Montana, and elsewhere. Much potential habitat for the type has not yet been inventoried in the rugged mountains and wilderness of southeastern British Columbia, northwestern Montana, central Idaho, and Cascade Range. It is likely that more occurrences of this association exist in these areas. *Alnus viridis* ssp. *sinuata* is a resilient resprouting species, and this association may be maintained by periodic severe disturbances including avalanches and floods. Few significant threats to this association have been documented. Due to the tendency of *Alnus viridis* ssp. *sinuata* to form impenetrable thickets, as well as the association's occurrence in rugged and steep terrain, livestock grazing, human recreation, and other threats are minimal. Exotic species rarely occur within this association. For these reasons, revising the rank from G3G4 to G4 is warranted.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association is a well-documented type known from 64 quantitative plots: 14 plots sampled in northeastern Oregon (Crowe and Clausnitzer 1997, Crowe et al. 2002), approximately 38 plots from eastern Washington (Wooten and Morrison 1995, Kovalchik 2001, WANHP 2002), and 12 plots in central and northern Idaho (IDCDC 2002). Several plots included in the more general *Alnus viridis* ssp. *sinuata* community type sampled by Hansen et al. (1995) in northwestern Montana are likely synonymous with this association. Stands are known from Glacier National Park, Montana, but the total number of occurrences is not known (MTNHP 2002). *Cinna latifolia* is not present in this community in Montana and rarely has over 10% cover in stands throughout its range. In stands with sparsely vegetated understories, *Athyrium filix-femina* can have low cover, but it remains the dominant understory species. The following three associations are similar but have yet to be incorporated into the National Vegetation Classification. The related, but distinct *Alnus viridis* ssp. *sinuata* / *Cinna latifolia* (Crowe and Clausnitzer 1997, Crowe et al. 2002) and *Alnus viridis* ssp. *sinuata* / *Gymnocarpium dryopteris* (Kovalchik 2001), which are distinguished by having 100% constancy and moderate cover of their respective diagnostic understory species, but only trace to low cover of *Athyrium filix-femina*. The *Alnus viridis* ssp. *sinuata* / *Rubus spectabilis* / *Athyrium filix-femina* association (Diaz and Mellon 1996, Murray 2000, Kovalchik 2001) apparently ranges from the eastern slope of the Cascades west to the Pacific coast and is distinguished by having moderate to high cover and constancy of *Rubus spectabilis*. If *Oplopanax horridus* is present with moderate cover, the stand is classified as *Alnus viridis* ssp. *sinuata* / *Oplopanax horridus* Shrubland (CEGL001157) (Kovalchik 2001). [SVC sees very little, if any, environmental distinction between ALNVIR/ATHFIL and ALNVIR/MESIC and only the slightest compositional distinction, mostly ATHFIL present with modest cover or not; this may be the case for trying to adopt a type defined elsewhere to local circumstances; recognizing both types does no real "harm," but it is probably an inconsequential distinction.]

GLOBAL SIMILAR ASSOCIATIONS:

- *Acer glabrum* Avalanche Chute Shrubland (CEGL001061)
- *Alnus viridis* ssp. *sinuata* / Mesic Forbs Shrubland (CEGL002633)
- *Alnus viridis* ssp. *sinuata* / *Oplopanax horridus* Shrubland (CEGL001157)--if *Oplopanax horridus* is present with moderate cover.

GLOBAL RELATED CONCEPTS:

- *Alnus viridis* ssp. *sinuata* / *Rubus spectabilis* / *Athyrium filix-femina* association (Diaz and Mellen 1996) ?
- *Alnus viridis* ssp. *sinuata* / *Rubus spectabilis* / *Athyrium filix-femina* association (Kovalchik 2001) ?
- *Alnus sinuata* / *Athyrium filix-femina* (Crowe and Clausnitzer 1997) =
- *Alnus sinuata* / *Athyrium filix-femina* Association (Kovalchik 1993) =
- *Alnus sinuata* / *Cinna latifolia* (Crowe and Clausnitzer 1997) =
- *Alnus sinuata* / *Cinna latifolia* association (Crowe et al. 2002) ?
- *Alnus sinuata*/ *Athyrium filix-femina* (Bourgeron and Engelking 1994) =
- *Alnus viridis* ssp. *sinuata* / *Gymnocarpium dryopteris* association (Kovalchik 2001) ?
- *Alnus viridis* ssp. *sinuata* community type (Hansen et al. 1995) B
- *Alnus viridis* ssp. *sinuata* / *Rubus spectabilis* / *Athyrium filix-femina* (Murray 2000) ?
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is found at middle elevations east of the Continental Divide. It is known from mountain slopes and high-gradient streams within several large drainages in the northern half of Glacier National Park, including Waterton valley, Many Glacier, and St. Mary.

GLOBAL RANGE: This association is known from moist, mid elevations in the inland Pacific Northwest. It is documented in Oregon, Idaho, Washington, British Columbia, Montana, and California.

NATIONS: CA?, US

STATES/PROVINCES: BC?, CA:S2?, ID:S2, MT, OR:S3?, WA:S3

USFS ECOREGIONS: M242C:CC, M261A:CC, M332A:CC, M332G:CC, M333A:CC, M333B:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); USFS (Hells Canyon, Umatilla, Wallowa-Whitman)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.101, GLAC.143, GLAC.2049, GLAC.208, GLAC.263, GLAC.324.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: C. Murphy, mod. G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Clearwater National Forest unpubl. data 1999, Crowe and Clausnitzer 1997, Crowe et al. 2002, Diaz and Mellen 1996, Driscoll et al. 1984, Hansen et al. 1995, IDCDC 2005, IDCDC unpubl. data 2002, Idaho Panhandle National Forest unpubl. data 1999, Kagan et al. 2000, Kovalchik 1993, Kovalchik 2001, MTNHP 2002b, MTNHP unpubl. data 2002a, Murray 2000, Nez Perce National Forest unpubl. data 1999a, Nez Perce National Forest unpubl. data 1999b, ORNHP unpubl. data, Sawyer and Keeler-Wolf 1995, Seyer 1984, WNHP unpubl. data 2002, Western Ecology Working Group n.d., Wooten and Morrison 1995

***Alnus viridis* ssp. *sinuata* / Mesic Forbs Shrubland**

SITKA ALDER / MESIC FORBS SHRUBLAND

IDENTIFIER: CEGL002633

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
Alliance	<i>Alnus viridis</i> ssp. <i>sinuata</i> Temporarily Flooded Shrubland Alliance (A.966)

Alliance (English name) Sitka Alder Temporarily Flooded Shrubland Alliance

Association *Alnus viridis* ssp. *sinuata* / Mesic Forbs Shrubland

Association (English name) Sitka Alder / Mesic Forbs Shrubland

ECOLOGICAL SYSTEM(S): Columbia Basin Foothill Riparian Woodland and Shrubland (CES304.768)
Northern Rocky Mountain Avalanche Chute Shrubland (CES306.801)

ELEMENT CONCEPT

GLOBAL SUMMARY: This deciduous shrubland is located in moderate to high-elevation (1200-3000 m) riparian habitats of the northern Rocky Mountains and Cascade Range where deep snow accumulations are common. They usually occur in low-gradient creek drainages, on midslope avalanche chutes, in cirque basins, and in relatively steep drainages, all of which flood from spring snowmelt or summer rainstorms. The wet soils and frequent fluvial disturbance act to discourage colonization by coniferous trees and allow full sunlight to reach the ground at these sites. Soils are often well-drained colluvial or glacial-fluvial deposits, generally sandy loam to clay loam over sorted gravels and sands. A dense tall-shrub cover of *Alnus viridis* ssp. *sinuata* characterizes this vegetation. *Acer circinatum*, *Alnus incana*, *Sambucus racemosa*, or *Salix drummondiana* may be codominant in the tall-shrub layer. *Acer glabrum*, *Ribes lacustre*, *Sorbus scopulina*, and *Menziesia ferruginea* may also be present. In the northern Rocky Mountains, *Abies lasiocarpa* colonizes these communities, and scattered seedlings or saplings may be present. Low cold-deciduous or ericaceous shrubs may be abundant, including *Rubus spectabilis*, *Rubus parviflorus*, *Sambucus racemosa*, *Paxistima myrsinites*, and *Vaccinium* spp. A lush herbaceous layer is usually present, characterized by a high diversity of low-abundance tall mesic forbs, including *Aconitum columbianum*, *Achillea millefolium*, *Heracleum maximum* (= *Heracleum lanatum*), *Veratrum viride*, *Senecio triangularis*, *Prosartes* spp. (= *Disporum* spp.), *Urtica dioica*, and *Osmorhiza berteroi* (= *Osmorhiza chilensis*). Graminoids are generally uncommon.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is known from elevations ranging from 1166 to 2016 m (3822-6611 feet). It is found along low-gradient creek drainages that are seasonally flooded, on midslope avalanche chutes, and in cirque basins. Ninety percent of the sampled stands occur on well-drained colluvial or glacial-fluvial deposits, the rest occur on sedimentary substrates. With the exception of one stand with clay loam soil, the association occurs on sandy loam soil, which varies from dark brown with thick duff to light tan mixed with gravel.

GLOBAL ENVIRONMENT: This deciduous shrubland is located in moderate to high-elevation (1200-3000 m) riparian habitats of the northern Rocky Mountains and Cascade Range where deep snow accumulations are common. They usually occur in low-gradient creek drainages, on midslope avalanche chutes, in cirque basins, and in relatively steep drainages, all of which flood from spring snowmelt or summer rainstorms. The wet soils and frequent fluvial disturbance act to discourage colonization by coniferous trees and allow full sunlight to reach the ground at these sites. Soils are often well-drained colluvial or glacial-fluvial deposits, generally sandy loam to clay loam over sorted gravels and sands.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: *Alnus viridis* ssp. *sinuata* clearly dominates this association but is found in a diverse shrub mix that often includes *Sambucus racemosa* and *Salix drummondiana* in the tall-shrub canopy and *Ribes lacustre*, *Rubus parviflorus* and *Menziesia ferruginea* in the short-shrub layer. While *Alnus viridis* ssp. *sinuata* has an average cover of 65%, the other characteristic species range from 5 to 18% average cover. The herbaceous layer is characterized by a high diversity of low-abundance tall mesic forbs. Typically, tall mesic forbs such as *Prosartes* spp. (= *Disporum* spp.), *Senecio triangularis*, *Thalictrum occidentale*, and *Urtica dioica* contribute to a fairly conspicuous forb layer with each species averaging up to 11% cover. *Galium triflorum* and, less commonly, *Circaea alpina* and *Viola canadensis* contribute to a low forb layer. Graminoids are uncommon in all stands. In most stands, ground cover is up to 75% litter, and mosses are present with less than 20% cover.

GLOBAL VEGETATION: A dense tall-shrub cover of *Alnus viridis* ssp. *sinuata* characterizes this vegetation. *Acer circinatum*, *Alnus incana*, *Sambucus racemosa*, or *Salix drummondiana* may be codominant in the tall-shrub layer. *Acer glabrum*, *Ribes lacustre*, *Sorbus scopulina*, and *Menziesia ferruginea* may also be present. In the northern Rocky Mountains, *Abies lasiocarpa* colonizes these communities, and scattered seedlings or saplings may be present. Low cold-deciduous or ericaceous shrubs may be abundant, including *Rubus spectabilis*, *Rubus parviflorus*, *Sambucus racemosa*, *Paxistima myrsinites*, and *Vaccinium* spp. A lush herbaceous layer is usually present, characterized by a high diversity of low-abundance tall mesic forbs, including *Aconitum columbianum*, *Achillea millefolium*, *Heracleum maximum* (= *Heracleum lanatum*), *Veratrum viride*, *Senecio triangularis*, *Prosartes* spp. (= *Disporum* spp.), *Urtica dioica*, and *Osmorhiza berteroi* (= *Osmorhiza chilensis*). Graminoids are generally uncommon.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Alnus viridis</i> ssp. <i>sinuata</i> , <i>Salix drummondiana</i>

Short shrub/sapling Herb (field)	Broad-leaved deciduous shrub Forb	<i>Menziesia ferruginea</i> , <i>Ribes lacustre</i> , <i>Rubus parviflorus</i> <i>Circaea alpina</i> , <i>Senecio triangularis</i> , <i>Urtica dioica</i> , <i>Viola canadensis</i>
Herb (field)	Graminoid	<i>Bromus vulgaris</i>
Global Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Acer circinatum</i> , <i>Alnus incana</i> , <i>Alnus viridis</i> ssp. <i>sinuata</i> , <i>Salix drummondiana</i>
Tall shrub/sapling Herb (field)	Broad-leaved deciduous shrub Forb	<i>Sambucus racemosa</i> <i>Achillea millefolium</i> , <i>Aconitum columbianum</i> , <i>Heracleum maximum</i> , <i>Osmorhiza berteroi</i> , <i>Senecio triangularis</i> , <i>Urtica dioica</i> , <i>Veratrum viride</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Actaea rubra*, *Alnus viridis* ssp. *sinuata*, *Galium triflorum*, *Ribes lacustre*, *Rubus parviflorus*, *Sambucus racemosa*, *Senecio triangularis*

GLOBAL: *Achillea millefolium*, *Aconitum columbianum*, *Alnus viridis* ssp. *sinuata*, *Heracleum maximum*, *Senecio triangularis*, *Urtica dioica*, *Veratrum viride*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: [SVC sees very little, if any, environmental distinction between ALNVIR/ATHFIL and ALNVIR/MESIC and only the slightest compositional distinction, mostly ATHFIL present with modest cover or not; this may be the case for trying to adopt a type defined elsewhere to local circumstances; recognizing both types does no real "harm," but it is probably an inconsequential distinction.]

GLOBAL SIMILAR ASSOCIATIONS:

- *Acer glabrum* Avalanche Chute Shrubland (CEGL001061)
- *Alnus viridis* ssp. *sinuata* / *Athyrium filix-femina* - *Cinna latifolia* Shrubland (CEGL001156)

GLOBAL RELATED CONCEPTS:

- *Alnus sinuata* / Mesic Forb (Crowe and Clausnitzer 1997) =
- *Alnus sinuata*/Mesic forb (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is known from low- to high-elevation mountainsides and basins in a wide variety of drainages throughout the IPP. In Glacier National Park, the association is in the Logan Creek drainage, within the Two Medicine valley, on the lower slopes of Mt. Cannon, and within the Goat Haunt area. In Waterton Lakes National Park, the association is found in the Cameron Creek and Bertha Creek drainages.

GLOBAL RANGE: This deciduous shrubland is located in moderate to high-elevation (1200-3000 m) riparian and avalanche chute habitats of the northern Rocky Mountains of Montana and Alberta, as well as the Cascade Range of Washington.

NATIONS: CA, US

STATES/PROVINCES: AB, ID?, MT, OR, WA:S3S4

USFS ECOREGIONS: M332C:CC, M333A:CC, M333B:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.17, GLAC.2032, GLAC.2050, GLAC.2063, GLAC.221, GLAC.223, GLAC.272, GLAC.297, WATE.9005, WATE.9006.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Crowe and Clausnitzer 1997, Driscoll et al. 1984, IDCDC 2005, Kovalchik 1993, Western Ecology Working Group n.d.

Cornus sericea* Temporarily Flooded Shrubland Alliance**Cornus sericea* Shrubland****RED-OSIER DOGWOOD SHRUBLAND**

IDENTIFIER: C EGL001165

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
Alliance	<i>Cornus sericea</i> Temporarily Flooded Shrubland Alliance (A.968)
Alliance (English name)	Red-osier Dogwood Temporarily Flooded Shrubland Alliance
Association	<i>Cornus sericea</i> Shrubland
Association (English name)	Red-osier Dogwood Shrubland

ECOLOGICAL SYSTEM(S): Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland (CES304.045)
North Pacific Shrub Swamp (CES204.865)
North Pacific Lowland Riparian Forest and Shrubland (CES204.869)
Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)
Western Great Plains Wooded Draw and Ravine (CES303.680)

ELEMENT CONCEPT

GLOBAL SUMMARY: This riparian tall shrubland is widespread in the Columbia Basin, the Intermountain Basin, and in the Rocky Mountains, and is discontinuously scattered in sheltered areas of the Colorado Plateau. It often forms continuous, narrow bands along streambanks, benches and bars, as well as in slot canyons. Many stands are located on nearly level, frequently flooded banks, in burns in steep avalanche chutes, or otherwise experience periodic disturbance. It also can form very dense, small stands with limited disturbance, often at the base of a cliff. Soils are relatively deep, well-drained silty to sandy clay loams derived from alluvium, colluvium or glacial till. Elevations range from 715 to 2700 m (2300-8800 feet), with the lower elevations occurring at the northern end of the range in Montana, the higher elevations in Utah and Colorado. The tall (1-2 m) deciduous shrub canopy is dominated by *Cornus sericea*, generally accompanied by other tall shrubs, including *Prunus virginiana*, *Ribes aureum*, *Crataegus douglasii*, *Acer glabrum*, *Alnus incana*, *Salix bebbiana*, *Salix scouleriana*, *Cercocarpus ledifolius*, and *Juniperus scopulorum*. Short shrubs have sparse to moderate cover and include *Rosa woodsii*, *Symphoricarpos* spp., *Paxistima myrsinites*, *Mahonia repens*, *Arctostaphylos patula*, *Ribes cereum*, and the liana *Clematis ligusticifolia*. The understory is diverse and ranges from sparse to dense depending on how closed the tall-shrub layer is. Common forbs include *Thalictrum occidentale*, *Solidago canadensis*, *Aralia nudicaulis*, *Heracleum maximum*, *Heliomeris multiflora*, *Erythronium grandiflorum*, *Equisetum arvense*, *Maianthemum stellatum*, *Sanicula marilandica*, *Angelica arguta*, and *Symphyotrichum laeve* (= *Aster laevis*). Graminoids are generally less important but may include significant cover by *Elymus glaucus* or *Calamagrostis canadensis*. The majority of the herbaceous layer may consist of non-native species, including *Cirsium arvense*, *Dactylis glomerata*, *Agrostis stolonifera*, *Poa palustris*, *Phalaris arundinacea*, and *Phleum pratense*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This montane, mesic association is located on flat low-level areas to steep slopes at variable aspects. It occurs within low-level riparian and floodplain areas at low elevations and on wet, rocky slopes at higher elevations, typically in avalanche chutes and adjacent to streambeds. Elevations range from 1100 to 1646

m (3600-5400 feet). Soil textures are moderately well- to well-drained loams or sandy clay loams developed on glacial, fluvial or colluvial landforms. Litter dominates the ground surface with 40-90% cover, although downed wood, large rock, and moss may also be common. Water may be temporarily present in the lower elevation areas as some stands within this type can be intermittently flooded. One of the sampled areas burned in the 1988 Red Bench Fire.

GLOBAL ENVIRONMENT: This tall shrubland association occurs as a narrow stringer adjacent to stream channels, near seeps on moist toeslopes of canyon walls, on narrow benches in ravines, narrow terraces of wider valleys, as well as floodplains. Stands have been documented in the Columbia Basin, the Great Basin, throughout the lower elevations of the Rocky Mountains, and in sheltered riparian areas of the Colorado Plateau. Elevations range from 715 m (3600 feet) near the Canadian border in Montana to 2700 m (8800 feet) in southern Utah and Colorado. Stands may occur on nearly level riparian sites or on steep, wet, rocky slopes or at the base of cliffs. Rocks and litter often cover most of the unvegetated surface. The soils are generally derived from glacial till, alluvium or colluvium and are often sandy loams or clay loams.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Tall shrubs dominate the vegetation with 40-90% cover and heights ranging from 1-5 m. *Cornus sericea* is the dominant tall shrub with 10-60% cover, although *Acer glabrum* may appear to be codominant in some areas with 5-25% cover. One sampled stand also had 60% cover of *Crataegus douglasii*. *Rubus parviflorus*, *Amelanchier alnifolia*, *Sorbus scopulina*, *Rubus idaeus*, and *Salix scouleriana* are consistently present with trace to 5% cover. *Alnus incana*, *Prunus virginiana*, and *Salix bebbiana* may be present with 2-3% cover. Short-shrub cover ranges from 10-30% with heights between 0.5-1 m. *Symphoricarpos albus* is most consistently present with 3-10% cover. *Rosa woodsii*, *Lonicera involucrata*, and *Vaccinium membranaceum* may sometimes be present with conspicuous cover. *Spiraea betulifolia*, *Paxistima myrsinites*, and *Mahonia repens*, all dwarf-shrubs, are also sometimes present with 1-3% cover. Finally, scattered tree species may be present within these stands. These are typically pole-sized trees that measure 2-10 m in height, but some trees can reach 15-20 m. Tree cover in some stands may be 5-10% and include cover from *Pseudotsuga menziesii*, *Abies lasiocarpa*, *Populus balsamifera ssp. trichocarpa*, and *Populus tremuloides*. These species, in addition to *Picea engelmannii* and *Pinus contorta*, can also periodically occur as tall shrubs and seedlings within this type.

Overall herbaceous cover ranges from 20-80% with heights from less than 0.5 to 1 m. High-constancy forbs include *Thalictrum occidentale*, *Solidago canadensis*, *Galium triflorum*, *Heracleum maximum*, *Angelica arguta*, *Carex geyeri*, *Prosartes hookeri*, and *Symphyotrichum laeve* (= *Aster laevis*), although cover of these species is generally only 1-4%. Herbaceous species that are sometimes present with higher cover include a mix of native and non-native plants. Non-native species include *Cirsium arvense* and *Dactylis glomerata* with average 30% cover, and *Agrostis stolonifera*, *Poa palustris*, *Phalaris arundinacea*, *Poa pratensis*, *Elymus repens*, and *Phleum pratense* with an average of 10% or less cover. Other native forbs that may be present with conspicuous cover include *Viola canadensis*, *Urtica dioica*, *Canadanthus modestus*, *Chamerion angustifolium*, *Fragaria virginiana*, *Elymus glaucus*, *Festuca subulata*, *Aralia nudicaulis*, *Erythronium grandiflorum*, *Athyrium filix-femina*, and *Sanicula marilandica* with an average 3-5% cover. Nonvascular cover is also generally low.

GLOBAL VEGETATION: This shrubland can be a pure stand of impenetrable *Cornus sericea* or more open with several other shrub species. Typically *Cornus sericea* is the dominant shrub; other shrubs commonly present include *Prunus virginiana*, *Crataegus douglasii*, *Acer glabrum*, *Alnus incana*, *Ribes aureum*, *Salix bebbiana*, *Salix scouleriana*, *Cercocarpus ledifolius*, and *Juniperus scopulorum*. Short shrubs have sparse to moderate cover and include *Rosa woodsii*, *Symphoricarpos oreophilus*, *Symphoricarpos albus*, *Paxistima myrsinites*, *Mahonia repens*, *Arctostaphylos patula*, and *Ribes cereum*. The understory is diverse and ranges from sparse to dense depending on how closed the tall-shrub layer is. Total vegetation cover is rarely less than 75% and often exceeds 100%. Some stands are dominated by *Heracleum maximum*, others by *Equisetum arvense*, and others by *Maianthemum stellatum* with other forbs, such as *Thalictrum occidentale*, *Solidago canadensis*, *Aralia nudicaulis*, *Heliomeris multiflora*, *Erythronium grandiflorum*, *Sanicula marilandica*, *Angelica arguta*, and *Symphyotrichum laeve* (= *Aster laevis*). Graminoids are generally less important but may include significant cover by *Elymus glaucus* or *Calamagrostis canadensis*. The majority of the herbaceous layer may consist of non-native species, including *Cirsium arvense*, *Dactylis glomerata*, *Agrostis stolonifera*, *Poa palustris*, *Phalaris arundinacea*, and *Phleum pratense*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Cornus sericea</i> , <i>Crataegus douglasii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rosa woodsii</i> , <i>Symphoricarpos albus</i>
Herb (field)	Forb	<i>Cirsium arvense</i> , <i>Thalictrum occidentale</i> , <i>Viola canadensis</i>
Herb (field)	Graminoid	<i>Agrostis stolonifera</i> , <i>Dactylis glomerata</i> , <i>Phalaris arundinacea</i> , <i>Poa palustris</i>

Global

Stratum

Tall shrub/sapling

Lifeform

Broad-leaved deciduous shrub

Species

Cornus sericea

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Angelica arguta*, *Cornus sericea*, *Rosa woodsii*, *Solidago canadensis*, *Symphoricarpos albus*, *Symphotrichum laeve*

GLOBAL: *Clematis ligusticifolia*, *Cornus sericea*, *Maianthemum stellatum*, *Mentha arvensis*, *Rosa woodsii*, *Salix exigua*, *Urtica dioica*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Elymus repens*, *Linaria vulgaris*, *Medicago lupulina*, *Phleum pratense*, *Poa pratensis*, *Taraxacum officinale*, *Trifolium pratense*

GLOBAL: *Agrostis stolonifera*, *Cirsium arvense*, *Dactylis glomerata*, *Linaria vulgaris*, *Medicago lupulina*, *Phalaris arundinacea*, *Phleum pratense*, *Poa pratensis*, *Taraxacum officinale*, *Trifolium pratense*

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4Q (27-Apr-2000).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association appears to be a broadly defined type that may be split in the future as more information becomes available. As such it is low-confidence. All references are surprising similar in their acceptance of variability within this type.

GLOBAL SIMILAR ASSOCIATIONS:

- *Cornus sericea* / *Galium triflorum* Shrubland (CEGL001166)
- *Cornus sericea* / *Heracleum maximum* Shrubland (CEGL001167)

GLOBAL RELATED CONCEPTS:

- *Cornus sericea* / *Heracleum lanatum* Community Type (Youngblood et al. 1985a) =
- *Cornus sericea* / *Heracleum lanatum* Community Type (Padgett et al. 1989) =
- *Cornus sericea* (Kittel et al. 1999b) =
- *Cornus sericea* (Bourgeron and Engelking 1994) =
- *Cornus sericea* Association (Crawford 2003) =
- *Cornus sericea* Community Type (Manning and Padgett 1995) =
- *Cornus sericea* Community Type (Hansen et al. 1988b) =
- *Cornus sericea* Plant Association (Jankovsky-Jones et al. 2001) =
- *Cornus sericea* Shrubland (Carsey et al. 2003a) =
- *Cornus sericea* ssp. *sericea* Association (Crowe et al. 2004) =
- *Cornus stolonifera* / *Saxifraga arguta* (Crowe and Clausnitzer 1997) =
- *Cornus stolonifera* Association (Diaz and Mellen 1996) =
- *Cornus stolonifera* Flood Site Association (MacKenzie and Moran 2004) B
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B
- Red-osier dogwood (*Cornus sericea*) Plant Association (Kittel et al. 1999a) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: Although this association is not very common throughout Glacier National Park, it can be found on both sides of the Continental Divide on both low-elevation floodplain and riparian areas and higher rocky slopes. It has been documented along the North Fork of the Flathead River just north of the Polebridge Ranger Station and near Coal Creek along the outer North Fork Road in the North Fork subdistrict, within a riparian area north of Avalanche Creek and east of Trout Lake in the Lake McDonald subdistrict, and finally east of Glens Lake in the Belly River subdistrict.

GLOBAL RANGE: This is a widespread western riparian shrubland that is documented by plot data in Washington, Oregon, Idaho, Nevada, Utah, Montana, Wyoming and Colorado.

NATIONS: US

STATES/PROVINCES: CO:S3, ID:S3, MT:S3, NV, OR:S4, UT, WA:S2S4, WY

USFS ECOREGIONS: 331D:CC, 341B:CC, M331A:CC, M331D:CC, M331E:CC, M331G:CC, M331H:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M333B:CC, M333C:CC, M333D:CC, M341B:CC

FEDERAL LANDS: NPS (Canyonlands, Capitol Reef, Curecanti, Glacier, Grand Teton); USFS (Bighorn, Columbia River Gorge, Gifford Pinchot, Malheur, Mount Hood, San Juan, Umatilla, Wallowa-Whitman)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2102, GLAC.2507, AAGL.887, AAGL.888, AAGL.C93, AAGL.D259.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: G. Kittel, mod. J. Coles

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Crawford 2001, Crawford 2003, Crowe and Clausnitzer 1997, Crowe et al. 2004, Diaz and Mellen 1996, Driscoll et al. 1984, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995, IDCDC 2005, Jankovsky-Jones et al. 2001, Jones 1992b, Jones and Ogle 2000, Kagan et al. 2000, Kittel et al. 1994, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1993, MTNHP 2002b, MacKenzie and Moran 2004, Manning and Padgett 1995, NVNHP 2003, Padgett et al. 1989, WNHP unpubl. data, Western Ecology Working Group n.d., Youngblood et al. 1985a

***Crataegus (douglasii, succulenta)* Temporarily Flooded Shrubland Alliance**

***Crataegus douglasii* - (*Crataegus chrysocarpa*) Shrubland BLACK HAWTHORN - (GOLDEN-FRUIT HAWTHORN) SHRUBLAND**

IDENTIFIER: CEG001093

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
Alliance	<i>Crataegus (douglasii, succulenta)</i> Temporarily Flooded Shrubland Alliance (A.954)
Alliance (English name)	(Black Hawthorn, Fleshy Hawthorn) Temporarily Flooded Shrubland Alliance
Association	<i>Crataegus douglasii</i> - (<i>Crataegus chrysocarpa</i>) Shrubland
Association (English name)	Black Hawthorn - (Golden-fruit Hawthorn) Shrubland

ECOLOGICAL SYSTEM(S): Western Great Plains Wooded Draw and Ravine (CES303.680)

ELEMENT CONCEPT

GLOBAL SUMMARY: This black hawthorn shrubland occurs in the northwestern Great Plains and edges of the Black Hills of the United States. The stands grow in mesic draws and on higher surfaces of streamside riparian areas in the plains and foothills. Stands of this type are nearly impenetrable thickets of hawthorns and other tall shrubs (to about 2.5 m) growing above low or medium-height (about 0.7 m), often patchy shrub layers of *Symphoricarpos occidentalis* and *Symphoricarpos albus*, and patchy herbaceous layers of graminoids. The herbaceous layer, present in stands with patchy shrub layers, usually consists of exotic species (*Bromus inermis*, *Poa pratensis*, *Phleum pratense*, *Cirsium arvense*), although several native species (*Carex sprengei*, *Elymus glaucus*, *Elymus virginicus*, *Elymus trachycaulus* ssp. *trachycaulus*, *Galium boreale*, *Galium aparine*, *Galium triflorum*) often are present and may have constituted the original understories.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT:

GLOBAL ENVIRONMENT: Stands of this type grow in mesic draws (Hansen et al. 1995, Thilenius et al. 1995, WYNDD unpubl. data) and on higher surfaces in streamside riparian areas (Hansen et al. 1995).

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION:

GLOBAL VEGETATION: *Crataegus douglasii* or *Crataegus succulenta* (= *Crataegus columbiana* var. *occidentalis*), either alone or together, dominate or codominate the tall (to ca. 2.5 m) shrub layer, which includes a substantial amount of *Prunus virginiana* and may include substantial amounts of *Amelanchier alnifolia* and *Prunus americana*. *Viburnum lentago* may be present. This tall-shrub layer often is so thick as to be all but impenetrable, but it may contain openings. A low to medium-height shrub layer (typically ca. 0.8 m tall) dominated by *Symphoricarpos occidentalis* or *Symphoricarpos albus*, is present in stands with patchy tall-shrub layers, with the lower shrub growing beneath the openings in the taller shrub canopy. The herbaceous layer, present in stands with patchy shrub layers, usually consists of exotic species (*Bromus inermis*, *Poa pratensis*, *Phleum pratense*, *Cirsium arvense*), although several native species (*Carex sprengelii*, *Elymus glaucus*, *Elymus virginicus*, *Elymus trachycaulus* ssp. *trachycaulus*, *Galium boreale*, *Galium aparine*, *Galium triflorum*) often are present and may have constituted the original understories. Herbaceous species are sparse beneath dense shrub overstories.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2Q (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: The role of *Crataegus chrysocarpa* in this type is not clear.

GLOBAL SIMILAR ASSOCIATIONS:

- (*Populus tremuloides*) / *Crataegus douglasii* / *Heracleum maximum* Shrubland (CEGL001094)--(Daubenmire 1970) Stands of both associations (plus *Crataegus douglasii* / *Symphoricarpos albus* Shrubland (CEGL001096)) have tall-shrub layers in which *Crataegus douglasii* and *Amelanchier alnifolia* may be major species; medium-height shrub layers with substantial amounts of *Prunus virginiana*, *Rosa* spp., and (in most stands) *Symphoricarpos albus*; and herbaceous understories with the exotic *Poa pratensis* as a major species. *Crataegus douglasii* - (*Crataegus chrysocarpa*) Shrubland (CEGL001093) differs in that stands of this type have *Crataegus succulenta* (= *Crataegus columbiana* var. *occidentalis*) as a dominant or codominant species in the tall-shrub layer; *Symphoricarpos occidentalis* as a major species in the medium-height shrub layer and *Ribes* spp. in that layer; and (often) *Carex sprengelii* as a major understory species.
- (*Populus tremuloides*) / *Crataegus douglasii* / *Symphoricarpos albus* Shrubland (CEGL001096)--(Daubenmire 1970) Stands of both associations (plus *Crataegus douglasii* / *Heracleum maximum* Shrubland (CEGL001094)) have tall-shrub layers in which *Crataegus douglasii* and *Amelanchier alnifolia* may be major species; medium-height shrub layers with substantial amounts of *Prunus virginiana*, *Rosa* spp., and (in most stands) *Symphoricarpos albus*; and herbaceous understories with the exotic *Poa pratensis* as a major species. *Crataegus douglasii* - (*Crataegus chrysocarpa*) Shrubland (CEGL001093) differs in that stands of this type have *Crataegus succulenta* (= *Crataegus columbiana* var. *occidentalis*) as a dominant or codominant species in the tall-shrub layer; *Symphoricarpos occidentalis* as a major species in the medium-height shrub layer and *Ribes* spp. in that layer; and (often) *Carex sprengelii* as a major understory species.
- *Crataegus douglasii* / *Rosa woodsii* Shrubland (CEGL001095)--(from Idaho). The relationship between the 2 types is unclear.

GLOBAL RELATED CONCEPTS:

- *Crataegus douglasii* (Bourgeron and Engelking 1994) =
- *Crataegus erythropoda* - *Prunus virginiana* vegetation type (Thilenius et al. 1995) =
- *Crataegus succulenta* community type (Hansen et al. 1995) B
- DRISCOLL FORMATION CODE:III.B.3.a. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE:

GLOBAL RANGE: This black hawthorn shrubland occurs in the northwestern Great Plains and edges of the Black Hills of the United States, ranging from Montana to western South Dakota.

NATIONS: US

STATES/PROVINCES: MT:S2, SD, WY?

USFS ECOREGIONS: 331D:CC, 331G:CC, M332B:CC, M332C:CC, M332D:CC, M333B:CC, M333D:CC, M334A:CC

FEDERAL LANDS: NPS (Glacier); USFS (Black Hills)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS:

LOCAL DESCRIPTION AUTHORS:

GLOBAL DESCRIPTION AUTHORS: G.P. Jones

REFERENCES: Bourgeron and Engelking 1994, Daubenmire 1970, Driscoll et al. 1984, Dusek 1980, Hansen et al. 1995, MTNHP 2002b, Thilenius et al. 1995, WYNDD unpubl. data, Western Ecology Working Group n.d.

***Elaeagnus commutata* Temporarily Flooded Shrubland Alliance**

***Elaeagnus commutata* Shrubland AMERICAN SILVERBERRY SHRUBLAND SILVERBERRY WETLAND SHRUBLAND**

IDENTIFIER: C EGL001098

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
Alliance	<i>Elaeagnus commutata</i> Temporarily Flooded Shrubland Alliance (A.956)
Alliance (English name)	American Silverberry Temporarily Flooded Shrubland Alliance
Association	<i>Elaeagnus commutata</i> Shrubland
Association (English name)	American Silverberry Shrubland
Association (Common name)	Silverberry Wetland Shrubland

ECOLOGICAL SYSTEM(S): Western Great Plains Wooded Draw and Ravine (CES303.680)

ELEMENT CONCEPT

GLOBAL SUMMARY: This shrubland is a minor type forming narrow stringers on stream terraces and at the margins of riparian areas. Elevation ranges from about 610 m on the Great Plains to 1524 m (2000-5000 feet) along the front of the Rocky Mountains. Soils are silty and derived from alluvium. Surficial geology is glacial-fluvial or lacustrine-fluvial deposits. Litter and duff cover 70% of the ground. Stands in the foothills of the Rocky Mountains appear to be more mesic than those from the eastern plains. Consequently, the species composition is variable. Stands located closer to the mountains and larger riparian areas have more mesic species. Stands surrounded by plains or foothill grasslands tend to have more typical dry-mesic species. *Elaeagnus commutata* is the dominant shrub throughout. *Salix* spp., *Amelanchier alnifolia*, *Prunus virginiana*, *Rosa woodsii*, and *Artemisia cana* may also be present. Common introduced graminoid species include *Poa pratensis*, *Phleum pratense*, and *Agrostis gigantea* (= *Agrostis alba*). Native abundant grasses include *Elymus lanceolatus* (= *Agropyron dasystachyum*), *Koeleria macrantha*, *Calamagrostis canadensis*,

Festuca campestris, and *Hesperostipa comata* (= *Stipa comata*). Forb cover can be variable and may include *Galium boreale*, *Ranunculus acriformis*, *Senecio triangularis*, *Pulsatilla patens ssp. multifida* (= *Anemone patens*), and *Geum triflorum*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association typically occurs within or near the floodplain on flat valley floors near lakes, rivers, and streams; its documented elevation range is from 1370 to 1420 m (4500-4650 feet). Soils are sandy loam to clay loam in texture and are moderately well- to well-drained. Surficial geology is glacial-fluvial or lacustrine-fluvial deposits. Litter and duff cover 70% of the ground.

GLOBAL ENVIRONMENT: This community occurs on terraces of small-order streams. Elevations range from about 610 m (2000 feet) at the eastern end of the range to about 1524 m (5000 feet) along the front of the Rocky Mountains. Presumably, soils are silty and derived from alluvium; it may be associated with deep loamy soils. Surficial geology is glacio-fluvial or lacustrine-fluvial deposits. Litter and duff covers 70% of the ground. Distance above stream level appears to be a critical factor.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This cold-deciduous montane shrubland is commonly found in patches between grassland and riparian areas near lakes, rivers, streams, and ditches. In this association, *Elaeagnus commutata* is unmistakably the dominant species with total canopy cover averaging nearly 50% in both plots in which it was sampled. Other shrubs that are consistently present are *Symphoricarpos albus*, *Rosa woodsii*, and *Amelanchier alnifolia*, while *Salix boothii* may be present with moderate cover. Overall shrub cover is 60-80% and shrub height is 0.5-2 m. Young *Populus balsamifera ssp. trichocarpa* may be present in the tree subcanopy layer with low cover at heights of 2-5 m. Total herbaceous cover ranges from 10-30% and may be diverse. Two exotic graminoids, *Poa pratensis* and *Phleum pratense*, are consistently present with 1-4% average cover. Other high-constancy forbs and graminoids include *Galium boreale*, *Geranium viscosissimum*, *Achillea millefolium*, *Cirsium hookerianum*, *Fragaria virginiana*, *Maianthemum stellatum*, *Potentilla gracilis*, and *Calamagrostis canadensis*. *Festuca campestris*, *Symphotrichum laeve* (= *Aster laevis*), *Senecio* spp., and *Solidago canadensis* may also be conspicuous in certain areas.

GLOBAL VEGETATION: Stands generally occur as stringers along streams between the true riparian zone and the true grassland/steppe zone. Consequently, the species composition is variable. Stands located closer to the mountains and larger riparian areas have more mesic species. Stands surrounded by plains or foothill grasslands tend to have more typical dry-mesic species. *Elaeagnus commutata* is the dominant shrub in all stands with 50-80% cover. Other shrubs may be codominant, such as *Salix exigua* and *Salix bebbiana* in true riparian settings. Other shrubs present may include *Prunus virginiana*, *Symphoricarpos albus*, *Rosa woodsii*, *Artemisia cana*, and *Amelanchier alnifolia*. Young *Populus balsamifera ssp. trichocarpa* may be present. Common introduced graminoid species include *Poa pratensis*, *Phleum pratense*, and *Agrostis gigantea* (= *Agrostis alba*). Native abundant grasses include *Elymus lanceolatus* (= *Agropyron dasystachyum*), *Koeleria macrantha*, *Calamagrostis canadensis*, *Festuca campestris*, and *Hesperostipa comata* (= *Stipa comata*). Forb cover can be variable and includes *Galium boreale*, *Geranium viscosissimum*, *Achillea millefolium*, *Cirsium hookerianum*, *Fragaria virginiana*, *Maianthemum stellatum*, *Potentilla gracilis*, *Symphotrichum laeve* (= *Aster laevis*), *Solidago canadensis*, *Urtica dioica*, *Ranunculus acriformis*, *Senecio triangularis*, *Pulsatilla patens ssp. multifida* (= *Anemone patens*), and *Geum triflorum*. Species such as *Festuca campestris* and *Geranium viscosissimum* tend to be more prominent in western stands.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree subcanopy	Broad-leaved deciduous tree	<i>Populus balsamifera ssp. trichocarpa</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Elaeagnus commutata</i> , <i>Rosa woodsii</i> , <i>Salix boothii</i> , <i>Symphoricarpos albus</i>
Herb (field)	Forb	<i>Galium boreale</i> , <i>Geranium viscosissimum</i> , <i>Symphotrichum laeve</i>
Herb (field)	Graminoid	<i>Festuca campestris</i> , <i>Phleum pratense</i> , <i>Poa pratensis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Elaeagnus commutata</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL: *Elaeagnus commutata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2Q (1-Feb-1996). The type is uncommon over a large range and occurs in a habitat prone to human-caused degradation. However, it is unclear whether this type repeats itself over the landscapes in a significant fashion. It seems to become more common north into Alberta.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Stands from the eastern and western portions of Montana, Idaho, and Alberta appear to be significantly different and may warrant recognition as separate types. Preliminary information from Alberta would support this separation and suggests there are likely three *Elaeagnus commutata*-dominated riparian associations: one an eastern, lower elevation type found roughly in the Great Plains on deeper soils; a second type, also on deeper soils but found at higher elevations in the foothills and along the front of the Rocky Mountains; and a third foothills and mountain type of a more northern distribution found on shallow, gravelly soils. This association is not well-documented in Montana and Wyoming (Hansen and Hoffman 1988, Jones 1992b, Hansen et al. 1995). Two stands were sampled in Glacier National Park; the type is noted to occur throughout the east side of the park in the transition zone between riparian and upland grasslands. It may prove to be more common further north along the front of the Canadian Rockies in Alberta and Saskatchewan. Thompson and Hansen (2002) sampled 12 stands in Alberta and concluded that this is a common, major type at low to mid elevations in the grasslands, but they include in their community type stands from "swale-like depressions" that may be better classified as an upland *Elaeagnus commutata* type. The Thompson and Hansen (2002) type seems to include an upland *Elaeagnus commutata* - *Symphoricarpos occidentalis* type that occurs within the grassland matrix in Alberta, likely into Saskatchewan.

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

- *Elaeagnus commutata* / *Carex* spp. Community Type (Harvey 1980) F
- *Elaeagnus commutata* / X Community Type (DeVelice et al. 1995) F
- *Elaeagnus commutata* (Bourgeron and Engelking 1994) =
- *Elaeagnus commutata* Community Type (Thompson and Hansen 2002) B
- DRISCOLL FORMATION CODE:III.B.3.a. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is documented at lower elevations in the Belly River and St. Mary drainages but is common on the east side of Glacier National Park in transition zones between grasslands and riparian areas near lakes, rivers, and streams. It is also likely found on the west side of Glacier National Park along the North Fork of the Flathead River.

GLOBAL RANGE: This community type has been described from the foothills of the Rocky Mountains and higher in the montane valley in Glacier National Park. It also occurs in the northern Great Plains of Montana. It has been reported to occur along the North Fork of the Flathead River and is reported to occur in Idaho. In Alberta, Canada, it has been documented from the Great Plains as well as in the foothills and montane areas. It may occur as far north as Jasper National Park, but detailed vegetation data from this location are not yet available.

NATIONS: CA, US

STATES/PROVINCES: AB:SU, ID:S2, MT:S2?

USFS ECOREGIONS: 331D:CC, 342D:CC, M332C:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES: Jen Asebrook, GNP Biological Sciences Technician, reports seeing a few small patches of this along the North Fork/Flathead River in the North Fork (old River CG for instance).

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.136, GLAC.157.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: P. Lesica, mod. G. Kittel and L. Allen

REFERENCES: Bourgeron and Engelking 1994, DeVelice et al. 1995, Driscoll et al. 1984, Hansen and Hoffman 1988, Hansen et al. 1995, Harvey 1980, IDCDC 2005, Jones 1992b, MTNHP 2002b, Thompson and Hansen 2002, Western Ecology Working Group n.d.

***Rhamnus alnifolia* Temporarily Flooded Shrubland Alliance**

***Rhamnus alnifolia* Shrubland**

ALDERLEAF BUCKTHORN SHRUBLAND

IDENTIFIER: C EGL001132

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
Alliance	<i>Rhamnus alnifolia</i> Temporarily Flooded Shrubland Alliance (A.962)
Alliance (English name)	Alderleaf Buckthorn Temporarily Flooded Shrubland Alliance
Association	<i>Rhamnus alnifolia</i> Shrubland
Association (English name)	Alderleaf Buckthorn Shrubland

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Subalpine Deciduous Shrubland (CES306.961)
Northern Rocky Mountain Montane-Foothill Deciduous Shrubland (CES306.994)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is known from the Blue Mountains of northeastern Oregon, scattered locations in moist mountainous regions of Idaho, Montana, and in western Wyoming. Stands of this *Rhamnus alnifolia* association occur at low to mid elevations (e.g., up to 2074 m [6800 feet]) in seeps, along sloped spring-fed creeks, on alluvial terraces of small streams (orders 1 and 2), and in broad basins or fens. Soils are typically loams and contain coarse rock fragments. Soils often show signs of a seasonally high water table (e.g., mottling), but the association also occurs on semipermanently saturated sites. Nearly complete cover of *Rhamnus alnifolia* characterizes this association, with few associates having consistently high cover due to the dense canopy. Associated shrubs that may be present include *Alnus incana*, *Lonicera involucrata*, *Ribes* spp., *Salix geyeriana*, and *Symphoricarpos albus*. The herbaceous understory is diverse, but most species have low to moderate cover. Common graminoid species include *Bromus* spp., *Calamagrostis canadensis*, *Cinna latifolia*, *Elymus glaucus*, and *Glyceria* spp. Tall forbs are characteristically present, including *Heracleum maximum*, *Mertensia* spp., *Thalictrum occidentale*, and *Urtica dioica*, but no single species has high cover and constancy throughout the association's range.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: The lone sampled example of this type is found as a small patch on the westside on a subirrigated, glacial drift-mantled valley floor location at 1165 m (3825 feet) elevation. Reconnaissance verified a number of other instances, all valley floor depressions or lower slope swales and ostensibly subirrigated.

GLOBAL ENVIRONMENT: *Rhamnus alnifolia* apparently requires wet, loamy soils containing coarse fragments. It apparently requires seasonally high water tables or semipermanent saturation (e.g., sites such as seeps or spring-fed creeks). *Rhamnus alnifolia* is not found on organic, acidic, saline, alkaline, or heavy clay soils (Elzinga and Rosentreter 2000). The species does appear resilient and vigorous on favorable sites. The competitive habit of *Rhamnus alnifolia* decreases establishment of other species. Where there is a mix of shrub species present it is thought that it may have invaded stands (Youngblood et al. 1985a).

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The sampled stand was strongly shrub-dominated, with *Rhamnus alnifolia* having at least 50% cover and *Symphoricarpos albus* also prominent. The undergrowth is not particularly diverse but is characterized by herbs indicative of at least a sub-hygic moisture regime, including *Actaea rubra*, *Angelica arguta*, *Elymus glaucus*, *Galium triflorum*, *Geum macrophyllum*, and *Urtica dioica*.

GLOBAL VEGETATION: Nearly complete cover of *Rhamnus alnifolia* characterizes this association, with few associates having consistently high cover due to the dense canopy. Associated shrubs that may be present include *Alnus incana*, *Lonicera involucrata*, *Ribes* spp., *Salix geyeriana*, and *Symphoricarpos albus*. The herbaceous understory is diverse, but most species have low to moderate cover. Common graminoid species include *Bromus* spp., *Calamagrostis canadensis*, *Cinna latifolia*, *Elymus glaucus*, *Poa pratensis*, *Poa nemoralis* ssp. *interior*, and *Glyceria* spp. Tall forbs are characteristically present, including *Heracleum maximum*, *Mertensia* spp., *Thalictrum occidentale*, *Rudbeckia occidentalis*, and *Urtica dioica*, but no single species has high cover and constancy throughout the association's range.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rhamnus alnifolia</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rhamnus alnifolia</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Geum macrophyllum*, *Rhamnus alnifolia*, *Urtica dioica*

GLOBAL: *Heracleum maximum*, *Rhamnus alnifolia*, *Rudbeckia occidentalis*, *Thalictrum occidentale*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3 (22-Oct-2002). This is a wide-ranging, but infrequently encountered association known from less than 30 occurrences in the Blue Mountains, moist mountainous areas of Idaho, Montana, and western Wyoming. This association requires wet, coarse loamy soils in areas of seasonally high water tables or semipermanent saturation (e.g., alluvial terraces, seeps, spring-fed creeks, and fens). However, sites favorable for the occurrence of *Rhamnus alnifolia*-dominated stands are uncommon across the landscape. The competitive, rhizomatous habit of *Rhamnus alnifolia* minimizes establishment of exotic species and makes the association resilient when disturbed. Although the number of occurrences is low, the wide range and resiliency of this association justify a G3 rank.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: The undergrowth situation described in "Global Classification Comments" appears to be echoed by the IPP occurrences; reconnaissance notes had the undergrowth variously dominated by *Geum macrophyllum*, *Angelica arguta*, and *Calamagrostis canadensis*, a situation best captured in the Crowe and Clausnitzer (1997) appellation *Rhamnus alnifolia* / Mesic Forb.

GLOBAL COMMENTS: Because no understory herbaceous species has consistently high cover and constancy, and *Rhamnus alnifolia* is clearly dominant with high cover, this association is broadly defined. Similar associations have not yet been incorporated into the National Vegetation Classification: Crowe and Clausnitzer (1997) identified a *Rhamnus alnifolia* / mesic forb community from the Blue Mountains of northeast Oregon. Oregon Natural Heritage Program (2002) identified a *Rhamnus alnifolia* / *Mertensia paniculata* community from the Blue Mountains of eastern Oregon that includes Crowe and Clausnitzer's stands. Youngblood et al. (1985a) did not have data supporting identification of an understory diagnostic species. Idaho stands of *Rhamnus alnifolia* are likely synonymous with Crowe and Clausnitzer's (1997) *Rhamnus alnifolia* / mesic forb community. The Idaho stands and *Rhamnus alnifolia* / mesic forb community (Crowe and Clausnitzer 1987) differ from *Rhamnus alnifolia* / *Mertensia paniculata* by lacking the diagnostic forb *Mertensia paniculata*. They are otherwise similar and all three types are synonymous according to Oregon Natural Heritage Program (2002). Further sampling is needed to confirm the existence of different *Rhamnus alnifolia* types.

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

- *Rhamnus alnifolia* / *Mertensia paniculata* Association (Crowe et al. 2004) =
- *Rhamnus alnifolia* (Bourgeron and Engelking 1994) =
- *Rhamnus alnifolia* / Mesic Forb (Crowe and Clausnitzer 1997) =
- *Rhamnus alnifolia* Dominance Type (Hansen et al. 1988b) =
- DRISCOLL FORMATION CODE:III.B.3.b. (Driscoll et al. 1984) B

OTHER COMMENTS

OTHER COMMENTS: As noted in the Global Rank & Reasons section, *Rhamnus alnifolia* is rhizomatous, but this competitive advantage is no guarantee against the encroachment of exotics as witnessed by the prominence of *Agrostis stolonifera*, *Elymus repens*, and *Urtica dioica* in the Glacier National Park stand.

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association has been documented only from the westside (of the Continental Divide), but there are no apparent reasons (floristic or environmental) that it could not occur on the eastside as well.

GLOBAL RANGE: This association is known from eastern Oregon and Washington, throughout Idaho and into western Wyoming and Montana.

NATIONS: CA?, US

STATES/PROVINCES: ID:S3, MT:S5, OR, WA:S1?, WY

USFS ECOREGIONS: M331D:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton); USFS (Umatilla)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.D686.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: C. Murphy, mod. G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Bursik and Moseley 1995, Crowe and Clausnitzer 1997, Crowe et al. 2002, Crowe et al. 2004, Driscoll et al. 1984, Elzinga and Rosentreter 2000, Hansen and Hall 2002, Hansen et al. 1988b, IDCDC 2005, IDCDC unpubl. data 2002, MTNHP 2002b, NRCS 2001, Norton et al. 1981, ORNHP unpubl. data 2002, WNHP unpubl. data 2002, Walford et al. 2001, Western Ecology Working Group n.d., Youngblood et al. 1985a

***Ribes lacustre* Temporarily Flooded Shrubland Alliance**

***Ribes lacustre* / *Chamerion angustifolium* Shrubland [Provisional]**

BRISTLY BLACK CURRANT / FIREWEED SHRUBLAND

IDENTIFIER: C EGL005889

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
Alliance	<i>Ribes lacustre</i> Temporarily Flooded Shrubland Alliance (A.970)
Alliance (English name)	Bristly Black Currant Temporarily Flooded Shrubland Alliance
Association	<i>Ribes lacustre</i> / <i>Chamerion angustifolium</i> Shrubland [Provisional]
Association (English name)	Bristly Black Currant / Fireweed Shrubland

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Subalpine Deciduous Shrubland (CES306.961)
Northern Rocky Mountain Montane-Foothill Deciduous Shrubland (CES306.994)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is uncommon on the east side of Glacier National Park in Montana. Data from 2 plots were used to describe this shrubland. It is a mesic, subalpine association that occurs on steep, low to midslopes with varying aspects at elevations between 1755 and 1920 m (5760-6300 feet). Soils are well-drained sandy loams that are developed on colluvial landforms. This cold-deciduous shrubland tends to occur in patches along steep slopes, particularly along moist avalanche chutes. Although herbaceous species are abundant, there is a distinct shrub layer with 20-30% cover and heights from 0.5-1 m. *Ribes lacustre* consistently dominates the shrub layer. *Spiraea betulifolia*, *Vaccinium membranaceum*, *Alnus viridis ssp. sinuata*, *Sorbus scopulina*, *Spiraea splendens var. splendens* (= *Spiraea densiflora*), and *Sambucus racemosa* are also present. Overall herbaceous cover ranges from 40-80% and is dominated by native forbs. *Chamerion angustifolium* often dominates the herbaceous layer with 10-70% cover. Other common forbs include *Heracleum maximum*, *Xerophyllum tenax*, *Bromus carinatus*, *Elymus glaucus*, *Senecio triangularis*, *Arnica latifolia*, *Arnica cordifolia*, *Angelica arguta*, *Osmorhiza occidentalis*, *Thalictrum occidentale*, *Valeriana sitchensis*, and *Veratrum viride*. Nonvascular cover is low.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Data from 2 plots were used to describe this shrubland. It is a mesic, subalpine association that occurs on steep, low to midslopes with varying aspects at elevations between 1755 and 1920 m (5760-6300 feet). Soils are well-drained sandy loams that are developed on colluvial landforms. They tend to have high gravel content and are light in color with red argillite. Litter comprises approximately 40% of the ground surface, although downed wood, moss, large rocks, and small rocks are also common.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This cold-deciduous shrubland tends to occur in patches along steep slopes, particularly within moist avalanche chutes. Although herbaceous species are abundant, there is a distinct shrub layer with 20-30% cover and heights from 0.5-1 m. *Ribes lacustre* consistently dominates the shrub layer with 10% cover. *Spiraea betulifolia*, *Vaccinium membranaceum*, *Alnus viridis ssp. sinuata*, *Sorbus scopulina*, *Spiraea splendens var. splendens* (= *Spiraea densiflora*), and *Sambucus racemosa* are also present with 1-20% cover. Overall herbaceous cover ranges from 40-80% and is dominated by native forbs with heights between 0.5 and 1 m. *Chamerion angustifolium* often dominates the herbaceous layer with 10-70% cover. Other high constancy forbs that have trace to 3% cover include *Heracleum maximum*, *Xerophyllum tenax*, *Bromus carinatus*, and *Elymus glaucus*. Forbs with conspicuous cover include *Senecio triangularis* that may have 10% cover and *Arnica latifolia* that may have up to 20% cover. Other species that may be present are *Arnica cordifolia*, *Angelica arguta*, *Osmorhiza occidentalis*, *Thalictrum occidentale*, *Valeriana sitchensis*, and *Veratrum viride* that have 3 to 5% cover, as well as *Symphyotrichum foliaceum* (= *Aster foliaceus*), *Calamagrostis canadensis*, *Eucephalus engelmannii*, *Mitella breweri*, *Galium triflorum*, *Polystichum lonchitis*, and *Lomatium dissectum* that have low cover. Nonvascular cover averages 5%.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Ribes lacustre</i> , <i>Spiraea betulifolia</i>
Herb (field)	Forb	<i>Arnica latifolia</i> , <i>Chamerion angustifolium</i> , <i>Senecio triangularis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Bromus carinatus*, *Chamerion angustifolium*, *Elymus glaucus*, *Heracleum maximum*, *Ribes lacustre*, *Spiraea betulifolia*, *Xerophyllum tenax*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2? (21-Jan-2004).

CLASSIFICATION

STATUS: Provisional

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This tentative association seems somewhat similar to *Ribes lacustre* / *Mertensia ciliata* Shrubland (CEGL001172) described from the Bighorns of Wyoming, but the associated shrubs and herbaceous species are different. It is likely that shrublands such as these are more widespread in the Rockies, but given their small occurrence size, they are little studied.

GLOBAL SIMILAR ASSOCIATIONS:

- *Ribes lacustre* / *Mertensia ciliata* Shrubland (CEGL001172)

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon on the east side of Glacier National Park on steep talus slopes that are often within avalanche chutes. It has been documented in the Two Medicine subdistrict along the Dawson Pass Trail and in the Cut Bank drainage above Medicine Grizzly Lake.

GLOBAL RANGE:

NATIONS: US

STATES/PROVINCES: MT:S2?

USFS ECOREGIONS: M333C:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.271, AAGL.B46.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Western Ecology Working Group n.d.

***Rosa woodsii* Temporarily Flooded Shrubland Alliance**

***Rosa woodsii* Shrubland**

WOODS' ROSE SHRUBLAND

IDENTIFIER: CEGL001126

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
Alliance	<i>Rosa woodsii</i> Temporarily Flooded Shrubland Alliance (A.959)
Alliance (English name)	Woods' Rose Temporarily Flooded Shrubland Alliance
Association	<i>Rosa woodsii</i> Shrubland
Association (English name)	Woods' Rose Shrubland

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Montane-Foothill Deciduous Shrubland (CES306.994)
Western Great Plains Wooded Draw and Ravine (CES303.680)

ELEMENT CONCEPT

GLOBAL SUMMARY: This shrubland occurs in the foothills and plains of Montana, Idaho, Nevada, and eastern California. Elevations range from 650-2490 m. Stands occur in floodplains and on alluvial terraces along rivers and streams, on hillsides below

springs, and in ravines and swales where overland flow from snowmelt and summer thunderstorms provides additional moisture. It can also occur on disturbed sites with little moisture, such as steep south-facing hill slopes. Sites are flat to moderately steep. Floodplain sites are temporarily flooded, well-drained with no perched water table. Soils range from sandy loams to silt loams. Stands typically have a moderately dense short-shrub layer which *Rosa woodsii* dominates. Some stands have moderate cover of *Rosa acicularis*, *Symphoricarpos occidentalis*, or *Toxicodendron rydbergii*. Other shrubs can include *Artemisia tridentata* and *Ribes aureum*. Some stands have an herbaceous layer dominated by the exotic grasses *Poa pratensis* or *Bromus tectorum* and the weedy forb *Cirsium arvense*. Other common herbaceous species include perennial graminoids, such as *Elymus glaucus*, *Leymus cinereus*, *Carex* spp., *Juncus balticus*, and *Muhlenbergia racemosa*, and the forbs *Achillea millefolium*, *Ambrosia psilostachya*, *Artemisia ludoviciana*, *Fragaria virginiana*, *Galium boreale*, *Geum macrophyllum*, and *Solidago canadensis*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is located on moderately steep high slopes at elevations near 1830 m (6000 feet) on southwest aspects. Soils are derived from glacial-fluvial deposits and are comprised of more than 70% argillite, sandstone, and quartzite. Soil texture is sand that is rapidly drained. Soils tend to be poorly developed with high gravel content. Sand, small rock, and large rock comprise 75% of the ground cover. The plot that represents this association is within the Napi Fire boundaries, a stand-replacing fire that occurred in 1988.

GLOBAL ENVIRONMENT: This shrubland is found in Montana, Idaho, Nevada, and eastern California at elevations ranging from 650-2490 m. Stands occur in floodplains and on alluvial terraces along rivers and streams, on hillsides below springs, and in ravines and swales where overland flow from snowmelt and summer thunderstorms provides additional moisture. Stands also occur on moderately steep upper slopes with southwest aspects. Sites are flat to moderately steep. Floodplain sites are temporarily flooded; they are also well-drained and do not have a shallow water table. Soils range from sandy loams to silt loams (Hansen et al. 1995). This association is considered marginally riparian (Manning and Padgett 1995) and often occupies sites on the upland fringe of riparian systems.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This cold-deciduous, subalpine shrubland may occur as a result of a hot, stand-replacing fire and subsequent soil erosion. The remaining gravelly sand is dominated by dwarf-shrubs and herbaceous vegetation that are moderately low in cover and diversity and less than 0.5 m in height. Dwarf-shrub cover is 30% and is dominated by *Rosa woodsii* with nearly 20% cover. *Rubus idaeus* is also a common shrub with 3% cover. Herbaceous cover is 20%, dominated by *Selaginella densa* with 10% cover. *Pseudoroegneria spicata* is common with 3% cover. Moss and lichens comprise 10% of the ground surface. Regenerating tree seedlings of *Abies lasiocarpa*, *Pinus contorta*, and *Picea engelmannii* may be present, but there is generally little soil to support a tree component.

GLOBAL VEGETATION: Stands typically have a moderately dense short-shrub layer which *Rosa woodsii* dominates. Some stands have moderate cover of *Rosa acicularis*, *Rubus idaeus*, *Symphoricarpos occidentalis*, *Symphoricarpos oreophilus*, or *Toxicodendron rydbergii*. Other shrubs can include *Artemisia tridentata* and *Ribes aureum*. Some stands have an herbaceous layer dominated by the exotic grasses *Poa pratensis* or *Bromus tectorum* and the weedy forb *Cirsium arvense*. Other common herbaceous species include perennial graminoids, such as *Elymus glaucus*, *Leymus cinereus*, *Pseudoroegneria spicata*, *Carex* spp., *Juncus balticus*, and *Muhlenbergia racemosa*, and the forbs *Achillea millefolium*, *Ambrosia psilostachya*, *Artemisia ludoviciana*, *Fragaria virginiana*, *Galium boreale*, *Geum macrophyllum*, *Selaginella densa*, and *Solidago canadensis*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Rosa woodsii</i> , <i>Rubus idaeus</i>
Herb (field)	Graminoid	<i>Pseudoroegneria spicata</i>
Herb (field)	Fern or fern ally	<i>Selaginella densa</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Rosa woodsii</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL: *Rosa woodsii*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

- *Rosa woodsii* (Bourgeron and Engelking 1994) =
- *Rosa woodsii* Community Type (Hansen et al. 1995) =
- *Rosa woodsii* Community Type (Manning and Padgett 1995) =
- DRISCOLL FORMATION CODE:III.B.3.a. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is very uncommon along the western boundary of the Blackfoot Reservation, east of Glacier National Park. It occurs in the subalpine zone on moderately steep high slopes that have been burned by hot, stand-replacing fires. A specific location on the Blackfoot Reservation is along southwest-facing slopes northeast of Napi Point.

GLOBAL RANGE: This dwarf-shrub association is known from the foothills and plains of Montana, Idaho, Nevada, eastern California, and potentially Saskatchewan.

NATIONS: CA?, US

STATES/PROVINCES: CA, ID:S4, MT:S5, NV:S3?, OR:SU, SK?

USFS ECOREGIONS: 322A:CC, 331D:CC, 331G:CC, 342A:CC, M331A:CC, M331B:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341A:CC

FEDERAL LANDS: BIA (Blackfoot); NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.190.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: M. Bagley, mod. G. Kittel and M.S. Reid

REFERENCES: Bagley pers. comm., Bourgeron and Engelking 1994, Driscoll et al. 1984, Hansen et al. 1990, Hansen et al. 1991, Hansen et al. 1995, IDCDC 2005, Kagan et al. 2004, MTNHP 2002b, Manning and Padgett 1995, NVNHP 2003, Nachlinger and Reese 1996, Western Ecology Working Group n.d.

***Salix (exigua, interior)* Temporarily Flooded Shrubland Alliance**

***Salix exigua* / *Agrostis stolonifera* Shrubland**

COYOTE WILLOW / CREEPING BENTGRASS SHRUBLAND

IDENTIFIER: C EGL001199

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)

Alliance *Salix (exigua, interior)* Temporarily Flooded Shrubland Alliance (A.947)
 Alliance (English name) (Coyote Willow, Sandbar Willow) Temporarily Flooded Shrubland Alliance
 Association *Salix exigua / Agrostis stolonifera* Shrubland
 Association (English name) Coyote Willow / Creeping Bentgrass Shrubland

ECOLOGICAL SYSTEM(S): North American Warm Desert Lower Montane Riparian Woodland and Shrubland (CES302.748)
 North American Warm Desert Riparian Woodland and Shrubland (CES302.753)
 Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

ELEMENT CONCEPT

GLOBAL SUMMARY: This community occurs in the foothills and in wide lowland valleys and canyons at low to mid elevations of 1560 to 2070 m (5125-6775 feet) of the Pecos, Rio Grande and Canadian River watersheds in northeastern and central New Mexico. This type is typically found on young alluvial bars that are flooded every two to five years, but it can also occur on higher bars or in partially filled back channels that are more rarely flooded. Soils are weakly developed Entisols that are generally loamy, or loamy over a matrix of sands and gravels. *Salix exigua* forms dense thickets with over 75% cover that are 1.5 to 2.5 m (4-8 feet) tall. In the shady and moist understory, exotic European pasture grasses, such as *Agrostis stolonifera* or the closely related *Agrostis gigantea*, are usually abundant to luxuriant in cover (25-75% or more cover). Other occasional shrub associates that are well-represented are *Salix lutea*, *Rosa woodsii*, and *Forestiera pubescens* var. *pubescens*. Mature trees are absent, but seedlings or saplings of obligate riparian tree species including *Populus deltoides* or *Populus angustifolia*) can be present. Generally the herbaceous understory is very diverse but variable.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT:

GLOBAL ENVIRONMENT: This community occurs in the foothills and in wide lowland valleys and canyons at low to mid elevations of 1560 to 2070 m (5125-6775 feet). This type is typically found on young alluvial bars that are flooded every two to five years, but it can also occur on higher bars or in partially filled back channels that are more rarely flooded. Soils are weakly developed Entisols that are generally loamy, or loamy over a matrix of sands and gravels. They range from the wetter Aeric Fluvaquents to somewhat drier Oxyaquic Ustifluvents. During most parts of the year, they tend to be moist at lower depths between 20 to 100 cm (8-18 inches).

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION:

GLOBAL VEGETATION: *Salix exigua* forms dense thickets with over 75% cover that are 1.5 to 2.5 m (4-8 feet) tall. In the shady and moist understory, exotic European pasture grasses, such as *Agrostis stolonifera* or the closely related *Agrostis gigantea*, are usually abundant to luxuriant in cover (25-75% or more cover). Other occasional shrub associates that are well-represented are *Salix lutea*, *Rosa woodsii*, and *Forestiera pubescens* var. *pubescens*. Mature trees are absent, but seedlings or saplings of obligate riparian tree species including *Populus deltoides* or *Populus angustifolia*) can be present. Generally the herbaceous understory is very diverse but variable. Of the 174 herbaceous species that have been recorded for the type, 51 are exotic species. Of the 38 native herbaceous wetland indicators, the most common and abundant are *Eleocharis palustris*, *Phalaris arundinacea*, *Schoenoplectus pungens* (= *Scirpus pungens*), *Argentina anserina*, *Symphotrichum foliaceum* (= *Aster foliaceus*), *Cicuta douglasii*, *Equisetum arvense*, *Equisetum laevigatum*, *Lycopus americanus*, and *Mentha arvensis*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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Global		
<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: GNA (modified/managed) (1-Feb-1996). This type was given a global rarity rank of GNA (not applicable) because of its exotic elements and, hence, is not tracked for biodiversity conservation purposes.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Grazing-induced modification of natural riparian shrublands. Stands in the Colorado Front Range foothills may be composed of intermediates of *Salix exigua* and *Salix interior* (G. Kittel pers. comm.).

This is one of the most common types found in New Mexico. While the diversity of species and density of some stands have an appearance of functionality and good condition, the species composition reflects nearby agricultural use and possibly degraded streamside conditions. Exotic grasses such as *Agrostis gigantea*, *Poa pratensis*, *Agropyron* spp., *Lolium arundinaceum* (= *Festuca arundinacea*), *Lolium pratense* (= *Festuca pratensis*), and *Dactylis glomerata* have effectively replaced the native graminoids, including sedges and rushes. Where these introduced graminoids dominate, streambanks are more susceptible to sloughing and accelerated erosion. These introduced species are highly palatable and therefore more susceptible to overgrazing. They also have fragile root systems that are less fibrous, thinner, and rooted at shallower depths than their native counterparts (i.e., *Carex*, *Juncus*, *Scirpus*, and, at upper elevations, *Glyceria*). Due to close proximity of water, this type often receives disproportionately heavy use by livestock. In general, effective restoration of the native species to enhance biodiversity, ecosystem quality, and streambank condition may require several years of minimal disturbance and responsible management of upland watershed conditions.

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

- *Salix exigua/Agrostis stolonifera* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE:

GLOBAL RANGE: This association is found in the Pecos, Rio Grande and Canadian River watersheds in northeastern and central New Mexico.

NATIONS: US

STATES/PROVINCES: NM

USFS ECOREGIONS: 313E:CC, 321A:CC, 331J:CC, M331F:CC, M331G:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS:

LOCAL DESCRIPTION AUTHORS:

GLOBAL DESCRIPTION AUTHORS: E. Muldavin et al.

REFERENCES: Bourgeron and Engelking 1994, Dick-Peddie et al. 1984, Driscoll et al. 1984, Muldavin et al. 2000a, Western Ecology Working Group n.d.

***Salix bebbiana* Temporarily Flooded Shrubland Alliance**

***Salix bebbiana* Shrubland**

BEBB'S WILLOW SHRUBLAND

BEAKED WILLOW SCRUB

IDENTIFIER: CEGL001173

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
Alliance	<i>Salix bebbiana</i> Temporarily Flooded Shrubland Alliance (A.971)
Alliance (English name)	Long-beak Willow Temporarily Flooded Shrubland Alliance
Association	<i>Salix bebbiana</i> Shrubland
Association (English name)	Bebb's Willow Shrubland
Association (Common name)	Beaked Willow Scrub

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

ELEMENT CONCEPT

GLOBAL SUMMARY: This riparian willow shrubland is found in the montane regions and western plains of the United States, and also along the eastern Front Range of the Rocky Mountains in Alberta. This community is a briefly flooded scrub-shrub wetland on slightly to moderately alkaline soils, usually near low-gradient streams. This shrubland is typically dominated by a dense growth of shrubs 0.5-3 m tall. The most abundant species in the shrub layer are *Salix bebbiana*, *Salix scouleriana*, and *Salix lucida ssp. caudata* (= *Salix fendleriana*). Other species found in this stratum include *Betula occidentalis*, *Cornus sericea ssp. sericea*, *Salix exigua*, *Salix melanopsis* (= *Salix fluviatilis*), *Salix lutea*, *Salix prolixa* (= *Salix rigida ssp. mackenzieana*), *Amelanchier alnifolia*, and *Prunus virginiana*. A shorter shrub layer is sometimes present, with *Symphoricarpos occidentalis*, *Ribes inerme*, *Lonicera involucrata*, and *Rosa acicularis*. The herbaceous layer can be very abundant and predominantly graminoids; common species include *Schoenoplectus* spp. and/or *Scirpus* spp., *Carex* spp., *Triglochin palustris*, *Calamagrostis canadensis*, *Bromus carinatus*, *Poa palustris*, and *Equisetum* spp. along the wetter margins of the community. Forbs can be abundant and variable in composition, ranging from mesic-site forbs to ones adapted to drier conditions. Species include *Heracleum maximum*, *Cicuta maculata*, *Geranium richardsonii*, *Geum macrophyllum*, *Gentianella amarella ssp. acuta* (= *Gentiana strictiflora*), *Prunella vulgaris*, *Pyrola asarifolia*, *Zizia aptera* (= *Zizia cordata*), *Sanicula marilandica*, *Viola canadensis*, *Vicia americana*, and *Ranunculus macounii*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This tall shrubland occurs in riparian areas between 1290-1370 m (4200-4500 feet) elevation along creeks or rivers or seasonally flooded river terraces. Slopes are gentle to flat. No soil information was available.

GLOBAL ENVIRONMENT: This is a riparian association, occurring along creeks, small rivers, and seasonally flooded terraces. It occurs in primarily montane to lower montane and foothill zones of the mountains and mountain valleys. Stands occur on slightly to moderately alkaline soils, usually near low-gradient streams. The water table is well below the soil surface for over half the growing season. However, there are brief periods of several days to a few weeks when water is at the surface. The ground surface often has high cover of litter.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This tall shrubland has between 60% and 80% canopy cover of tall shrubs, and up to 50% cover of short shrubs. It is dominated by 40-65% cover of *Salix bebbiana*, with several other tall shrubs present, including *Betula occidentalis*, *Salix lutea*, *Salix prolixa* (= *Salix rigida ssp. mackenzieana*), *Cornus sericea*, and *Amelanchier alnifolia*. A shorter shrub layer is also present, with *Symphoricarpos occidentalis*, *Ribes inerme*, *Lonicera involucrata*, and *Rosa acicularis*. The herbaceous layer can be quite thick, with over 90% cover, and 70-80% litter covering the ground surface. It is dominated by graminoids, with the most abundant species being *Calamagrostis canadensis* (up to 15% cover), *Elymus canadensis* (with 5% cover), *Equisetum pratense* (up to 30% cover), *Equisetum arvense* (up to 30% cover), *Poa palustris* (1%), *Bromus carinatus* (up to 55% cover), and *Carex deweyana* (1%). The forb layer is also abundant, with *Heracleum maximum*, *Cicuta maculata*, *Geranium richardsonii*, and *Geum macrophyllum* having >5% cover, and many other species with <1% cover. The two sampled occurrences had an average of 44 species in them.

GLOBAL VEGETATION: This shrubland is typically dominated by a dense growth of shrubs 0.5-3 m tall. The most abundant species in the shrub layer are *Salix bebbiana*, *Salix scouleriana*, and *Salix lucida ssp. caudata* (= *Salix fendleriana*). Other species found in this stratum include *Betula occidentalis*, *Cornus sericea ssp. sericea*, *Salix exigua*, *Salix fluviatilis*, and *Prunus virginiana*. Multi-stemmed trees and/or shrubs 1.5-5 m tall have 30-100% cover; single-stemmed trees have less than 30% cover. The herbaceous layer often contains *Schoenoplectus* spp. and/or *Scirpus* spp., *Carex* spp., *Triglochin palustris*, *Calamagrostis canadensis*, and *Equisetum* spp. along the wetter margins of the community. In the drier areas *Gentianella amarella ssp. acuta* (= *Gentiana*

strictiflora), *Prunella vulgaris*, *Pyrola asarifolia*, *Zizia aptera* (= *Zizia cordata*), *Sanicula marilandica*, *Viola canadensis*, *Vicia americana*, and *Ranunculus macounii* are frequently present.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Betula occidentalis</i> , <i>Salix bebbiana</i>
Herb (field)	Forb	<i>Cicuta maculata</i> , <i>Heracleum maximum</i> , <i>Viola canadensis</i>
Herb (field)	Graminoid	<i>Bromus carinatus</i> , <i>Calamagrostis canadensis</i>
Herb (field)	Fern or fern ally	<i>Equisetum arvense</i> , <i>Equisetum pratense</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Cornus sericea</i> , <i>Salix bebbiana</i> , <i>Salix lutea</i>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i>
Herb (field)	Fern or fern ally	<i>Equisetum arvense</i> , <i>Equisetum pratense</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Salix bebbiana*

GLOBAL: *Salix bebbiana*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Ribes inerme*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3? (1-Feb-1996). Most sites have been impacted by grazing.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: These stands have been heavily grazed and may be degraded occurrences of a *Salix lutea* plant association.

GLOBAL COMMENTS: The distribution and classification of this community need further investigation. Changes in historic natural processes, including flooding, and more recent human impacts, such as grazing, have altered this community. While Hansen et al. (1995) report *Salix bebbiana* communities to be widespread and common in Montana (they sampled 27 stands), the relationship of their *Salix bebbiana* community type to this plant association is unclear. Most, if not all, of Hansen et al.'s (1995) stands had understories dominated by introduced and weedy species, such as *Poa pratensis*, *Phleum pratense*, *Agrostis stolonifera*, and *Solidago canadensis*. They also considered that these communities represent browsing or grazing disclimax communities of *Salix geyeriana*, *Salix drummondiana*, or *Salix lutea* habitat types.

GLOBAL SIMILAR ASSOCIATIONS:

- *Salix bebbiana* / Mesic Graminoids Shrubland (CEGL001174)

GLOBAL RELATED CONCEPTS:

- *Betula* - *Salix* Association (Hayward 1928) B
- *Salix bebbiana* (Bourgeron and Engelking 1994) =
- *Salix bebbiana* Community Type (Hansen et al. 1995) I
- Bebb willow (*Salix bebbiana*) Plant Association (Kittel et al. 1997a) =
- Bebb willow (*Salix bebbiana*) Plant Association (Kittel et al. 1999a) =
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B
- Palustrine (Cowardin et al. 1979) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association was found in two locations within Waterton Lakes National Park along Belly River and Crooked Creek.

GLOBAL RANGE: This beaked willow shrubland is found in the montane regions and western plains of the United States, ranging from South Dakota and Montana south to New Mexico.

NATIONS: CA, US

STATES/PROVINCES: AB, CO:S2, ID, MT:S3?, NM, SD:S2, WY:S2S3

USFS ECOREGIONS: 313:?, 331D:CC, 331E:C?, 331F:C?, 331G:CC, 342F:CC, M331E:CC, M331I:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC, M341B:CC

FEDERAL LANDS: NPS (Wind Cave); PC (Waterton Lakes); USFS (Black Hills, Pike-San Isabel, San Juan)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.9002, WATE.9014.

LOCAL DESCRIPTION AUTHORS: G. Kittel

GLOBAL DESCRIPTION AUTHORS: J. Drake, mod. M.S. Reid

REFERENCES: Baker 1982b, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Cowardin et al. 1979, Dick-Peddie 1993, Driscoll et al. 1984, Hansen et al. 1991, Hansen et al. 1995, Hayward 1928, IDCDC 2005, Jones 1992b, Kittel et al. 1997a, Kittel et al. 1999a, Kittel et al. 1999b, MTNHP 2002b, NMNHP unpubl. data, Szaro 1989, Thilenius 1971, Western Ecology Working Group n.d.

***Salix boothii* Temporarily Flooded Shrubland Alliance**

***Salix boothii* / *Carex utriculata* Shrubland**

BOOTH'S WILLOW / NORTHWEST TERRITORY SEDGE SHRUBLAND

IDENTIFIER: CEG001178

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
Alliance	<i>Salix boothii</i> Temporarily Flooded Shrubland Alliance (A.972)
Alliance (English name)	Booth's Willow Temporarily Flooded Shrubland Alliance
Association	<i>Salix boothii</i> / <i>Carex utriculata</i> Shrubland
Association (English name)	Booth's Willow / Northwest Territory Sedge Shrubland

ECOLOGICAL SYSTEM(S): North Pacific Montane Riparian Woodland and Shrubland (CES204.866)
Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

ELEMENT CONCEPT

GLOBAL SUMMARY: Stands occur between 1800 and 2805 m (5900-9200 feet) in elevation. Sites are usually in wide valley bottoms on low-gradient floodplains, often associated with abandoned and current beaver ponds. This cold-deciduous shrubland is composed of tall willows, from 1.2-2.4 m (4-8 feet) in height. *Salix boothii* is the dominant species, as a monoculture or with lesser amounts to near codominance of *Salix geyeriana*, *Salix lucida*, *Salix drummondiana*, or *Salix wolfii*. Other shrubs may be present in small amounts; generally underneath the taller shrubs are *Lonicera involucrata*, *Betula nana* (= *Betula glandulosa*), *Dasiphora fruticosa* ssp. *floribunda* (= *Pentaphylloides floribunda*), *Ribes inerme*, or *Ribes lacustre*. The herbaceous undergrowth is very abundant, often a dense sward of pure *Carex utriculata*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT:

GLOBAL ENVIRONMENT: This is one of the wettest *Salix boothii* shrublands. Stands occur between 1800 and 2805 m (5900-9200 feet) in elevation. Sites are usually in wide valley bottoms on low-gradient floodplains, often associated with abandoned and current beaver ponds. However, this shrubland can occur on seeps, wet toeslopes, streambanks of small meandering streams, and moist terraces, and has been seen on narrow and steep riparian corridors as well, but this is more the exception. Ground surface can be smooth or of undulating topography. Soils are for the most part accumulated fine particles from periodic inundation and are most often classified as Mollisols, but occasionally are Entisols. Soil textures are clays, fine loams or sandy, and can have an organic layer at the

surface. Soils are usually wet, with the water table at the surface throughout the growing season, but can be drier with water tables up to 1 m in depth.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION:

GLOBAL VEGETATION: This cold-deciduous shrubland is composed of tall willows, from 1.2-2.4 m (4-8 feet) in height. *Salix boothii* is the dominant species, as a monoculture or with lesser amounts to near codominance of *Salix geyeriana*, *Salix lucida*, *Salix drummondiana*, or *Salix wolfii*. Other shrubs may be present in small amounts; generally underneath the taller shrubs are *Lonicera involucrata*, *Betula nana* (= *Betula glandulosa*), *Dasiphora fruticosa* ssp. *floribunda* (= *Pentaphylloides floribunda*), *Ribes inerme*, or *Ribes lacustre*. The herbaceous undergrowth is very abundant, often a dense sward of pure *Carex utriculata*. Other graminoids can be present, rarely codominant, and include *Carex aquatilis*, *Carex pellita* (= *Carex lanuginosa*), *Glyceria grandis*, *Calamagrostis stricta*, *Calamagrostis canadensis*, *Poa palustris*, and *Deschampsia caespitosa*. Forb cover is generally sparse; the species present are highly variable but are usually high-moisture indicators. Forb species reported include *Symphyotrichum foliaceum* (= *Aster foliaceus*), *Chamerion angustifolium* (= *Epilobium angustifolium*), *Castilleja miniata*, *Fragaria virginiana*, *Symphyotrichum lanceolatum*, *Maianthemum stellatum* (= *Smilacina stellata*), *Mentha arvensis*, *Veronica americana*, or *Pedicularis groenlandica*, and many others.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Global		
<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Salix boothii</i>
Herb (field)	Graminoid	<i>Carex utriculata</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL: *Carex utriculata*, *Salix boothii*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Stands reported in Oregon (Kovalchik 1987, Crowe and Clausnitzer 1997, Crowe et al. 2004) may be mixed with other willows (*Salix geyeriana*, *Salix lemmonii*, *Salix bebbiana*); stands dominated by *Salix boothii* are a possibility.

GLOBAL SIMILAR ASSOCIATIONS:

- *Salix drummondiana* / *Carex utriculata* Shrubland (CEGL002631)
- *Salix geyeriana* / *Carex utriculata* Shrubland (CEGL001207)

GLOBAL RELATED CONCEPTS:

- *Salix* / *Carex rostrata* (Kovalchik 1987) B
- *Salix boothii* - *Salix geyeriana* / *Carex utriculata* Association (Crowe et al. 2004) B
- *Salix boothii* / *Carex rostrata* Community Type (Youngblood et al. 1985a) =
- *Salix boothii* / *Carex rostrata* Community Type (Norton et al. 1981) B
- *Salix boothii* / *Carex rostrata* Community Type (Walford et al. 2001) =
- *Salix boothii* / *Carex rostrata* Community Type (Padgett et al. 1989) =
- *Salix boothii* / *Carex utriculata* (Kittel et al. 1999b) =
- *Salix boothii* / *Carex utriculata* Shrubland (Carsey et al. 2003a) =
- *Salix boothii* / *Carex rostrata* (Bourgeron and Engelking 1994) =
- *Salix drummondiana* - *Salix myrtillofolia* / *Carex rostrata* Community Type (Mutz and Queiroz 1983) B

- *Salix geyeriana* / *Carex rostrata* Habitat Type (Hansen et al. 1995) B
- *Salix* spp. / *Carex rostrata* (Crowe and Clausnitzer 1997) B
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE:

GLOBAL RANGE: This wet riparian shrubland is known from Colorado, Wyoming, Idaho, Montana, Idaho, Oregon and possibly California.

NATIONS: US

STATES/PROVINCES: CA?, CO:S3, ID:S4, OR:S3, UT:S3?, WY:S2S3

USFS ECOREGIONS: 342B:CC, 342D:CC, M242C:CC, M331A:CC, M331D:CC, M331H:CC, M332A:CC, M332E:CC, M332G:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton); USFS (Bighorn?, Deschutes, Ochoco, Shoshone)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS:

LOCAL DESCRIPTION AUTHORS:

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Christy pers. comm., Crowe and Clausnitzer 1997, Crowe et al. 2004, Driscoll et al. 1984, Hansen et al. 1995, IDCDC 2005, Jones and Ogle 2000, Kagan et al. 2000, Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1987, Mutz and Graham 1982, Mutz and Queiroz 1983, Norton et al. 1981, Padgett et al. 1988b, Padgett et al. 1989, Tuhy and Jensen 1982, Walford et al. 2001, Western Ecology Working Group n.d., Youngblood et al. 1985a, Youngblood et al. 1985b

Salix boothii / Mesic Forbs Shrubland

BOOTH'S WILLOW / MESIC FORBS SHRUBLAND

IDENTIFIER: C EGL001180

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
Alliance	<i>Salix boothii</i> Temporarily Flooded Shrubland Alliance (A.972)
Alliance (English name)	Booth's Willow Temporarily Flooded Shrubland Alliance
Association	<i>Salix boothii</i> / Mesic Forbs Shrubland
Association (English name)	Booth's Willow / Mesic Forbs Shrubland

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is known from southern and central Idaho, western Montana, western Colorado, Utah, California, and Wyoming. Stands are found over a broad range of elevations from 1370-3050 m (4500-10,000 feet), in riparian areas on stream benches, meadows, and seeps located in narrow or broad valley bottoms. Soils are often organic. The vegetation has a 1- to 2-m tall-shrub layer that often forms extensive thickets, or willow carrs, on broad montane floodplains. The overstory of this shrubland association is dominated by *Salix boothii*. *Salix geyeriana* or *Salix drummondiana* may codominate. *Salix wolfii*, *Lonicera involucrata*, and/or *Ribes inerme* commonly form a low-shrub layer, generally tucked under the bases of the taller willows. The dense herbaceous understory is dominated by forbs. No one species is dominant or consistently present in all stands; however, when taken together, the total forb cover is greater than the total graminoid cover. Forb species typically include *Heracleum maximum* (= *Heracleum lanatum*), *Mertensia* spp., *Maianthemum stellatum* (= *Smilacina stellata*), *Symphyotrichum foliaceum*, *Aconitum columbianum*, *Cirsium arvense*, *Fragaria virginiana*, *Geranium viscosissimum*, *Hydrophyllum fendleri*, *Urtica dioica*, and *Rudbeckia*

occidentalis. Although highly variable, graminoid cover is typically less than 20%. Graminoid species include *Poa pratensis*, *Carex microptera*, *Calamagrostis canadensis*, *Agrostis gigantea*, and *Phleum pratense*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This shrubland association occurs along rivers and lakeshores on slightly elevated, flat floodplain terraces with a seasonally flooded hydrologic regime. Elevation at the two plots sampled in this association range from 1370-1412 m (4500-4630 feet). Parent material is derived from glacial-fluvial deposits. The soil is typically a well-developed and well-drained sandy loam. Pieces of angular argillite are usually present. Ground cover is primarily litter, with trace amounts of wood and bare soil.

GLOBAL ENVIRONMENT: Stands are found over a broad range of elevations from 1370-3050 m (4500-10,000 feet), and in riparian areas on stream benches, meadows, and seeps located in narrow or broad valley bottoms. Soils are often organic.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: *Salix boothii* is the dominant species in this shrubland association. It contributes almost exclusively to a total short-shrub canopy cover of approximately 75-80% in a layer 1-2 m high. *Symphoricarpos albus* is consistently present with a cover of 5-10%. *Amelanchier alnifolia*, *Lonicera involucrata*, and *Ribes inerme* may also be present with 1-3% cover. The total canopy cover in the herbaceous layer is roughly 20% and dominated by a variety of moist-site forbs. High-constancy forbs include *Angelica arguta*, *Bromus carinatus*, *Chamerion angustifolium*, *Heracleum maximum*, *Maianthemum stellatum*, *Osmorhiza occidentalis*, *Thalictrum occidentale*, and non-native species *Phleum pratense* and *Taraxacum officinale*. *Calamagrostis canadensis* may be abundant in certain areas. Other species that may be present include *Urtica dioica*, *Galium triflorum*, *Symphyotrichum laeve* (= *Aster laevis*), *Geum macrophyllum*, *Fragaria virginiana*, *Solidago canadensis*, *Viola canadensis*, and *Elymus glaucus*. Finally, *Populus tremuloides* may also be present in the subcanopy, shrub or herbaceous layers with up to 15% cover.

GLOBAL VEGETATION: The vegetation has a 1- to 2-m tall-shrub layer that often forms extensive thickets, or willow carrs, on broad montane floodplains. The overstory of this shrubland association is dominated by *Salix boothii*. *Salix geyeriana* or *Salix drummondiana* may codominate. *Salix wolfii*, *Lonicera involucrata*, and/or *Ribes inerme* commonly form a low-shrub layer. The dense herbaceous understory is dominated by forbs. No one species is dominant or consistently present in all stands; however, when taken together, the total forb cover is greater than the total graminoid cover. Forb species typically include *Heracleum maximum* (= *Heracleum lanatum*), *Mertensia* spp., *Maianthemum stellatum* (= *Smilacina stellata*), *Symphyotrichum foliaceum*, *Aconitum columbianum*, *Cirsium arvense*, *Fragaria virginiana*, *Geranium viscosissimum*, *Hydrophyllum fendleri*, *Urtica dioica*, and *Rudbeckia occidentalis*. Although highly variable, graminoid cover is typically less than 20%. Graminoid species include *Poa pratensis*, *Carex microptera*, *Calamagrostis canadensis*, *Agrostis gigantea*, and *Phleum pratense*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Salix boothii</i> , <i>Symphoricarpos albus</i>
Herb (field)	Forb	<i>Angelica arguta</i> , <i>Chamerion angustifolium</i> , <i>Heracleum maximum</i> , <i>Thalictrum occidentale</i>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Salix boothii</i>
Herb (field)	Forb	<i>Maianthemum stellatum</i> , <i>Urtica dioica</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Angelica arguta*, *Bromus carinatus*, *Calamagrostis canadensis*, *Chamerion angustifolium*, *Heracleum maximum*, *Maianthemum stellatum*, *Osmorhiza occidentalis*, *Salix boothii*, *Symphoricarpos albus*, *Thalictrum occidentale*

GLOBAL: *Heracleum maximum*, *Salix boothii*, *Urtica dioica*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Phleum pratense*, *Taraxacum officinale*, *Urtica dioica*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3 (19-Sep-2000). This association occurs in Idaho, California, and is a widespread type across Utah and Colorado where most of the known occurrences are located. In many parts of its range this association is threatened by livestock overgrazing, stream flow alterations, and heavy recreational use.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: Only one plot was sampled to define this association, indicating it is probably uncommon, with limited distribution in Glacier National Park; however, *Salix boothii* is one of the most common willows throughout northwestern Montana. Hansen et al. (1995) recognize *Salix geyeriana* as an ecological analogue of *Salix boothii* in Montana, and this one plot would key to a *Salix geyeriana* community type in their classification.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Salix boothii* / *Maianthemum stellatum* Shrubland (CEGL001187)
- *Salix boothii* / Mesic Graminoids Shrubland (CEGL001181)
- *Salix boothii* / *Poa palustris* Shrubland (CEGL001183)
- *Salix geyeriana* / Mesic Forbs Shrubland (CEGL002666)

GLOBAL RELATED CONCEPTS:

- *Salix boothii* / Mesic Forb Community Type (Padgett et al. 1989) =
- *Salix boothii* / Mesic Forb Plant Association (Kittel et al. 1997b) =
- *Salix boothii* / Mesic Forb Shrubland (Carsey et al. 2003a) =
- *Salix boothii*/Mesic Forb (Kittel et al. 1999b) =
- *Salix boothii*/Mesic forb (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This shrubland association is not common in the International Peace Park. It occurs on some floodplains in Glacier National Park, east of the Continental Divide. Specifically, the association was documented in the Belly River drainage and along St. Mary Lake. It may also occur along other river and lakeplains on the eastern side of Glacier National Park.

GLOBAL RANGE: This association is known from Colorado, Utah, Idaho, California, and possibly Wyoming.

NATIONS: US

STATES/PROVINCES: CA:S2?, CO:S3, ID:S3, MT, NV:S3, OR:SU, UT:S3?, WY

USFS ECOREGIONS: 342B:CC, 342E:CC, M331D:CC, M331H:CC, M332E:CC, M333C:CC, M341A:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton); USFS (Medicine Bow?, Shoshone?)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.135, AAGL.594.

LOCAL DESCRIPTION AUTHORS: S. Kimball, mod. J. Asebrook

GLOBAL DESCRIPTION AUTHORS: J. Thompson and J. Stevens, mod. G. Kittel

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Driscoll et al. 1984, Hansen et al. 1988b, Hansen et al. 1995, IDCDC 2005, Jones and Ogle 2000, Kagan et al. 2004, Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1997b, Kittel et al. 1999b, NVNHP 2003, Norton et al. 1981, Padgett et al. 1988b, Padgett et al. 1989, Sawyer and Keeler-Wolf 1995, Weixelman et al. 1996, Western Ecology Working Group n.d., Youngblood et al. 1985a, Youngblood et al. 1985b

Salix drummondiana* Temporarily Flooded Shrubland Alliance**Salix drummondiana* / *Calamagrostis canadensis* Shrubland
DRUMMOND'S WILLOW / BLUEJOINT SHRUBLAND****IDENTIFIER:** C EGL002667**NVC Classification**

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
Alliance	<i>Salix drummondiana</i> Temporarily Flooded Shrubland Alliance (A.973)
Alliance (English name)	Drummond's Willow Temporarily Flooded Shrubland Alliance
Association	<i>Salix drummondiana</i> / <i>Calamagrostis canadensis</i> Shrubland
Association (English name)	Drummond's Willow / Bluejoint Shrubland

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)**ELEMENT CONCEPT**

GLOBAL SUMMARY: This is a widespread mountainous riparian association known from lakeshores, floodplains, riparian zones, and wet meadows at elevations ranging from 707 to 3110 m (2320-10,200 feet). This association occurs from Colorado to Montana west to Washington and most often occurs in valley bottom positions, ranging from relatively narrow montane valleys to wide glacial troughs. Stands can be long narrow strings along steep-gradient streams or wide willow shrublands. Soils are usually well-developed but poorly drained, dark-colored silty clay loams. These soils often have much organic material intermixed and overlie deposits of gravel and rocks. Soils can occasionally be well-drained, gravelly loamy sands. It is characterized by a dense canopy of *Salix drummondiana* and a thick undergrowth of *Calamagrostis canadensis*. Stands are often associated with beaver activity.

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:** Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This is a common riparian association, known from lakeshores, floodplains, riparian zones, and wet meadows at elevations ranging from 1140 to 2090 m (3738-6086 feet). This association most often occurs in valley bottom positions, ranging from relatively narrow montane valleys to wide glacial troughs, typically on glacial, fluvial, or lacustrine deposits. Stands also occur as riparian stringers in steeper drainages on mountain toeslopes underlain by various sedimentary rocks. Sites for this association are usually seasonally flooded and include wide floodplains, among and within braided intermittent channels; adjacent to moderate-gradient, low order streams; in wet meadows along small streams; around lakeshore and outlet wetlands; and occasionally in seep-fed areas. Soils are usually well-developed, but poorly drained, dark-colored silty clay loams. These soils often have much organic material intermixed and overlie deposits of gravel and rocks. Soils can occasionally be well-drained, gravelly loamy sand in habitats heavily influenced by fluvial processes (deposition and erosion). Beaver cutting and browsing by ungulates, especially moose, are common in this association and may help maintain a diverse and lush undergrowth by opening the shrub canopy.

GLOBAL ENVIRONMENT: This montane to subalpine riparian shrubland is found in the Colorado Rockies north to Montana, Idaho and Washington and may extend into Canada. This is a mountainous region with a varied, continental climate of warm summers and cold winters. Precipitation falls predominantly as snow in the winter and spring, although summer convective showers make a significant contribution to the total. It occurs in the lower subalpine zone, from 707 m (2320 feet) in the north to approximately 3110 m (10,200 feet) elevation in the southern extend, along moderate-sized streams in relatively broad glaciated valleys. The floodplains are low-gradient and have sand- or silt-beds within which the streams meander. It occasionally occurs on smaller streams with several 1- to 5-m wide channels. The sites often have active or abandoned beaver dams and ponds. Soils are usually well-developed but poorly drained, dark-colored silty clay loams. These soils often have much organic material intermixed and overlie deposits of gravel and rocks. Soils can occasionally be well-drained, gravelly loamy sand in habitats heavily influenced by fluvial processes (deposition and erosion).

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: An overstory of *Salix drummondiana*, averaging 1 to 2 m tall, usually characterizes this association. Except in recently burned or early seral stands, this willow has high cover (at least 68% cover). *Salix drummondiana* can also occur as a shorter understory shrub, often mixed with *Ribes lacustre* (averaging 24% cover) or shrubs with low constancy, such as *Cornus sericea*, *Lonicera involucrata*, *Ribes inerme*, or *Salix boothii*. *Calamagrostis*

canadensis, with 100% constancy, is dominant in the majority of stands (averaging 33% cover) forming a diagnostic understory layer up to 1 m in height. *Carex utriculata* is moderately constant, but its cover does not exceed 10%. The presence of a diverse mesic forb layer is also often characteristic of this association. However, no forb species averages more than 10% cover. Tall forbs, each present in greater than 50% of stands, include *Eucephalus engelmannii*, *Senecio triangularis*, *Thalictrum occidentale*, and *Urtica dioica*. Shorter mesic forbs, especially *Symphyotrichum foliaceum* (= *Aster foliaceus*) and *Equisetum arvense*, are also usually common in the understory. *Cirsium arvense* can have moderate cover in burnt stands. Although highly variable from stand to stand (often inversely related to the amount of litter), the cover of nonvascular species can be as high as 60%. Litter cover ranges from 20 to 60%. Conifer invasion is rare in this association.

GLOBAL VEGETATION: This is a broad-leaved deciduous shrubland association, consisting of a mixed layer of multistemmed *Salix* clumps scattered in a matrix of graminoids. The 3- to 5-m tall *Salix drummondiana* dominates (>20%), with lesser amounts of the equally tall *Salix monticola*, *Salix planifolia*, *Salix boothii*, and shorter shrubs such as *Salix wolfii*, *Ribes lacustre*, *Cornus sericea*, *Lonicera involucrata*, or *Ribes inerme*. Total shrub cover is high, between 30% and 75%. The lush herbaceous layer is dominated by graminoids, both perennial grasses and sedges. The two dominant species are *Calamagrostis canadensis* and *Carex utriculata*. Several other common graminoids include *Carex aquatilis*, *Carex microptera*, and *Deschampsia caespitosa*. The most abundant perennial forbs include *Heracleum maximum* (= *Heracleum lanatum*), *Equisetum arvense*, *Senecio triangularis*, *Thalictrum occidentale*, *Cardamine cordifolia*, and *Mertensia ciliata*. *Urtica dioica* and *Cirsium arvense* can be abundant in recently disturbed stands. Total herbaceous cover is typically over 70%.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Salix drummondiana</i>

SHORT SHRUB/SAPLING *RIBES LACUSTRE*

Herb (field)	Forb	<i>Eucephalus engelmannii</i> , <i>Symphyotrichum foliaceum</i> , <i>Urtica dioica</i>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i> , <i>Carex utriculata</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	<i>Salix monticola</i> , <i>Salix planifolia</i>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Salix drummondiana</i> , <i>Salix wolfii</i>
Herb (field)	Forb	<i>Cardamine cordifolia</i> , <i>Heracleum maximum</i> , <i>Mertensia ciliata</i>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i> , <i>Carex rostrata</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Calamagrostis canadensis*, *Equisetum arvense*, *Salix drummondiana*, *Senecio triangularis*, *Thalictrum occidentale*

GLOBAL: *Calamagrostis canadensis*, *Carex rostrata*, *Equisetum arvense*, *Salix drummondiana*, *Salix planifolia*, *Senecio triangularis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Cirsium arvense*, *Poa palustris*, *Rumex crispus*, *Urtica dioica*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3 (14-Nov-1997). This association requires low-gradient floodplain habitats in which natural processes are intact. This association is geographically widespread but occurs only in areas with suitable environmental conditions of medium- to fine-textured alluvial soils, perennial soil moisture, and abundant light. The low-gradient meadows where this association occurs are favored as summer pasture for domestic livestock. Livestock herbivory of seedlings can lead to losses of stands by attrition, and many stands are severely impacted (G. Kittel pers. comm.). This association is threatened by livestock grazing and invasive species throughout its range.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: In the IPP, *Salix drummondiana* / Mesic Forbs Shrubland (CEGL001192) is differentiated from this association, *Salix drummondiana* / *Calamagrostis canadensis* Shrubland

(CEGL002667), by a lack of *Calamagrostis canadensis*, and *Salix drummondiana* / *Carex utriculata* Shrubland (CEGL002631) is distinguished by having *Carex utriculata* dominant or with at least 10% canopy cover.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Picea engelmannii* / *Salix drummondiana* Woodland (CEGL005843)
- *Salix drummondiana* / *Carex scopulorum* var. *prionophylla* Shrubland (CEGL001584)
- *Salix drummondiana* / *Carex utriculata* Shrubland (CEGL002631)
- *Salix drummondiana* / Mesic Forbs Shrubland (CEGL001192)

GLOBAL RELATED CONCEPTS:

- *Salix drummondiana* - *Calamagrostis canadensis* Habitat Type/Association (Komarkova 1986) =
- *Salix drummondiana* - *Salix monticola* / *Calamagrostis canadensis* - *Carex rostrata* (Baker 1986) =
- *Salix drummondiana* - *Salix monticola* / *Calamagrostis canadensis* - *Carex rostrata* Association (Baker 1989b) =
- *Salix drummondiana* / *Calamagrostis canadensis* Association (Kovalchik 1993) =
- *Salix drummondiana* / *Calamagrostis canadensis* Association (Kittel et al. 1999b) =
- *Salix drummondiana* / *Calamagrostis canadensis* Community Type (Tuhy and Jensen 1982) =
- *Salix drummondiana* / *Calamagrostis canadensis* Habitat Type (Hall and Hansen 1997) =
- *Salix drummondiana* / *Calamagrostis canadensis* Habitat Type (Hansen et al. 1995) =
- *Salix drummondiana* / *Calamagrostis canadensis* Plant Association (Johnston 1987) =
- *Salix drummondiana* / *Calamagrostis canadensis* Shrubland (Carsey et al. 2003b) =
- *Salix drummondiana* / *Calamagrostis canadensis* Shrubland (Carsey et al. 2003a) =
- *Salix drummondiana*/ *Calamagrostis canadensis* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE: III.B.3.c. (Driscoll et al. 1984) B
- UNESCO FORMATION CODE: III.B.3c (UNESCO 1973) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This is a major, widespread riparian and wetland association at low to mid elevations in the Glacier National Park portion of the IPP. The majority of stands are scattered across the east slope and interior drainages. The association is known from wetlands near lakeshores and outlet creeks (e.g., at Swiftcurrent and Slide Lakes), floodplains and wet meadows of wide-bottomed stream valleys (e.g., Waterton Valley and North Fork Cut Bank Creek), and riparian zones of steeper creeks in narrower valleys (e.g., Fortymile Creek on the east slope and Autumn Creek in the Middle Fork Flathead basin). Only one occurrence of this association has been documented on the west slope (in the Dutch Creek drainage of the North Fork Flathead River basin).

GLOBAL RANGE: This association has been described from southwestern Colorado to Montana, Idaho, and Washington, and is to be expected throughout the northern intermountain region at suitable sites.

NATIONS: CA?, US

STATES/PROVINCES: AB?, BC?, CO:S3, ID:S2, MT, WA:S2?

USFS ECOREGIONS: M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332E:CC, M332F:CC, M333A:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier, Rocky Mountain)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.121, GLAC.188, GLAC.2076, GLAC.244, GLAC.58, GLAC.97, GLAC.2649.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: M.S. Reid, mod. D. Sarr, G. Kittel, K.A. Schulz

REFERENCES: Baker 1986, Baker 1989a, Baker 1989b, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Carsey et al. 2003b, Driscoll et al. 1984, Hall and Hansen 1997, Hansen et al. 1995, IDCDC 2005, Johnston 1987, Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel et al. 1999a, Kittel et al. 1999b, Komarkova 1986, Kovalchik 1993, MTNHP 2002b, Sanderson and Kettler 1996, Tuhy and Jensen 1982, UNESCO 1973, WNHP unpubl. data, Western Ecology Working Group n.d.

***Salix drummondiana* / Mesic Forbs Shrubland
DRUMMOND'S WILLOW / MESIC FORBS SHRUBLAND**

IDENTIFIER: C EGL001192**NVC Classification**

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
Alliance	<i>Salix drummondiana</i> Temporarily Flooded Shrubland Alliance (A.973)
Alliance (English name)	Drummond's Willow Temporarily Flooded Shrubland Alliance
Association	<i>Salix drummondiana</i> / Mesic Forbs Shrubland
Association (English name)	Drummond's Willow / Mesic Forbs Shrubland

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

ELEMENT CONCEPT

GLOBAL SUMMARY: This riparian shrubland most commonly occurs on relatively steep streams and rarely forms more than a narrow, 1.5- to 7.5-m (5-25 feet) wide band along streambanks. It is known from the mountains of Colorado, Utah, Wyoming and Montana, from 960-3450 m (3150-11,300 feet). It occurs in narrow, V-shaped valleys as a dense, narrow band along high-gradient (1-41%) streams and as large willow shrublands in broad valleys, 50-305 m (150-1000 feet) wide, along low-gradient (1-3%), moderately sinuous streams. Stands also occur along broad, highly sinuous streams and broad, actively down-cutting channels. This association can also occur near seeps. Soils range from deep sandy loams and sandy clay loams with no coarse fragments to shallow silty clay loams and sandy clay loams over coarse, angular cobbles. The closed to partially open canopy of *Salix drummondiana* and a thick carpet of many forb species, with no single species dominant nor consistently present, characterize this plant association.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is known from the bottoms of large glacial troughs from 960 m (3150 feet) in elevation to mountain streams at outlets of tarns as high as 1850 m (6070 feet). The association most commonly occurs along moderate-gradient streams of various orders that drain cirques and glacial troughs. In these areas, stands form on flat, gently sloped, or undulating stream terraces, as well as in channels of active floodplains. Although usually seasonally flooded, the vegetation of terrace stands is probably not as disturbed as that of stands in floodplain positions. The soil of terraces and floodplains is nearly always derived from glacial-fluvial deposits and is well-drained. Soil textures are characteristically sandy, occasionally with gravel and argillite stones intermixed, and sometimes loamy, but vary in the amount silt, clay, and organic matter present. About a third of the stands are known from habitat on alluvial or colluvial fan deposits at the toeslopes of steep mountains. Such sites are at the bases of avalanche chutes or along steep, low order drainages. The association forms gently to steeply sloped riparian stands in these settings, often on rockier soils of variable drainage ability. Occasionally, the association is observed on alluvial soils in valley bottom wetlands, such as in wet meadows around beaver ponds or sloughs. The soils in these areas are more poorly drained than in other habitats, remaining flooded or saturated for long periods.

GLOBAL ENVIRONMENT: This riparian shrubland most commonly occurs on relatively steep streams and typically forming a narrow, 1.5- to 7.5-m (5-25 feet) band along streambanks, from 960-3500 m (3150-11,300 feet) in elevation. It occurs in narrow, V-shaped valleys as a dense, narrow band along high-gradient (1-41%) streams, but can also occur as large willow shrublands in broad valleys, 50-300 m (150-1000 feet) wide, along low-gradient (1-3%), moderately sinuous streams. It also occurs along broad, highly sinuous streams and broad, actively down-cutting channels. This association also occur near seeps. Soils range from deep sandy loams and sandy clay loams with no coarse fragments to shallow silty clay loams and sandy clay loams over coarse, angular cobbles.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This association is characterized by high species diversity in both the shrub overstory and the forb-dominated understory. *Salix drummondiana* is the only shrub with both high cover (averaging at least 67% cover) and 100% constancy. *Ribes lacustre* is present under or around *Salix drummondiana* clumps in the majority of stands, but cover averages only 5%. Indicative of the high species diversity present, the medium to tall shrubs *Lonicera involucrata*, *Rubus parviflorus*, and *Sambucus racemosa* are sometimes present, but with cover averaging less than 10%. Although infrequently observed, the tall shrubs *Acer glabrum*, *Alnus viridis ssp. sinuata*, *Cornus sericea*, *Crataegus douglasii*, and *Rhamnus alnifolia*, and shorter *Salix glauca* can all have cover greater than 10% in this association. In general, the shrub overstory can vary in height from 1 to over 2 m, depending on the species composition and other site conditions. The herbaceous undergrowth is clearly dominated by mesic forbs up to 1 m tall, but their total cover and composition varies, probably in relation to the interactions between flood disturbances and shrub overstory density. The most characteristic and abundant forbs are *Heracleum maximum*, *Thalictrum occidentale*, and *Urtica dioica*, each present in the majority of stands. *Urtica dioica* has an average cover of 25%, while the other two average 7 to 10% cover. A mix of other mesic forb species, each with varying cover but lower constancy (e.g., *Erigeron peregrinus*,

Prosartes spp. (= *Disporum* spp., *Osmorhiza* spp., and *Senecio* spp.) is also usually present. *Galium triflorum* is present in the majority of stands with an average cover of 5%, forming a diverse mesic forb ground layer with species such as *Mitella* spp. and *Viola* spp. that have low cover and constancy. Total graminoid cover averages 20% or less and species diversity is low. The most frequently encountered species are tall grasses (*Elymus glaucus* and various *Bromus* spp.). The cover of nonvascular species averages only 5 to 10%. Instead, often about two-thirds of the ground is covered by litter and woody material.

GLOBAL VEGETATION: *Salix drummondiana* forms an open to closed canopy of tall shrubs lining the streambank with 20-98% cover. Several other shrub species may be present, some with equal cover, but none that exceed that of *Salix drummondiana*. Other shrub species that may be present include *Salix brachycarpa*, *Salix planifolia*, and *Alnus incana* in Colorado, and *Salix glauca*, *Ribes lacustre*, *Lonicera involucrata*, and *Alnus viridis* in Montana. Mature trees may be present, not forming a true overhead canopy, but a few individuals may be scattered about the shrubland or with their canopy leaning over from an adjacent forested association. Tree species that may be present include *Picea engelmannii*, *Abies lasiocarpa*, *Populus angustifolia*, and *Populus tremuloides*. The herbaceous undergrowth in some stands is sparse due to heavy shade and shallow soils. Other stands have a rich diversity of forbs and graminoids in the undergrowth. In general, total forb cover exceeds that of graminoid cover, and no single species is dominant. Forb species include *Mertensia ciliata*, *Heracleum maximum* (= *Heracleum lanatum*), *Thalictrum occidentale*, *Cardamine cordifolia*, *Oxypolis fendleri*, *Hydrophyllum fendleri*, *Galium triflorum*, *Rudbeckia occidentalis*, *Saxifraga odontoloma*, *Solidago canadensis*, *Angelica arguta*, *Cirsium arvense*, *Delphinium X occidentale*, *Eucephalus engelmannii*, *Ligusticum filicinum*, *Maianthemum stellatum*, *Valeriana occidentalis*, and *Delphinium barbeyi*. Graminoid species include *Carex utriculata*, *Equisetum arvense*, and *Calamagrostis canadensis*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling		<i>Crataegus douglasii</i> , <i>Rhamnus alnifolia</i> , <i>Salix drummondiana</i>
Short shrub/sapling		<i>Alnus viridis</i> ssp. <i>sinuata</i> , <i>Salix glauca</i>
Herb (field)	Forb	<i>Erigeron peregrinus</i> , <i>Heracleum maximum</i> , <i>Thalictrum occidentale</i> , <i>Urtica dioica</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Salix drummondiana</i>
Herb (field)	Forb	<i>Heracleum maximum</i> , <i>Thalictrum occidentale</i> , <i>Urtica dioica</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Galium triflorum*, *Heracleum maximum*, *Thalictrum occidentale*

GLOBAL: *Salix drummondiana*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Agrostis stolonifera*, *Taraxacum officinale*, *Urtica dioica*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (7-Apr-1998).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This association is distinguished from other *Salix drummondiana* associations in the IPP by its lack of both *Calamagrostis canadensis* and *Carex utriculata*, and by having mixed mesic forbs as undergrowth dominants.

GLOBAL COMMENTS: Without catkins *Salix drummondiana* can be difficult to distinguish from the similar looking *Salix geyeriana*. Both species are tall, greater than 2 m (5 feet), montane willows with strongly pruinose (a waxy covering that rubs off, similar to the coating on a plum) current-year twigs. However, the two species can be distinguished using only vegetative characters. *Salix geyeriana* leaves are never more than 13 mm wide and *Salix drummondiana* leaves are, on average, over 13 mm wide (on nonsucker shoots) (Welsh et al. 1987).

Closely related communities include: the *Salix boothii*/mesic forb community type (Padgett et al. 1989) which includes stands dominated by *Salix drummondiana*, the *Salix boothii/Smilacina stellata* community type (Youngblood et al. 1985a), which also includes stands dominated by *Salix drummondiana*, and the *Salix drummondiana* community type (Manning and Padgett 1995), which does not appear to have any significant forb undergrowth.

GLOBAL SIMILAR ASSOCIATIONS:

- *Salix drummondiana* / *Calamagrostis canadensis* Shrubland (CEGL002667)

GLOBAL RELATED CONCEPTS:

- *Salix drummondiana* - *Salix monticola* Community Type (Phillips 1977) =
- *Salix drummondiana* / *Mertensia ciliata* Association (Cooper and Cottrell 1990) =
- *Salix drummondiana* / Mesic Forb Shrubland (Carsey et al. 2003a) =
- *Salix drummondiana*/Mesic forb (Bourgeron and Engelking 1994) =
- *Salix drummondiana*/Mesic forb (Kittel et al. 1999b) =
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B
- Drummond willow/Mesic Forbs (*Salix drummondiana*/Mesic Forbs) (Kittel et al. 1999a) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This is a major riparian association in the IPP. It is most frequently observed across the east slope of Glacier National Park at low to mid elevations, ranging from the Belly River basin south to the Two Medicine Creek basin, but it is also known from the McDonald Creek basin on the west slope. It is also known from the interior in the Waterton Valley area, as well as one location in Waterton Lakes National Park. The association most commonly occurs along moderate-gradient streams of various orders that drain tarns (e.g., along the Mokowanis River below Cosley Lake, along Otatso Creek below Slide Lake, and along Pass Creek below Stoney Indian Pass). The association is also known from mountain toeslopes at the base of avalanche chutes or steep creeks, such as at the head of Lake Sherburne and in the McDonald Creek valley. This association is also occasionally present in wetlands of glacial trough bottoms, such as at Two Medicine Lake beaver ponds and the McDonald Lake outlet slough.

GLOBAL RANGE: This plant association occurs in Colorado, Montana and Alberta, Canada. It is likely to be more widespread, but is currently undocumented elsewhere.

NATIONS: CA, US

STATES/PROVINCES: AB, CO:S4, MT, WY

USFS ECOREGIONS: M331D:CC, M331G:CC, M331H:CC, M331I:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton, Rocky Mountain); PC (Waterton Lakes); USFS (San Juan)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.119, GLAC.131, GLAC.144, GLAC.2060, GLAC.21, GLAC.2300, GLAC.231, GLAC.57, WATE.4073.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Cooper and Cottrell 1990, Driscoll et al. 1984, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1996, Kittel et al. 1999a, Kittel et al. 1999b, MTNHP 2002b, Manning and Padgett 1995, Padgett et al. 1989, Phillips 1977, Western Ecology Working Group n.d., Youngblood et al. 1985a

***Salix geyeriana* Temporarily Flooded Shrubland Alliance**

***Salix geyeriana* / Mesic Forbs Shrubland**

GEYER'S WILLOW / MESIC FORBS SHRUBLAND

IDENTIFIER: CEGL002666

NVC Classification

Physiognomic Class Shrubland (III)
Physiognomic Subclass Deciduous shrubland (III.B.)

Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
Alliance	<i>Salix geyeriana</i> Temporarily Flooded Shrubland Alliance (A.975)
Alliance (English name)	Geyer's Willow Temporarily Flooded Shrubland Alliance
Association	<i>Salix geyeriana</i> / Mesic Forbs Shrubland
Association (English name)	Geyer's Willow / Mesic Forbs Shrubland

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

ELEMENT CONCEPT

GLOBAL SUMMARY: The association is widely distributed, but infrequently sampled, in the northern central and southern Rocky Mountains at mid to high elevations of about 1122 to over 3019 m (3680-9900 feet). This association usually occurs in wide, low-gradient valley bottoms with sinuous streams or large rivers, but it is also known from narrower, slightly steeper valleys of headwater creeks. Sites supporting this association include terraces and streambanks (at or much higher than mean high water), as well as the drier margins of wetland floodplains. Soils are highly stratified alluvium and range from well-drained sandy loams and clay loams, with large amounts of coarse fragments intermixed, to highly organic and poorly drained, silty clay loams with mottling. The association is clearly dominated by clumps of 1.5- to 2.5-m tall *Salix geyeriana* (usually 60-90% cover) with *Salix boothii* sometimes also present with low to moderate cover. Other willows, such as *Salix drummondiana*, low shrubs (especially *Dasiphora fruticosa* ssp. *floribunda*, *Ericameria parryi*, *Ribes inerme*, *Ribes lacustre*, and/or *Rosa woodsii*), and trees occasionally occur with low to moderate cover in stands. There is a diverse mixture of mesic forbs (with cover greater than that of mesic graminoids) in the understory, forming multiple height layers. No single species has consistently high cover or constancy. The most common and widespread forbs are *Aconitum columbianum*, *Equisetum arvense*, *Fragaria virginiana*, *Geranium* spp., *Geum macrophyllum*, *Maianthemum stellatum*, *Pedicularis groenlandica*, *Swertia perennis*, and *Symphyotrichum foliaceum*. Other tall forb species, sometimes with moderate cover but lower constancy, include *Angelica arguta*, *Heracleum maximum*, *Mertensia* spp., *Polemonium occidentale*, *Potentilla gracilis*, *Thalictrum* spp., and *Urtica dioica*. The graminoid layer is poorly developed, tending to be dominated by exotic species with low cover (e.g., *Agrostis gigantea*, *Agrostis stolonifera*, *Poa pratensis*, and *Phleum pratense*), but also includes native graminoids (most commonly *Bromus ciliatus*, *Calamagrostis canadensis*, *Carex microptera*, *Carex utriculata*, or *Juncus balticus*).

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: One stand of this association was observed at 1122 m (3680 feet) elevation in a wet-meadow complex located on the flat bottom of a wide river valley. The association occurred on somewhat poorly drained soil rich with organic deposits. The soil had a silty loam texture. *Carex utriculata* dominated adjacent wetter soil.

GLOBAL ENVIRONMENT: The association is widely distributed, but infrequently sampled, in the northern central and southern Rocky Mountains at mid to high elevations of about 1122 to over 3019 m (3680-9900 feet). This association usually occurs in wide, low-gradient valley bottoms with sinuous streams or large rivers, but it is also known from narrower, slightly steeper valleys of headwater creeks. Sites supporting this association include terraces and streambanks (at or much higher than mean high water), as well as the drier margins of wetland floodplains. Soils are highly stratified alluvium and range from well-drained sandy loams and clay loams, with large amounts of coarse fragments intermixed, to highly organic and poorly drained, silty clay loams with mottling (Padgett et al. 1989, Kittel et al. 1999b, Carsey et al. 2003a).

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: In the one stand observed, *Salix geyeriana* with 70% cover (>2 m tall) characterized this association along with a dense and constant understory of the low shrubs *Rhamnus alnifolia* and the mesic forbs *Stellaria borealis* and *Urtica dioica*, each with 40% cover. *Salix boothii*, with 7% cover, was scattered throughout the stand, with lesser amounts of *Ribes inerme* in the understory. *Geum macrophyllum* and other mesic forbs, such as *Heracleum maximum*, were also present with 3% cover each. *Bromus ciliatus*, with 4% cover, was the only graminoid with greater than trace cover. Litter and duff covered 90% of the ground, while mosses were present with only low cover.

GLOBAL VEGETATION: The association is clearly dominated by clumps of 1.5- to 2.5-m tall *Salix geyeriana* (usually 60-90% cover) with *Salix boothii* sometimes also present (with low to moderate cover). Other tall willows, such as *Salix drummondiana*, low shrubs (especially *Dasiphora fruticosa* ssp. *floribunda*, *Ericameria parryi*, *Ribes inerme*, *Ribes lacustre*, and/or *Rosa woodsii*), and trees occasionally occur with low to moderate cover in stands. There is a diverse mixture of mesic forbs (with cover greater than that of mesic graminoids) in the understory, forming multiple height layers. No single species has consistently high cover or constancy. The most common and widespread forbs are *Aconitum columbianum*, *Equisetum arvense*, *Fragaria virginiana*, *Geranium* spp., *Geum macrophyllum*, *Maianthemum stellatum*, *Pedicularis groenlandica*, *Swertia perennis*, and *Symphyotrichum foliaceum*. Other tall forb species, sometimes with moderate cover but lower constancy, include *Angelica arguta*, *Heracleum maximum*, *Mertensia* spp.,

Polemonium occidentale, *Potentilla gracilis*, *Rumex salicifolius*, *Thalictrum* spp., *Urtica dioica*, and *Vicia americana*. The graminoid layer is poorly developed, tending to be dominated by exotic species with low cover (e.g., *Agrostis gigantea*, *Agrostis stolonifera*, *Poa pratensis*, and *Phleum pratense*), but also includes native graminoids (most commonly *Bromus ciliatus*, *Calamagrostis canadensis*, *Carex microptera*, *Carex utriculata*, or *Juncus balticus*). Introduced forbs include *Cardaria chalapensis*, *Cirsium arvense*, *Descurainia sophia*, *Lepidium campestre*, and *Taraxacum officinale*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Salix boothii</i> , <i>Salix geyeriana</i>

SHORT SHRUB/SAPLING RHAMNUS ALNIFOLIA

Herb (field)	Forb	<i>Stellaria borealis</i> , <i>Urtica dioica</i>
Herb (field)	Graminoid	<i>Bromus ciliatus</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Salix boothii</i> , <i>Salix geyeriana</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i> , <i>Ribes inerme</i>
Herb (field)	Dwarf-shrub	<i>Rosa woodsii</i>
Herb (field)	Forb	<i>Aconitum columbianum</i> , <i>Fragaria virginiana</i> , <i>Geum macrophyllum</i> , <i>Maianthemum stellatum</i>
Herb (field)	Graminoid	<i>Bromus ciliatus</i> , <i>Carex microptera</i> , <i>Juncus balticus</i>
Herb (field)	Fern or fern ally	<i>Equisetum arvense</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Rhamnus alnifolia*, *Salix geyeriana*, *Stellaria borealis*

GLOBAL: *Geum macrophyllum*, *Ribes inerme*, *Ribes lacustre*, *Rosa woodsii*, *Salix geyeriana*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Poa palustris*, *Poa pratensis*

GLOBAL: *Agrostis stolonifera*, *Phleum pratense*, *Poa pratensis*

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3 (22-Oct-2002). This association is a widely distributed and well-documented association known mainly from mid to high elevations of the northern Rockies (especially central and eastern Idaho) and central Rockies (especially Colorado). This association usually occurs on streambanks and terraces in wide, low-gradient valley bottoms of variable size streams, but it may also occur on the drier margins of floodplains. Habitats and soils supporting this association are variable but are relatively common across the landscape. Despite the association's broad geographic range, wide distribution of potential habitat, and relatively low environmental specificity, stands of this type are infrequently observed. Large stands in good to excellent ecological condition, with no exotic grasses or forbs in the understory, are rare. This association is known from only about 60-100 occurrences. Because this is a broadly defined association by some researchers, degraded stands with exotic species in the understory have been included in classification results. This makes estimation of the exact number of occurrences difficult. Livestock overgrazing, hydrologic alterations, road building, and recreational use are documented threats to the association. Stands are apparently under-represented in protected areas.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Classification of this association is based on over 20 plots from throughout the range of the association (Youngblood et al. 1985a, Padgett et al. 1989, Kittel et al. 1999b, Jankovsky-Jones et al. 2001, Walford et al. 2001, IDCDC 2002). This association is sometimes lumped within broader associations when dominance by *Salix geyeriana* is not obvious. A general *Salix geyeriana* association described in eastern Idaho may include stands with mesic forb understories (Hansen and Hall 2002). In contrast, other studies may have split this association into finer types that are included here; some of these may represent grazing-induced variants of this association. Several other associations, such as *Salix boothii* / Mesic Forbs Shrubland (CEGL001180), may floristically resemble this association. However, when undisturbed, this association is defined by obvious *Salix geyeriana* dominance with an

understory dominated by mixed native mesic forbs, none of which has consistently high cover and constancy (Youngblood et al. 1985a, Padgett et al. 1989).

GLOBAL SIMILAR ASSOCIATIONS:

- *Salix boothii* / Mesic Forbs Shrubland (CEGL001180)
- *Salix geeyeriana* - *Salix monticola* / Mesic Forbs Shrubland (CEGL001223)--from Colorado differs because *Salix monticola* is always present with a significant cover (sometimes greater abundance than *Salix geeyeriana*).

GLOBAL RELATED CONCEPTS:

- *Salix* spp. / Mesic Forb (Crowe and Clausnitzer 1997) B
- *Salix geeyeriana* / *Fragaria virginiana* Habitat Type (Mattson 1984) F
- *Salix geeyeriana* / *Geum macrophyllum* Community Type (Tuhy 1981) F
- *Salix geeyeriana*/*Achillea millefolium* ssp. *lanulosa* (Bourgeron and Engelking 1994) F
- *Salix geeyeriana* / Mesic Forb Shrubland (Carsey et al. 2003b) =
- *Salix geeyeriana* / Mesic Forb Shrubland (Carsey et al. 2003a) =
- *Salix geeyeriana* / Mesic Forbs Community Type (Padgett et al. 1989) =
- *Salix geeyeriana* / Mesic Forbs Community Type (Youngblood et al. 1985a) =
- *Salix geeyeriana*/Mesic forb (Bourgeron and Engelking 1994) =
- *Salix geeyeriana*/Mesic forb (Kittel et al. 1999b) =
- Cold Willow/Mesic Forb Association (Weixelman et al. 1996) B
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B
- Geyer willow/Mesic Forbs (*Salix geeyeriana*/Mesic Forbs) Plant Association (Kittel et al. 1999a) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is known from Round Prairie, a low-elevation wet-meadow complex near the North Fork Flathead River. It is approximately 5 miles northwest of the Polebridge ranger station on the northwest side of Glacier National Park.

GLOBAL RANGE: This association is known mainly from mid to high elevations of the northern, central and southern Rocky Mountains from Montana and Idaho to Colorado extending west into the high plateaus of Utah. Very similar associations, if determined synonymous, may extend the range to Nevada and Oregon (Weixelman et al. 1996, Crowe and Clausnitzer 1997).

NATIONS: US

STATES/PROVINCES: CO:S3, ID:S3, MT, UT:S2S3, WY:S2

USFS ECOREGIONS: 313B:??, 342D:CC, M331A:C?, M331B:C?, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M331J:C?, M332C:CC, M332E:CC, M332F:CC, M332G:CC, M333B:CC

FEDERAL LANDS: NPS (Curecanti, Glacier); USFS (Hells Canyon, Rio Grande, Routt, San Juan, Shoshone?, Umatilla, Wallowa-Whitman)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES: Further sampling will provide data necessary for better characterizing the vegetation and environmental conditions of this association. Also, although only one *Salix drummondiana* was found in the plot, more were found elsewhere in shrubland along the western edge of the meadow.

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2528.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: C. Murphy, mod. G. Kittel and K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Carsey et al. 2003b, Crowe and Clausnitzer 1997, Driscoll et al. 1984, Hansen and Hall 2002, IDCDC 2005, IDCDC unpubl. data 2002, Jankovsky-Jones et al. 2001, Jensen and Tuhy 1981, Johnston 1987, Jones and Ogle 2000, Kettler and McMullen 1996, Kittel et al. 1999a, Kittel et al. 1999b, Mattson 1984, Padgett et al. 1988b, Padgett et al. 1989, Phillips 1977, Richard et al. 1996, Tuhy 1981, Walford et al. 2001, Weixelman et al. 1996, Western Ecology Working Group n.d., Youngblood et al. 1985a, Youngblood et al. 1985b

***Salix glauca* Temporarily Flooded Shrubland Alliance**

***Salix glauca* Shrubland**

GRAYLEAF WILLOW SHRUBLAND

IDENTIFIER: C EGL001136**NVC Classification**

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
Alliance	<i>Salix glauca</i> Temporarily Flooded Shrubland Alliance (A.963)
Alliance (English name)	Grayleaf Willow Temporarily Flooded Shrubland Alliance
Association	<i>Salix glauca</i> Shrubland
Association (English name)	Grayleaf Willow Shrubland

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine Dwarf-Shrubland (CES306.810)

ELEMENT CONCEPT

GLOBAL SUMMARY: This cold-deciduous, mesic, subalpine shrubland occurs on moderate to steep slopes at elevations between 1770 and 3000 m (5800-9900 feet), in areas of snow catchment, fluvial and colluvial landforms, talus and scree in avalanche paths. Stands are mesic and can be temporarily flooded by seasonal runoff. Soils are thin, poorly developed and well-drained with or without calcareous sandstone gravels. Stands can occur as a uniform shrubland or, in the alpine, within ribbons that alternate with talus and scree. Stands are dominated by *Salix glauca* with 25-60% cover. Co-occurring shrub species are highly variable. In Glacier National Park, *Spiraea betulifolia*, *Amelanchier alnifolia*, *Penstemon fruticosus*, *Dasiphora fruticosa* ssp. *floribunda*, *Symphoricarpos occidentalis*, and *Arctostaphylos uva-ursi* can be present with 5-15% cover. *Abies lasiocarpa* seedlings may also be present in the shrub layer with low cover. In southeastern Montana and in Grand Teton National Park, stands had no other shrubs present. Graminoid cover is low (1-15%) with *Festuca campestris*, *Bromus inermis*, *Poa alpina*, *Trisetum spicatum*, or *Elymus caninus* (= *Agropyron caninum*). Forb cover can be low to high with several species combined contributing 10-60%. Species present may include *Aquilegia flavescens*, *Hedysarum sulphurescens*, *Heracleum maximum*, *Thalictrum occidentale*, *Anemone multifida*, *Antennaria umbrinella*, *Arenaria congesta*, *Erigeron* sp., *Potentilla gracilis*, *Chamerion angustifolium*, *Oreostemma alpigenum* (= *Aster alpigenuus*), *Castilleja miniata*, *Clematis occidentalis*, *Valeriana sitchensis*, and *Synthyris pinnatifida*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: The *Salix glauca* association can be found on moderate to steep slopes at elevations between 1770 and 2207 m (5800-7240 feet) on various aspects. It generally occurs on low to midslopes or in hanging valleys on fluvial and colluvial landforms, including talus and scree, that are known avalanche paths. These areas are typically mesic, but can be temporarily flooded by seasonal runoff. Soils are well-drained Regosolics, typically with a sandy loam soil texture. They are often weakly developed, lacking a B horizon, and have high gravel content. Parent material is often calcareous, but some areas may contain both sedimentary and metamorphic material. Litter can be as high as 85% in some areas, while large and small rocks and bare soil dominate other areas. This community is generally maintained by periodic avalanching and slope instability due to flooding and colluvial action.

GLOBAL ENVIRONMENT: This association occurs on moderate to steep slopes at elevations between 1770 and 3000 m (5800-9900 feet) in areas of snow catchment, fluvial and colluvial landforms, talus and scree in avalanche paths. Stands are mesic and can be temporarily flooded by seasonal runoff. Soils are thin, poorly developed and well-drained, or calcareous sandstone, with high gravel or coarse-fragment content averaging 30%. Litter can be high due to slow decomposition. Stands in Glacier National Park are influenced by periodic avalanches and flooding. Elsewhere, the high elevation and more gentle slopes indicate more stable conditions. Thus, stands can occur as a uniform shrubland or, at higher alpine elevations, within ribbons that alternate with talus and scree.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This cold-deciduous, mesic, subalpine dwarf-shrubland is dominated by *Salix glauca* that ranges in cover from 20-55%. Other shrubs that have high constancy with cover ranging between 2 and 10% include *Dasiphora fruticosa* ssp. *floribunda* (= *Pentaphylloides floribunda*) and *Dryas octopetala*. Shrub species *Spiraea betulifolia*, *Amelanchier alnifolia*, *Penstemon fruticosus*, *Symphoricarpos occidentalis*, *Rosa acicularis*, *Ribes lacustre*, and *Arctostaphylos uva-ursi* may also be present with 2-10% cover. Young *Abies lasiocarpa* or *Pinus albicaulis* seedlings may also be present in the shrub layer with 2-20% cover. Overall shrub cover is 40-90% and shrub height is 1-2 m. Total herbaceous cover averages 30% with heights of less than 0.5 m. High-constancy forbs with average cover ranging from trace to 10% include *Aquilegia flavescens*, *Hedysarum sulphurescens*, *Heracleum maximum*, *Thalictrum occidentale*, *Valeriana sitchensis*, *Angelica dawsonii*, *Arenaria capillaris*, *Pedicularis contorta*, *Poa alpina*, and *Anemone multifida*. *Chamerion angustifolium*, *Festuca campestris*, *Bromus inermis*, and *Fragaria virginiana* may also have 5-15% cover in certain areas. Other conspicuous forbs may include *Achillea millefolium*, *Symphotrichum foliaceum* (= *Aster foliaceus*), *Castilleja miniata*, *Clematis occidentalis*, *Solidago multiradiata*, *Festuca*

idahoensis, *Elymus trachycaulus*, *Trisetum spicatum*, *Galium boreale*, and *Bromus inermis* var. *pumpellianus* (= *Bromus pumpellianus*). Bryoid cover is low. This association can occur as a uniform shrubland or within ribbons that alternate with talus and scree.

GLOBAL VEGETATION: This cold-deciduous, mesic, subalpine shrubland is dominated by *Salix glauca* that ranges in cover from 3-60%. Co-occurring shrub species are highly variable. In Glacier National Park, *Spiraea betulifolia*, *Amelanchier alnifolia*, *Penstemon fruticosus*, *Dasiphora fruticosa* ssp. *floribunda*, *Symphoricarpos occidentalis*, and *Arctostaphylos uva-ursi* can be present with 5-15% cover. *Abies lasiocarpa* seedlings may also be present in the shrub layer with low cover. Further south in southeastern Montana and Grand Teton National Park, stands had no other shrubs present. Graminoid cover is low (1-15%) with *Festuca campestris*, *Bromus inermis*, *Poa alpina*, *Trisetum spicatum*, or *Elymus caninus* (= *Agropyron caninum*). Forb cover can be low or high, 10-60%, with such species as *Aquilegia flavescens*, *Hedysarum sulphurescens*, *Heracleum maximum*, *Thalictrum occidentale*, *Anemone multifida*, *Antennaria umbrinella*, *Arenaria congesta*, *Erigeron* sp., *Potentilla gracilis*, *Chamerion angustifolium*, *Fragaria virginiana*, *Achillea millefolium*, *Symphotrichum foliaceum* (= *Aster foliaceus*), *Oreostemma alpigenum* (= *Aster alpigenuus*), *Castilleja miniata*, *Clematis occidentalis*, *Valeriana sitchensis*, and *Synthyris pinnatifida*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i> , <i>Salix glauca</i> , <i>Spiraea betulifolia</i>
Short shrub/sapling	Dwarf-shrub	<i>Penstemon fruticosus</i>
Herb (field)	Dwarf-shrub	<i>Arctostaphylos uva-ursi</i>
Herb (field)	Forb	<i>Aquilegia flavescens</i> , <i>Chamerion angustifolium</i> , <i>Hedysarum sulphurescens</i> , <i>Heracleum maximum</i>
Herb (field)	Graminoid	<i>Festuca campestris</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Salix glauca</i>
Herb (field)	Forb	<i>Hedysarum sulphurescens</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Anemone multifida*, *Aquilegia flavescens*, *Dasiphora fruticosa* ssp. *floribunda*, *Dryas octopetala*, *Hedysarum sulphurescens*, *Salix glauca*, *Thalictrum occidentale*

GLOBAL: *Hedysarum sulphurescens*, *Oreostemma alpigenum*, *Poa alpina*, *Salix glauca*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Angelica dawsonii*, *Bromus inermis*, *Calochortus apiculatus*, *Hedysarum sulphurescens*, *Hypericum perforatum*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3? (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: The name *Salix glauca* Shrubland is based on one plot published by Cooper et al. (1997). Two stands in Glacier National Park have much higher species richness, and related stands (mentioned in Cooper et al. (1997)) that occur in Alberta have yet again different species composition. The Glacier National Park and Cooper et al. (1997) plots fall into a general category of a *Salix glauca* / mesic forb type, while the other stands mentioned have various graminoid-dominated understories. More information is needed to determine if two different *Salix glauca* associations are warranted. Padgett et al. (1989) describe an unclassified plot dominated by *Salix glauca* with a forb undergrowth dominated by *Mertensia ciliata* on a rocky steep ephemeral stream in the Uinta Mountains in northern Utah that could be included in this concept.

GLOBAL SIMILAR ASSOCIATIONS:

- *Salix glauca* / *Deschampsia caespitosa* Shrubland (CEGL001137)

GLOBAL RELATED CONCEPTS:

- *Salix glauca* (Bourgeron and Engelking 1994) =
- *Salix glauca* Community Type (Cooper et al. 1997) =
- DRISCOLL FORMATION CODE:III.B.3.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon in Waterton Lakes National Park and on the east side of Glacier National Park. It is localized to moderately steep slopes in the lower to upper subalpine that are snow-avalanched. In Glacier National Park, this association has been located near the head of Stoney Indian Lake and south of the Gable Pass Trail in the Belly River subdistrict.

GLOBAL RANGE: This association occurs in Montana and Alberta, Canada

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S2, WY

USFS ECOREGIONS: M331A:C?, M331D:CC, M332C:CC, M332E:CC, M333B:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton); PC (Waterton Lakes); USFS (Beaverhead)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.108, WATE.5022, AAGL.2231.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Cooper and Lesica 1992, Cooper et al. 1997, Driscoll et al. 1984, Jones and Ogle 2000, MTNHP 2002b, Padgett et al. 1989, Western Ecology Working Group n.d.

***Symphoricarpos occidentalis* Temporarily Flooded Shrubland Alliance**

***Symphoricarpos occidentalis* Shrubland**

WESTERN SNOWBERRY SHRUBLAND

IDENTIFIER: CEGL001131

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
Alliance	<i>Symphoricarpos occidentalis</i> Temporarily Flooded Shrubland Alliance (A.961)
Alliance (English name)	Western Snowberry Temporarily Flooded Shrubland Alliance
Association	<i>Symphoricarpos occidentalis</i> Shrubland
Association (English name)	Western Snowberry Shrubland

ECOLOGICAL SYSTEM(S):	Northwestern Great Plains Floodplain (CES303.676)
	Northwestern Great Plains Mixedgrass Prairie (CES303.674)
	North-Central Interior Floodplain (CES202.694)
	Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822)
	Western Great Plains Floodplain (CES303.678)
	Western Great Plains Riparian Woodland and Shrubland (CES303.956)
	Western Great Plains Wooded Draw and Ravine (CES303.680)

ELEMENT CONCEPT

GLOBAL SUMMARY: This western snowberry shrubland is found in the western tallgrass, northern Great Plains, and in the foothills of the northern Rocky Mountains of the United States and Canada. Stands occur in mesic depressions and swales, typically surrounded by upland grassland communities. The soils are silts and loams. This type has three distinct vegetation layers, a shrub layer (approximately 80 cm tall), a graminoid-dominated layer (approximately 30 cm tall), and a forb-dominated layer (<20 cm tall). *Symphoricarpos occidentalis* is the predominant species in the shrub layer and at times forms almost monospecific stands. *Rosa*

woodsii commonly occurs interspersed with the *Symphoricarpos occidentalis*. Other shrubs, such as *Rhus trilobata* and *Prunus virginiana*, often occur as thickets on the fringe of this community. *Rhus trilobata* and *Prunus virginiana* can reach 2 m or more. The herbaceous layer is poorly represented where the shrubs are dense, although *Poa pratensis* occurs in many stands. Common forbs include *Artemisia ludoviciana*, *Solidago* spp., and *Achillea millefolium*. Vines, such as *Parthenocissus vitacea*, are often found climbing through the shrubs. This type is frequently observed in heavily grazed meadows and prairies.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this shrubland association are found on flat alluvial terraces on glacial-fluvial and alluvial deposits. The elevation range is between 1022 and 1092 m (3350-3580 feet). The soil tends to be a moderately well-drained to rapidly drained silty loam containing no gravel or rocks. The average litter cover found at these stands is moderate to high, with much of the ground surface covered. Two of three stands documented have evidence of previous disturbance, either surface undulations from an unknown source or recent fire (the 1988 Red Bench Fire).

GLOBAL ENVIRONMENT: This community is found in mesic swales, depressions, ravines and floodplains. Some examples of this community experience intermittent and brief flooding. In Glacier National Park, it occurs at 1022-1092 m (3350-3580 feet) elevation. The soils are fertile and well-drained to imperfectly drained silts and loams. The upper soil horizon is usually deep, although a thin layer of sand may be present if the site has been recently flooded (Jones and Walford 1995).

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This shrubland association is dominated by an intermittent canopy of *Symphoricarpos occidentalis* within both the short- and dwarf-shrub layers. Other shrubs present in the short-shrub layer that contribute minor cover are *Amelanchier alnifolia*, *Rubus idaeus*, and *Rosa acicularis*. A trace of *Pinus contorta* is present in one stand that was previously burned. The herbaceous layer averages over 80% cover and can be diverse; species commonly present and sometimes abundant include *Calamagrostis canadensis*, *Calamagrostis rubescens*, *Achnatherum nelsonii*, *Symphotrichum laeve* (= *Aster laevis*), and *Galium boreale*. The invasives *Poa pratensis* (27% average cover) and *Phleum pratense* (22% average cover) are present in all sampled stands. There are traces of other exotic species as well.

GLOBAL VEGETATION: Throughout its range this community is dominated by shrubs approximately 1 m tall. Shrub cover is typically greater than 50%, and in places it can approach 100%. These shrubs form dense clumps that exclude most other species. *Symphoricarpos occidentalis* is the most common shrub, but *Rhus trilobata* and *Prunus virginiana* can be locally abundant and can grow to 2-3 m in places. *Toxicodendron rydbergii*, *Amelanchier alnifolia*, *Rubus idaeus*, and *Rosa acicularis* may also be present. Herbaceous species and smaller shrubs are most abundant at the edges of this community and in gaps between the clumps of taller shrubs where the shading is less complete. *Rosa woodsii* is a typical smaller shrub. Common graminoids include *Pascopyrum smithii*, *Calamagrostis canadensis*, *Calamagrostis rubescens*, *Achnatherum nelsonii*, and *Poa pratensis*. *Achillea millefolium*, *Artemisia ludoviciana*, *Galium boreale*, and *Solidago* spp. are common forbs of this community. Woody vines sometimes occur, including *Parthenocissus vitacea*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Symphoricarpos occidentalis</i>
Herb (field)	Forb	<i>Symphotrichum laeve</i>
Herb (field)	Graminoid	<i>Phleum pratense</i> , <i>Poa pratensis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Symphoricarpos occidentalis</i>
Herb (field)	Graminoid	<i>Poa pratensis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL: *Symphoricarpos occidentalis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Cirsium arvense*, *Linaria vulgaris*, *Taraxacum officinale*, *Verbascum thapsus*

GLOBAL: *Cirsium arvense*, *Linaria vulgaris*, *Pascopyrum smithii*, *Phleum pratense*, *Taraxacum officinale*, *Verbascum thapsus*

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4G5 (1-Feb-1996). This type is common throughout the northern Great Plains. Historically, it may never have been very extensive. It has been observed to grow out from forest or woodland edges and shade out the grasses. It is tolerant of both grazing and fire (Hansen and Hoffman 1988), and is under no threat from human activities. In some cases, heavily grazed pastures may favor this types. Many examples are somewhat weedy; thus the type is not demonstrably secure.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: All sampled stands of this association had high cover to invasive or exotic species. Given the flat terrace locations of these stands, it is likely they were used in the past for pasturing, thus the invasive species.

GLOBAL COMMENTS: This type often occurs in heavily disturbed areas in conjunction with exotic species such as *Poa pratensis* and *Cirsium arvense*. Because it occurs in mesic swales, depressions, ravine bottoms and floodplains, some stands are occasionally flooded, whereas others are just very moist. Thus, it tends to fall on both sides of the upland/wetland division. In Nebraska and South Dakota, the associated *Rhus* species may be *Rhus aromatica*, rather than *Rhus trilobata*. This may be a mix of several types dominated by *Symphoricarpos occidentalis*. In Alberta, a *Symphoricarpos occidentalis* - *Rosa woodsii* type of depressions and swales in the grassland matrix as well as a *Symphoricarpos occidentalis* with *Calamovilfa* on sandy soils seem to be separate types.

GLOBAL SIMILAR ASSOCIATIONS:

- *Fraxinus pennsylvanica* - *Ulmus americana* / *Prunus virginiana* Woodland (CEGL000643)--related in terms of habitat; floristically distinct.
- *Symphoricarpos albus* Shrubland (CEGL005890)

GLOBAL RELATED CONCEPTS:

- *Symphoricarpos occidentalis* / *Elytrigia smithii* Plant Association (Johnston 1987) =
- *Symphoricarpos occidentalis* (Bourgeron and Engelking 1994) =
- *Symphoricarpos occidentalis* (Kittel et al. 1999b) =
- *Symphoricarpos occidentalis* Community (Hansen et al. 1995) =
- *Symphoricarpos occidentalis* Community (Hansen et al. 1984) =
- *Symphoricarpos occidentalis* Community (Thompson and Hansen 2002) =
- *Symphoricarpos occidentalis* Community (Jones and Walford 1995) =
- *Symphoricarpos occidentalis* Series (Jones 1992b) ?
- *Symphoricarpos occidentalis* Shrubland (Carsey et al. 2003a) =
- DRISCOLL FORMATION CODE:III.B.3.a. (Driscoll et al. 1984) B
- Low Shrub (Meyer 1985) =
- Snowberry (*Symphoricarpos occidentalis*) Plant Association (Kittel et al. 1997a) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from three stands in Glacier National Park west of the Continental Divide. All stands are located in lowland meadows.

GLOBAL RANGE: This western snowberry shrubland is found in the western tallgrass, the northern Great Plains, and in the foothills of the northern Rocky Mountains of the United States and Canada.

NATIONS: CA, US

STATES/PROVINCES: AB:S4S5, CO:S3, IA?, MB:S5, MT:S4S5, ND:S4?, NE:S4, SD:SU, SK, WY?

USFS ECOREGIONS: 251Bb:CPP, 331C:CC, 331D:CC, 331E:CC, 331F:CC, 331G:CC, 331H:CC, 332A:CP, 332B:CP, 332C:CP, 332D:CP, 342A:CC, M331B:??, M332B:CC, M332D:CC, M332E:CC, M334A:CC

FEDERAL LANDS: NPS (Agate Fossil Beds, Badlands, Glacier, Jewel Cave, Scotts Bluff, Theodore Roosevelt, Wind Cave); USFS (Black Hills, Pawnee); USFWS (Lacreek)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2278, GLAC.2609, GLAC.2610.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: J. Drake, mod. G. Kittel

REFERENCES: ANHIC 2005, Bourgeron and Engelking 1994, Butler et al. 2002, CONHP unpubl. data 2003, Carsey et al. 2003a, Christy 1973, Clark 1977b, Clark et al. 1980, Driscoll et al. 1984, Greenall 1996, Hansen and Hoffman 1988, Hansen et al. 1984, Hansen et al. 1991, Hansen et al. 1995, INAI unpubl. data, Johnston 1987, Jones 1992b, Jones and Walford 1995, Kittel et al. 1994, Kittel et al. 1997a, Kittel et al. 1999a, Kittel et al. 1999b, MTNHP 2002b, McAdams et al. unpubl. data 1998, Meyer 1985, NDNHI n.d., Steinauer and Rolfmeier 2000, Thompson and Hansen 2002, Von Loh et al. 2000, Western Ecology Working Group n.d.

III.B.2.N.e. Seasonally flooded cold-deciduous shrubland

Betula nana Seasonally Flooded Shrubland Alliance

Betula nana / *Carex* spp. Shrubland

SWAMP BIRCH / SEDGE SPECIES SHRUBLAND

IDENTIFIER: CEGLO05887

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Seasonally flooded cold-deciduous shrubland (III.B.2.N.e.)
Alliance	<i>Betula nana</i> Seasonally Flooded Shrubland Alliance (A.995)
Alliance (English name)	Swamp Birch Seasonally Flooded Shrubland Alliance
Association	<i>Betula nana</i> / <i>Carex</i> spp. Shrubland
Association (English name)	Swamp Birch / Sedge species Shrubland

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Conifer Swamp (CES306.803)
Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
Rocky Mountain Subalpine-Montane Fen (CES306.831)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is found on the west side of Glacier National Park in Montana, and is also known from several low-elevation sites in Waterton Lakes National Park in Alberta. This association is found at 1135 to 1540 m (3720-5049 feet) elevation on basin floors. Sites are flat to gently inclined peatlands. Soils are organic (sedge peat), seasonally flooded to saturated, and very poorly drained. *Betula nana* dominates the shrub canopy in all stands, with up to 70% cover. *Dasiphora fruticosa* ssp. *floribunda* and *Salix serissima* occur less frequently with less than 10% cover. *Salix drummondiana*, along with several other tall shrubs and short *Picea engelmannii*, occur with very low constancy. *Carex* species characterize the herbaceous understory, individually having between 20 and 60% constancy. The *Carex* species with the highest average cover are *Carex interior*, *Carex lasiocarpa*, *Carex limosa*, and *Carex aquatilis*. Stands can contain a moisture gradient with *Betula nana* on slightly higher and better drained ground, with a *Carex lasiocarpa*-dominated fen or other *Carex* species in the lowest and wettest area. *Trichophorum caespitosum* is infrequent but can have high cover (55%). Forbs common in peatlands are usually present, such as *Menyanthes trifoliata*, *Comarum palustre*, and *Petasites frigidus* var. *sagittatus* (= *Petasites sagittatus*). Most stands are shallowly flooded with an average moss and lichen cover of only 20%, while the drier stands have high ground cover of moss and lichens.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is found at 1135 to 1540 m (3720-5049 feet) elevation on basin floors. Sites are flat to gently inclined peatlands. Soils are organic (sedge peat), seasonally flooded to saturated, and very poorly drained.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: *Betula nana* dominates the shrub canopy in all stands, up to 1 m in height, with up to 70% cover. *Dasiphora fruticosa* ssp. *floribunda* and *Salix serissima* occur less frequently with less than 10% cover. *Salix drummondiana* (with 13% cover), along with several other tall shrubs and short *Picea engelmannii* (each with trace cover), occur with very low constancy. *Carex* species characterize the herbaceous understory, individually having between

20 and 60% constancy. The *Carex* species with the highest average cover are *Carex interior* (40%), *Carex lasiocarpa* (33%), *Carex limosa* (20%), and *Carex aquatilis* (17%). Stands can contain a moisture gradient with *Betula nana* on slightly higher and better drained ground, with a *Carex lasiocarpa*-dominated fen or other *Carex* species in the lowest and wettest area. *Trichophorum caespitosum* is infrequent but can have high cover (55%). Forbs common in peatlands are usually present, such as *Menyanthes trifoliata* (with 27% average cover and 60% constancy), *Comarum palustre* (with 20% cover and low constancy), and *Petasites frigidus* var. *sagittatus* (= *Petasites sagittatus*) (40% constancy and 13% average cover). Most stands are shallowly flooded with an average moss and lichen cover of only 20%, while the drier stands have high ground cover of moss and lichens.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Salix drummondiana</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Betula nana</i>
Herb (field)	Forb	<i>Comarum palustre</i> , <i>Menyanthes trifoliata</i> , <i>Petasites frigidus</i> var. <i>sagittatus</i>
Herb (field)	Graminoid	<i>Carex aquatilis</i> , <i>Carex interior</i> , <i>Carex lasiocarpa</i> , <i>Carex limosa</i> , <i>Trichophorum caespitosum</i>

**Global
Stratum**

Lifeform

Species

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Betula nana*, *Carex aquatilis*, *Carex diandra*, *Carex utriculata*, *Dasiphora fruticosa* ssp. *floribunda*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: GNR (21-Apr-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This association combines the *Betula nana* / *Carex aquatilis*, *Betula nana* / *Carex interior*, *Betula nana* / *Carex lasiocarpa*, and *Betula nana* / *Carex limosa* associations of the Draft IPP classification. *Betula nana* / *Carex utriculata* Shrubland (CEGL001079) has been kept separate because it is a well-defined NVC type already.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Betula nana* / *Carex lasiocarpa* Shrubland (CEGL002700)
- *Betula nana* / *Carex utriculata* Shrubland (CEGL001079)
- *Betula nana* / Mesic Forbs - Mesic Graminoids Shrubland (CEGL002653)

GLOBAL RELATED CONCEPTS:

- *Betula nana* / (*Carex aquatilis* var. *dives*) (Murray 2000) ?

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is found in the Big Prairie peatland near Polebridge on the west side of Glacier National Park. It is also known from several low-elevation sites in Waterton Lakes National Park.

GLOBAL RANGE:

NATIONS: CA, US

STATES/PROVINCES: AB, MT

USFS ECOREGIONS: M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2271, WATE.5069, WATE.5072, WATE.5075, WATE.5070.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Murray 2000, Western Ecology Working Group n.d.

Betula nana / *Carex utriculata* Shrubland

SWAMP BIRCH / NORTHWEST TERRITORY SEDGE SHRUBLAND

IDENTIFIER: C EGL001079

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Seasonally flooded cold-deciduous shrubland (III.B.2.N.e.)
Alliance	<i>Betula nana</i> Seasonally Flooded Shrubland Alliance (A.995)
Alliance (English name)	Swamp Birch Seasonally Flooded Shrubland Alliance
Association	<i>Betula nana</i> / <i>Carex utriculata</i> Shrubland
Association (English name)	Swamp Birch / Northwest Territory Sedge Shrubland

ECOLOGICAL SYSTEM(S): North Pacific Montane Riparian Woodland and Shrubland (CES204.866)
Northern Rocky Mountain Conifer Swamp (CES306.803)
Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

ELEMENT CONCEPT

GLOBAL SUMMARY: This seasonally flooded, cold-deciduous shrubland occurs in marshes in the subalpine and montane riparian zones. Elevations range from 900 m to over 1700 m (990-5580 feet). Stands can occur on beaver ponds, lakes, marshes, seeps, swales, and wet alluvial terraces adjacent to low-gradient meandering streams. They are found in areas where soils are saturated from snowmelt runoff for a significant part of the growing season, often on fens, where the vegetation receives water from seeps and springs. Soils are commonly Histosols, flooded until mid summer and saturated all year in many sites. Quaking mats are typical of many stands. *Betula nana* (= *Betula glandulosa*) dominates the canopy with a range of cover from 5% to 60%. The total shrub canopy ranges from sparse to moderate, and there are often large, open spaces between individual shrub clumps. Other shrubs present include *Salix planifolia*, *Salix geeyeriana*, *Salix wolfii*, *Rhamnus alnifolia*, *Dasiphora fruticosa* ssp. *floribunda* (= *Pentaphylloides floribunda*), *Cornus sericea*, *Alnus incana*, and *Ribes* spp. The herbaceous undergrowth has high cover and is found on small hummocks. The dominant graminoid is *Carex utriculata* (= *Carex rostrata*); several other species are typically present, in lower abundance and include *Calamagrostis stricta*, *Carex aquatilis*, *Carex livida*, and *Carex lasiocarpa*. Forb cover is variable, with occasional species being abundant. Forbs commonly present may include *Cicuta maculata*, *Comarum palustre*, *Mentha arvensis*, *Galium* spp., *Ranunculus sceleratus*, *Sparganium natans* (= *Sparganium minimum*), and *Thalictrum alpinum*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is found from 1135 to 1530 m (3720-5016 feet) elevation on flat basin floors (with alluvium, peat, or organic marsh deposits) to gently sloping fens on sideslope benches. All soils are poorly drained peat and are seasonally flooded (but drained during dry years), saturated or with standing water throughout the growing season. At least 60% (3 of 5) of the stands have woody vegetation concentrated on less persistently flooded hummocks that are interspersed with water tracks.

GLOBAL ENVIRONMENT: This seasonally flooded, cold-deciduous shrubland occurs in marshes in the subalpine and montane riparian zones. Elevations range from 900 m to over 1700 m (990-5580 feet). Stands can occur on beaver ponds, lakes, marshes, seeps, swales, and wet alluvial terraces adjacent to low-gradient meandering streams (Hansen et al. 1995). They are found in areas where soils are saturated from snowmelt runoff for a significant part of the growing season, often on fens, where the vegetation receives water from seeps and springs. Soils are commonly Histosols, flooded until mid-summer and saturated all year in many sites. Organic matter accumulations may form floating, quaking mats as this association encroaches onto open water.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: *Betula nana* occurs in all stands of this association with an average cover of 42%, usually dominating the open short-shrub layer. *Rhamnus alnifolia*, as well as several other low shrubs less than about 1 m in height (e.g., *Rubus pubescens*, *Salix candida*, and *Dasiphora fruticosa* ssp. *floribunda*), are occasionally intermixed but average only 5% or less cover. Taller shrubs (most notably *Salix boothii* and *Salix drummondiana*) are sometimes also present or codominant, but the constancy of all tall shrubs is low. While mature and tall *Picea engelmannii* were present in only one stand sampled, young (up to 5 m tall) *Picea engelmannii* were encroaching in 3 of 5 stands sampled and had up to 10% cover. One burned stand contained blackened, moss-encrusted *Picea engelmannii* stumps and downed logs, but no living trees. Woody vegetation is often concentrated on less persistently flooded hummocks.

Carex utriculata dominates the relatively diverse herbaceous understory with an average cover of 45% and 100% constancy, though other *Carex* species can also be present with low to moderate cover. For example, *Carex aquatilis* (found in 40% of the stands) has up to 15% cover, and in one stand, *Carex lasiocarpa* had 40% cover. *Bromus* spp. also have medium constancy (approximately 40%) and up to 10% cover. Often an indicator of peatlands, the forb *Comarum palustre* is found in 60% of the stands with average cover of 9%. *Symphyotrichum falcatum* (= *Aster falcatus*) and *Equisetum arvense* have moderate cover (17% and up to 30%, respectively) but low constancy. Ground cover is primarily litter and duff, with occasional downed wood, and the cover of moss ranging from zero to very high.

GLOBAL VEGETATION: *Betula nana* (= *Betula glandulosa*) dominates the canopy with a range of cover from 5% to 60%. The total shrub canopy ranges from sparse to moderate, and there are often large, open spaces between individual shrub clumps. Other shrubs present include *Salix planifolia*, *Salix geyeriana*, *Salix wolfii*, *Rhamnus alnifolia*, *Dasiphora fruticosa* ssp. *floribunda* (= *Pentaphylloides floribunda*), *Cornus sericea*, *Alnus incana*, and *Ribes* spp. The herbaceous undergrowth has high cover and is found on small hummocks. The dominant graminoid is *Carex utriculata* (= *Carex rostrata*); several other species are typically present in lower abundance and include *Calamagrostis stricta*, *Carex aquatilis*, *Carex livida*, and *Carex lasiocarpa*. Forb cover is variable, with occasional species being abundant. Forbs commonly present may include *Cicuta maculata*, *Comarum palustre*, *Mentha arvensis*, *Galium* spp., *Ranunculus sceleratus*, *Sparganium natans* (= *Sparganium minimum*), and *Thalictrum alpinum*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Salix boothii</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Betula nana</i> , <i>Rhamnus alnifolia</i>
Herb (field)	Forb	<i>Comarum palustre</i> , <i>Symphyotrichum falcatum</i>
Herb (field)	Graminoid	<i>Carex aquatilis</i> , <i>Carex lasiocarpa</i> , <i>Carex utriculata</i>
Herb (field)	Fern or fern ally	<i>Equisetum arvense</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Betula nana</i>
Herb (field)	Graminoid	<i>Carex utriculata</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Betula nana*, *Carex utriculata*, *Picea engelmannii*, *Rubus pubescens*

GLOBAL: *Betula nana*, *Carex aquatilis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4? (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: The clear dominance by *Carex utriculata* and low cover of other *Carex* spp. distinguish this association from *Betula nana* / *Carex* spp. Shrubland (CEGL005887).

GLOBAL COMMENTS: Stands from Hansen et al (1995) included areas where *Carex aquatilis* dominated. The Closed Tall Shrub Birch Shrub and the Closed Tall Shrub Birch-Willow Shrub communities of Viereck et al. (1992) may contain occurrences that belong to this association.

GLOBAL SIMILAR ASSOCIATIONS:

- *Betula nana* / *Carex* spp. Shrubland (CEGL005887)
- *Betula nana* / Mesic Forbs - Mesic Graminoids Shrubland (CEGL002653)

GLOBAL RELATED CONCEPTS:

- *Betula glandulosa* / *Carex rostrata* Habitat Type (Hansen et al. 1995) =
- *Betula glandulosa* / *Carex utriculata* Plant Association (Jankovsky-Jones et al. 1999) =
- *Betula glandulosa*/*Carex rostrata* (Bourgeron and Engelking 1994) =
- Closed Tall Shrub Birch Shrub Community (Viereck et al. 1992) ?
- Closed Tall Shrub Birch-Willow Shrub Community (Viereck et al. 1992) ?
- DRISCOLL FORMATION CODE:III.B.3.a. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: In Glacier National Park, this association is found at low elevations west of the Continental Divide in the Bowman Lake, Kintla Lake, and North Fork Flathead River basins. In Waterton Lakes National Park, this association is found east of the divide in the Belly River drainage.

GLOBAL RANGE: This association is known from Idaho, Montana, Oregon, Alberta, and possibly occurs in California.

NATIONS: CA, US

STATES/PROVINCES: AB, CA?, ID:S3, MT:S4, OR:S2

USFS ECOREGIONS: M242C:CC, M261G:CC, M331A:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2221, GLAC.2250, GLAC.2644, WATE.9025, WATE.9026.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Hansen et al. 1991, Hansen et al. 1995, IDCDC 2005, Jankovsky-Jones et al. 1999, Kagan et al. 2000, Kittel et al. 1999b, MTNHP 2002b, Phillips 1977, Viereck et al. 1992, Western Ecology Working Group n.d.

***Betula occidentalis* Seasonally Flooded Shrubland Alliance**

***Betula occidentalis* Shrubland**

WATER BIRCH SHRUBLAND

IDENTIFIER: CEGL001080

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)

Formation	Seasonally flooded cold-deciduous shrubland (III.B.2.N.e.)
Alliance	<i>Betula occidentalis</i> Seasonally Flooded Shrubland Alliance (A.996)
Alliance (English name)	Water Birch Seasonally Flooded Shrubland Alliance
Association	<i>Betula occidentalis</i> Shrubland
Association (English name)	Water Birch Shrubland
ECOLOGICAL SYSTEM(S):	Columbia Basin Foothill Riparian Woodland and Shrubland (CES304.768) Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

ELEMENT CONCEPT

GLOBAL SUMMARY: This shrubland occurs on stream benches and floodplains in narrow to moderately wide valleys and hillside seeps in mountains, canyons and foothills across much of the western U.S. Surface water is present for extended periods during the growing season. The water table, after flooding ceases, is variable, extending from saturated to well below the ground surface. Substrates are typically alluvial and range from fairly shallow, finer-textured soils to gravel and boulders. Soils usually have signs of saturation (mottles). The vegetation is characterized by a nearly continuous tall-shrub to small-tree canopy dominated by *Betula occidentalis* along the streambank. Other shrub species include *Alnus incana*, *Cornus sericea*, *Dasiphora fruticosa* ssp. *floribunda* (= *Pentaphylloides floribunda*), *Salix* spp., *Amelanchier utahensis*, *Rhus trilobata*, *Shepherdia argentea*, and *Prunus virginiana*. Along narrow valleys at higher elevations, conifers may overhang the stream edge. Herbaceous undergrowth can be limited because of the dense shrub canopy. However, if the shrub canopy is open and the stand is on relatively well-drained yet mesic site (for example, elevated river benches), the herbaceous layer can be abundant. It is often a diverse mixture of grasses and forbs that is dominated by disturbance-induced species, including most commonly *Agrostis stolonifera*, *Cirsium arvense*, *Phleum pratense*, and *Poa pratensis*. Native forb species include *Maianthemum stellatum*, *Heracleum sphondylium*, *Thalictrum fendleri*, and *Rudbeckia laciniata*. Graminoid cover is highly variable and can include *Carex utriculata*, *Carex pellita* (= *Carex lanuginosa*), *Carex microptera*, *Carex nebrascensis*, *Glyceria* spp., *Juncus balticus*, and introduced hay grasses. Diagnostic of this association is the *Betula occidentalis*-dominated tall-shrub layer and a variable, weedy, mixed herbaceous undergrowth that occurs on sites that are flooded for extended periods during the growing season.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This shrubland association occupies seasonally flooded, low-level terraces along streams. Topography is generally flat. Elevation is typically around 1240 m (4067 feet). Parent material is derived from noncalcareous glacial-fluvial deposits. Soil is moderately well-drained and moist for most of the growing season. It may have a small amount of clay, but the texture is primarily a sandy or silt loam. Ground surfaces are predominantly covered with litter, but wood may occupy up to 25% of the surface area.

GLOBAL ENVIRONMENT: This shrubland occupies moderately wide stream benches and floodplains in narrow to moderately wide valleys and hillside seeps in mountains and foothills, as well as on stream banks and canyon bottoms in the Colorado Plateau. It is found primarily along fast-moving, moderate- to high-gradient mountain and foothill streams, although in the Colorado Plateau it occurs more frequently on low-gradient perennial or intermittent streams. Elevation ranges from 910 to 2700 m (2975-6630 feet). Stands also occur along small floodplains of steep-gradient, narrow streams where the valley sideslope meets the stream edge. In high-gradient situations, the community often occurs as narrow, linear stringers where *Betula occidentalis* forms a closed canopy crowding the streambank. Broader stands occur around seeps adjacent to the stream channel, or along isolated springs on hillslopes away from the valley bottom, and on the floodplains of low-gradient streams. Surface water is present for extended periods during the growing season. After flooding ceases, the water table is variable and ranges from nearly saturated to well below the ground surface.

Soils are fairly shallow, ranging from 30 cm to greater than 60 cm, often overlying river cobbles. Most soils have a surface layer of 50-90% organic matter. Subsurface layers range from loam to sand with abundant gravel throughout the profile (Hansen et al. 1995). Skeletal layers, derived from alluvium, occur at a greater depth. In the northern range of Yellowstone National Park, soils typically have a large ash component. Stands along narrow, steep stream channels occur between large alluvial and colluvial boulders and have almost no soil development.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The total shrub canopy cover is typically around 20% in this association, with cover contributed almost exclusively by *Betula occidentalis*. Trace amounts of *Populus balsamifera* ssp. *trichocarpa* and *Populus tremuloides* may also be present. Average height for the tallest shrub layer is 5-10 m. *Betula occidentalis* is successfully reproducing, evidenced by the presence of shrub-like trees in the understory. Tall-shrub cover is primarily contributed by small *Betula occidentalis* and by *Salix bebbiana*, in a layer 2-5 m high. The combined cover of these two species is approximately 40%. A wide variety of short shrubs make up a layer 0.5-1 m tall, with an overall cover of 20%. *Amelanchier alnifolia*, *Cornus sericea* ssp. *sericea* and *Symphoricarpos occidentalis* are among several short-shrub species that contribute 1-5% cover. Dwarf-shrubs are typically absent from this association. Herbaceous cover is dense, approaching 90% in most stands. The most dominant species in the

herbaceous layer are *Calamagrostis canadensis* and *Poa palustris*, each with 20-25% cover. *Equisetum arvense* and *Solidago gigantea* are also well-represented. A wide variety of mesic forbs are usually present in trace amounts, such as *Maianthemum stellatum*, *Mentha arvensis*, and *Heracleum maximum*. Exotic species, such as *Cirsium arvense* and *Taraxacum officinale*, may also be present.

GLOBAL VEGETATION: *Betula occidentalis* forms a nearly continuous tall-shrub to small-tree canopy with 10-90% cover. Other shrub species include *Alnus incana*, *Cornus sericea*, *Dasiphora fruticosa* ssp. *floribunda* (= *Pentaphylloides floribunda*), *Salix exigua*, *Shepherdia argentea*, *Jamesia americana*, *Amelanchier utahensis*, *Juniperus scopulorum*, *Prunus virginiana*, *Rhus trilobata*, *Salix boothii*, and *Salix monticola*. Along narrow valleys at higher elevations, conifers may overhang the stream edge. At lower elevations, *Populus balsamifera* ssp. *trichocarpa*, *Populus tremuloides*, and other *Populus* species may be present. Conifer species present include *Pseudotsuga menziesii*, *Abies lasiocarpa*, and *Picea pungens*. If the shrub canopy is dense, herbaceous undergrowth will be limited; if open, the herbaceous layer can be abundant. Herbaceous species are typically weedy or adapted to frequent disturbance. Herbaceous-rich stands generally have equal amounts of forb and graminoid cover. Forb species can include *Maianthemum stellatum*, *Heracleum sphondylium*, *Thalictrum fendleri*, *Equisetum arvense*, *Mentha arvensis*, *Solidago gigantea*, and *Rudbeckia laciniata*. Graminoid species include *Calamagrostis canadensis*, *Poa palustris*, *Carex utriculata*, *Carex pellita* (= *Carex lanuginosa*), *Carex microptera*, *Carex nebrascensis*, *Glyceria* spp., and *Juncus balticus*. Introduced species typically present include *Cirsium arvense*, *Taraxacum officinale*, *Agrostis stolonifera*, and *Poa pratensis*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Betula occidentalis</i> , <i>Salix bebbiana</i>
Herb (field)	Forb	<i>Solidago gigantea</i>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i> , <i>Poa palustris</i>
Herb (field)	Fern or fern ally	<i>Equisetum arvense</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Betula occidentalis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Betula occidentalis*, *Calamagrostis canadensis*, *Maianthemum stellatum*, *Salix bebbiana*

GLOBAL: *Betula occidentalis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL: *Poa pratensis*

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4 (26-May-2004). The association is located in U- or V-shaped canyons along moderate- to high-gradient streams with gentle streambanks, floodplains, islands, and alluvial terraces in western and central Montana, northern Wyoming, and central and southern Idaho. It occurs in low-gradient situations in canyon bottoms in the Colorado Plateau of Utah and Colorado. Discontinuous linear stands are present between 915 and 1920 m (3000-6300 feet) elevation on various aspects where the water table is high and soils are of clay, silt or loam. Stand degradation is increasing as a result of threats such as alteration of stream hydrology due to the deposits of excess sedimentation from outside the stream system, road construction, livestock grazing and trailing, introduction of exotic species, and noxious weeds. However, this type is widespread in distribution and is defined to include disturbed stands, so its conservation status is unlikely to be rare.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association is for stands that don't fit purely graminoid-dominated or forb-dominated understories of other *Betula occidentalis* associations. Stands included here generally have roughly equal amounts of forb and graminoid cover, typically of weedy or disturbance-caused species. Stands with very little herbaceous cover are also included here. It is likely that this type will be split in the future as more inventory is completed and a better review of *Betula occidentalis* associations is completed.

Hansen and Hall (2002) and Hansen et al. (1995) describe the *Betula occidentalis* community type as an early- to mid-seral community associated with disturbance. In Montana, Hansen et al. (1995) consider this type to be seral to various *Salix* spp.-dominated "habitat types," and in eastern and southern Idaho, Hansen and Hall (2002) consider it to be seral to the presence of species representing climax vegetation types. One-half of Hansen et al.'s (1995) stands include *Cornus sericea* (average canopy cover 11%) with mesic forbs included in the undergrowth. *Betula occidentalis* / *Cornus sericea* Shrubland (CEGL001161) and *Betula occidentalis* / *Maianthemum stellatum* Shrubland (CEGL001162) are similar to this type but appear to have less exotic species present.

GLOBAL SIMILAR ASSOCIATIONS:

- *Betula occidentalis* / *Cornus sericea* Shrubland (CEGL001161)
- *Betula occidentalis* / *Maianthemum stellatum* Shrubland (CEGL001162)--forb species indicative of mesic situations are consistently abundant and dominant while graminoid species are in low amounts.
- *Betula occidentalis* / Mesic Graminoids Shrubland (CEGL002654)--graminoid species are consistently in high abundance while forb species, though usually present, are in low amounts.

GLOBAL RELATED CONCEPTS:

- *Betula occidentalis* (Bourgeron and Engelking 1994) =
- *Betula occidentalis* Bench Community Type (Manning and Padgett 1995) =
- *Betula occidentalis* Community Type (Hansen et al. 1995) B
- *Betula occidentalis* Community Type (Chadde et al. 1988) B
- *Betula occidentalis* Community Type (Hansen et al. 1991) B
- *Betula occidentalis* Community Type (Hansen and Hall 2002) B
- *Betula occidentalis* Community Type (Hall and Hansen 1997) =
- *Betula occidentalis* Dominance Type (Evans 1989a) =
- DRISCOLL FORMATION CODE:III.B.3.a. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association occurs on low-level benches in Waterton Lakes National Park. Specifically, it was documented in the Crooked Creek drainage, on the south side of the creek. Only one occurrence of this association was documented during field data collection. The association may occur in Glacier National Park, but has not been documented within its boundaries.

GLOBAL RANGE: This association is known from mountainous regions of Washington, Idaho, Montana, Wyoming, north into Alberta, and may extend south into Colorado and Nevada.

NATIONS: CA, US

STATES/PROVINCES: AB, CO, ID:S2, MT:S3, NV?, UT, WA:S1, WY:S3

USFS ECOREGIONS: 331F:CC, 341B:CC, 342F:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331G:C?, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Canyonlands, Capitol Reef?, Dinosaur, Glacier?, Yellowstone); PC (Waterton Lakes); USFS (Fishlake, Humboldt-Toiyabe, Malheur, Umatilla, Wallowa-Whitman)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.9012.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: G. Kittel, mod. J. Coles

REFERENCES: Bourgeron and Engelking 1994, Chadde et al. 1988, Crowe and Clausnitzer 1997, Driscoll et al. 1984, Evans 1989a, Hall and Hansen 1997, Hansen and Hall 2002, Hansen et al. 1991, Hansen et al. 1995, IDCDC 2005, Jones 1992b, Kittel and Lederer 1993, MTNHP 2002b, Manning and Padgett 1995, NVNHP 2003, Padgett et al. 1989, Weixelman et al. 1996, Western Ecology Working Group n.d.

***Salix boothii* Seasonally Flooded Shrubland Alliance**

***Salix boothii* / *Calamagrostis canadensis* Shrubland
BOOTH'S WILLOW / BLUEJOINT SHRUBLAND**

IDENTIFIER: CEGL001175

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Seasonally flooded cold-deciduous shrubland (III.B.2.N.e.)
Alliance	<i>Salix boothii</i> Seasonally Flooded Shrubland Alliance (A.1001)
Alliance (English name)	Booth's Willow Seasonally Flooded Shrubland Alliance
Association	<i>Salix boothii</i> / <i>Calamagrostis canadensis</i> Shrubland
Association (English name)	Booth's Willow / Bluejoint Shrubland

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

ELEMENT CONCEPT

GLOBAL SUMMARY: This riparian shrub association is found in the U.S. Rocky Mountains from western Montana south through western Wyoming, central and eastern Idaho, and northeastern Utah, into northern Colorado, and west as far as eastern Oregon and possibly eastern Washington. Stands occur on medium- or fine-textured mineral soils (sometimes with an appreciable volume of rock fragments) with a seasonally high water table, on terraces and gentle slopes. Elevations vary with geographic area from 1469 m (4820 feet) in Montana to over 2745 m (9000 feet) in the Uinta Mountains of Utah. The vegetation consists of a tall-shrub layer dominated by *Salix boothii* and often containing *Salix geyeriana*, *Salix drummondiana*, *Salix eastwoodiae*, or *Salix commutata*; often, a low-shrub layer of *Lonicera involucrata*, *Ribes* spp., and *Salix wolfii*; and a thick herbaceous layer in which *Calamagrostis canadensis* (or, in Montana, *Calamagrostis stricta*) contributes as much cover as does any other native species. The dominance of *Salix boothii* in the tall-shrub layer and *Calamagrostis canadensis* in the herbaceous layer set this association apart from other willow associations.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT:

GLOBAL ENVIRONMENT: This riparian shrub association is found in the U.S. Rocky Mountains from western Montana south through western Wyoming, central and eastern Idaho, and northeastern Utah, into northern Colorado, and west as far as eastern Oregon and possibly eastern Washington. Stands occur on medium- or fine-textured mineral soils (sometimes with an appreciable volume of rock fragments) with a seasonally high water table, on terraces and gentle slopes. Elevations vary with geographic area from 1469 to 2234 m (4820-7330 feet) in Montana, 1890 to 2290 m (6100-7500 feet) in western Wyoming and eastern Idaho, over 2745 m (9000 feet) in the Uinta Mountains of northeastern Utah, 2370 to 2700 m (7900-8900 feet) in northern Colorado, and about 2164 m (7100 feet) in eastern Oregon.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION:

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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Global		
<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4Q (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Needed at some point is a regionwide review of the Rocky Mountain riparian willow shrub types (particularly the relationships of *Salix boothii*, *Salix geyeriana*, and *Salix drummondiana* communities) that reconciles different approaches used in different local classifications.

GLOBAL SIMILAR ASSOCIATIONS:

- *Salix boothii* / *Poa palustris* Shrubland (CEGL001183)

GLOBAL RELATED CONCEPTS:

- *Salix* / *Calamagrostis canadensis* Community Type (Tuhy and Jensen 1982) I
- *Salix* / *Calamagrostis canadensis* Plant Association (Kovalchik 2001) B
- *Salix boothii* - *Salix commutata* / *Calamagrostis canadensis* Association (Crowe et al. 2004) I
- *Salix boothii* / *Calamagrostis canadensis* Community Type (Youngblood et al. 1985a) I
- *Salix boothii* / *Calamagrostis canadensis* Community Type (Padgett et al. 1989) I
- *Salix boothii* / *Poa pratensis* Community Type, modal phase (Norton et al. 1981) I
- *Salix boothii*/ *Calamagrostis canadensis* (Bourgeron and Engelking 1994) =
- *Salix boothii* / Mesic Graminoid Shrubland (Carsey et al. 2003a) B
- *Salix geyeriana* / *Calamagrostis canadensis* Community Type (Walford et al. 2001) I
- *Salix geyeriana* / *Calamagrostis canadensis* Habitat Type (Hansen et al. 1995) B
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE:

GLOBAL RANGE: This riparian shrub association is found in the U.S. Rocky Mountains from western Montana south through western Wyoming, central and eastern Idaho, and northeastern Utah, into northern Colorado, and west as far as eastern Oregon and possibly eastern Washington.

NATIONS: US

STATES/PROVINCES: CO:S2, ID:S3, MT?, NV, OR:S1?, UT:S2?, WA?, WY:S2?

USFS ECOREGIONS: 342B:CC, M331A:CC, M331D:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332E:CC, M332F:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS:

LOCAL DESCRIPTION AUTHORS:

GLOBAL DESCRIPTION AUTHORS: G.P. Jones

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Crowe et al. 2004, Driscoll et al. 1984, Hansen et al. 1995, IDCDC 2005, Kagan et al. 2004, Kovalchik 2001, MTNHP 2002b, Mutz and Graham 1982, Mutz and Queiroz 1983, NVNHP 2003, Norton et al. 1981, Padgett et al. 1988b, Padgett et al. 1989, Tuhy and Jensen 1982, Walford et al. 2001, Western Ecology Working Group n.d., Youngblood et al. 1985a

***Salix commutata* Seasonally Flooded Shrubland Alliance**

***Salix commutata* / Mesic Graminoid Shrubland**

UNDERGREEN WILLOW / MESIC GRAMINOID SHRUBLAND

IDENTIFIER: CEGL003497

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Seasonally flooded cold-deciduous shrubland (III.B.2.N.e.)
Alliance	<i>Salix commutata</i> Seasonally Flooded Shrubland Alliance (A.1003)
Alliance (English name)	Undergreen Willow Seasonally Flooded Shrubland Alliance
Association	<i>Salix commutata</i> / Mesic Graminoid Shrubland
Association (English name)	Undergreen Willow / Mesic Graminoid Shrubland
ECOLOGICAL SYSTEM(S):	Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

ELEMENT CONCEPT

GLOBAL SUMMARY: This shrubland association is distributed in moist sites at high elevation on both sides of the Continental Divide in Glacier National Park. This small-patch shrubland association occurs on subirrigated gentle slopes and flat terraces along high-elevation streams and ponds. The association also occupies shallow swales where water accumulates from snowmelt and remains until early summer. Species composition is indicative of sites retaining snow cover longer than the adjacent landscape. Sampled elevations range from 1920-2000 m (6298-6560 feet), the uppermost portion of subalpine environments. Parent material is derived from glacio-fluvial deposits and soils vary from poorly drained clay loams to well-drained loamy sand. Ground cover is primarily litter. *Salix commutata* is the dominant and virtually the only shrub contributing to a canopy cover of 40-90%. Dwarf-shrubs *Kalmia microphylla* and *Salix arctica* are sporadically represented, and small, stunted *Picea engelmannii* may be present. The herbaceous layer has 20-30% cover, contributed by a variety of moist-site, high-elevation sedges and forbs. The presence and occasionally modest coverage of *Carex nigricans*, *Juncus mertensianus*, *Juncus drummondii*, and *Sibbaldia procumbens* is indicative of sites retaining snowpack well into the growing season. *Arnica latifolia* and/or *Hypericum scouleri* ssp. *nortoniae* (= *Hypericum formosum* var. *nortoniae*) may be present with covers ranging from 10-20%. Other species characteristic of a high moisture status include *Senecio triangularis*, *Parnassia fimbriata*, *Erigeron peregrinus*, and *Veronica wormskjoldii*; typically their cover is quite low.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This small-patch shrubland association occurs on subirrigated gentle slopes and flat terraces along high-elevation streams and ponds. The association also occupies shallow swales where water accumulates from snowmelt and remains until early summer. A seasonally flooded hydrologic regime creates moist conditions throughout most of the growing season. Species composition is indicative of sites retaining snow cover longer than the adjacent landscape. Sampled elevations range from 1920-2000 m (6298-6560 feet), the uppermost portion of subalpine environments. Parent material is derived from glacial-fluvial deposits. Soil varies from a poorly drained clay loam to a well-drained loamy sand and may or may not be well-developed. Pieces of angular argillite are sometimes present in less well-developed soil. Ground cover is primarily litter, with trace amounts of rock, wood, water and bare soil.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: *Salix commutata* is the dominant and virtually the only shrub contributing to a canopy cover of 40-90%, in a layer 0.5-1 m high. Dwarf-shrubs *Kalmia microphylla* and *Salix arctica* are sporadically represented. Small, stunted *Picea engelmannii* may be present with a cover of 1-10%. The total canopy cover in the herbaceous layer is 20-30%, contributed by a variety of moist-site, high-elevation sedges and forbs. The presence and occasionally modest coverage of *Carex nigricans*, *Juncus mertensianus*, *Juncus drummondii*, and *Sibbaldia procumbens* is indicative of sites retaining snowpack well into the growing season. *Arnica latifolia* and/or *Hypericum scouleri* ssp. *nortoniae* (= *Hypericum formosum* var. *nortoniae*) may be present with covers ranging from 10-20%. Other species characteristic of a high moisture status include *Senecio triangularis*, *Parnassia fimbriata*, *Erigeron peregrinus*, and *Veronica wormskjoldii*; typically their cover is quite low (1-2%).

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Salix commutata</i>
Herb (field)	Forb	<i>Arnica latifolia</i> , <i>Hypericum scouleri</i> ssp. <i>nortoniae</i>
Herb (field)	Graminoid	<i>Carex nigricans</i>

Global

Stratum

Lifeform

Species

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Salix commutata*, *Senecio triangularis*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Cirsium arvense*, *Poa palustris*, *Rumex crispus*, *Urtica dioica*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: GNR (1-Jun-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Hansen et al. (1995) reported three stands dominated by *Salix commutata*. These are included in the *Salix planifolia* / *Carex aquatilis* Habitat Type, as the authors consider *Salix commutata* to be an ecological equivalent to *Salix planifolia* at high altitudes. The understory of *Salix commutata* stands may or may not be similar to the stands from Glacier National Park. Tuhy and Jensen (1982) describe a *Salix commutata* / *Carex scopulorum* riparian association that may be similar. Viereck et al. (1995) note a *Salix commutata* / *Carex aquatilis* / *Calliargon giganteum* by Streveler et al. (1973) as part of the Open Low Willow-Graminoid Bog.

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This shrubland association is distributed in moist sites at high elevation on both sides of the Continental Divide in Glacier National Park. Specifically, it was documented in the cirque basins above the Belly River Valley, along the channel meanders of the upper reaches of Reynolds Creek, and in moist depressions near Granite Park Campground.

GLOBAL RANGE: This association is known only from western Montana.

NATIONS: US

STATES/PROVINCES: MT

USFS ECOREGIONS: M333C:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.105, GLAC.2022, GLAC.251.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: M.S. Reid

REFERENCES: Hansen et al. 1995, Streveler et al. 1973, Tuhy and Jensen 1982, Viereck et al. 1992, Western Ecology Working Group n.d.

***Salix drummondiana* Seasonally Flooded Shrubland Alliance**

***Salix drummondiana* / *Carex utriculata* Shrubland**

DRUMMOND'S WILLOW / NORTHWEST TERRITORY SEDGE SHRUBLAND

IDENTIFIER: C EGL002631

NVC Classification

Physiognomic Class	Shrubland (III)
Physiognomic Subclass	Deciduous shrubland (III.B.)
Physiognomic Group	Cold-deciduous shrubland (III.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
Formation	Seasonally flooded cold-deciduous shrubland (III.B.2.N.e.)
Alliance	<i>Salix drummondiana</i> Seasonally Flooded Shrubland Alliance (A.1004)
Alliance (English name)	Drummond's Willow Seasonally Flooded Shrubland Alliance
Association	<i>Salix drummondiana</i> / <i>Carex utriculata</i> Shrubland
Association (English name)	Drummond's Willow / Northwest Territory Sedge Shrubland

ECOLOGICAL SYSTEM(S): North Pacific Montane Riparian Woodland and Shrubland (CES204.866)
Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is a broadly distributed association ranging from British Columbia, south into eastern Washington, west into Idaho, Montana, and south into Wyoming and Colorado. It has an elevational range spanning over 1525 m (5000 feet) from 700 to 2380 m (2300-7800 feet). Its primary habitat is adjacent to beaver ponds, mountain rivers and streams, alluvial terraces and marshes, as well as seeps and springs. *Salix drummondiana* is 100% constant, its cover averaging over 50%, and no other shrubs are even 50% constant or have more than 30% cover. Other shrubs typically present include *Salix monticola*, *Salix geyeriana*, *Salix boothii*, mixed with but never as abundant as *Salix drummondiana*. Shorter shrubs can be present as well and include *Lonicera involucrata*, *Ribes inerme*, and *Rubus* sp. *Carex utriculata* is the dominant graminoid in the herbaceous layer, and at least in a major part of its range, 10% of canopy cover may consist of any one of several *Carex* spp. (*Carex vesicaria*, *Carex atherodes*, *Carex aquatilis*, *Carex lenticularis*). Modal stands tend to have *Carex utriculata* dominant or codominant with *Carex aquatilis*. Other graminoids that may be present include *Calamagrostis canadensis*. A whole host of introduced graminoids proliferate with grazing disturbance, such as *Poa pratensis* and *Phleum pratense*. The forb component is generally insignificant, only occasionally comprising more than 10% cover, and component species vary widely. Documented forb species include *Canadanthus modestus* (= *Aster modestus*), *Symphytotrichum spathulatum* var. *spathulatum* (= *Aster occidentalis*), *Geum macrophyllum*, *Epilobium ciliatum*, *Comarum palustre* (= *Potentilla palustris*), and *Mentha arvensis*. In Colorado, other forbs with a cover of trace to up to 10% include *Trifolium* sp., *Trollius laxus* ssp. *albiflorus*, *Caltha leptosepala* var. *leptosepala*, *Chamerion angustifolium* ssp. *circumvagum*, *Epilobium saximontanum*, *Galium triflorum*, *Heracleum maximum*, *Pedicularis groenlandica*, *Rorippa* sp., *Rumex crispus*, and *Thalictrum fendleri*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: One stand of this association was observed at 1333 m (4375 feet) elevation in a wetland at the bottom of a wide glacial trough. The association occurred on a mudflat in a wet meadow surrounding an inlet creek to a lake. The soil was very moist and poorly drained. It had a silty clay loam texture with large amounts of organic matter intermixed. Mottling was present, indicative of seasonal flooding followed by drawdown of the water table in late summer. Browsing of *Salix drummondiana* by moose, as well as cutting by beaver, were observed in the plot.

GLOBAL ENVIRONMENT: This is a broadly distributed association ranging from British Columbia, south into eastern Washington, west into Idaho, Montana, and south into Wyoming and Colorado. The elevational range spans 1525 m (5000 feet) from 700 to 2815 m (2300-9235 feet). Its primary habitat is adjacent to beaver ponds, mountain rivers and streams, alluvial terraces and marshes, as well as seeps and springs. Soils are very moist and poorly drained, silty clay loam to sandy loam with large amounts of organic matter intermixed. Mottling can be present, indicative of seasonal flooding followed by drawdown of the water table in late summer.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: In the one wetland where the association was observed, *Salix drummondiana* formed a locally dense stand with patchy distribution within a *Carex utriculata*-dominated wetland. One plot was sampled with 90% cover of 1- to 2-m tall *Salix drummondiana* over a relatively sparse herbaceous understory. *Carex utriculata*, averaging 0.5 to 1 m tall, was clearly the most dominant understory species, but its cover was only 10%. Two other mesic graminoids, a *Glyceria* species and *Juncus balticus*, were also present with trace cover. *Equisetum arvense*, with 3% cover, was the only forb with greater than trace cover. The cover of nonvascular species was about 5%, with the remaining ground covered by even amounts of litter and bare soil.

GLOBAL VEGETATION: *Salix drummondiana* is 100% constant, its cover averaging over 50%, and no other shrubs are even 50% constant or have more than 30% cover. In southern Montana the *Salix drummondiana*-dominated types occupy higher elevation sites with *Salix geyeriana*- and *Salix boothii*-dominated types tending to occur at intermediate elevations, though this is not necessarily the

distribution pattern in other areas. *Carex utriculata* is the dominant graminoid in the herbaceous layer, and at least in a major part of its range, 10% of canopy cover consists of any one of several *Carex* spp. (*Carex vesicaria*, *Carex atherodes*, *Carex aquatilis*, *Carex lenticularis*). Modal stands tend to have *Carex utriculata* dominant or codominant with *Carex aquatilis*. Other native graminoids include *Glyceria* species and *Juncus balticus*. A whole host of introduced graminoids proliferate with grazing disturbance. The forb component is generally insignificant, only occasionally comprising more than 10% cover. *Canadanthus modestus* (= *Aster modestus*), *Symphotrichum spathulatum* var. *spathulatum* (= *Aster occidentalis*), *Geum macrophyllum*, *Epilobium ciliatum*, *Comarum palustre* (= *Potentilla palustris*), and *Mentha arvensis* are the forbs having both the highest constancy and coverage values.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Salix drummondiana</i>
Herb (field)	Graminoid	<i>Carex utriculata</i>
Herb (field)	Fern or fern ally	<i>Equisetum arvense</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Salix drummondiana</i>
Herb (field)	Graminoid	<i>Carex utriculata</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex utriculata*, *Equisetum arvense*

GLOBAL: *Carex utriculata*, *Salix drummondiana*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (29-Jan-2000). This association (or the environments it represents) is very common, perhaps one of the most common, *Salix* spp.-dominated riparian/wetland types of the Northwest and Intermountain West. Even were it to be most narrowly defined, say by the dominance of *Salix drummondiana* and *Carex utriculata* alone (other species a minor component) or by these species having very high cover values, say in excess of 50%, then this type would still be abundant. The most significant threat to this community is livestock overuse, which can lead to the reduced vigor, highlining, clubbing, or death of willows. The principal graminoids, *Carex utriculata* and *Carex aquatilis*, are not particularly palatable, but on narrow riparian or small wetland sites within extensive rangeland, these and other sedge species are heavily utilized, particularly where stocking rates are high. Vegetation trampling, hummocking and a shift to weedy species (or their introduction) occurs as a result and can result in an irremediable type conversion.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: In the IPP, this association is described from only two plots. This association is distinguished from *Salix drummondiana* / Mesic Forbs Shrubland (CEGL001192) and *Salix drummondiana* / *Calamagrostis canadensis* Shrubland (CEGL002667) by *Carex utriculata* having at least 10% canopy cover; this difference separates the distinctly wetter *Salix drummondiana* / *Carex utriculata* Shrubland (CEGL002631) from the other two *Salix drummondiana*-dominated associations.

GLOBAL COMMENTS: This type is substantiated by 43 plots in Montana and 20 plots in Washington. In addition, surrounding states have a number of well-documented, highly similar tall *Salix* spp.-dominated associations in which *Salix drummondiana* can be both a dominant/codominant and highly constant, including *Salix drummondiana* - *Salix boothii* / *Carex rostrata* - *Carex aquatilis* Shrubland (not in USNVC), *Salix boothii* / *Carex utriculata* Shrubland (CEGL001178), *Salix geyeriana* / *Carex utriculata* Shrubland (CEGL001207), and *Salix lutea* / *Carex utriculata* Shrubland (CEGL001220). *Salix drummondiana* can also be a major component in short willow communities, e.g., *Salix candida* / *Carex utriculata* Shrubland (CEGL001188) and *Salix wolfii* / *Carex utriculata* Shrubland (CEGL001237). Other *Salix* spp.-dominated associations have appreciable coverages of *Carex utriculata*, raising the issue of what coverages of *Carex utriculata* will be accorded indicator status. Another significant hurdle in establishing confidence in this type is what, if any, *Carex* spp. will be accepted as ecological equivalents (as used by Hansen et al. 1995). In addition *Salix drummondiana* is easily confused with *Salix sitchensis* making community identification difficult. There is a monumental amount of

crosswalk work to accomplish before this type can be unequivocally classified across its considerable geographic range. Similar, if not identical, types under different names have been described throughout the Northwest and Intermountain West. However, a type of this exact name (accepting *Carex utriculata* as synonymous with *Carex rostrata*) was first described for Montana; its identifying series or alliance level features are *Salix* spp. having at least 10% canopy cover and *Salix drummondiana* having greater canopy cover than the combined cover of *Salix geyeriana* and *Salix boothii* and less cover than *Salix lutea*.

GLOBAL SIMILAR ASSOCIATIONS:

- *Picea engelmannii* / *Salix drummondiana* Woodland (CEGL005843)
- *Salix boothii* / *Carex utriculata* Shrubland (CEGL001178)
- *Salix candida* / *Carex utriculata* Shrubland (CEGL001188)
- *Salix drummondiana* / *Calamagrostis canadensis* Shrubland (CEGL002667)
- *Salix geyeriana* / *Carex utriculata* Shrubland (CEGL001207)
- *Salix lutea* / *Carex utriculata* Shrubland (CEGL001220)
- *Salix wolfii* / *Carex utriculata* Shrubland (CEGL001237)

GLOBAL RELATED CONCEPTS:

- *Salix boothii* / *Carex rostrata* Community Type (Youngblood et al. 1985a) B
- *Salix drummondiana* - *Carex utriculata* Swamp (MacKenzie and Moran 2004) =
- *Salix drummondiana* - *Salix myrtilifolia* / *Carex rostrata* - *Carex aquatilis* Community Type (Mutz and Queiroz 1983) B
- *Salix drummondiana* / *Carex rostrata* Habitat Type (Hansen et al. 1995) =
- *Salix drummondiana* / *Carex utriculata* Association (Kovalchik 1993) =
- *Salix drummondiana*/ *Carex utriculata* (Bourgeron and Engelking 1994) =
- *Salix* spp. / *Carex rostrata* Community Type (Tuhy and Jensen 1982) B
- DRISCOLL FORMATION CODE:III.B.3.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is known from one low-elevation wetland around the inlet to one of the larger Kootenai Lakes in the Waterton Valley of Glacier National Park.

GLOBAL RANGE: This association is found abundantly in the Northern Rocky Mountains of Montana and Idaho, and in eastern Washington. It may also occur in northern Utah and western Wyoming, but has not been confirmed from these states.

NATIONS: CA, US

STATES/PROVINCES: BC, CO:S3, ID:S3, MT:S4, UT?, WA:S3, WY

USFS ECOREGIONS: M242C:CC, M331D:CC, M331I:CC, M332F:CC, M332G:CC, M333A:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton, Rocky Mountain)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES: If additional stands of this association exist in the IPP, further sampling will provide data necessary for better characterizing the vegetation and environmental conditions of this association.

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.145.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper, mod. G. Kittel

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Driscoll et al. 1984, Hall and Hansen 1997, Hansen et al. 1995, IDCDC 2005, Kovalchik 1993, MTNHP 2002b, MacKenzie and Moran 2004, Moseley et al. 1994, Mutz and Queiroz 1983, Tuhy and Jensen 1982, WNHP unpubl. data, Western Ecology Working Group n.d., Youngblood et al. 1985a

IV. DWARF-SHRUBLAND

IV.A.1.N.b. Creeping or matted needle-leaved or microphyllous evergreen dwarf-shrubland

Arctostaphylos uva-ursi Dwarf-shrubland Alliance

Arctostaphylos uva-ursi / *Festuca campestris* - *Festuca idahoensis* Dwarf-shrubland

BEARBERRY OR KINIKINNICK / PRAIRIE FESCUE - IDAHO FESCUE DWARF-SHRUBLAND

IDENTIFIER: C EGL005830

NVC Classification

Physiognomic Class	Dwarf-shrubland (IV)
Physiognomic Subclass	Evergreen dwarf-shrubland (IV.A.)
Physiognomic Group	Needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.1.)
Physiognomic Subgroup	Natural/Semi-natural needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.1.N.)
Formation	Creeping or matted needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.1.N.b.)
Alliance	<i>Arctostaphylos uva-ursi</i> Dwarf-shrubland Alliance (A.1079)
Alliance (English name)	Kinikinnick or Bearberry Dwarf-shrubland Alliance
Association	<i>Arctostaphylos uva-ursi</i> / <i>Festuca campestris</i> - <i>Festuca idahoensis</i> Dwarf-shrubland
Association (English name)	Bearberry or Kinikinnick / Prairie Fescue - Idaho Fescue Dwarf-shrubland

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine Turf (CES306.816)

ELEMENT CONCEPT

GLOBAL SUMMARY: This dwarf-shrubland type is found in the montane to mid-alpine zones of the northern Rockies in northwestern Montana, and extending north into the montane zone of Alberta. The elevation where it occurs ranges almost 790 m (2600 feet), from 1340 to 2130 m (4400-7000 feet), essentially ranging from the montane to the mid-alpine. It occurs on moderate to steep slopes with predominantly southerly exposures, though it has been found on all aspects. This dwarf-shrubland is associated with positions that can be inferred to be wind-battered. It has been recorded exclusively from sedimentary substrates, predominantly limestones and siltstones. These have weathered into thin, fine-textured, and well- to excessively drained soils whose water regime is characterized as predominantly subxeric. The inference that these are stressful sites is borne out in the species composition and structure with the dwarf-shrub *Arctostaphylos uva-ursi* functioning as the community dominant and other low-shrubs, *Juniperus horizontalis*, *Dasiphora fruticosa* ssp. *floribunda*, *Rosa woodsii*, and *Juniperus communis*, being common associates. *Arctostaphylos uva-ursi* cover ranges from about 5% to as high as 70%, averaging about 30%. *Arctostaphylos* cover appears to be loosely inversely correlated with cover of the dominant (and diagnostic) grasses, *Festuca campestris* and *Festuca idahoensis*, whose average canopy cover hovers around 20-25% and 2-5%, respectively. The only other graminoids with even moderate constancy are *Koeleria macrantha* and *Agoseris glauca*, with cover seldom exceeding 5%. High cover values (>30%) for *Danthonia parryi* characterize higher elevation and relatively mesic stands. Other graminoids present and associated with severe high-elevation sites include *Calamagrostis purpurascens* and *Carex elynoides*. The forb component is highly diverse, though individual stands are not as diverse. Forbs present in at least half the stands include *Oxytropis sericea*, *Penstemon confertus*, *Packera cana* (= *Senecio canus*), *Sedum lanceolatum*, *Zigadenus elegans*, *Hedysarum sulphurescens*, *Galium boreale*, *Lupinus sericeus*, *Erigeron caespitosus*, *Gaillardia aristata*, *Allium cernuum*, *Achillea millefolium*, and *Fragaria virginiana*. Cover for any of these is typically low, except the cover of *Lupinus sericeus* and *Hedysarum sulphurescens* which tends to exceed 5%.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This is a small-patch type found almost exclusively east of the Continental Divide that exhibits a very broad elevation range, from 1045 to 2180 m (3425-7150 feet). It is closely associated with xeric environments such as upper ridge slopes, slope shoulders, and the convex uppermost portions of ridgelines. It has been documented from all but north-facing slopes, but the higher elevation stands are by far most commonly associated with southeast- through west-facing slopes of moderate to steep inclinations; lower elevation stands (mostly below 5500 feet) occur on more gradual slopes and even in exceptional cases on well-drained flats. All sites are hypothesized to be swept snow-free by prevailing westerlies, and sites not directly exposed could be impacted by eddy currents that redistribute the snowpack. This community occurs primarily on colluvial slopes composed of sedimentary rock, predominantly argillite and limestone, and also is

found on glacial drift, till and fluvial materials. Soils are rocky, shallow, and moderately well- to mostly well-drained with sandy loam being by far the most common texture of sampled stands. Between the high litter cover, mostly in excess of 80%, and ground-appressed *Arctostaphylos*, there is little ground surface exposed (up to 20%), usually patches of larger rocks (>6 cm).

GLOBAL ENVIRONMENT: This association has been identified in reconnaissance from eastern slopes of the Northern Rocky Mountains and is well-documented from Glacier-Waterton International Peace Park. It is apparently also found in the montane zone of western Alberta, where it is a prominent small-patch or linear type. The established elevation span is almost 790 m (2600 feet), from 1340 to 2130 m (4400-7000 feet), essentially ranging from the montane to the mid-alpine. It occurs predominantly on moderate to steep slopes with southerly exposures, though it has been found on all aspects. Whether it occurs on lower or upper slopes, flat or convex topography, it is associated with positions that can be inferred to be wind-battered. It has been recorded exclusively from sedimentary substrates, predominantly limestones and siltstones. These have weathered into thin, fine-textured, and well- to excessively drained soils whose water regime is characterized as predominantly subxeric, ranging from xeric to submesic.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Total vascular plant cover ranges from approximately 40% to 95%, with more than half of the stands having in excess of 70% cover. In this type's modal expression the dark green mats of *Arctostaphylos uva-ursi* provide the dominant aspect with scattered, though taller, dwarf-shrubs including *Juniperus communis*, *Juniperus horizontalis*, and *Dasiphora fruticosa* ssp. *floribunda*, occurring in a high proportion of the stands. On the most favorable sites, usually those of lower elevations, total bunchgrass cover, principally comprised of *Festuca campestris*, *Festuca idahoensis*, *Danthonia intermedia* (Waterton Lakes National Park is unique in having *Danthonia parryi* as a codominant bunchgrass), and *Carex obtusata*, may approach 60%, but more usually their combined cover is less than 25% with only *Festuca campestris* and *Festuca idahoensis* contending for dominance. It is the cover of these bunch grasses that distinguishes these sites from *Arctostaphylos uva-ursi* / *Solidago multiradiata* Dwarf-shrubland (CEGL005832), which is more depauperate in terms of graminoids and occurs at generally higher elevations, on rockier slopes with considerably less soil development. *Carex scirpoidea* and *Carex petasata* (lower elevations only) may be present with relatively high cover (up to 25% for *Carex scirpoidea*) on those sites that have an early-season elevated moisture status (all sites dry rapidly by mid-summer). Other high constancy and low cover graminoids, at least at lower elevations of the type, below approximately 1580 to 1675 m (5200-5500 feet), include *Achnatherum nelsonii*, *Koeleria macrantha*, and *Pseudoroegneria spicata*; *Calamagrostis koelerioides* occurs consistently in higher elevation stands. Forb diversity is generally high on both a community and per stand basis, which is to be expected with such a wide-ranging community, spanning the montane to alpine continuum and which often occurs in ecotonal positions between grassland and woodland. Forbs found on higher elevation sites include *Astragalus australis* (= *Astragalus aboriginorum*), *Selaginella wallacei*, *Potentilla diversifolia*, *Antennaria umbrinella*, *Minuartia obtusiloba* (= *Arenaria obtusiloba*), and *Oxytropis campestris*. Forbs consistently present across the whole type include *Bupleurum americanum*, *Hedysarum sulphurescens*, *Besseyia wyomingensis*, *Solidago multiradiata*, *Pedicularis contorta*, *Achillea millefolium*, *Anemone multifida*, *Galium boreale*, *Cerastium arvense*, and *Campanula rotundifolia*. On lower elevation sites *Penstemon confertus*, *Lupinus sericeus*, and *Balsamorhiza sagittata*, though not necessarily expressing high constancy, occasionally have relatively high cover values, in excess of 10%. Higher elevation, moister sites are characterized by variable combinations of *Polygonum bistortoides*, *Arnica rydbergii*, *Dodecatheon pulchellum*, and *Zigadenus elegans*; occurring on comparably moist, lower elevation sites are *Potentilla glandulosa*, *Potentilla gracilis*, *Geranium viscosissimum*, and *Zigadenus venenosus*.

GLOBAL VEGETATION: The inference that these are stressful sites is borne out in the species composition and structure with the dwarf-shrub *Arctostaphylos uva-ursi* functioning as the community dominant and other low shrubs, such as *Juniperus horizontalis*, *Dasiphora fruticosa* ssp. *floribunda*, *Rosa woodsii*, and *Juniperus communis*, being common associates. The last three shrubs named above only reach a third of their potential height in this community. *Arctostaphylos uva-ursi* cover ranges from about 5% to as high as 70%, averaging about 30%. The control of *Arctostaphylos* cover is not directly apparent with the data at hand; however, it does appear to be loosely inversely correlated with cover of the dominant (and diagnostic) grasses *Festuca campestris* and *Festuca idahoensis*, whose average canopy cover hovers around 20-25% and 2-5%, respectively. These cover values for the diagnostic grasses are considerably less than half those reported for these grasses for the next most closely related association, *Festuca campestris* - *Festuca idahoensis* (Mueggler and Stewart 1980). The only other graminoids with even moderate constancy are *Koeleria macrantha* and *Agoseris glauca*; however, their cover seldom exceeds 5%. High cover values (>30%) for *Danthonia parryi* characterize higher elevation and relatively mesic stands. Other graminoids present and associated with severe high-elevation sites include *Calamagrostis purpurascens* and *Carex elynoides*. The forb component is highly diverse, as expected with a type spanning such an elevation range, though individual stands are not as diverse. Forbs present in at least half the stands include *Oxytropis sericea*, *Penstemon confertus*, *Packera cana* (= *Senecio canus*), *Sedum lanceolatum*, *Zigadenus elegans*, *Hedysarum sulphurescens*, *Galium boreale*, *Lupinus sericeus*, *Erigeron caespitosus*, *Gaillardia aristata*, *Allium cernuum*, *Achillea millefolium*, and *Fragaria virginiana*. Cover for any of these is typically low, except the cover of *Lupinus sericeus* and *Hedysarum sulphurescens* which tends to exceed 5%.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Arctostaphylos uva-ursi</i> , <i>Dasiphora fruticosa</i> ssp. <i>floribunda</i> , <i>Juniperus communis</i> , <i>Juniperus horizontalis</i>

Herb (field)	Forb	<i>Achillea millefolium</i> , <i>Bupleurum americanum</i> , <i>Hedysarum sulphurescens</i> , <i>Pedicularis contorta</i> , <i>Penstemon confertus</i> , <i>Potentilla diversifolia</i> , <i>Solidago multiradiata</i>
Herb (field)	Graminoid	<i>Achnatherum nelsonii</i> , <i>Calamagrostis koelerioides</i> , <i>Carex obtusata</i> , <i>Danthonia intermedia</i> , <i>Festuca campestris</i> , <i>Festuca idahoensis</i> , <i>Pseudoroegneria spicata</i>

Global

Stratum

Herb (field)
Herb (field)
Herb (field)

Lifeform

Dwarf-shrub
Forb
Graminoid

Species

Arctostaphylos uva-ursi, *Dasiphora fruticosa* ssp. *floribunda*
Hedysarum sulphurescens, *Lupinus sericeus*
Festuca campestris, *Festuca idahoensis*

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Arctostaphylos uva-ursi*, *Carex scirpoidea*, *Danthonia intermedia*, *Dasiphora fruticosa* ssp. *floribunda*, *Festuca campestris*, *Festuca idahoensis*, *Juniperus horizontalis*

GLOBAL: *Arctostaphylos uva-ursi*, *Festuca campestris*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4 (22-Jan-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This community has been previously recognized for Waterton Lakes National Park by Achuff et al. (2002a) as H28: *Festuca scabrella* - *Arctostaphylos uva-ursi*; however, one of the plots they allocated here had no fescue and abundant *Pseudoroegneria spicata* and was allocated to *Arctostaphylos uva-ursi* / *Pseudoroegneria spicata*. Achuff et al. (2002a) also defined two types, H25: *Danthonia* spp. - *Festuca scabrella* - *Koeleria macrantha* and H27: *Agropyron spicatum* - *Festuca scabrella*, that had plots with sufficient (>10% cover) *Arctostaphylos uva-ursi* and appropriate *Festuca* spp. cover to be grouped with the community delineated here. Damm (2001) in his Braun-Blanquet-type classification of subalpine/alpine environments named a *Solidagini multiradiatae* - *Arctostaphyletum uva-ursi* Association, numerous stands of which qualified as *Arctostaphylos uva-ursi* / *Festuca campestris* - *Festuca idahoensis* Dwarf-shrubland (CEGL005830); others of Damm's plant associations containing the type named here include *Zigadeno elegantis* - *Caricetum scirpoideae*.

GLOBAL COMMENTS: This is a newly defined type for the U.S. Vegetation Classification. Apparently it is common in the montane zone of Alberta. Types considered synonymous with this one include *Festuca scabrella* - *Arctostaphylos uva-ursi* and *Festuca scabrella* - *Carex obtusata* / *Arctostaphylos uva-ursi* from Waterton National Park (Achuff et al. 2002a) and Alberta's montane subregion (Willoughby et al. 2001). Several of the plots used to substantiate the type had also been classified as *Agropyron spicatum* - *Festuca scabrella* (Achuff et al. 2002a), and the others were collected in the course of the Glacier-Waterton Mapping Project. A vegetation type comparable in environment (wind-exposed southerly exposures in the subalpine and alpine) has been described from the North Cascades of Washington and British Columbia (Douglas and Bliss 1977), but there the type is characterized by the dominance of *Arctostaphylos uva-ursi* with only traces of grasses and forbs.

GLOBAL SIMILAR ASSOCIATIONS:

- *Arctostaphylos uva-ursi* / *Pseudoroegneria spicata* Dwarf-shrubland (CEGL005831)
- *Arctostaphylos uva-ursi* / *Solidago multiradiata* Dwarf-shrubland (CEGL005832)
- *Arctostaphylos uva-ursi* Dwarf-shrubland (CEGL001392)--dominance of *Arctostaphylos uva-ursi* with only traces of grasses and forbs.

GLOBAL RELATED CONCEPTS:

- *Festuca scabrella* - *Arctostaphylos uva-ursi* Community Type (Willoughby 2001) =
- *Festuca scabrella* - *Carex obtusata* / *Arctostaphylos uva-ursi* Community Type (Willoughby et al. 2001) =
- *Oxytropido campestris* - *Bupleuretum americani* Association (Damm 2001) I
- *Solidagini multiradiatae* - *Arctostaphyletum uva-ursi* Association (Damm 2001) I
- *Zigadeno elegantis* - *Caricetum scirpoideae* Association (Damm 2001) I

- H25: *Danthonia* spp. - *Festuca scabrella* - *Koeleria macrantha* Vegetation Type (Achuff et al. 2002a) I
- H27: *Agropyron spicatum* - *Festuca scabrella* Vegetation Type (Achuff et al. 2002a) I
- H28: *Festuca scabrella* - *Arctostaphylos uva-ursi* Vegetation Type (Achuff et al. 2002a) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This is a common small-patch type encountered in both Waterton Lakes and Glacier national parks, virtually restricted to lands east of the Continental Divide. It is especially well represented north of Sun Rift Gorge in Baring Creek and Appistoki Creek valleys.

GLOBAL RANGE: Found in the montane to mid-alpine zones of the northern Rockies in northwestern Montana, and extending north into the montane zone of Alberta.

NATIONS: CA, US

STATES/PROVINCES: AB, MT

USFS ECOREGIONS: M333B:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GRAS-00-006, GRAS-00-008, GRAS-00-014, GRAS-00-016, GRAS-00-022, GRAS-00-026, GRAS-00-028, GRAS-00-029, GRAS-00-034, GRAS-00-042, GRAS-00-044, GRAS-00-047, GRAS-01-002, GRAS-01-018, GRAS-01-020, GRAS-01-029, GRAS-01-031, GRAS-01-032, GRAS-01-039, GRAS-01-041, GRAS-01-043, GRAS-01-049, GRAS-01-050, GRAS-99-015, GRAS-99-040, GRAS-99-041, GRAS-99-042, GRAS-99-050, GRAS-99-056, GRAS-99-057, GLAC.33, GLAC.155, GLAC.159, GLAC.311, GLAC.56, CD474, CD231, CD149, CD41, CD514, CD15, CD78, CD39, CD42, CD38, [CD712], CD35, CD36, CD38, CD39, CD17, CD80, WATE.4030, WATE.4033, WATE.4041, WATE.4042, WATE.4045, WATE.4051, WATE.4066, WATE.5009, WATE.5040, WATE.5067, WATE.5096, WATE.5102, WATE.5119, WATE.5132, WATE.5143, WATE.4022.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Achuff et al. 2002a, Damm 2001, Western Ecology Working Group n.d., Willoughby 2001, Willoughby et al. 2001

Arctostaphylos uva-ursi / *Pseudoroegneria spicata* Dwarf-shrubland

BEARBERRY OR KINIKINNICK / BLUEBUNCH WHEATGRASS DWARF-SHRUBLAND

IDENTIFIER: CEG005831

NVC Classification

Physiognomic Class	Dwarf-shrubland (IV)
Physiognomic Subclass	Evergreen dwarf-shrubland (IV.A.)
Physiognomic Group	Needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.1.)
Physiognomic Subgroup	Natural/Semi-natural needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.1.N.)
Formation	Creeping or matted needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.1.N.b.)
Alliance	<i>Arctostaphylos uva-ursi</i> Dwarf-shrubland Alliance (A.1079)
Alliance (English name)	Kinikinnick or Bearberry Dwarf-shrubland Alliance
Association	<i>Arctostaphylos uva-ursi</i> / <i>Pseudoroegneria spicata</i> Dwarf-shrubland
Association (English name)	Bearberry or Kinikinnick / Bluebunch Wheatgrass Dwarf-shrubland

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine Turf (CES306.816)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is a minor, small-patch to linear type described from the east slope of the Rocky Mountain Front and is also found on very similar environments throughout the montane zone of southern Alberta. It is characteristic of relatively thin-soiled, well- to rapidly drained and exposed sites that are inferred to be moderately to highly wind-impacted (downslope Chinook winds). Sites are predominantly convex ridgelines with gentle to steep southerly exposures. The inventoried elevation range is from 1342 to 1875 m (4400-6150 feet), though based on reconnaissance information, it is known to span an even broader range. *Arctostaphylos uva-ursi*, with widely variable cover (10% to 75%), is dominant or codominant in the dwarf-shrub layer (height <50 cm); other

consistently present shrubs of this layer are *Juniperus horizontalis*, *Juniperus communis*, *Dasiphora fruticosa* ssp. *floribunda*, and *Rosa* spp. Extremely browsed specimens of *Amelanchier alnifolia* are always present. *Pseudoroegneria spicata* dominates the herb layer, though its cover is also highly variable (averages about 30%). The only other graminoids having a presence in half the stands are *Festuca campestris* and *Festuca idahoensis*; their cover generally does not exceed 5%. The forbs with highest constancy include *Galium boreale*, *Achillea millefolium*, *Hedysarum sulphurescens*, *Campanula rotundifolia*, and *Anemone multifida*; only rarely do any of the forbs attain as much as 5% cover, and the lifeform itself comprises less than 15% cover.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This uncommon community occurs in small, mostly linear patches associated with the most wind-exposed, water-shedding and well-drained positions, often upper slopes, slope shoulders or convex ridgelines; often it occurs as a narrow linear ecotone between adjacent communities, its extent too limited to practically sample. It has been recorded from only moderate to steep southwest- through southeast-facing slopes over an elevation range of some 360 m (1200 feet), from 1365 to 1725 m (4490-5640 feet); the upper elevation figure is expected to be near the type's limit (*Pseudoroegneria spicata* is an accidental much above this elevation), but it is believed to extend to considerably lower elevations (montane habitats) than recorded. Soils are generally rapidly drained, moderately to highly rocky (a factor easily overlooked beneath heath mat), and derived from limestone and red and green argillites. The amount of litter is highly variable, from 5 to 40%.

GLOBAL ENVIRONMENT: This is a minor, small-patch to linear type described from the east slope of the Rocky Mountain Front. It is characteristic of relatively thin-soiled, well- to rapidly drained and exposed sites that are inferred to be moderately to highly wind-impacted (downslope Chinook winds). Sites are predominantly convex ridgelines with gentle to steep southerly exposures; it is also found on very similar environments throughout the montane zone of southern Alberta. The inventoried elevation range is from 1342 to 1875 m (4400-6150 feet) in Glacier National Park and quite similar in greater southwestern Alberta (1395-1848 m), though based on reconnaissance information, it is known to span an even broader range.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Such a severe environment might be expected to have a highly reduced vascular cover but such is not necessarily the case, though it is highly variable from 40% to 100%. In the case of the highest cover values, it is largely attributable to a nearly continuous mat of dwarf-shrubs, foremost in cover among which is *Arctostaphylos uva-ursi*. Other high-constancy dwarf-shrubs include *Dasiphora fruticosa* ssp. *floribunda*, *Juniperus communis*, and *Juniperus horizontalis*; their cover seldom exceeds 10%. *Amelanchier alnifolia* may occur here in a dwarf form owing to a combination of severe hedging and environment. The canopy cover of *Pseudoroegneria spicata* is many times that (up to 60% cover) of the next most abundant bunch grasses, which are usually *Festuca idahoensis*, *Festuca campestris*, or *Koeleria macrantha*. The forb component is usually quite diverse, but its aggregate cover is mostly less than 20%. The most constant forbs are *Lupinus sericeus*, *Achillea millefolium*, *Galium boreale*, *Campanula rotundifolia*, *Antennaria microphylla*, *Penstemon confertus*, *Packera cana* (= *Senecio canus*), and *Bupleurum americanum*; of these, only *Lupinus sericeus* and *Achillea millefolium* have demonstrated greater than 5% cover.

GLOBAL VEGETATION: *Arctostaphylos uva-ursi*, with widely variable cover (10 to 75%), is dominant or codominant in the dwarf-shrub layer (height <50 cm); other consistently present constituents of this layer are *Juniperus horizontalis*, *Juniperus communis*, *Dasiphora fruticosa* ssp. *floribunda*, and *Rosa* spp. Extremely browsed specimens of *Amelanchier alnifolia* are always present. *Pseudoroegneria spicata* dominates the herb layer, though its cover is also highly variable (averages about 30%). The only other graminoids having a presence in half the stands are *Festuca campestris* and *Festuca idahoensis*; their cover generally does not exceed 5%. The forbs with highest constancy include *Galium boreale*, *Achillea millefolium*, *Hedysarum sulphurescens*, *Campanula rotundifolia*, and *Anemone multifida*; only rarely do any of the forbs attain as much as 5% cover, and the lifeform itself comprises less than 15% cover.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Arctostaphylos uva-ursi</i> , <i>Dasiphora fruticosa</i> ssp. <i>floribunda</i> , <i>Juniperus horizontalis</i>
Herb (field)	Forb	<i>Achillea millefolium</i> , <i>Bupleurum americanum</i> , <i>Campanula rotundifolia</i> , <i>Galium boreale</i> , <i>Lupinus sericeus</i> , <i>Penstemon confertus</i>
Herb (field)	Graminoid	<i>Festuca campestris</i> , <i>Festuca idahoensis</i> , <i>Koeleria macrantha</i> , <i>Pseudoroegneria spicata</i>

Global

Stratum

Herb (field)
Herb (field)
Herb (field)

Lifeform

Dwarf-shrub
Forb
Graminoid

Species

Arctostaphylos uva-ursi, *Dasiphora fruticosa* ssp. *floribunda*
Achillea millefolium, *Galium boreale*, *Hedysarum sulphurescens*
Pseudoroegneria spicata

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Arctostaphylos uva-ursi*, *Dasiphora fruticosa* ssp. *floribunda*, *Juniperus horizontalis*

GLOBAL: *Amelanchier alnifolia*, *Arctostaphylos uva-ursi*, *Dasiphora fruticosa* ssp. *floribunda*, *Juniperus horizontalis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2G3 (22-Jan-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This is a newly described type with one plot derived from C. Damm's (2001) *Solidagini multiradiatae* - *Arctostaphyletum uva-ursi* plant association and the other documenting plots derived from both Glacier and Waterton Lakes national parks. Though described from a minimal number of plots, the author has seen the type as described along the length of the Rocky Mountain Front in Montana.

GLOBAL COMMENTS: This type has been defined based on a review of the field data of Achuff et al. (2002a) and Willoughby et al. (2001) (somewhat less than 40% of the 26 stands that defined his *Pseudoroegneria* - *Carex obtusata* community) and reallocating certain plots to this type and data collected in the course of inventorying Glacier-Waterton International Peace Park for a joint mapping project. The grasslands data accumulated by Jennifer Asebrook and fellow researchers also have plot information that substantiates this type.

GLOBAL SIMILAR ASSOCIATIONS:

- *Arctostaphylos uva-ursi* / *Festuca campestris* - *Festuca idahoensis* Dwarf-shrubland (CEGL005830)
- *Arctostaphylos uva-ursi* / *Solidago multiradiata* Dwarf-shrubland (CEGL005832)
- *Arctostaphylos uva-ursi* Dwarf-shrubland (CEGL001392)

GLOBAL RELATED CONCEPTS:

- *Agropyron spicatum* - *Carex obtusata* Community Type (Willoughby et al. 2001) I
- *Solidagini multiradiatae* - *Arctostaphyletum uva-ursi* plant association (Damm 2001) ?
- H27: *Agropyron spicatum* - *Festuca scabrella* Vegetation Type (Achuff et al. 2002a) I
- H28: *Festuca scabrella* - *Arctostaphylos uva-ursi* Vegetation Type (Achuff et al. 2002a) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This type has been described from the mid to upper subalpine of both Glacier and Waterton Lakes national parks. Glacier National Park sites have been sampled predominantly in the vicinity of the Bering Creek drainage.

GLOBAL RANGE: This is a minor, small-patch to linear type described from the east slope of the Rocky Mountain Front of Montana and is also found on very similar environments throughout the montane zone of southern Alberta.

NATIONS: CA, US

STATES/PROVINCES: AB, MT

USFS ECOREGIONS: M332C:CC, M333C:PP

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.65, CD484, WATE.4022, WATE.5031, WATE.5037, WATE.5103, WATE.5143.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Achuff et al. 2002a, Damm 2001, Western Ecology Working Group n.d., Willoughby et al. 2001

Arctostaphylos uva-ursi / *Solidago multiradiata* Dwarf-shrubland

BEARBERRY OR KINIKINNICK / ROCKY MOUNTAIN GOLDENROD DWARF-SHRUBLAND

IDENTIFIER: CEGL005832

NVC Classification

Physiognomic Class	Dwarf-shrubland (IV)
Physiognomic Subclass	Evergreen dwarf-shrubland (IV.A.)
Physiognomic Group	Needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.1.)
Physiognomic Subgroup	Natural/Semi-natural needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.1.N.)
Formation	Creeping or matted needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.1.N.b.)
Alliance	<i>Arctostaphylos uva-ursi</i> Dwarf-shrubland Alliance (A.1079)
Alliance (English name)	Kinikinnick or Bearberry Dwarf-shrubland Alliance
Association	<i>Arctostaphylos uva-ursi</i> / <i>Solidago multiradiata</i> Dwarf-shrubland
Association (English name)	Bearberry or Kinikinnick / Rocky Mountain Goldenrod Dwarf-shrubland

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine Turf (CES306.816)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is the most widespread *Arctostaphylos uva-ursi* community in Glacier National Park of Montana. This small-patch type has been documented from the highest subalpine elevations to the lower alpine, from 1700 to 2290 m (5575-7510 feet). It is often associated with dead and dying ridgetop *Pinus albicaulis* stands or krummholz patches of *Abies lasiocarpa* and *Pinus flexilis*. The general aspect is of talus cones and slopes of moderate to steep inclination (18-62%) carpeted with a dark-green heath-dominated mat. The predominantly westerly to southerly exposures coupled with prevailing westerlies (removing most snow cover) and rapidly drained soils produce a xeric microclimate. Parent material is colluvium derived primarily from red and green argillite and in a few cases quartzite and arenite. The slopes have been stabilized and the surfaces compacted with only a few boulders protruding and are generally smooth to gently undulating in relief

Despite the xerophytic nature of the vegetation, it is quite profuse with vascular cover exceeding 80% in more than 75% of the plots. The dwarf-shrub layer is strongly dominant and includes the prostrate *Arctostaphylos uva-ursi* with cover ranging from slightly more than 10% to in excess of 75%; *Dasiphora fruticosa* ssp. *floribunda* and *Juniperus communis* are highly constant but have low cover. The graminoid component is minor with only *Calamagrostis koelerioides*, *Festuca idahoensis*, and *Festuca campestris* approaching 50% constancy and present in only trace amounts. The forb component is relatively diverse, but no one species is diagnostic of, or even exhibits, higher cover in this type; those with high constancy include *Solidago multiradiata*, *Hedysarum sulphurescens*, *Minuartia obtusiloba* (= *Arenaria obtusiloba*), *Potentilla diversifolia*, *Potentilla diversifolia*, *Campanula rotundifolia*, *Galium boreale*, *Cerastium arvense*, *Achillea millefolium*, *Pulsatilla patens* ssp. *multifida* (= *Anemone patens*), *Bupleurum americanum*, *Sedum lanceolatum*, and *Antennaria umbrinella*. Lichen cover on exposed rocks is generally greater than that of surface bryophytes with both generally comprising less than 3% cover and not exceeding 15%.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This small-patch type, described as fell-field by Damm (2001), has been documented from the highest subalpine elevations to the lower alpine, from 1700 to 2290 m (5575-7510 feet); most of this type occurs below 1900 m (6230 feet) if sample plots are a good reflection of type distribution. It is often associated with dead and dying ridgetop *Pinus albicaulis* stands or krummholz patches of *Abies lasiocarpa* and *Pinus flexilis*. The general aspect is of talus cones and slopes of moderate to steep inclination (18-62%) carpeted with a dark-green heath-dominated mat. The predominantly westerly to southerly exposures coupled with prevailing westerlies (removing most snow cover) and rapidly drained soils produce a xeric microclimate. Parent material is colluvium derived primarily from red and green argillite and in a few cases quartzite and arenite. The slopes have been stabilized and the surfaces compacted with only a few boulders protruding and are generally smooth to gently undulating in relief. This community has also been described from exposed, shallowly inclined colluvial footslopes and essentially flat weather ground moraines.

GLOBAL ENVIRONMENT:**VEGETATION DESCRIPTION**

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Despite the xerophytic nature of the vegetation, it is quite profuse with vascular cover exceeding 80% in more than 75% of the plots. The dwarf-shrub layer is strongly dominant and includes the prostrate *Arctostaphylos uva-ursi* with cover ranging from slightly more than 10% to in excess of 75%; *Dasiphora fruticosa* ssp. *floribunda* and *Juniperus communis* are virtually omnipresent as upright dwarf-shrubs (<0.5 m), though they seldom occur with greater than 5% cover. The graminoid component is minor with only *Calamagrostis koelerioides*, *Festuca idahoensis*, and *Festuca campestris* approaching 50% constancy and present in only trace amounts. The forb component is relatively diverse but no one species is diagnostic of, or even exhibits, higher cover in this type; those with high constancy include *Solidago multiradiata*, *Hedysarum sulphurescens*, *Minuartia obtusiloba* (= *Arenaria obtusiloba*), *Potentilla diversifolia*, *Potentilla diversifolia*, *Campanula rotundifolia*, *Galium boreale*, *Cerastium arvense*, *Achillea millefolium*, *Pulsatilla patens* ssp. *multifida* (= *Anemone patens*), *Bupleurum americanum*, *Sedum lanceolatum*, and *Antennaria umbrinella*. Lichen cover on exposed rocks is generally greater than that of surface bryophytes with both generally comprising less than 3% cover and not exceeding 15%.

GLOBAL VEGETATION:**MOST ABUNDANT SPECIES****WATERTON-GLACIER INTERNATIONAL PEACE PARK**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Arctostaphylos uva-ursi</i> , <i>Dasiphora fruticosa</i> ssp. <i>floribunda</i> , <i>Juniperus communis</i>
Herb (field)	Forb	<i>Achillea millefolium</i> , <i>Galium boreale</i> , <i>Hedysarum sulphurescens</i> , <i>Minuartia obtusiloba</i> , <i>Solidago multiradiata</i>
Herb (field)	Graminoid	<i>Calamagrostis koelerioides</i> , <i>Festuca idahoensis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Arctostaphylos uva-ursi*, *Dasiphora fruticosa* ssp. *floribunda*, *Hedysarum sulphurescens*, *Juniperus communis*, *Solidago multiradiata*

GLOBAL:**OTHER NOTEWORTHY SPECIES****WATERTON-GLACIER INTERNATIONAL PEACE PARK:****GLOBAL:****CONSERVATION STATUS RANK**

GLOBAL RANK & REASONS: G2G3 (22-Jan-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This fell-field vegetation type is comprised of a subsample of Damm's (2001) association of approximately the same name, *Solidagini multiradiatae* - *Arctostaphyletum uva-ursi*. Those plots of his type that had *Festuca idahoensis*, *Festuca campestris*, or *Pseudoroegneria spicata* with at least 5% cover are treated as *Arctostaphylos uva-ursi* / *Festuca campestris* - *Festuca idahoensis* Dwarf-shrubland (CEGL005830) and *Arctostaphylos uva-ursi* / *Pseudoroegneria spicata* Dwarf-shrubland (CEGL005831), respectively, and those plots with *Dryas octopetala* as an important component (at least 5%) were recognized as *Dryas octopetala* - *Carex rupestris* Dwarf-shrub Herbaceous Vegetation (CEGL001892). This latter type was also recognized at the subassociation level by Damm (2001), and he recognized various other subassociation groupings of his primary association as well. One plot with appreciable amounts of *Amelanchier* and *Prunus* (and *Carex geyeri*) was placed in *Amelanchier alnifolia* / *Pseudoroegneria spicata* - Bunchgrass Shrubland (CEGL001065). It should be noted that the nominal species *Solidago multiradiata* is a broadly distributed species from montane grasslands on limestone to the highest alpine fell-fields and as such hardly constitutes a diagnostic species, much less a characteristic species.

GLOBAL COMMENTS: This fell-field vegetation type is comprised of a subsample of Damm's (2001) association of approximately the same name, *Solidagini multiradiatae* - *Arctostaphyletum uva-ursi*. Those plots of his type that had *Festuca idahoensis*, *Festuca campestris*, or *Pseudoroegneria spicata* with at least 5% cover are treated as *Arctostaphylos uva-ursi* / *Festuca*

campestris - *Festuca idahoensis* Dwarf-shrubland (CEGL005830) and *Arctostaphylos uva-ursi* / *Pseudoroegneria spicata* Dwarf-shrubland (CEGL005831), respectively, and those plots with *Dryas octopetala* as an important component (at least 5%) were recognized as *Dryas octopetala* - *Carex rupestris* Dwarf-shrub Herbaceous Vegetation (CEGL001892). It should be noted that the nominal species *Solidago multiradiata* is a broadly distributed species from montane grasslands on limestone to the highest alpine fell-fields and as such hardly constitutes a diagnostic species, much less a characteristic species.

GLOBAL SIMILAR ASSOCIATIONS:

- *Arctostaphylos uva-ursi* / *Festuca campestris* - *Festuca idahoensis* Dwarf-shrubland (CEGL005830)
- *Arctostaphylos uva-ursi* / *Pseudoroegneria spicata* Dwarf-shrubland (CEGL005831)
- *Arctostaphylos uva-ursi* Dwarf-shrubland (CEGL001392)--dominance of *Arctostaphylos uva-ursi* with only traces of grasses and forbs.

GLOBAL RELATED CONCEPTS:

- *Solidagini multiradiatae* - *Arctostaphyletum uva-ursi* Association (Damm 2001) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This is the most widespread *Arctostaphylos uva-ursi* community in the IPP and has been abundantly documented from the Appistoki Creek and Baring Creek valleys of Glacier National Park; prudent speculation places this type in Waterton Lakes National Park based on presumed appropriate habitat.

GLOBAL RANGE:

NATIONS: CA?, US

STATES/PROVINCES: AB?, MT:S2?

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes?)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: CD723, CD724, CD372, CD224, CD461, CD225, CD286, CD287, CD248, CD229, CD238, CD100, CD101, CD234, CD486, CD76, CD77, CD387.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Damm 2001, Western Ecology Working Group n.d.

***Dryas drummondii* Dwarf-shrubland Alliance**

***Dryas drummondii* / *Chamerion latifolium* Dwarf-shrubland**

DRUMMOND'S MOUNTAIN-AVENS / DWARF FIREWEED DWARF-SHRUBLAND

IDENTIFIER: CEGL005834

NVC Classification

Physiognomic Class	Dwarf-shrubland (IV)
Physiognomic Subclass	Evergreen dwarf-shrubland (IV.A.)
Physiognomic Group	Needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.1.)
Physiognomic Subgroup	Natural/Semi-natural needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.1.N.)
Formation	Creeping or matted needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.1.N.b.)
Alliance	<i>Dryas drummondii</i> Dwarf-shrubland Alliance (A.2629)
Alliance (English name)	Drummond's Mountain-avens Dwarf-shrubland Alliance
Association	<i>Dryas drummondii</i> / <i>Chamerion latifolium</i> Dwarf-shrubland
Association (English name)	Drummond's Mountain-avens / Dwarf Fireweed Dwarf-shrubland

ECOLOGICAL SYSTEM(S):

ELEMENT CONCEPT

GLOBAL SUMMARY: This dwarf-shrubland association is apparently widespread in the Canadian Rocky Mountains, being reported from northwestern Montana, north and west into Alberta and British Columbia. This is a small-patch community associated with fluvial and glacial landforms, most especially point bars and stream terraces having well- to rapidly drained cobbly soils (Inceptisols of U.S. and Regosols of Canadian designation). It is found in the montane to lower subalpine zones, ranging in elevation from 1000 to 1700 m. Sites typically have gentle slopes and various aspects. Landforms include point bars, fluvial terraces or benches, gently sloping banks, moraines, and lakeshores. These sites are temporarily flooded in spring runoff, experiencing both fluvial deposition and erosion. That portion of the surface not covered by a vegetation mat is occupied by a variable combination of exposed soil and small cobbles that ranges between 15 and 65% cover. *Dryas drummondii* cover ranges from 25% to more than 80%, seldom projecting more than 0.03 m above the surface. *Shepherdia canadensis*, *Salix brachycarpa*, and *Juniperus communis* are the only other shrubs with more than 50% constancy, and they generally occur in low amounts. *Arctostaphylos uva-ursi* can occur in drier stands. The herbaceous layer is species-poor and has low cover. *Oxytropis sericea* and *Chamerion latifolium* (= *Epilobium latifolium*) are the only forbs present in half the plots or more and in greater than trace amounts. Seedlings of *Populus balsamifera ssp. trichocarpa*, *Picea glauca*, and *Picea engelmannii* are found here, but given the high energy environment of these sites, they apparently are uprooted before they can become securely established.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This small-patch community is associated with fluvial landscapes, most especially point bars and stream terraces having well- to rapidly drained cobbly soils (Inceptisols of U.S. and Regosols of Canadian designation). That portion of the surface not covered by a vegetation mat is occupied by a variable combination of exposed soil and small cobbles that ranges between 15 and 65% cover. These sites are temporarily flooded in spring runoff, experiencing both fluvial deposition and erosion. Sampled sites range in elevation from 1280 to 1550 m (4210-5080 feet). They occur on benches or gently sloping banks where aspect is not a factor.

GLOBAL ENVIRONMENT: This small-patch community is associated with fluvial and glacial landforms, most especially point bars and stream terraces having well- to rapidly drained cobbly soils (Inceptisols of U.S. and Regosols of Canadian designation). It is found in the montane to lower subalpine zones, ranging in elevation from 1000 m (in the north) to 1700 m (3280-5576 feet). Sites typically have gentle slopes and various aspects. Landforms include point bars, fluvial terraces or benches, gently sloping banks, moraines, and lakeshores. These sites are temporarily flooded in spring runoff, experiencing both fluvial deposition and erosion. That portion of the surface not covered by a vegetation mat is occupied by a variable combination of exposed soil and small cobbles that ranges between 15 and 65% cover.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: With the grey-green carpet of the dwarf-shrub (predominantly prostrate) *Dryas drummondii* often blending with the colors of the rocky substrate, this community can often be overlooked on casual inspection; *Dryas drummondii* cover ranges from 30% to more than 80%, seldom projecting more than 0.03 m above the surface. *Shepherdia canadensis* and *Juniperus communis* are the only shrubs with more than 50% constancy, and they occur only in trace amounts. Graminoids also occur in trace amounts with no particular constancy. *Oxytropis sericea* and *Chamerion latifolium* (= *Epilobium latifolium*) are the only forbs present in half the plots or more and in greater than trace amounts. Seedlings of *Populus balsamifera ssp. trichocarpa* and *Picea engelmannii* are found here, but given the high energy environment of these sites, they apparently are uprooted before they can become securely established.

GLOBAL VEGETATION: With the grey-green carpet of the dwarf-shrub (predominantly prostrate) *Dryas drummondii* often blending with the colors of the rocky substrate, this community can often be overlooked on casual inspection; *Dryas drummondii* cover ranges from 25% to more than 80%, seldom projecting more than 0.03 m above the surface. *Shepherdia canadensis*, *Salix brachycarpa*, and *Juniperus communis* are the only other shrubs with more than 50% constancy, and they generally occur in low amounts. *Arctostaphylos uva-ursi* can occur in drier stands. The herbaceous layer is species-poor and has low cover. *Oxytropis sericea* and *Chamerion latifolium* (= *Epilobium latifolium*) are the only forbs present in half the plots or more and in greater than trace amounts. *Chamerion latifolium* is generally found in moist depressions and near stream channels. Graminoids also occur in trace amounts with no particular constancy. Seedlings of *Populus balsamifera ssp. trichocarpa*, *Picea glauca* and *Picea engelmannii* are found here, but given the high energy environment of these sites, they apparently are uprooted before they can become securely established.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Shepherdia canadensis</i>

Herb (field)	Dwarf-shrub	<i>Dryas drummondii</i>
Herb (field)	Forb	<i>Oxytropis sericea</i>
Herb (field)	Other herbaceous	<i>Picea engelmannii</i> , <i>Populus balsamifera</i> ssp. <i>trichocarpa</i>

Global

Stratum

Herb (field)
Herb (field)

Lifeform

Dwarf-shrub
Forb

Species

Arctostaphylos uva-ursi, *Dryas drummondii*
Chamerion latifolium

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Chamerion latifolium*

GLOBAL: *Chamerion latifolium*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3? (28-Jan-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This vegetation type has not yet been assigned to an Alliance; the association name comes from Achuff et al. (2002a), and they note the type is well-represented in the Canadian literature.

GLOBAL COMMENTS: A number of other communities characterized by *Dryas drummondii* are reported by Achuff et al. (2002a) as occurring throughout western Canada.

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

- *Dryas drummondii* - *Epilobium latifolium* Vegetation Type, H08 (Achuff and Dudynsky 1984b) =
- *Dryas drummondii* - *Epilobium latifolium* Vegetation Type, H08 (Achuff and Dudynsky 1984a) =
- *Dryas drummondii* - *Epilobium latifolium* Vegetation Type, H08 (Achuff et al. 1993) =
- *Dryas drummondii* - *Epilobium latifolium* Vegetation Type, H08 (Achuff and Corns 1982) =
- H08: *Dryas drummondii* - *Epilobium latifolium* Vegetation Type (Achuff et al. 2002a) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is found associated with fluvial systems at montane elevations within both Glacier National Park and Waterton Lakes National Park.

GLOBAL RANGE: This dwarf-shrubland association is apparently widespread in the Canadian Rocky Mountains, being reported from Glacier National Park in northwestern Montana, north and west into a number of Canadian parks, including Banff, Jasper, Yoho, Kootenay, and Glacier national parks of British Columbia.

NATIONS: CA, US

STATES/PROVINCES: AB, MT

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Banff, Glacier, Jasper, Kootenay, Waterton Lakes, Yoho)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.5142, WATE.5150, GLAC.139.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Achuff and Corns 1982, Achuff and Dudynsky 1984a, Achuff and Dudynsky 1984b, Achuff et al. 1993, Achuff et al. 2002a, Western Ecology Working Group n.d.

***Phyllodoce glanduliflora* Dwarf-shrubland Alliance**

***Phyllodoce glanduliflora* / *Sibbaldia procumbens* Dwarf-shrubland YELLOW MOUNTAIN-HEALTH / CREEPING GLOW-WORT DWARF-SHRUBLAND**

IDENTIFIER: C EGL005877

NVC Classification

Physiognomic Class	Dwarf-shrubland (IV)
Physiognomic Subclass	Evergreen dwarf-shrubland (IV.A.)
Physiognomic Group	Needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.1.)
Physiognomic Subgroup	Natural/Semi-natural needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.1.N.)
Formation	Creeping or matted needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.1.N.b.)
Alliance	<i>Phyllodoce glanduliflora</i> Dwarf-shrubland Alliance (A.1084)
Alliance (English name)	Yellow Mountain-heath Dwarf-shrubland Alliance
Association	<i>Phyllodoce glanduliflora</i> / <i>Sibbaldia procumbens</i> Dwarf-shrubland
Association (English name)	Yellow Mountain-health / Creeping Glow-wort Dwarf-shrubland

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine Dwarf-Shrubland (CES306.810)

ELEMENT CONCEPT

GLOBAL SUMMARY: Documented from Glacier National Park, Montana. This community is found as small patches from the upper subalpine to alpine environments, its documented elevation range being from 1930 to 2320 m (6330-7610 feet). It is a moderately chionophilous type often noted as a dark green ericaceous border around long-persisting snowbed depressions. It also occurs on somewhat exposed ridges of terraced landscapes on positions where the ericaceous dwarf-shrubs are projecting through the snow in late June and July and the lower, less exposed positions in the landscape are still snow covered. It occurs on gentle terrain with slopes mostly less than 15% and noted to not exceed 35%. The accumulated peat layer is hypothesized to isolate the ericaceous root mat from differences in rock chemistry; therefore the community is found on both calcareous limestones and non-calcareous siltstones and argillites. The amount of exposed rock (which is frost-heaved to the surface) and soil is generally less than 5%, whereas litter in combination with moss and lichen cover form a nearly continuous cover. The heath species, *Phyllodoce glanduliflora*, *Phyllodoce empetriformis*, and/or their hybrid *Phyllodoce X intermedia*, having at least 10% cover, are diagnostic for this community. In general the cover of these dwarf-shrubs exceeds 25% and they form a discontinuous layer about 0.15 m high. *Salix arctica* and *Kalmia microphylla* are the only other dwarf-shrubs of note. *Carex nigricans* is the one graminoid consistently present, though cover seldom exceeds 10%. Other high constancy graminoids include *Phleum alpinum*, *Luzula glabrata*, and a variable combination of *Juncus* species, *Juncus mertensianus*, *Juncus drummondii*, and *Juncus parryi*. Though its cover seldom exceeds 5%, *Sibbaldia procumbens* is diagnostic of the chionophilous nature of this community; other high-constancy forbs include *Erigeron peregrinus*, *Packera streptanthifolia* (= *Senecio cymbalarioides*), *Hieracium gracile*, *Arenaria capillaris*, *Hypericum scouleri* (= *Hypericum formosum*), and *Veronica wormskjoldii*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This community is found as a small patches from the upper subalpine to alpine environments, its documented elevation range being from 1930 to 2320 m (6330-7610 feet). It is a moderately chionophilous type often noted as a dark green ericaceous border around long-persisting snowbed depressions occupied by the *Carex nigricans* community. It also occurs on somewhat exposed ridges of terraced landscapes on positions where the ericaceous dwarf-shrubs are projecting through the snow in late June and July and the lower, less exposed positions in the landscape are still snow covered. It occurs on gentle terrain with slopes mostly less than 15% and noted to not exceed 35%. Aspects are various for gentle slopes and primarily northerly for steeper slopes. The accumulated peat layer is hypothesized to isolate the ericaceous root mat from differences in rock chemistry; therefore the community is found on both calcareous limestones and non-calcareous siltstones and argillites. The amount of exposed rock (which is frost-heaved to the surface) and soil is generally less than 5%, whereas litter in combination with moss and lichen cover form a nearly continuous cover.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The heath species, *Phyllodoce glanduliflora*, *Phyllodoce empetriformis*, and/or their hybrid *Phyllodoce X intermedia*, having at least 10% cover, are diagnostic for this community. In general the cover of these dwarf-shrubs exceeds 25% and they form a discontinuous layer about 0.15 m high. *Salix arctica* and *Kalmia microphylla* are the only other dwarf-shrubs of note (see Classification Comments for discriminating *Kalmia* from *Phyllodoce* types). *Carex nigricans* is the one graminoid consistently present, though cover seldom exceeds 10%. Other high constancy graminoids include *Phleum alpinum*, *Luzula glabrata*, and a variable combination of *Juncus* species, *Juncus mertensianus*, *Juncus drummondii*, and *Juncus parryi*. Though its cover seldom exceeds 5%, *Sibbaldia procumbens* is diagnostic of the chionophilous nature of this community; other high-constancy forbs include *Erigeron peregrinus*, *Packera streptanthifolia* (= *Senecio cymbalarioides*), *Hieracium gracile*, *Arenaria capillaris*, *Hypericum scouleri* (= *Hypericum formosum*), and *Veronica wormskjoldii*.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Phyllodoce empetriformis</i> , <i>Phyllodoce glanduliflora</i> , <i>Phyllodoce x intermedia</i>
Herb (field)	Forb	<i>Erigeron peregrinus</i> , <i>Packera streptanthifolia</i> , <i>Sibbaldia procumbens</i>
Herb (field)	Graminoid	<i>Carex nigricans</i> , <i>Juncus drummondii</i> , <i>Phleum alpinum</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Phyllodoce empetriformis*, *Phyllodoce glanduliflora*, *Phyllodoce x intermedia*, *Sibbaldia procumbens*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2G3 (13-Jan-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This community is very close floristically and environmentally to that in which *Kalmia microphylla* is a significant component (cover >10%), but the *Phyllodoce* type is less floristically rich, has no *Kalmia microphylla* and occurs on slightly drier sites with less accumulated peat. Damm (2001) recognized a *Sibbaldia procumbens* - *Phyllodocetum glanduliflorae* Association that is largely synonymous with, though more broadly defined than, the type described here (names reversed to comply with NVC); Damm's plots containing appreciable amounts of the taller and more strongly peat-associated *Kalmia microphylla* were allocated to *Kalmia microphylla* / *Carex nigricans* Dwarf-shrubland (CEGL001402) (these plots also had *Carex nigricans* more abundantly represented).

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Sibbaldia procumbens* - *Polygonum bistortoides* Herbaceous Vegetation (CEGL001933)

GLOBAL RELATED CONCEPTS:

- *Sibbaldia procumbens* - *Phyllodocetum glanduliflorae* Association (Damm 2001) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: Damm (2001) documented this type extensively in the Logan Pass vicinity and to a lesser degree throughout Glacier National Park; it has not been documented from Waterton Lakes National Park, but there should be no biological arguments against its occurrence.

GLOBAL RANGE:

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S2S3

USFS ECOREGIONS: M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes?)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: CD610, CD744, CD127, CD394, CD531, CD532, CD530, CD653, CD124, CD121, CD203, CD581, CD604, CD747, CD317, CD339.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Damm 2001, Western Ecology Working Group n.d.

IV.A.1.N.g. Saturated needle-leaved or microphyllous evergreen dwarf-shrubland***Kalmia microphylla* Saturated Dwarf-shrubland Alliance*****Kalmia microphylla* / *Carex nigricans* Dwarf-shrubland****ALPINE LAUREL / BLACK ALPINE SEDGE DWARF-SHRUBLAND**

IDENTIFIER: CEGL001402

NVC Classification

Physiognomic Class	Dwarf-shrubland (IV)
Physiognomic Subclass	Evergreen dwarf-shrubland (IV.A.)
Physiognomic Group	Needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.1.)
Physiognomic Subgroup	Natural/Semi-natural needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.1.N.)
Formation	Saturated needle-leaved or microphyllous evergreen dwarf-shrubland (IV.A.1.N.g.)
Alliance	<i>Kalmia microphylla</i> Saturated Dwarf-shrubland Alliance (A.1096)
Alliance (English name)	Alpine Laurel Saturated Dwarf-shrubland Alliance
Association	<i>Kalmia microphylla</i> / <i>Carex nigricans</i> Dwarf-shrubland
Association (English name)	Alpine Laurel / Black Alpine Sedge Dwarf-shrubland

ECOLOGICAL SYSTEM(S):

ELEMENT CONCEPT

GLOBAL SUMMARY: This association may be widespread throughout the western United States and western Canada. It is currently known from California, Washington, Oregon, Montana, and British Columbia. This is a dwarf-shrubland association found in moist subalpine and alpine meadows, snowbeds, lake margins, and other low-gradient depressions of the northern Rockies and Pacific ranges from 1585 to 3965 m (5200-13,000 feet) in elevation. These habitats are cold and snowy, with snowfields lingering into June or later. Soils are frigid, derived from bedrock or aggraded alluvium, usually high in organic matter, and strongly acidic. These communities are often associated with hummocky topography, which provides a juxtaposition of saturated and somewhat drained microhabitats. Water tables are often at or near the surface for much of the growing season, and organic decomposition is slow. This association is typified by a dominant dwarf-shrub layer of *Kalmia microphylla*. Other ericaceous shrubs, including *Phyllodoce empetriformis*, *Phyllodoce breweri*, *Ledum glandulosum*, and *Vaccinium* spp., are common associates. Dwarf *Salix* spp. may also be present, such as *Salix farriae* or *Salix arctica*. The herbaceous layer is typically dominated by graminoids, of which *Carex* usually predominate. *Carex nigricans* is the dominant species, with cover ranging from 10% to well over 50% or more. *Carex scopulorum*, *Carex spectabilis*, *Carex aquatilis*, *Carex canescens*, and *Carex pellita* (= *Carex lanuginosa*) are especially common. Grasses, such as

Deschampsia caespitosa, *Danthonia intermedia*, and *Phleum alpinum*, may also be locally abundant. Mesic to hygric forbs are usually scattered through the graminoid matrix, including *Symphotrichum spathulatum* (= *Aster occidentalis*), *Oreostemma alpigenum* (= *Aster alpigenus*), *Pedicularis groenlandica*, *Caltha leptosepala*, *Parnassia fimbriata*, *Trollius laxus*, *Veronica* spp., *Gentiana* spp., *Dodecatheon* spp., and *Epilobium* spp. The moss layer is often virtually continuous but can also be only a few percent.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Though predominantly a subalpine type, it extends to alpine habitats, and its documented elevation ranges from 2000 to 2350 m (6560-7710 feet). This community occupies the moister, collecting positions and depressions of rolling and terraced terrain and often borders streambanks. Surfaces are generally flat to mildly sloping; aspects are various and not considered controlling due to the low slope angles (and overwhelming effects of abundant moisture). It often occurs contiguous to snowbed depressions and thus is indicative of moderately long-persisting winter snowpack, though not so long as the *Carex nigricans*-dominated snowbeds. The adjacent snowbeds provide a reliable water source into midsummer, and combined with the peaty organic soil's storage capacity, these sites remain saturated throughout a typical summer. Both non-calcareous red and green argillites and calcareous limestones are represented, but they are usually isolated from contact with the rooting mat by the pure organic peaty soils (which may have appreciable silt content throughout in the sites subject to spring flooding).

GLOBAL ENVIRONMENT: Vegetation within this association is found in moist subalpine and alpine meadows, snowbeds, lake margins, and other low-gradient depressions of the northern Rockies and Pacific ranges from 5200-13,000 feet in elevation. These habitats are cold and snowy, with snowfields lingering into June or later. Soils are frigid, derived from bedrock or aggraded alluvium, usually high in organic matter, and strongly acidic. These communities are often associated with hummocky topography, which provides a juxtaposition of saturated and somewhat drained microhabitats. Water tables are often at or near the surface for much of the growing season, and organic decomposition is slow.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The vascular plant cover usually approaches 100% and has not been noted to be lower than 60%. The dwarf-shrub heath component, comprised of *Kalmia microphylla*, *Phyllodoce empetriformis*, and *Phyllodoce glanduliflora*, provides the dominant aspect. Other dwarf-shrubs with highly variable coverage include *Salix arctica* (indicative of hygric moisture status), *Gaultheria humifusa* (characteristic of peaty soils), and *Vaccinium scoparium*. Graminoids with high constancy include *Carex nigricans*, *Vahlodea atropurpurea*, *Juncus mertensianus*, and *Juncus drummondii*. Forbs tending to typify the wetter sites include *Parnassia fimbriata*, *Triantha glutinosa* (= *Tofieldia glutinosa*), *Trollius laxus*, *Veronica wormskjoldii*, and *Pedicularis groenlandica*. Those of high constancy throughout the type include *Sibbaldia procumbens*, *Hieracium gracile*, *Packera streptanthifolia* (= *Senecio cymbalarioides*), *Hypericum scouleri* (= *Hypericum formosum*), *Epilobium anagallidifolium* (= *Epilobium alpinum*), *Erigeron peregrinus*, and *Castilleja occidentalis* (a hemiparasite of *Salix arctica*). The moss layer is often virtually continuous but can also be only a few percent. The ground layer is characterized by the bright yellow-green color of *Aulacomnium palustre*, the moss with highest constancy and cover.

GLOBAL VEGETATION: This association is typified by a dominant dwarf-shrub layer of *Kalmia microphylla*. Other ericaceous shrubs, including *Phyllodoce empetriformis*, *Phyllodoce breweri*, *Ledum glandulosum*, and *Vaccinium* spp., are common associates. Dwarf *Salix* spp. may also be present, such as *Salix farriarum* or *Salix arctica*. The herbaceous layer is typically dominated by graminoids, of which Carices usually predominate. *Carex nigricans* is the dominant species, with cover ranging from 10% to well over 50% or more. *Carex scopulorum*, *Carex spectabilis*, *Carex aquatilis*, *Carex canescens*, and *Carex pellita* (= *Carex lanuginosa*) are especially common. Grasses, such as *Deschampsia caespitosa*, *Danthonia intermedia*, and *Phleum alpinum*, may also be locally abundant. Mesic to hygric forbs are usually scattered through the graminoid matrix including *Symphotrichum spathulatum* (= *Aster occidentalis*), *Oreostemma alpigenum* (= *Aster alpigenus*), *Pedicularis groenlandica*, *Caltha leptosepala*, *Parnassia fimbriata*, *Trollius laxus*, *Veronica* spp., *Gentiana* spp., *Dodecatheon* spp., and *Epilobium* spp. The moss layer is often virtually continuous but can also be only a few percent.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Gaultheria humifusa</i> , <i>Kalmia microphylla</i> , <i>Phyllodoce empetriformis</i> , <i>Phyllodoce glanduliflora</i> , <i>Salix arctica</i>
Herb (field)	Forb	<i>Epilobium anagallidifolium</i> , <i>Hypericum scouleri</i> , <i>Packera streptanthifolia</i> , <i>Sibbaldia procumbens</i>
Herb (field)	Graminoid	<i>Carex nigricans</i> , <i>Juncus mertensianus</i> , <i>Vahlodea atropurpurea</i>

Global

Stratum

Herb (field)
Herb (field)

Lifeform

Dwarf-shrub
Graminoid

Species

Kalmia microphylla
Carex nigricans, *Carex scopulorum*

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex nigricans*, *Kalmia microphylla*, *Phyllodoce empetriformis*, *Phyllodoce glanduliflora*

GLOBAL: *Kalmia microphylla*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This type was incorporated into two of the associations defined by C. Damm (2001), *Sibbaldio procumbentis* - *Phyllodoce glanduliflorae* and *Aulacomnio* - *Kalmietum microphyllae*. The dwarf-shrubland recognized here (CEGL001402) keys on the dependably chionophilous nature of *Carex nigricans* and the recognition that *Kalmia microphylla* is strongly associated with hygric to hydric sites with significant peat accumulations.

GLOBAL COMMENTS: The dwarf-shrubland recognized here (CEGL001402) keys on the dependably chionophilous nature of *Carex nigricans* and the recognition that *Kalmia microphylla* is strongly associated with hygric to hydric sites with significant peat accumulations.

GLOBAL SIMILAR ASSOCIATIONS:

- *Kalmia microphylla* / *Carex scopulorum* Dwarf-shrubland (CEGL001403)

GLOBAL RELATED CONCEPTS:

- *Aulacomnio* - *Kalmietum microphyllae* Association (Damm 2001) I
- *Carex nigricans* - *Kalmia polifolia* Herbaceous Vegetation (Keeler-Wolf 2002) =
- *Kalmia microphylla* / *Carex nigricans* (Wooten and Morrison 1995) =
- *Kalmia microphylla* / *Aster alpigenus* (Bourgeron and Engelking 1994) =
- *Kalmia polifolia* / *Aster alpigenus* association (Hamann 1972) =
- *Salix farriarum* / *Carex nigricans* Association (Kovalchik 1993) =
- *Sibbaldio procumbentis* - *Phyllodoce glanduliflorae* Association (Damm 2001) I
- Blackish Sedge - Mountain Laurel Association (Taylor 1984) =
- DRISCOLL FORMATION CODE:IV.A.2.a. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This community has been recognized for only Glacier National Park with many of the documenting plots coming from the Logan Pass vicinity, but all environmental conditions supporting it should be found in Waterton Lakes National Park as well.

GLOBAL RANGE: This association may be widespread throughout the western United States and western Canada. It is currently known from California, Washington, Oregon, Montana, and British Columbia.

NATIONS: CA, US

STATES/PROVINCES: AB?, BC?, CA, MT, OR:S2, WA:S3

USFS ECOREGIONS: M242A:C?, M242B:CC, M242C:C?, M261E:CC, M332C:CC, M333A:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier, Mount Rainier, Yosemite); PC (Waterton Lakes?)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: CD413, CD612, CD645, CD649, CD123, CD122, CD569, CD527, CD588, CD622, CD574, CD578, CD572, CD335, CD334, CD345, CD341, CD744.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: T. Keeler-Wolf, mod. M.S. Reid

REFERENCES: Bourgeron and Engelking 1994, Damm 2001, Driscoll et al. 1984, Hamann 1972, Kagan et al. 2000, Keeler-Wolf 2002, Kovalchik 1993, Taylor 1984, Western Ecology Working Group n.d., Wooten and Morrison 1995

IV.B.2.N.a. Cespitose cold-deciduous dwarf-shrubland

Vaccinium (caespitosum, myrtilus, scoparium) Dwarf-shrubland Alliance

Vaccinium (myrtilus, scoparium) / Luzula glabrata var. hitchcockii Dwarf-shrubland (WHORTLEBERRY, GROUSEBERRY) / HITCHCOCK'S SMOOTH WOODRUSH DWARF-SHRUBLAND

IDENTIFIER: CEGLO05879

NVC Classification

Physiognomic Class	Dwarf-shrubland (IV)
Physiognomic Subclass	Deciduous dwarf-shrubland (IV.B.)
Physiognomic Group	Cold-deciduous dwarf-shrubland (IV.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous dwarf-shrubland (IV.B.2.N.)
Formation	Cespitose cold-deciduous dwarf-shrubland (IV.B.2.N.a.)
Alliance	<i>Vaccinium (caespitosum, myrtilus, scoparium)</i> Dwarf-shrubland Alliance (A.1114)
Alliance (English name)	(Dwarf Blueberry, Whortleberry, Grouseberry) Dwarf-shrubland Alliance
Association	<i>Vaccinium (myrtilus, scoparium) / Luzula glabrata var. hitchcockii</i> Dwarf-shrubland
Association (English name)	(Whortleberry, Grouseberry) / Hitchcock's Smooth Woodrush Dwarf-shrubland

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine Dwarf-Shrubland (CES306.810)

ELEMENT CONCEPT

GLOBAL SUMMARY: This community has been documented from throughout the southern reaches of Glacier National Park, Montana. This small-patch community has been documented from 1775 to 2280 m (5820-7475 feet), usually on moderate to steep southerly exposures (southeasterly to southwesterly), but northerly aspects have been noted as well. It is mostly found on mid- to upper-slope positions as well as slope shoulders and ridges. Soils have developed from argillites, mudstone and sandstone of colluvial or glacial deposition, contain more than 20% rock in the upper profile and are rapidly drained loams and loamy sands. All sampled stands currently have mixtures of trace amounts of seedling and sapling *Abies lasiocarpa*, *Picea engelmannii*, and *Pinus albicaulis*. These sites are characterized as having more than 10% *Vaccinium scoparium* (or *Vaccinium myrtilus*) cover; usually these species have in excess of 20% cover. Other shrubs are not consistently present and, with the exception of *Spiraea betulifolia*, none have more than 3% cover. The graminoid component for a given stand ranges from diverse (in excess of 10 species) to relatively depauperate (only 2 species), but only four species, *Luzula glabrata*, *Trisetum spicatum*, *Danthonia intermedia*, and *Carex geyeri*, occur with greater than 50% constancy and only *Luzula glabrata* has coverages consistently in excess of 10%. *Luzula*'s presence and cover are indicative of persisting snowpack; also indicative of this condition are the graminoids *Juncus drummondii* and *Juncus parryi* and forbs *Sibbaldia procumbens* and *Arenaria capillaris*, but their constancy and covers are low. The forb component is generally diverse, but there were no forbs having high-constancy values; only *Xerophyllum tenax*, *Chamerion angustifolium*, and *Silene parryi* have values in excess of 50%. There is a relatively broad moisture regime represented with the moister sites having *Erigeron peregrinus*, *Valeriana sitchensis*, and *Hypericum scouleri* (= *Hypericum formosum*) and on the drier ones *Eriogonum flavum*, *Erigeron compositus*, and trace amounts of various bunchgrass species or *Carex geyeri*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This small-patch community has been documented from 1775 to 2280 m (5820-7475 feet), usually on moderate to steep southerly exposures (southeasterly to southwesterly), but northerly aspects have been noted as well. It is mostly found on mid- to upper-slope positions as well as slope shoulders and ridges. Soils have developed from argillites, mudstone and sandstone of colluvial or glacial deposition, contain more than 20% rock in the upper profile and are rapidly drained loams and loamy sands. The amount of exposed surface is quite variable, from virtually none to more than 20% fine and coarse rock; mostly litter is in excess of 40%.

GLOBAL ENVIRONMENT:**VEGETATION DESCRIPTION**

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: There is fragmentary evidence that some of the sites formerly had tree populations of varying densities, most likely approximating an open woodland to savanna structure. All plots currently have mixtures of trace amounts of seedling and sapling *Abies lasiocarpa*, *Picea engelmannii*, and *Pinus albicaulis*. Sectioned stems indicate slow tree growth rates, 2-4 feet in 20 to 60 years. These sites are characterized as having more than 10% *Vaccinium scoparium* (or *Vaccinium myrtillus*) cover; usually these species have in excess of 20% cover. Other shrubs are not consistently present and, with the exception of *Spiraea betulifolia*, none have more than 3% cover. The graminoid component for a given plot ranges from diverse (in excess of 10 species) to relatively depauperate (only 2 species), but only four species, *Luzula glabrata*, *Trisetum spicatum*, *Danthonia intermedia*, and *Carex geyeri*, occur with greater than 50% constancy and only *Luzula glabrata* has coverages consistently in excess of 10%. *Luzula*'s presence and cover are indicative of persisting snowpack; also indicative of this condition are the graminoids *Juncus drummondii* and *Juncus parryi* and forbs *Sibbaldia procumbens* and *Arenaria capillaris*, but their constancy and covers are low. The forb component is generally diverse, but there were no forbs having high-constancy values; only *Xerophyllum tenax*, *Chamerion angustifolium*, and *Silene parryi* have values in excess of 50%. There is a relatively broad moisture regime represented with the moister sites having *Erigeron peregrinus*, *Valeriana sitchensis*, and *Hypericum scouleri* (= *Hypericum formosum*) and on the drier ones *Eriogonum flavum*, *Erigeron compositus*, and trace amounts of various bunchgrass species or *Carex geyeri*.

GLOBAL VEGETATION:**MOST ABUNDANT SPECIES****WATERTON-GLACIER INTERNATIONAL PEACE PARK**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Spiraea betulifolia</i> , <i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Chamerion angustifolium</i> , <i>Erigeron peregrinus</i> , <i>Valeriana sitchensis</i> , <i>Xerophyllum tenax</i>
Herb (field)	Graminoid	<i>Carex geyeri</i> , <i>Luzula glabrata</i> var. <i>hitchcockii</i> , <i>Trisetum spicatum</i>
Herb (field)	Other herbaceous	<i>Abies lasiocarpa</i> , <i>Picea engelmannii</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Vaccinium myrtillus*, *Vaccinium scoparium*

GLOBAL:**OTHER NOTEWORTHY SPECIES**

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:**CONSERVATION STATUS RANK**

GLOBAL RANK & REASONS: G2G3 (14-Jan-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: Some of the plots recognized by C. Damm (2001) as belonging to the *Xerophyllum tenax* community were reassigned to the *Vaccinium scoparium* community based on the relatively high cover of both *Vaccinium scoparium* and *Luzula glabrata*, both indicative of conditions more extreme than those indicated by just *Xerophyllum tenax*. We have included *Vaccinium myrtillus* as an indicator species because it is a close analogue of *Vaccinium scoparium* and broadly distributed on the eastern side of Glacier and Waterton Lakes national parks.

GLOBAL COMMENTS:**GLOBAL SIMILAR ASSOCIATIONS:****GLOBAL RELATED CONCEPTS:**

- *Xerophylletum tenacis* Association (Damm 2001) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This community has been documented from throughout the southern reaches of Glacier National Park with only *Vaccinium scoparium* as the dominant dwarf-shrub; we expect it to be found in Waterton Lakes National Park (possibly with *Vaccinium myrtillus* as the dominant dwarf-shrub) based on what appears to be potential habitat.

GLOBAL RANGE:

NATIONS: CA?, US

STATES/PROVINCES: AB, MT:S2S3

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes?)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.183, GLAC.2002, GLAC.285, CD601.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Damm 2001, Western Ecology Working Group n.d.

IV.B.2.N.b. Creeping or matted cold-deciduous dwarf-shrubland

Salix arctica Dwarf-shrubland Alliance*Salix arctica* - (*Salix petrophila*, *Salix nivalis*) / *Polygonum bistortoides* Dwarf-shrubland
ARCTIC WILLOW - (ALPINE WILLOW, SNOW WILLOW) / AMERICAN BISTORT DWARF-SHRUBLAND

IDENTIFIER: CEGLO01431

NVC Classification

Physiognomic Class	Dwarf-shrubland (IV)
Physiognomic Subclass	Deciduous dwarf-shrubland (IV.B.)
Physiognomic Group	Cold-deciduous dwarf-shrubland (IV.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous dwarf-shrubland (IV.B.2.N.)
Formation	Creeping or matted cold-deciduous dwarf-shrubland (IV.B.2.N.b.)
Alliance	<i>Salix arctica</i> Dwarf-shrubland Alliance (A.1117)
Alliance (English name)	Arctic Willow Dwarf-shrubland Alliance
Association	<i>Salix arctica</i> - (<i>Salix petrophila</i> , <i>Salix nivalis</i>) / <i>Polygonum bistortoides</i> Dwarf-shrubland
Association (English name)	Arctic Willow - (Alpine Willow, Snow Willow) / American Bistort Dwarf-shrubland

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine Dwarf-Shrubland (CES306.810)

ELEMENT CONCEPT

GLOBAL SUMMARY: This dwarf-shrub alpine association is known from the Rocky Mountains of Alberta, Montana and Wyoming. It occurs primarily as small patches, from the uppermost subalpine to the highest alpine elevations, from 1980 to 3231 m (6495-10,600 feet). It is mainly associated with receiving positions, toeslopes and lower to midslopes of gentle terrain. It occurs in mesic areas with slopes that range from flat to moderate (up to 50% grade), with all aspects represented. The type occurs predominantly in small, visually salient patches that appear as a continuous blanket of green due to high coverage of both the vascular and bryophyte components. The dwarf-shrub layer is commonly dominated by *Salix arctica*, *Salix petrophila*, or *Salix nivalis*. *Dryas octopetala* may be present or absent in the dwarf-shrub layer with up to 20% cover. Graminoids are present in all stands but are neither diverse nor in high quantities. Common species include *Poa alpina* and moist-site *Carex* spp. (*Carex albonigra*, *Carex phaeocephala*, and *Carex nova*). The herbaceous layer is dominated by forbs, most notably *Polygonum bistortoides*, but other forbs, including *Polygonum viviparum*, *Geum rossii*, *Potentilla diversifolia*, *Oreostemma alpigenum* (= *Aster alpigenuus*), *Solidago multiradiata*, and *Claytonia lanceolata*, are often codominant. Other common species include *Astragalus kentrophyta*, *Phlox pulvinata*, *Tetaneuris grandiflora*, *Arenaria congesta*, *Oxytropis deflexa*, and *Castilleja* spp. *Picea engelmannii* seedlings may be

present. This association most often grades to moist turf types or unequivocal snowbed communities (e.g., *Carex nigricans* Herbaceous Vegetation (CEGL001816)) or wet meadows (e.g., *Deschampsia caespitosa* - *Caltha leptosepala* Herbaceous Vegetation (CEGL001882)). Most other dwarf-shrub *Salix* spp.-dominated types occur on yet wetter sites; therefore, they should be recognized first in working keys.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This community occurs primarily as small patches, from the uppermost subalpine to the highest alpine elevations, from 1980 to 2440 m (6495-7990 feet). It is mainly associated with receiving positions, stream terraces, toeslopes and lower to midslopes of gentle terrain. Slopes range from flat to moderate with all aspects represented, though steeper slopes tend to have northerly or easterly exposures. This community is also noted to occur downslope from snowbed communities, which may augment its moisture supply. Substrates include various sedimentary rock types, both calcareous (limestone) and not (siltstones, argillite). Owing to a nearly continuous mat of vegetation comprised of vascular plants, bryophytes and lichens (in the aggregate usually exceeding 80% cover), which in turn generates a rich litter layer, the amount of exposed soil and rock has not been noted to exceed 5%.

GLOBAL ENVIRONMENT: This community occurs primarily as small patches, from the uppermost subalpine to the highest alpine elevations, from 1980 to 3231 m (6495-10,600 feet). It is mainly associated with receiving positions, toeslopes and lower to midslopes of gentle terrain. Stands are found in gentle terrain on toeslope to midslope, potentially water-receiving positions, as well as shallow swales and broad depressions (potential snowbed sites). Slopes range from flat to moderate (up to 50%), with all aspects represented. This community is also noted to occur downslope from snowbed communities, which may augment its moisture supply. Substrates include various sedimentary rock types, both calcareous (limestone) and not (siltstones, argillite). Owing to a nearly continuous mat of vegetation comprised of vascular plants, bryophytes and lichens (in the aggregate usually exceeding 80% cover), which in turn generates a rich litter layer, the amount of exposed soil and rock can be limited, but occasionally as high as 70%.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: In its most developed form this community presents the aspect of a green carpet with tufts of graminoids and forbs projecting. *Salix arctica* or *Salix nivalis* form a dwarf (mostly <0.03 m tall), discontinuous mat having 10 to more than 50% cover; other dwarf-shrubs, such as *Dryas octopetala*, *Dasiphora fruticosa* ssp. *floribunda* (= *Pentaphylloides floribunda*), *Phyllodoce empetriformis*, and *Salix commutata*, often occur in trace amounts but can have higher cover (up to 40%). Herbs associated with snowbed environments, e.g., *Sibbaldia procumbens*, *Arenaria capillaris*, *Antennaria alpina*, *Juncus parryi*, and *Juncus drummondii*, have moderate to high constancy but low cover within this type. Other high-constancy graminoids include *Carex paysonis*, *Carex phaeocephala*, and *Carex podocarpa*. The most abundant forbs, usually associated with mesic to hygric environments, include *Packera streptanthifolia* (= *Senecio cymbalarioides*), *Potentilla diversifolia*, *Castilleja occidentalis*, *Polygonum viviparum*, *Erigeron peregrinus*, *Heracleum sphondylium*, and *Veronica wormskjoldii*; even hygric to hydric forbs, such as *Parnassia fimbriata*, *Triantha glutinosa* (= *Tofieldia glutinosa*), and *Trollius laxus* are sporadically represented, sometimes with appreciable cover. Other species that may be present include *Polygonum bistortoides*, *Solidago multiradiata*, *Gentiana calycosa*, *Poa alpina*, *Phleum alpinum*, *Agoseris glauca*, *Zigadenus elegans*, *Pedicularis groenlandica*, and *Smelowskia calycina*.

GLOBAL VEGETATION: This type occurs predominantly in small, visually salient patches that appear as a continuous blanket of green due to high coverage of both the vascular and bryophyte components. It occurs in mesic areas. The dwarf-shrub layer is commonly dominated by *Salix arctica*; *Salix petrophila* replaces *Salix arctica* in one stand. *Dryas octopetala* may be present or absent in the dwarf-shrub layer with up to 20% cover. Graminoids are present in all stands but are neither diverse nor in high quantities. Common species include *Poa alpina* and moist-site *Carex* spp. (*Carex albonigra*, *Carex phaeocephala*, and *Carex nova*). The herbaceous layer is dominated by forbs, most notably *Polygonum bistortoides*, but other forbs, including *Polygonum viviparum*, *Geum rossii*, *Potentilla diversifolia*, *Solidago multiradiata*, *Oreostemma alpigenum* (= *Aster alpigenuus*), and *Claytonia lanceolata*, are often codominant. Other common species include *Astragalus kentrophyta*, *Phlox pulvinata*, *Tetraneuris grandiflora*, *Arenaria congesta*, *Oxytropis deflexa*, and *Castilleja* spp. *Picea engelmannii* seedlings are present in one stand contributing 1% cover to the dwarf-shrub layer.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Dwarf-shrub	<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i> , <i>Salix arctica</i>
Herb (field)	Forb	<i>Packera streptanthifolia</i> , <i>Polygonum viviparum</i> , <i>Potentilla diversifolia</i> , <i>Sibbaldia procumbens</i>
Herb (field)	Graminoid	<i>Carex paysonis</i> , <i>Carex phaeocephala</i> , <i>Carex podocarpa</i>

Global

Stratum

Short shrub/sapling
Herb (field)

Lifeform

Dwarf-shrub
Forb

Species

Salix arctica, *Salix nivalis*, *Salix petrophila*
Polygonum bistortoides, *Polygonum viviparum*, *Sibbaldia procumbens*

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex paysonis*, *Carex phaeocephala*, *Dasiphora fruticosa* ssp. *floribunda*, *Packera streptanthifolia*, *Polygonum viviparum*, *Potentilla diversifolia*, *Salix arctica*, *Sibbaldia procumbens*

GLOBAL: *Polygonum bistortoides*, *Polygonum viviparum*, *Salix arctica*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Hedysarum sulphurescens*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2G3Q (4-Jan-2000). This type is ranked G2G3Q to emphasize the lack of confidence in the classification status. While documentation of this association has improved based on data from Glacier National Park, its differentiation from other *Salix arctica* or *Salix nivalis* associations is still not clear. This type is described for only western Montana, with possible occurrences in the Beartooth Plateau vicinity. However, very possibly it is synonymous with named associations in Canada, Wyoming, Colorado and New Mexico. Based on known locations this association should be rated G2, but there is significant potential habitat for the type within Montana alone, which has occasioned adding the G3 designation.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: The plots documenting this community have been drawn from three different associations described by C. Damm (2001), *Leprario caesioalbae* - *Salicetum arcticae*, *Polytricho piliferi* - *Arenarietum capillaris*, and *Aulacomnio* - *Kalmietum microphyllae*. This type is very similar to *Dryas octopetala* - *Polygonum viviparum* Dwarf-shrub Herbaceous Vegetation (CEGL001894) (Damm's *Salix nivalis* - *Dryadetum octopetalae* Association) in both composition and environmental parameters, lacking the strong representation of *Dryas octopetala* and occupying more mature sites with greater overall vegetative cover and a less moisture-stressed environment.

GLOBAL COMMENTS: This association is weakly supported by plot data, and almost no formal inventory has been conducted, though the authors of the type noted it to be common in some mountain ranges other than those in which it was sampled for classification purposes. This type has not been crosswalked with several other similarly named associations (*Salix arctica* / *Geum rossii* Dwarf-shrubland (CEGL001430) [Colorado], *Salix arctica* / *Polygonum viviparum* Dwarf-shrubland Association (no equivalent in USNVC) [Wyoming], *Salix arctica* - *Salix nivalis* Dwarf-shrubland (CEGL001432) [New Mexico], as well as *Salix arctica*-dominated snowbed communities from the Canadian Rockies that appear, at least superficially, to be comparable in vegetation and environment. Until this crosswalk is completed this association should be considered of questionable taxonomy and may be more common than the global rank indicates. In addition, plot work in Waterton Lakes National Park, Alberta, and in Grand Teton National Park included stands dominated by *Salix nivalis* or *Salix petrophila* rather than *Salix arctica*. Stands dominated by *Salix petrophila* (= *Salix arctica* ssp. *petraea*) and *Salix arctica* can stay together, as these are very closely related taxa, but stands dominated by *Salix nivalis* (= *Salix reticulata*) may be better served in their own association.

GLOBAL SIMILAR ASSOCIATIONS:

- *Dryas octopetala* - *Polygonum viviparum* Dwarf-shrub Herbaceous Vegetation (CEGL001894)
- *Salix arctica* - *Salix nivalis* Dwarf-shrubland (CEGL001432)
- *Salix arctica* / *Carex nigricans* Dwarf-shrubland (CEGL005878)
- *Salix arctica* / *Geum rossii* Dwarf-shrubland (CEGL001430)

GLOBAL RELATED CONCEPTS:

- *Aulacomnio* - *Kalmietum microphyllae* Association (Damm 2001) I
- *Leprario caesioalbae* - *Salicetum arcticae* Association (Damm 2001) I
- *Polytricho piliferi* - *Arenarietum capillaris* Association (Damm 2001) I
- *Salix arctica*/*Polygonum bistortoides* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:IV.B.3.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This small-patch community is common throughout the alpine of Glacier National Park and known from Waterton Lakes National Park, though its distributional extent is unspecified.

GLOBAL RANGE: This alpine association has been defined for western Montana, southern Alberta, and western Wyoming.

NATIONS: CA, US

STATES/PROVINCES: AB, CO?, MT:S2S3, WY

USFS ECOREGIONS: M331A:CC, M331B:C?, M331D:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M333C:CC, M333D:C?

FEDERAL LANDS: NPS (Glacier, Grand Teton); PC (Waterton Lakes); USFS (Shoshone?)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.153, CD409, CD266, CD613, CD631, CD736, CD746, CD208, CD196, CD609, CD434, CD396, CD414, CD529, CD199, WATE.4071, AAGL.2208.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper, mod. J. Asebrook

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper, mod. M.S. Reid and G. Kittel

REFERENCES: Achuff and Corns 1982, Baker 1983a, Bourgeron and Engelking 1994, Cooper and Lesica 1992, Cooper et al. 1997, Damm 2001, Driscoll et al. 1984, Jones and Ogle 2000, Komarkova 1976, MTNHP 2002b, Potkin and Munn 1989, Western Ecology Working Group n.d., Willard 1979

Salix arctica* / *Carex nigricans* Dwarf-shrubland*ARCTIC WILLOW / BLACK ALPINE SEDGE DWARF-SHRUBLAND**

IDENTIFIER: CEGL005878

NVC Classification

Physiognomic Class	Dwarf-shrubland (IV)
Physiognomic Subclass	Deciduous dwarf-shrubland (IV.B.)
Physiognomic Group	Cold-deciduous dwarf-shrubland (IV.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous dwarf-shrubland (IV.B.2.N.)
Formation	Creeping or matted cold-deciduous dwarf-shrubland (IV.B.2.N.b.)
Alliance	<i>Salix arctica</i> Dwarf-shrubland Alliance (A.1117)
Alliance (English name)	Arctic Willow Dwarf-shrubland Alliance
Association	<i>Salix arctica</i> / <i>Carex nigricans</i> Dwarf-shrubland
Association (English name)	Arctic Willow / Black Alpine Sedge Dwarf-shrubland

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine Dwarf-Shrubland (CES306.810)

ELEMENT CONCEPT

GLOBAL SUMMARY: Documented from Glacier National Park, Montana. This community occurs primarily as small patches, from the uppermost subalpine to mid-alpine elevations, ranging from 2000 to 2320 m (6560-7610 feet). It is mainly associated with receiving positions, the toeslopes and lower to midslopes of gentle terrain; slopes range from flat to moderate with all aspects represented, though steeper slopes tend to have northerly or easterly exposures. This community is considered a snowbed type having deep and late-persisting snow cover, which augments its moisture supply late into the growing season. Substrates include various sedimentary rock types, both calcareous (limestone) and not (siltstones, argillite). There is a nearly continuous mat of vegetation comprised of vascular plants, bryophytes and lichens (aggregate usually exceeding 80% cover). In its modal form this community resembles a nubby green carpet with tufts of graminoids and forbs projecting. Vascular plant cover generally exceeds 50% but may range from 20 to 98%. *Salix arctica* forms a short-shrub layer (<0.03 m) having more than 10% cover and in most cases more than 25% cover. Other dwarf-shrubs, including *Kalmia microphylla* and *Phyllodoce glanduliflora*, generally have less than 5% cover and are present in a small fraction of the stands. The graminoid component is dominated by *Carex nigricans*, a sod-forming, rhizomatous species well known as a snowbed indicator. The forb layer may be species-rich but its cover is usually not greater than 20%. The presence of forbs *Trollius laxus*, *Parnassia fimbriata*, *Triantha glutinosa* (= *Tofieldia glutinosa*), and *Veronica wormskjoldii* are indicative of the hygric nature of these sites; other forbs more mesic in their affinities and having at least 75% constancy include *Packera streptanthifolia* (= *Senecio cymbalarioides*), *Sibbaldia procumbens*, *Erigeron peregrinus*, *Hypericum scouleri*, *Castilleja*

occidentalis, and *Potentilla diversifolia*. Mosses contributing the most cover to what often appears to be a continuous carpet include *Aulacomnium palustre*, *Philonotis fontana*, and various species of *Bryum*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This community occurs primarily as small patches, from the uppermost subalpine to mid-alpine elevations, ranging from 2000 to 2320 m (6560-7610 feet). It is mainly associated with receiving positions, the toeslopes and lower to midslopes of gentle terrain; slopes range from flat to moderate with all aspects represented, though steeper slopes tend to have northerly or easterly exposures. This community is considered a snowbed type having deep and late-persisting snow cover, which augments its moisture supply late into the growing season. Substrates include various sedimentary rock types, both calcareous (limestone) and not (siltstones, argillite). Owing to a nearly continuous mat of vegetation comprised of vascular plants, bryophytes and lichens (aggregate usually exceeding 80% cover), which in turn generates a rich litter layer, the amount of exposed soil and rock has not been noted to exceed 5%.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: In its modal form this community resembles a nubby green carpet with tufts of graminoids and forbs projecting. Vascular plant cover generally exceeds 50% but may range from 20% to 98%. *Salix arctica* forms a short-shrub layer (<0.03 m) having more than 10% cover and in most cases more than 25% cover. Other dwarf-shrubs, including *Kalmia microphylla* and *Phyllodoce glanduliflora*, generally have less than 5% cover and are present in a small fraction of the stands. The graminoid component is dominated by *Carex nigricans*, a sod-forming, rhizomatous species well known as a snowbed indicator. Other graminoids are poorly represented; only *Carex podocarpa*, *Juncus drummondii* and *Juncus mertensianus* exhibit more than 50% constancy, though their cover is mostly less than 5%. The forb layer may be species-rich but its cover is usually not greater than 20%. The presence of forbs *Trollius laxus*, *Parnassia fimbriata*, *Triantha glutinosa* (= *Tofieldia glutinosa*), and *Veronica wormskjoldii* are indicative of the hygric nature of these sites; other forbs more mesic in their affinities and having at least 75% constancy include *Packera streptanthifolia* (= *Senecio cymbalarioides*), *Sibbaldia procumbens*, *Erigeron peregrinus*, *Hypericum scouleri*, *Castilleja occidentalis*, and *Potentilla diversifolia*. Mosses contributing the most cover to what often appears to be a continuous carpet, include *Aulacomnium palustre*, *Philonotis fontana*, and various species of *Bryum*.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Salix arctica</i>
Herb (field)	Forb	<i>Hypericum scouleri</i> , <i>Packera streptanthifolia</i> , <i>Sibbaldia procumbens</i>
Herb (field)	Graminoid	<i>Carex nigricans</i> , <i>Carex podocarpa</i> , <i>Juncus drummondii</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex nigricans*, *Salix arctica*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: GNR (1-Jun-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This syntaxon has been composed from the data presented by C. Damm (2001) for Glacier National Park. The stands representing this type have been derived from three of his associations, including *Leprario caesioalbae* - *Salicetum arcticae*, *Sibbaldio procumbentis* - *Caricetum nigricantis*, and *Aulacomnio - Kalmietum microphyllae*. The emphasis in our treatment has been placed on the structural uniformity conferred by the dwarf-shrub *Salix arctica* and the significant coverages of *Carex nigricans* as a dependable indicator of snowbed environments.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Salix arctica* - (*Salix petrophila*, *Salix nivalis*) / *Polygonum bistortoides* Dwarf-shrubland (CEGL001431)
- *Salix arctica* - *Salix nivalis* Dwarf-shrubland (CEGL001432)
- *Salix arctica* / *Geum rossii* Dwarf-shrubland (CEGL001430)

GLOBAL RELATED CONCEPTS:

- *Aulacomnio - Kalmietum microphyllae* Association (Damm 2001) I
- *Leprario caesioalbae - Salicetum arcticae* Association (Damm 2001) I
- *Sibbaldio procumbentis - Caricetum nigricantis* Association (Damm 2001) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This community has been documented only from the alpine of Glacier National Park, but it is fully expected to occur in Waterton Lakes National Park because of appropriate habitat.

GLOBAL RANGE:

NATIONS: CA?, US

STATES/PROVINCES: AB?, MT:S2

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes?)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: CD573, CD584, CD580, CD563, CD565, CD598, CD751, CD125, CD750, CD571, CD611.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Damm 2001, Western Ecology Working Group n.d.

V. HERBACEOUS VEGETATION

V.A.5.N.c. Medium-tall sod temperate or subpolar grassland

Calamagrostis rubescens Herbaceous Alliance

Calamagrostis rubescens Herbaceous Vegetation

PINEGRASS HERBACEOUS VEGETATION

IDENTIFIER: C EGL005862

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Medium-tall sod temperate or subpolar grassland (V.A.5.N.c.)
Alliance	<i>Calamagrostis rubescens</i> Herbaceous Alliance (A.2637)
Alliance (English name)	Pinegrass Herbaceous Alliance
Association	<i>Calamagrostis rubescens</i> Herbaceous Vegetation
Association (English name)	Pinegrass Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Subalpine-Upper Montane Grassland (CES306.806)
Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is a small- to large-patch herbaceous association found in northwestern Montana in Glacier National Park. Small to large patches of this type are located on flat benches or east-facing slight slopes at elevations between 1070 and 1220 m (3500-4000 feet) on low slopes. Soil texture ranges from loam to silt loam, derived from argillite glacial till. Soils are moderately to well-drained. Litter covers most of the ground surface at 80%. Downed wood ranges from 4-10%, since both of the sampled stands were intensely burned in the 1980s. Overall, this stand-replacing fire has altered soils (rendering them aquaphobic, severely retarding infiltration rates), altered site potential, mostly totally consumed duff, and caused some soil erosion. This association is montane and grass-dominated, with *Calamagrostis rubescens* the dominant. Overall herbaceous cover is very high, ranging from 80-100%. Average cover of *Calamagrostis rubescens* is 45%, twice the cover of any other herbaceous species. *Symphyotrichum laeve* (= *Aster laevis*), *Lathyrus ochroleucus*, and *Achillea millefolium* are also consistently common. Other high-constancy herbaceous species include native species *Packera pseudaurea* (= *Senecio pseudaureus*), *Galium boreale*, and *Fragaria virginiana*, and exotic species *Poa pratensis* and *Taraxacum officinale*. *Vicia americana*, *Arnica cordifolia*, *Carex concinnoides*, and *Carex microptera* may be present with conspicuous cover. Shrub cover can be moderate in this association ranging from 5-25%. Short shrubs may be common in some areas, with *Symphoricarpos albus*, *Amelanchier alnifolia*, and *Rubus parviflorus* the most common. *Mahonia repens*, *Rosa woodsii*, and *Vaccinium caespitosum*, may also be present in low amounts. *Pinus contorta* saplings, averaging 9% cover, are consistently present in this association. In some occurrences, the tree seedling and sapling layers may be quite abundant, up to 30% or more cover. As these trees mature, this association will change over time to become a forested community.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Small to large patches of this type are located on flat benches or east-facing slight slopes at elevations between 1070 and 1220 m (3500-4000 feet) on low slopes. Soil texture ranges from loam to silt loam, derived from argillite glacial till. Soils are moderately to well-drained. Litter covers most of the ground surface at 80%. Downed wood ranges from 4-10%, since both of the sampled plots were intensely burned in the 1988 Red Bench Fire. Overall, this stand-replacing fire has altered soils (rendering them aquaphobic, severely retarding infiltration rates), altered site potential, mostly totally consumed duff, and caused some soil erosion.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This association is a montane, mesic, herbaceous type that is dominated by *Calamagrostis rubescens*. It is currently an herbaceous association because a stand-replacing fire in 1988

left only standing dead trees in the overstory. Overall herbaceous cover is very high, ranging from 80-100%. Average cover of *Calamagrostis rubescens* is 45%, twice the cover of any other herbaceous species. *Symphyotrichum laeve* (= *Aster laevis*), with 28% average cover, *Lathyrus ochroleucus* with 5% average cover, and *Achillea millefolium* with 3% average cover are also consistently common. Other high-constancy herbaceous species include native species *Packera pseudaurea* (= *Senecio pseudaurea*), *Galium boreale*, and *Fragaria virginiana*, and exotic species *Poa pratensis* and *Taraxacum officinale*. *Vicia americana*, *Arnica cordifolia*, *Carex concinnoides*, and *Carex microptera* may be present with conspicuous cover. Shrub cover can be moderate in this association ranging from 5-25%. Short shrubs may be common in some areas, dominated by *Symphoricarpos albus* with 12% average cover, *Amelanchier alnifolia* with 5% average cover, and *Rubus parviflorus* with 4% average cover. *Mahonia repens*, *Rosa woodsii*, and *Vaccinium caespitosum*, all less than 0.5 m in height, may also be present in low amounts. *Pinus contorta* saplings, averaging 9% cover, are consistently present in this association. As these trees mature, this association will change over time to become a forested community.

GLOBAL VEGETATION:**MOST ABUNDANT SPECIES****WATERTON-GLACIER INTERNATIONAL PEACE PARK**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Needle-leaved tree	<i>Pinus contorta</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i> , <i>Symphoricarpos albus</i>
Herb (field)	Forb	<i>Achillea millefolium</i> , <i>Lathyrus ochroleucus</i> , <i>Symphyotrichum laeve</i>
Herb (field)	Graminoid	<i>Calamagrostis rubescens</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Fragaria virginiana*, *Galium boreale*, *Packera pseudaurea*

GLOBAL:**OTHER NOTEWORTHY SPECIES**

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Cirsium arvense*, *Hieracium aurantiacum*, *Phleum pratense*, *Poa pratensis*, *Taraxacum officinale*

GLOBAL:**CONSERVATION STATUS RANK**

GLOBAL RANK & REASONS: G3G4? (2-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: As defined, this association is comprised of stands undergoing secondary succession or, depending on fire severity, something approximating primary succession. These sites probably take at least 40 years to become pole-sized stands; it is unclear what time spans would be required to achieve full stocking or closed-canopy condition. Stands wherein *Calamagrostis rubescens* would be the long-persisting dominant (climax) or diagnostic species have not been inventoried as yet.

GLOBAL COMMENTS: As defined, this association is comprised of stands undergoing secondary succession or, depending on fire severity, something approximating primary succession. These sites probably take at least 40 years to become pole-sized stands; it is unclear what time spans would be required to achieve full stocking or closed-canopy condition. Stands wherein *Calamagrostis rubescens* would be the long-persisting dominant (climax) or diagnostic species have not been inventoried as yet.

GLOBAL SIMILAR ASSOCIATIONS:**GLOBAL RELATED CONCEPTS:****ELEMENT DISTRIBUTION**

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is very uncommon on the west side of Glacier National Park, localized within a severely burned area of the 1988 Red Bench Fire on and north of the Bowman Lake Road. It occurs on low-elevation benches and slight slopes just north of Polebridge in the North Fork subdistrict.

GLOBAL RANGE:

NATIONS: US

STATES/PROVINCES: MT:S3S4, WY

USFS ECOREGIONS: M331D:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton); USFS (Bridger-Teton)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2241, GLAC.2607, GRAS-00-031.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Western Ecology Working Group n.d.

***Elymus repens* Herbaceous Alliance**

***Elymus repens* Semi-natural Herbaceous Vegetation**

CREEPING WILD RYE SEMI-NATURAL HERBACEOUS VEGETATION

IDENTIFIER: CEGL005868

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Medium-tall sod temperate or subpolar grassland (V.A.5.N.c.)
Alliance	<i>Elymus repens</i> Herbaceous Alliance (A.2658)
Alliance (English name)	Creeping Wild Rye Herbaceous Alliance
Association	<i>Elymus repens</i> Semi-natural Herbaceous Vegetation
Association (English name)	Creeping Wild Rye Semi-natural Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association occurs on disturbed low-elevation sites, including floodplains, on the east side of Glacier National Park in Montana and in western Colorado. This community develops in response to disturbance and is composed mainly of noxious weeds, exotics and native increaser species. This association was sampled on flat to gently sloping lower slopes, toeslopes and valley bottoms at elevations between 1450 and 1555 m (4750-5100 feet) in Montana and between 1710 and 2285 m (5610-7500 feet) in Colorado. Soils are derived from glacial or fluvial deposits but are variable in soil texture, ranging from moderately well-drained sandy loams to clay loams to poorly drained gravel and rock. Litter dominates the ground surface. This montane, mesic to subhygric herbaceous association has low overall species diversity due to the dominance of *Elymus repens* (= *Elytrigia repens* var. *repens*), an exotic rhizomatous grass. *Elymus repens* is a highly invasive species in mesic areas and tends to exclude other species once established. Overall herbaceous cover ranges from 25-85% with *Elymus repens* clearly dominating this association with 5-80% cover. Other species sometimes present with low cover include *Cerastium arvense*, *Carex* spp., *Symphyotrichum laeve* (= *Aster laevis*), *Achillea millefolium*, *Equisetum laevigatum*, *Iva axillaris*, *Taraxacum officinale*, *Poa palustris*, and *Penstemon confertus*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is located on flat to gently sloping low or toeslopes at elevations between 1450 and 1555 m (4750-5100 feet) at various aspects. Soils are derived from glacial-fluvial deposits but are variable in soil texture. They range from moderately well-drained sandy loams to poorly drained gravel and rock. Litter dominates the ground surface with 85-90% cover.

GLOBAL ENVIRONMENT: This association is characteristic of disturbed low-elevation sites, including floodplains, in western Colorado and in Glacier National Park, Montana. It is very likely to be more common and widespread than is currently documented.

This community develops in response to disturbance and is composed mainly of noxious weeds, exotics and native increaser species. It occurs on flat to gently sloping lower slopes, toeslopes and valley bottoms at elevations between 1450 and 1555 m (4750-5100 feet) in Montana and between 1710 and 2285 m (5610-7500 feet) in Colorado. Soils are derived from glacial or fluvial deposits but are variable in soil texture, ranging from moderately well-drained sandy loams to clay loams to poorly drained gravel and rock. Litter dominates the ground surface.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This montane, mesic to subhygric, herbaceous association has low overall species diversity due to the dominance of *Elymus repens* (= *Elytrigia repens* var. *repens*), an exotic grass. Overall herbaceous cover ranges from 25-50% with *Elymus repens* clearly dominating this association with 5-39% cover. Other high-constancy species with low cover include *Cerastium arvense* and *Carex* spp. *Symphotrichum laeve* (= *Aster laevis*), *Achillea millefolium*, *Taraxacum officinale*, *Poa palustris*, and *Penstemon confertus* may be present with conspicuous cover.

GLOBAL VEGETATION: This montane, mesic to subhygric herbaceous association has low overall species diversity due to the dominance of *Elymus repens* (= *Elytrigia repens* var. *repens*), an exotic rhizomatous grass. *Elymus repens* is a highly invasive species in mesic areas and tends to exclude other species once established. Overall herbaceous cover ranges from 25-85% with *Elymus repens* clearly dominating this association with 5-80% cover. Other species sometimes present with low cover include *Cerastium arvense*, *Carex* spp., *Symphotrichum laeve* (= *Aster laevis*), *Achillea millefolium*, *Equisetum laevigatum*, *Iva axillaris*, *Taraxacum officinale*, *Poa palustris*, and *Penstemon confertus*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Achillea millefolium</i> , <i>Symphotrichum laeve</i> , <i>Taraxacum officinale</i>
Herb (field)	Graminoid	<i>Elymus repens</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Elymus repens</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Cerastium arvense*, *Taraxacum officinale*

GLOBAL: *Elymus repens*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Phleum pratense*, *Poa pratensis*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: GNA (invasive) (4-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This is a disturbance community comprised mainly of noxious weeds, exotics and native increaser species; sites that this community is potentially capable of invading should be identified.

GLOBAL COMMENTS: Identification of this association is usually unequivocal as *Elymus repens* tends to form dense monocultures exclusive of most other species.

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association occurs on disturbed, low-elevation sites on the east side of Glacier National Park but is uncommon. Disturbance usually consists of historic grazing or flooding. Specific locations of this association include below the high-water mark along Lake Sherburne in the Many Glacier subdistrict and near Lubeck Lake and cabin in the Two Medicine subdistrict.

GLOBAL RANGE: This association has been documented from stands in northwestern Montana and western Colorado. It is likely to be much more common and widely distributed than the limited data indicate.

NATIONS: US

STATES/PROVINCES: CO, MT

USFS ECOREGIONS: M331E:CC, M331G:CC, M332C:CC

FEDERAL LANDS: NPS (Curecanti, Dinosaur, Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GRAS-01-012, GRAS-01-035, GRAS-01-045.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: J. Coles

REFERENCES: Beetle 1955, Gross and Werner 1982, Western Ecology Working Group n.d.

V.A.5.N.d. Medium-tall bunch temperate or subpolar grassland

Achnatherum nelsonii Herbaceous Alliance

Achnatherum nelsonii - *Lupinus sericeus* Herbaceous Vegetation

NELSON'S NEEDLEGRASS - PURSH'S SILKY LUPINE HERBACEOUS VEGETATION

IDENTIFIER: C EGL005860

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d.)
Alliance	<i>Achnatherum nelsonii</i> Herbaceous Alliance (A.1271)
Alliance (English name)	Nelson's Needlegrass Herbaceous Alliance
Association	<i>Achnatherum nelsonii</i> - <i>Lupinus sericeus</i> Herbaceous Vegetation
Association (English name)	Nelson's Needlegrass - Pursh's Silky Lupine Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040)

ELEMENT CONCEPT

GLOBAL SUMMARY: This montane, mesic to subxeric, herbaceous association is uncommon in Waterton Lakes National Park, Alberta, and on the west side of Glacier National Park, Montana. It occurs at elevations between 1090 and 1360 m (3580-4460 feet) under a broad range of environmental conditions, on flat to somewhat steep slopes from the basin floor to high slopes at various aspects. Soil texture ranges from moderately well-drained to rapidly drained silt loam or clay. These are generally moderately to well-developed, medium- to coarse-textured soils that have developed on fluvial, morainal, and sometimes eolian landforms. These landforms include alluvial terraces, benches, fluvial fans, and ground moraines. Litter and small rock dominate the ground surface. One of the sampled areas in Glacier National Park burned in the 1988 Red Bench fire. This association is dominated by *Achnatherum nelsonii* with 1-90% cover, *Lupinus sericeus* with 5-15% cover, and *Koeleria macrantha* with 10-20% cover. Overall herbaceous cover ranges from 90-100% with moderate species diversity and heights less than 0.5 m. Other moderate- to high-constancy species with average cover ranging from 1-5% include *Galium boreale*, *Achillea millefolium*, *Festuca idahoensis*, *Gaillardia aristata*, *Arnica sororia*, *Antennaria parvifolia*, *Zigadenus elegans*, *Anemone multifida*, *Castilleja lutescens*, *Lithospermum ruderales*, and *Potentilla gracilis*. Low-constancy herbaceous species that may have conspicuous cover in certain areas are *Pseudoroegneria spicata*, *Danthonia parryi*, *Fragaria virginiana*, *Selaginella densa*, *Monarda fistulosa*, *Poa nemoralis* ssp. *interior* (= *Poa interior*), *Carex petasata*, *Apocynum androsaemifolium*, and *Elymus trachycaulus*. *Poa pratensis* and *Phleum pratense* may also be present with low to moderate cover in disturbed areas. Shrubs may be present in certain areas with low cover. Common shrubs may include *Dasiphora fruticosa* ssp. *floribunda*, *Arctostaphylos uva-ursi*, and *Rosa acicularis*. Nonvascular cover averages 5%.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs at elevations between 1090 and 1360 m (3580-4460 feet) under a broad range of environmental conditions. It occurs on flat to somewhat steep slopes from the basin floor to high slopes at various aspects. Soil texture ranges from moderately well-drained to rapidly drained silt loam or clay. In Waterton Lakes National Park, soils have also been classified as Rego or Orthic Black Chernozems, Orthic Regosols, or Lithic Orthic Brunisols. These are generally moderately to well-developed, medium- to coarse-textured soils that have developed on fluvial, morainal, and sometimes eolian landforms. These landforms include alluvial terraces, benches, fluvial fans, and ground moraines. Litter and small rock dominate the ground surface. One of the sampled areas in Glacier National Park burned in the 1988 Red Bench fire.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This montane, mesic to subxeric, herbaceous association is dominated by *Achnatherum nelsonii* with 1-90% cover, *Lupinus sericeus* with 5-15% cover, and *Koeleria macrantha* with 10-20% cover. Overall herbaceous cover ranges from 90-100% with moderate species diversity and heights less than 0.5 m. Other moderate- to high-constancy species with average cover ranging from 1-5% include *Galium boreale*, *Achillea millefolium*, *Festuca idahoensis*, *Gaillardia aristata*, *Arnica sororia*, *Antennaria parvifolia*, *Zigadenus elegans*, *Anemone multifida*, *Castilleja lutescens*, *Lithospermum ruderale*, and *Potentilla gracilis*. Low-constancy herbaceous species that may have conspicuous cover in certain areas are *Pseudoroegneria spicata*, *Danthonia parryi*, *Fragaria virginiana*, *Selaginella densa*, *Monarda fistulosa*, *Poa nemoralis* ssp. *interior* (= *Poa interior*), *Carex petasata*, *Apocynum androsaemifolium*, and *Elymus trachycaulus*. *Poa pratensis* and *Phleum pratense* may also be present with low to moderate cover in disturbed areas. Shrubs may be present in certain areas with low cover. Common shrubs may include *Dasiphora fruticosa* ssp. *floribunda*, *Arctostaphylos uva-ursi*, and *Rosa acicularis*. Nonvascular cover averages 5%.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Gaillardia aristata</i> , <i>Galium boreale</i> , <i>Lupinus sericeus</i> , <i>Potentilla gracilis</i> , <i>Zigadenus elegans</i>
Herb (field)	Graminoid	<i>Achnatherum nelsonii</i> , <i>Festuca idahoensis</i> , <i>Koeleria macrantha</i> , <i>Pseudoroegneria spicata</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Achnatherum nelsonii*, *Festuca idahoensis*, *Galium boreale*, *Koeleria macrantha*, *Lupinus sericeus*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Calochortus apiculatus*, *Euphorbia esula*, *Hedysarum sulphurescens*, *Phleum pratense*, *Poa pratensis*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2G3 (2-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This community was not identified by Mueggler and Stewart (1980) in their comprehensive habitat type classification of western Montana rangelands, nor are there data in their constancy-cover table to suggest that such a type might have been submerged within another type. Thus the type is speculated to be

relatively uncommon. Cooper (2003) has found supporting evidence for this type on the Kootenai National Forest, where it occurs in forest openings on shallow soils in a high precipitation regime where most of the landscape is forested.

GLOBAL COMMENTS: This type has apparently been identified on the Kootenai National Forest (to the west of Glacier National Park, bordering northern Idaho) (Cooper 2003) as a minor type of shallow soil openings in montane forests.

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon in Waterton Lakes National Park and on the west side of Glacier National Park in the North Fork subdistrict. This association was specifically observed in Big Prairie in Glacier National Park and in the Blakiston 3, Bison Paddock 1, Oil Basin 2, and Y-Camp 1 ecosites within the Waterton River watershed in Waterton Lakes National Park.

GLOBAL RANGE:

NATIONS: CA, US

STATES/PROVINCES: AB, ID, MT:S2?

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes); USFS (Kootenai)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2608, GLAC.2084, WATE.4016, WATE.5054, WATE.5029, WATE.5034, WATE.5136.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Cooper 2003, Mueggler and Stewart 1980, Western Ecology Working Group n.d.

***Festuca campestris* Herbaceous Alliance**

***Festuca campestris* - *Festuca idahoensis* Herbaceous Vegetation**

PRAIRIE FESCUE - IDAHO FESCUE HERBACEOUS VEGETATION

PRAIRIE FESCUE - IDAHO FESCUE MIXEDGRASS PRAIRIE

IDENTIFIER: CEGL005875

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d.)
Alliance	<i>Festuca campestris</i> Herbaceous Alliance (A.1255)
Alliance (English name)	Prairie Fescue Herbaceous Alliance
Association	<i>Festuca campestris</i> - <i>Festuca idahoensis</i> Herbaceous Vegetation
Association (English name)	Prairie Fescue - Idaho Fescue Herbaceous Vegetation
Association (Common name)	Prairie Fescue - Idaho Fescue Mixedgrass Prairie

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040)
Northwestern Great Plains Mixedgrass Prairie (CES303.674)

ELEMENT CONCEPT

GLOBAL SUMMARY: This dry-mesic, mid-height grassland is found in the northwestern Great Plains and mountain and foothill slopes on both sides of the Continental Divide. A disjunct occurrence of the association is reported for the Steens Mountains in

southeastern Oregon. It occurs on mesic sites from 900-2100 m (3000-7000 feet) elevation on any aspect, becoming restricted to west- and southwest-facing slopes farther north. Slopes vary from flat to gentle toeslopes and lowslopes, generally less than 30%. Soils are loamy and moderately deep on a variety of soil parent materials. This midgrass community is dominated by *Festuca campestris* and *Festuca idahoensis*, but *Festuca campestris* generally has greater canopy cover and can be more abundant on undisturbed sites. A diverse assemblage of herbaceous species has a combined cover ranging from 30-85%. *Carex obtusata* may be common, especially on more mesic sites. Other graminoids may also be found, including *Danthonia intermedia*, *Koeleria macrantha*, *Phleum pratense*, *Achnatherum nelsonii*, and *Achnatherum occidentale* (= *Stipa occidentalis*). Additional forbs may include *Achillea millefolium*, *Galium boreale*, *Selaginella densa*, *Lupinus sericeus*, and *Geum triflorum*. Shrubs are typically present, though in low stature and cover, generally <10%. On rare occasions, shrubs may be present with up to 30% cover. However, in all stands native forbs and grasses dominate this herbaceous association. Shrub species that may be present include *Artemisia frigida*, *Artemisia campestris*, *Rosa arkansana*, *Amelanchier alnifolia*, and *Arctostaphylos uva-ursi*. Stands of the association are relatively well adapted to periodic wildfire. While natural fire disturbance regimes of this grassland vegetation are not well known, estimates of fire-return intervals range from 10 to 20 years.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This mesic, montane to lower subalpine association occurs mostly on flat to gentle toeslopes and lowslopes at elevations between 1370 and 1980 m (4490-6500 feet) on predominantly south- and east-facing slopes. Soils are moderately well-drained sandy loams, silt loams or sandy clay loams. Parent material is coarse quartzite and argillite developed on morainal and glaciofluvial landforms. Litter dominates the ground surface.

GLOBAL ENVIRONMENT: This community is found on moderate to steep mountain and foothill slopes on both sides of the Continental Divide. It occurs on mesic sites, mostly on flat to gentle toeslopes and lowslopes (<30%) from 900 to 2100 m (3000-7000 feet) elevation on any aspect, becoming restricted to west- and southwest-facing slopes farther north. Soils are loamy and moderately deep on a variety of soil parent materials. In Glacier National Park, soils are moderately well-drained sandy loams, silt loams or sandy clay loams. Parent material is coarse quartzite and argillite developed on morainal and glaciofluvial landforms. Litter dominates the ground surface.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Although low-shrub cover is consistently present within this type, native forbs and grasses dominate this herbaceous association. A diverse assemblage of herbaceous species has a combined cover ranging from 30-85%. *Festuca campestris* with 1-27% cover and *Festuca idahoensis* with 1-8% cover are the diagnostic and dominant graminoid species. Other dominant and common forbs and grasses include *Selaginella densa* with 1-28% cover, *Lupinus sericeus* with 0-21% cover, *Danthonia intermedia* with 0-24% cover, *Phleum pratense* with 0-22% cover, *Achnatherum nelsonii* with 0-13% cover, and *Penstemon confertus* with 0-9% cover. Other high-constancy species with low cover (average 1-2%) include *Cerastium arvense*, *Galium boreale*, *Achillea millefolium*, *Potentilla gracilis*, *Koeleria macrantha*, *Agoseris glauca*, *Anemone multifida*, *Carex obtusata*, *Carex petasata*, *Gaillardia aristata*, and *Lomatium triternatum*. *Poa pratensis*, *Lithospermum ruderale*, *Fragaria virginiana*, *Balsamorhiza sagittata*, and *Carex rossii* have low constancy but may be present with high cover. Total shrub cover averages 10%, and can be as much as 30%. *Amelanchier alnifolia* and *Arctostaphylos uva-ursi* were the only shrubs seen in 43 sampled stands.

GLOBAL VEGETATION: Although rich in forbs, this is a grassland community clearly dominated by *Festuca campestris* and *Festuca idahoensis*. Tussocks of the bunchgrass *Festuca campestris* are a prominent component with culms that may be taller than 75 cm. *Festuca campestris* generally has greater canopy cover and is even more abundant on undisturbed sites. *Carex obtusata* may be common, especially on more mesic sites. Other graminoids may also be found, including *Danthonia intermedia*, *Koeleria macrantha*, *Phleum pratense*, *Achnatherum nelsonii*, and *Achnatherum occidentale* (= *Stipa occidentalis*). Additional forbs may include *Achillea millefolium*, *Galium boreale*, *Selaginella densa*, *Lupinus sericeus*, and *Geum triflorum*. Total shrub cover is usually less than 10%. On rare occasions, shrubs may be present with up to 30% cover. In these cases, the herbaceous cover is high and stands are clearly grasslands. Shrub species that may be present include *Artemisia frigida*, *Artemisia campestris*, *Rosa arkansana*, *Amelanchier alnifolia*, and *Arctostaphylos uva-ursi*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Achillea millefolium</i> , <i>Lupinus sericeus</i> , <i>Penstemon confertus</i>
Herb (field)	Graminoid	<i>Danthonia intermedia</i> , <i>Festuca campestris</i> , <i>Festuca idahoensis</i> , <i>Phleum pratense</i>
Herb (field)	Fern or fern ally	<i>Selaginella densa</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Achillea millefolium</i> , <i>Campanula rotundifolia</i> , <i>Galium boreale</i> , <i>Geum triflorum</i>
Herb (field)	Graminoid	<i>Danthonia intermedia</i> , <i>Festuca campestris</i> , <i>Festuca idahoensis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Achillea millefolium*, *Agoseris glauca*, *Cerastium arvense*, *Festuca campestris*, *Festuca idahoensis*, *Galium boreale*, *Koeleria macrantha*, *Potentilla gracilis*

GLOBAL: *Festuca campestris*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Centaurea biebersteinii*, *Hedysarum sulphurescens*, *Penstemon albertinus*, *Poa pratensis*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3 (30-Sep-2004). This *Festuca campestris* plant association occurs over a wide geographical range encompassing the northwestern Great Plains, northern Rocky Mountains, and Palouse Prairie regions of western Montana, northern Idaho, and northeastern Washington. The association occurs on moderate to steep mountain and foothill slopes on all aspects at 900-2100 m (3000-7000 feet) elevation with loamy, moderately deep soils. Historic records suggest the association was once considerably more abundant throughout its range. The size, number, and ecological viability of occurrences of the association have declined significantly due to conversion to cultivation, intensive livestock use, alteration of fire disturbance regimes, and the introduction of exotic species.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: *Festuca scabrella* (rough fescue) is now generally recognized as a complex, consisting of three separate species (*Festuca campestris*, *Festuca altaica*, and *Festuca hallii*) (Aiken and Darbyshire 1990). Kartesz (1999) treats *Festuca scabrella* as *Festuca altaica*. Of the species within the former *Festuca scabrella* complex, *Festuca campestris* is the one most likely to be found with *Festuca idahoensis* at the western edge of the Great Plains (ibid., Aiken et al. 1996). Confirmation is required that *Festuca campestris* is the species of fescue that occurs in this vegetation type.

In the Flora of the Pacific Northwest (Hitchcock et al. 1977a), *Festuca scabrella* Torr. in Hook includes *Festuca scabrella* var. *major* and *Festuca altaica* ssp. *scabrella*, basically combining both *Festuca altaica* and *Festuca scabrella*, if we follow Kartesz (1999). Lesica (2002) also equates *Festuca campestris*, *Festuca altaica* ssp. *scabrella* to *Festuca scabrella*. Kartesz (1999) equates *Festuca scabrella* var. *major* to *Festuca campestris*, and *Festuca scabrella*, *Festuca altaica* ssp. *scabrella* and *Festuca altaica* var. *scabrella* to *Festuca altaica*. This apparent confusion is cleared up in Festuca of North America by Aiken et al. (1996). Distribution maps clearly show that *Festuca altaica* occurs well north of the U.S.-Canada line, while *Festuca campestris* occurs in Washington, Oregon, Idaho, Montana, south-central and eastern British Columbia, and southern Alberta (there is no overlap between these two maps). In addition, none of the U.S. floras for this region (Hitchcock and Cronquist 1973, Cronquist et al. 1977, Dorn 1984, Lesica 2002) list *Festuca altaica*. In conclusion, we can assume Mueggler and Stewart's (1980) *Festuca scabrella* (from which this association was originally based) really equals *Festuca scabrella* var. *major*, and, therefore, we can follow Kartesz (1999) and call it *Festuca campestris*. Montana Natural Heritage Ecologist Steve Cooper (pers. comm.) agrees with calling it *Festuca campestris*.

The dominance of *Festuca campestris* with a significant cover of *Festuca idahoensis* defines this type. The absence or low cover of *Danthonia parryi* is also significant. *Danthonia parryi* is commonly a third codominant in the Alberta foothills, forming a *Festuca campestris* - *Festuca idahoensis* - *Danthonia parryi* type, usually associated with deeper soils. *Festuca campestris* - *Festuca idahoensis* - *Danthonia parryi* has been described by a number of other authors (e.g., Jaques 1976, Willoughby et al. 1998). It is considered the "modal grassland community type in Black Chernozemic soils in the foothills of southern Alberta" (Willoughby et al. 1998). Although *Festuca campestris* remains clearly dominant, it is separated from the *Festuca campestris* - *Festuca idahoensis* type by the prominence of *Danthonia parryi*. *Danthonia parryi* has been noted as occasionally codominant with *Festuca scabrella* in northern Montana, east of the Continental Divide, but Mueggler and Stewart (1980) did not note enough other differences to define a separate type. Additional work is needed, but these likely should be considered two separate communities, given the extensive occurrence of the *Festuca campestris* - *Festuca idahoensis* - *Danthonia parryi* type in Alberta.

Mueggler and Stewart (1980) recognized two phases of the *Festuca campestris* - *Festuca idahoensis* type. The *Geranium viscosissimum* phase is characterized by the presence of *Geranium viscosissimum* and *Potentilla gracilis*, with a greater abundance of *Achnatherum occidentale* (= *Stipa occidentalis*) and *Pseudoroegneria spicata* than generally present in the rest of the type. This phase is recognized as a National Vegetation Classification association, *Festuca campestris* - *Festuca idahoensis* - *Geranium viscosissimum* Herbaceous Vegetation (CEGL005870), based on recent data (1994, 1999-2002) from Waterton-Glacier International Peace Park. The *Achnatherum richardsonii* (= *Stipa richardsonii*) phase is found on moist sites. It is similar to the *Geranium viscosissimum* phase but with conspicuous cover of *Achnatherum richardsonii* and substantial *Carex filifolia* and *Danthonia intermedia*. This phase has also been elevated to a NVC association, *Festuca campestris* - (*Festuca idahoensis*) - *Achnatherum richardsonii* Herbaceous Vegetation (CEGL005869), based on recent data (1994, 1999-2002) from Waterton-Glacier International Peace Park.

Koterba and Habeck (1971) looked at grasslands along the North Fork Valley, Glacier National Park, Montana. They found stands in which *Festuca scabrella* was a common associate with *Festuca idahoensis* but concluded that these grasslands in general represent a mixture of Great Plains and Intermountain elements, making them floristically unusual. The *Festucetum scabrella* association of Lynch (1955) in Glacier County, Montana, is dominated by *Festuca scabrella* with *Festuca ovina* and *Achnatherum nelsonii* ssp. *dorei* (= *Stipa columbiana*) also significant. As Lynch considers *Festuca idahoensis* to be an intergrading variety of *Festuca ovina*, this association appears to be similar to *Festuca campestris* - *Festuca idahoensis* Herbaceous Vegetation (CEGL005875). Lynch notes similarities with other *Festuca scabrella* types in Alberta, Washington and Idaho.

Tisdale (1982) compared the plant communities documented in the Pacific Northwest Bunchgrass region. He found the *Festuca scabrella* / *Festuca idahoensis* types reported in Montana (Mueggler and Stewart 1980) and in Idaho (Tisdale 1979) to be similar; however, a subsequent study (Tisdale and Bramble-Brodahl 1983) did not note a *Festuca scabrella* - *Festuca idahoensis* type. Tisdale (1982) suggests that the relationship is unclear between similar types reported for British Columbia, Oregon and Washington.

GLOBAL SIMILAR ASSOCIATIONS:

- *Festuca campestris* - (*Festuca idahoensis*) - *Achnatherum richardsonii* Herbaceous Vegetation (CEGL005869)
- *Festuca campestris* - *Festuca idahoensis* - *Geranium viscosissimum* Herbaceous Vegetation (CEGL005870)
- *Festuca campestris* - *Pseudoroegneria spicata* Herbaceous Vegetation (CEGL001629)

GLOBAL RELATED CONCEPTS:

- *Festuca campestris* - *Festuca idahoensis* - *Danthonia parryi* (Willoughby et al. 1998) B
- *Festuca campestris* - *Festuca idahoensis* - *Danthonia parryi* (Jaques 1976) B
- *Festuca campestris* / *Festuca idahoensis* Habitat Type (Mueggler and Stewart 1980) B
- *Festuca scabrella*-*Festuca idahoensis* (Bourgeron and Engelking 1994) =
- *Festucetum scabrella* association (Lynch 1955) =
- DRISCOLL FORMATION CODE:V.B.4.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is common on low- to mid-elevation moraines and benches along toeslopes and lowslopes on the east side of Glacier National Park. Stands occur within the St. Mary subdistrict in Two Dog Flats, St. Mary Flats, near Rising Sun, and along the Red Eagle Trail. Within the Many Glacier subdistrict, it occurs on Swiftcurrent Ridge, in Cracker Flats, in Apikuni Flats, along Lake Sherburne and Windy Creek, along Kennedy and Boulder creeks, and on Yellow Mountain. Within the Two Medicine subdistrict, it occurs on Spot Mountain east of Marias Pass near Pray Lake, along Lower Two Medicine Lake, and in the Looking Glass meadow. Within the Cut Bank drainage on the Milk River Ridge, it occurs on Mad Wolf Mountain, along Lake Creek and the ridge, and near the campground and ranger station. Within the Belly River subdistrict, stands occur north of the Belly River and near the old 3-mile campground on the Belly River Trail.

GLOBAL RANGE: This community is found in Montana, north of 46 degrees N latitude, as well as uncommonly in Idaho, Washington and Oregon, and into southwestern Alberta, Canada.

NATIONS: CA, US

STATES/PROVINCES: AB, ID:S1, MT:S3, OR:S3, WA:S1

USFS ECOREGIONS: 331A:CC, 331D:CC, M331A:??, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); USFS (Kootenai)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GRAS-00-032, GRAS-99-011, GRAS-99-023, GRAS-99-025, GRAS-99-026, GRAS-99-027, GRAS-99-053.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: G. Kittel, mod. S. Rust and M.S. Reid

REFERENCES: Aiken and Darbyshire 1990, Aiken et al. 1996, Bourgeron and Engelking 1994, Cooper 2003, Cooper pers. comm., Cronquist et al. 1977, Daubenmire 1970, Dorn 1984, Driscoll et al. 1984, FEIS 1998, Hitchcock and Cronquist 1973, Hitchcock et al. 1977a, Hodgkinson and Young 1973, Jaques 1976, Kagan et al. 2004, Kartesz 1999, Koterba and Habeck 1971, Lesica 2002, Lynch 1955, MTNHP 2002b, McLean 1970, Mueggler and Stewart 1980, Tisdale 1947, Tisdale 1979, Tisdale 1982, Tisdale and Bramble-Brodahl 1983, Tisdale and McLean 1957, WNHP unpubl. data, Western Ecology Working Group n.d., Willms and Fraser 1992, Willms et al. 1985, Willoughby 1997, Willoughby et al. 1998

***Festuca campestris* - *Pseudoroegneria spicata* Herbaceous Vegetation**
PRAIRIE FESCUE - BLUEBUNCH WHEATGRASS HERBACEOUS VEGETATION

ROUGH FESCUE - BLUEBUNCH WHEATGRASS MIXEDGRASS PRAIRIE

IDENTIFIER: CEGL001629

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d.)
Alliance	<i>Festuca campestris</i> Herbaceous Alliance (A.1255)
Alliance (English name)	Prairie Fescue Herbaceous Alliance
Association	<i>Festuca campestris</i> - <i>Pseudoroegneria spicata</i> Herbaceous Vegetation
Association (English name)	Prairie Fescue - Bluebunch Wheatgrass Herbaceous Vegetation
Association (Common name)	Rough Fescue - Bluebunch Wheatgrass Mixedgrass Prairie

ECOLOGICAL SYSTEM(S): Northwestern Great Plains Aspen Forest and Parkland (CES303.681)
 Northwestern Great Plains Mixedgrass Prairie (CES303.674)
 Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040)

ELEMENT CONCEPT

GLOBAL SUMMARY: This *Festuca campestris* association is found in the northwestern Great Plains, and on the slopes of the Front Range of Montana and Alberta. It occurs between 823-1890 m (2700-6200 feet) elevation, on level topography and steep slopes of all aspects. Soils are loamy and moderately deep. This midgrass community is fairly arid and heavily dominated by *Festuca campestris* (= *Festuca scabrella*). *Pseudoroegneria spicata* is abundant, while *Festuca idahoensis* is common. Other graminoids that may be found are *Bouteloua gracilis*, *Muhlenbergia cuspidata*, and *Hesperostipa comata* (= *Stipa comata*). Forbs may include *Heterotheca villosa*, *Liatris punctata*, and *Lupinus sericeus*. The short shrubs *Artemisia frigida* and *Gutierrezia sarothrae* are also common. This association is differentiated from *Festuca campestris* - *Festuca idahoensis* Herbaceous Vegetation (CEGL001628) by the conspicuous abundance of *Pseudoroegneria spicata*. In addition, *Festuca idahoensis* is generally less abundant than *Festuca campestris*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This subxeric, montane to lower subalpine association is documented from elevations ranging between 1340 and 1890 m (4400-6200 feet) and generally associated with gentle lowslopes at lower to mid-elevations on mostly southerly aspects. The higher elevation expressions of this type are virtually exclusively found on steep to very steep west- to south-facing exposures. Soils are generally well-drained to very well-drained sandy loams or sandy clay loams, also characterized as Orthic Regosolics or Black Chernozems. These are weakly to moderately developed, coarse-textured soils that are developed on fluvial and colluvial landforms. Exposed soil, ranging from 15 to 70% cover, generally comprises the largest category of exposed substrates, with litter and small rock constituting less than 40% combined cover, for the most part.

GLOBAL ENVIRONMENT: This community occurs in northwestern Montana between 823-1890 m (2700-6200 feet) elevation and is generally associated with gentle lowslopes at lower to mid-elevations on mostly southerly aspects. The higher elevation expressions of this type are virtually exclusively found on steep to very steep west- to south-facing exposures (Mueggler and Stewart 1980). Soils are moderately deep, generally well-drained to very well-drained sandy loams or sandy clay loams. Soils have been

classified as Orthic Regosolics, Black Chernozems, Vertic Agribotoll, or Entic Haploborolls. Bare soil ranges from 5% to 70% cover, and rock and litter is generally less than 40% combined cover.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This community is dominated by a relatively diverse assemblage of herbaceous species with a combined cover ranging from 35 to 100% and heights of less than 0.5 m; there appears to be no compositional shift with the change in overall canopy cover. *Festuca campestris* with 2-45% cover and *Pseudoroegneria spicata* with 4-40% cover are generally both the dominant and diagnostic herbs. Other high-constancy herbs usually having lower cover values (than dominant graminoids) include *Achillea millefolium*, *Galium boreale*, *Festuca idahoensis*, *Lupinus sericeus*, *Penstemon confertus*, *Anemone multifida*, *Cerastium arvense*, *Eriogonum umbellatum*, *Geranium viscosissimum*, *Agoseris glauca*, *Campanula rotundifolia*, *Lomatium triternatum*, and *Selaginella densa*. Lower constancy herbaceous species that may have high cover in certain areas include the forbs *Antennaria parvifolia*, *Antennaria umbrinella*, *Arabis nuttallii*, *Artemisia ludoviciana*, *Hedysarum sulphurescens*, *Lomatium dissectum*, *Eriogonum flavum*, *Sedum lanceolatum*, *Sedum stenopetalum*, *Fragaria virginiana*, and the graminoids *Koeleria macrantha*, *Poa nemoralis* ssp. *interior* (= *Poa interior*), *Bromus inermis* ssp. *pumpellianus* and *Carex rossii*. Shrubs are sometimes present within this association with cover between 5-10%. *Amelanchier alnifolia*, *Spiraea betulifolia*, and *Rosa acicularis* are most commonly present with low cover. Bryophyte cover ranges from 5-10%, dominated by *Tortula ruralis* and *Hypnum revolutum*.

GLOBAL VEGETATION: This midgrass community is heavily dominated by *Festuca campestris* (= *Festuca scabrella*). *Pseudoroegneria spicata* (4-40% cover) is abundant while *Festuca idahoensis* is common. Other graminoids that may be found are *Bouteloua gracilis*, *Muhlenbergia cuspidata*, and *Hesperostipa comata* (= *Stipa comata*). Forbs may include *Heterotheca villosa*, *Liatris punctata*, *Balsamorhiza sagittata*, *Antennaria parvifolia*, *Achillea millefolium*, *Lomatium triternatum*, *Penstemon confertus*, *Anemone multifida*, *Cerastium arvense*, *Eriogonum umbellatum*, *Geranium viscosissimum*, *Agoseris glauca*, *Campanula rotundifolia*, and *Lupinus sericeus*. The short shrubs *Artemisia frigida* and *Gutierrezia sarothrae* are also common, and *Amelanchier alnifolia*, *Spiraea betulifolia*, and *Rosa acicularis* can also occur in low cover.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Achillea millefolium</i> , <i>Galium boreale</i> , <i>Lupinus sericeus</i>
Herb (field)	Graminoid	<i>Festuca campestris</i> , <i>Festuca idahoensis</i> , <i>Pseudoroegneria spicata</i>
Nonvascular	Moss	<i>Hypnum revolutum</i> , <i>Tortula ruralis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Festuca campestris</i> , <i>Pseudoroegneria spicata</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Anemone multifida*, *Cerastium arvense*, *Eriogonum umbellatum*, *Festuca campestris*, *Festuca idahoensis*, *Galium boreale*, *Penstemon confertus*, *Pseudoroegneria spicata*

GLOBAL: *Festuca campestris*, *Festuca idahoensis*, *Pseudoroegneria spicata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Bromus inermis*, *Calochortus apiculatus*, *Hedysarum sulphurescens*, *Hypericum perforatum*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This community (with the same name and recognized by the same combination of diagnostic species) has been described as occurring throughout northwestern Montana, including the immediate vicinity of Glacier National Park by Mueggler and Stewart (1980) and Damm (2001) who described it as a mere community, insufficiently documented to be a recognized as a Braun-Blanquet type of plant association.

GLOBAL COMMENTS: This association is dominated by *Festuca campestris* and not *Festuca altaica*. This association is primarily based on a description from Mueggler and Stewart (1980), with taxonomy following Hitchcock et al. (1977a). In Hitchcock et al., *Festuca scabrella* Torr. in Hook includes *Festuca scabrella* var. *major* and *Festuca altaica* ssp. *scabrella*, basically combining both *Festuca altaica* and *Festuca scabrella*, if we follow Kartesz (1999). Lesica (2002) also equates *Festuca campestris*, *Festuca altaica* ssp. *scabrella* to *Festuca scabrella*. Kartesz (1999) equates *Festuca scabrella* var. *major* to *Festuca campestris*, and *Festuca scabrella*, *Festuca altaica* ssp. *scabrella* and *Festuca altaica* var. *scabrella* to *Festuca altaica*. This apparent confusion is cleared up in "Festuca of North America" work by Aiken et al. (1996). Distribution maps clearly show that *Festuca altaica* occurs well north of the U.S.-Canada line, while *Festuca campestris* occurs in Washington, Oregon, Idaho, Montana, south-central and eastern British Columbia, and southern and southwestern Alberta (there is no overlap between these two maps). In addition, none of the U.S. floras for this region (Hitchcock and Cronquist 1973, Cronquist et al. 1977, Dorn 1984, Lesica 2002) list *Festuca altaica*. So in conclusion, we can assume Mueggler and Stewart's (1980) original *Festuca scabrella* really equals *Festuca scabrella* var. *major*, and, therefore, we can follow Kartesz (1999) and call it *Festuca campestris*. Montana Heritage Ecologist Steve Cooper (pers. comm.) agrees with calling it *Festuca campestris*.

Some stands of *Festuca campestris* - *Pseudoroegneria spicata* Herbaceous Vegetation (CEGL001629) may have a significant amount of *Festuca idahoensis*, making separation with the *Festuca campestris* - *Festuca idahoensis* vegetation type problematic. However, the presence of a number of Great Plains species in combination with *Festuca campestris* and *Pseudoroegneria spicata* seems to separate the two types. Species reported as occurring regularly (>50% constancy) in the *Festuca campestris* - *Pseudoroegneria spicata* type but not reported for the *Festuca campestris* - *Festuca idahoensis* type include *Gaura coccinea*, *Gutierrezia sarothrae*, *Liatris punctata*, and *Hesperostipa comata* (= *Stipa comata*) (Mueggler and Stewart 1980). Shrubs and *Pseudoroegneria spicata* tend to be less prominent in the *Festuca campestris* - *Festuca idahoensis* type.

GLOBAL SIMILAR ASSOCIATIONS:

- *Festuca campestris* - (*Festuca idahoensis*) - *Achnatherum richardsonii* Herbaceous Vegetation (CEGL005869)
- *Festuca campestris* - *Festuca idahoensis* - *Geranium viscosissimum* Herbaceous Vegetation (CEGL005870)
- *Festuca campestris* - *Festuca idahoensis* Herbaceous Vegetation (CEGL005875)

GLOBAL RELATED CONCEPTS:

- *Agropyron spicatum* - *Festuca scabrella* Vegetation Type (Achuff et al. 2002a) I
- *Agropyron*-*Festuca* or Upper Grassland Zone (Tisdale 1947) =
- *Festuca scabrella* / *Agropyron spicatum* Habitat Type (Mueggler and Stewart 1980) =
- *Festuca scabrella*-*Agropyron inerme* Dominance Group (Looman 1969) =
- *Festuca scabrella*-*Pseudoroegneria spicata* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:V.B.4.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon in Waterton Lakes National Park and on the east side of Glacier National Park. It is specifically found in the Two Medicine subdistrict in Glacier National Park west of Marias Pass, on lower Spot Mountain, and on the west side of Red Mountain. In Waterton Lakes National Park, this association occurs in the Hell-Roaring 1 ecosite within the Rowe watershed, in the Bauerman 2 ecosite within the Crooked Creek watershed, and in the Bison Paddock 1 ecosite within the Waterton River watershed.

GLOBAL RANGE: This community is found in Montana and southwestern Alberta. It may also occur in the southern central interior British Columbia.

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S4, ND

USFS ECOREGIONS: 331D:CC, M331A:??, M332B:CC, M332C:CC, M332D:CC, M332E:C?, M333B:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes); USFS (Kootenai)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: CD463, CD462, CD477, CD475, CD482, GRAS-01-030, GRAS-01-042, WATE.4087, WATE.5024, WATE.5033.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: J. Drake, mod. K.A. Schulz and G. Kittel

REFERENCES: Achuff et al. 2002a, Aiken et al. 1996, Bourgeron and Engelking 1994, Cooper 2003, Cooper pers. comm., Cronquist et al. 1977, Damm 2001, Dorn 1984, Driscoll et al. 1984, Hitchcock and Cronquist 1973, Hitchcock et al. 1977a, Kartesz

1999, Lesica 2002, Looman 1969, MTNHP 2002b, Mueggler and Stewart 1980, NDNHI n.d., Tisdale 1947, Western Ecology Working Group n.d.

***Festuca idahoensis* Herbaceous Alliance**

***Festuca campestris* - (*Festuca idahoensis*) - *Achnatherum richardsonii* Herbaceous Vegetation**

PRAIRIE FESCUE - (IDAHO FESCUE) - RICHARDSON'S NEEDLEGRASS HERBACEOUS VEGETATION

IDENTIFIER: CEGL005869

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d.)
Alliance	<i>Festuca idahoensis</i> Herbaceous Alliance (A.1251)
Alliance (English name)	Idaho Fescue Herbaceous Alliance
Association	<i>Festuca campestris</i> - (<i>Festuca idahoensis</i>) - <i>Achnatherum richardsonii</i> Herbaceous Vegetation
Association (English name)	Prairie Fescue - (Idaho Fescue) - Richardson's Needlegrass Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040)

ELEMENT CONCEPT

GLOBAL SUMMARY: This dry-mesic, mid-height grassland is found in the northwestern Great Plains on mountain and foothill slopes on both sides of the Continental Divide. It occurs on mesic sites from 900-2100 m (3000-7000 feet) elevation on any aspect, becoming restricted to west- and southwest-facing slopes farther north. Slopes vary from flat to gentle toeslopes and lowslopes, generally less than 30%. Soils are loamy and moderately deep on a variety of soil parent materials. It is dominated by a combination of *Festuca campestris*, *Festuca idahoensis*, and at least >10% cover of *Achnatherum richardsonii* (= *Stipa richardsonii*). *Festuca campestris* generally has greater canopy cover than *Festuca idahoensis* and, where very abundant, indicates undisturbed sites. Herbaceous cover ranges from 60-100% with moderate species diversity and heights less than 0.5 m. Other abundant graminoid species include *Carex filifolia*, *Danthonia intermedia*, and *Koeleria macrantha*. Forb species typically present include *Achillea millefolium*, *Geum triflorum*, *Antennaria rosea*, *Eriogonum umbellatum*, *Penstemon confertus*, *Galium boreale*, *Lupinus sericeus*, and *Geranium viscosissimum*. Shrubs can be present, low in stature (<0.5m) and cover (<5%). In general the shrub component is even less abundant than in the similar *Festuca campestris* - *Festuca idahoensis* Herbaceous Vegetation (CEGL005875) and *Festuca campestris* - *Festuca idahoensis* - *Geranium viscosissimum* Herbaceous Vegetation (CEGL005870). Shrub species that may be present include *Symphoricarpos albus*, *Artemisia tridentata* ssp. *vaseyana*, *Arctostaphylos uva-ursi*, and *Rosa arkansana*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs on mostly flat, low level areas at elevations between 1070 and 1140 m (3500-3750 feet), although it can sometimes occur on moderate, south-facing slopes. Soils are generally well-drained silt or sandy loams, developed on till or glaciofluvial landforms including benches and alluvial terraces. One unusual sampled area, however, occurred on organic deposits with clay soil texture. Litter dominates the ground surface with 30-90% cover. There is less litter in some areas that were burned in the 1988 Red Bench fire and in management-ignited prescribed fires in the 1990s.

GLOBAL ENVIRONMENT: This community is found on moderate to steep mountain and foothill slopes on both sides of the Continental Divide. It occurs on mesic sites, mostly on flat to gentle toeslopes and lowslopes (<30%) from 900 to 2100 m (3000-7000 feet) elevation on any aspect, becoming restricted to west- and southwest-facing slopes farther north. Soils are loamy and moderately deep on a variety of soil parent materials. In Glacier National Park, soils are moderately well-drained sandy loams, silt loams or sandy clay loams. Parent material is coarse quartzite and argillite developed on moraine and glaciofluvial landforms. One stand occurred on organic deposits with clay soil texture. Litter dominates the ground surface.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Native grasses dominate this montane, mesic to subxeric herbaceous association. Herbaceous cover ranges from 60-100% with moderate species diversity and heights less than 0.5 m.

Achnatherum richardsonii often dominates the vegetation with 10-60% cover, although *Festuca campestris*, *Festuca idahoensis*, and *Danthonia intermedia* are also very common with 10-15% average cover. Other high- to moderate-constancy herbaceous species with lower cover include *Achillea millefolium*, *Geum triflorum*, *Antennaria rosea*, *Eriogonum umbellatum*, *Penstemon confertus*, *Galium boreale*, *Lupinus sericeus*, *Geranium viscosissimum*, *Carex* spp., *Koeleria macrantha*, *Achnatherum nelsonii*, *Lithospermum ruderales*, and *Potentilla gracilis*. *Carex duriuscula*, *Potentilla glandulosa*, and *Potentilla arguta* may be present in a few areas with higher cover. Short or dwarf-shrubs are also present in certain areas with approximately 5% cover and heights less than 1 m. If shrubs are present, *Symphoricarpos albus*, *Artemisia tridentata* ssp. *vaseyana*, and *Arctostaphylos uva-ursi* are generally the most common. Nonvascular cover ranges between 0-30%.

GLOBAL VEGETATION: This mid-grassland is dominated by a combination of *Festuca campestris*, *Festuca idahoensis*, and at least >10% cover of *Achnatherum richardsonii* (= *Stipa richardsonii*). *Festuca campestris* generally has greater canopy cover than *Festuca idahoensis* and, where very abundant, indicates undisturbed sites. Herbaceous cover ranges from 60-100% with moderate species diversity and heights less than 0.5 m. Other abundant graminoid species include *Carex filifolia*, *Danthonia intermedia*, and *Koeleria macrantha*. Forb species typically present include *Achillea millefolium*, *Geum triflorum*, *Antennaria rosea*, *Eriogonum umbellatum*, *Penstemon confertus*, *Galium boreale*, *Lupinus sericeus*, and *Geranium viscosissimum*. Shrubs can be present, low in stature (<0.5m) and cover (<5%). In general the shrub component is even less abundant than in the similar *Festuca campestris* - *Festuca idahoensis* Herbaceous Vegetation (CEGL005875) and *Festuca campestris* - *Festuca idahoensis* - *Geranium viscosissimum* Herbaceous Vegetation (CEGL005870). Shrub species that may be present include *Symphoricarpos albus*, *Artemisia tridentata* ssp. *vaseyana*, *Arctostaphylos uva-ursi*, and *Rosa arkansana*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Antennaria rosea</i> , <i>Geranium viscosissimum</i> , <i>Geum triflorum</i> , <i>Lupinus sericeus</i>
Herb (field)	Graminoid	<i>Achnatherum richardsonii</i> , <i>Danthonia intermedia</i> , <i>Festuca campestris</i> , <i>Festuca idahoensis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Antennaria rosea</i> , <i>Geranium viscosissimum</i> , <i>Geum triflorum</i> , <i>Lupinus sericeus</i>
Herb (field)	Graminoid	<i>Achnatherum richardsonii</i> , <i>Danthonia intermedia</i> , <i>Festuca campestris</i> , <i>Festuca idahoensis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Achnatherum richardsonii*, *Danthonia intermedia*, *Eriogonum umbellatum*, *Festuca campestris*, *Festuca idahoensis*, *Galium boreale*, *Penstemon confertus*

GLOBAL: *Achnatherum richardsonii*, *Danthonia intermedia*, *Festuca campestris*, *Festuca idahoensis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Calochortus apiculatus*, *Phleum pratense*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2G3? (5-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: Based on a 15-plot sample, this community was previously identified as the *Achnatherum richardsonii* (= *Stipa richardsonii*) phase, encompassing the more moist portion of the *Festuca campestris* - *Festuca idahoensis* habitat type (Mueggler and Stewart 1980). The phase has been elevated to association status based on yet more plot data and renamed as above.

GLOBAL COMMENTS: *Festuca scabrella* (rough fescue) is now generally recognized as a complex, consisting of three separate species (*Festuca campestris*, *Festuca altaica* and *Festuca hallii*) (Aiken and Darbyshire 1990). Kartesz (1999) treats *Festuca scabrella* as *Festuca altaica*, and *Festuca scabrella* var. *major* as *Festuca campestris*. Of the species within the former *Festuca scabrella*

complex, *Festuca campestris* is the one most likely to be found with *Festuca idahoensis* at the western edge of the Great Plains (Aiken et al. 1996, Kartesz 1999). Confirmation is required that *Festuca campestris* is the species of fescue that occurs in this vegetation type.

Mueggler and Stewart (1980) is the first comprehensive work on the grasslands of western Montana in which this and other *Festuca scabrella* associations are based. They used Hitchcock et al. (1955-69) as their taxonomic authority. In the Flora of the Pacific Northwest (Hitchcock et al. 1955-69), *Festuca scabrella* Torr. in Hook includes *Festuca scabrella* var. *major* and *Festuca altaica* ssp. *scabrella*, basically combining both *Festuca altaica* and *Festuca scabrella*, if we follow Kartesz (1999). Lesica (2002) also equates *Festuca campestris*, *Festuca altaica* ssp. *scabrella* to *Festuca scabrella*. Kartesz (1999) equates *Festuca scabrella* var. *major* to *Festuca campestris*, and *Festuca scabrella*, *Festuca altaica* ssp. *scabrella* and *Festuca altaica* var. *scabrella* to *Festuca altaica*. This apparent confusion is cleared up in Festuca of North America by Aiken et al. (1996). Distribution maps clearly show that *Festuca altaica* occurs well north of the U.S.-Canada line, while *Festuca campestris* occurs in Washington, Oregon, Idaho, Montana, south-central and eastern British Columbia, and in southern Alberta (there is no overlap between these two maps). In addition, none of the U.S. floras for this region (Hitchcock and Cronquist 1973, Cronquist et al. 1977, Dorn 1984, Lesica 2002) list *Festuca altaica*. In conclusion, we can assume Mueggler and Stewart's (1980) *Festuca scabrella* really equals *Festuca scabrella* var. *major*, and, therefore, we can follow Kartesz (1999) and call it *Festuca campestris*. Montana Heritage Ecologist Steve Cooper (pers. comm.) agrees with calling it *Festuca campestris*.

The dominance of *Festuca campestris* with a significant cover of *Achnatherum richardsonii* defines this type. The absence or low cover of *Danthonia parryi* is also significant. *Danthonia parryi* is commonly a third codominant in the Alberta foothills, forming a *Festuca campestris* - *Festuca idahoensis* - *Danthonia parryi* type, usually associated with deeper soils. *Danthonia parryi* has been noted as occasionally codominant with *Festuca scabrella* in northern Montana, east of the Continental Divide, but Mueggler and Stewart (1980) did not note enough other differences to define a separate type. Additional work is needed, but these likely should be considered two separate communities, given the extensive occurrence of the *Festuca campestris* - *Festuca idahoensis* - *Danthonia parryi* type in Alberta.

Mueggler and Stewart (1980) recognize two phases of their *Festuca campestris* - *Festuca idahoensis* habitat type. The *Geranium viscosissimum* phase is characterized by the presence of *Geranium viscosissimum* and *Potentilla gracilis*, with a greater abundance of *Achnatherum occidentale* (= *Stipa occidentalis*) and *Pseudoroegneria spicata* than generally present in the rest of the type. This phase is now an association, *Festuca campestris* - *Festuca idahoensis* - *Geranium viscosissimum* Herbaceous Vegetation (CEGL005870), based on recent data (1994, 1999-2002) from Waterton-Glacier International Peace Park. The *Achnatherum richardsonii* (= *Stipa richardsonii*) phase (e.g., this association) is found on moist sites. It is similar to the *Geranium viscosissimum* phase, but with conspicuous cover of *Achnatherum richardsonii* and substantial *Carex filifolia* and *Danthonia intermedia*. This phase is now recognized as an association, based on recent data (1994, 1999-2002) from Waterton-Glacier International Peace Park.

Festuca campestris - *Festuca idahoensis* - *Danthonia parryi* has been described by a number of authors (e.g., Jaques 1979, Willoughby et al. 1998). It is considered the "modal grassland community type in Black Chernozemic soils in the foothills of southern Alberta" (Willoughby et al. 1998). Although *Festuca campestris* remains clearly dominant, it is separated from the *Festuca campestris* - *Festuca idahoensis* type by the prominence of *Danthonia parryi*. Koterba and Habeck (1971) looked at grasslands along the North Fork Valley, Glacier National Park, Montana. They found stands in which *Festuca scabrella* was a common associate with *Festuca idahoensis*, but concluded that these grasslands in general represent a mixture of Great Plains and Intermountain elements, making them floristically unusual. The *Festucetum scabrella* association of Lynch (1955) in Glacier County, Montana, is dominated by *Festuca scabrella* with *Festuca ovina* and *Achnatherum nelsonii* ssp. *dorei* (= *Stipa columbiana*) also significant. As Lynch considers *Festuca idahoensis* to be an intergrading variety of *Festuca ovina*, this association appears to be similar to *Festuca campestris* - *Festuca idahoensis* Herbaceous Vegetation (CEGL001628). Lynch notes similarities with other *Festuca scabrella* types in Alberta, Washington and Idaho.

GLOBAL SIMILAR ASSOCIATIONS:

- *Festuca campestris* - *Festuca idahoensis* - *Geranium viscosissimum* Herbaceous Vegetation (CEGL005870)
- *Festuca campestris* - *Festuca idahoensis* Herbaceous Vegetation (CEGL005875)
- *Festuca campestris* - *Pseudoroegneria spicata* Herbaceous Vegetation (CEGL001629)

GLOBAL RELATED CONCEPTS:

- *Festuca scabrella*/*Festuca idahoensis* Habitat Type, *Stipa richardsonii* Phase (Mueggler and Stewart 1980) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is common in the North Fork subdistrict on the west side of Glacier National Park. It is specifically located on level areas along Glacier Route 7 within Big Prairie and Round Prairie.

GLOBAL RANGE: This association is known from Montana and southern Alberta and is expected to occur in British Columbia, Idaho, Oregon and Washington.

NATIONS: CA?, US

STATES/PROVINCES: ID?, MT, OR?, WA?

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.1007, GLAC.2100, GLAC.2244, GLAC.2270, GLAC.2526, GLAC.2603, GLAC.2605, GLAC.2631.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Aiken and Darbyshire 1990, Aiken et al. 1996, Cronquist et al. 1977, Dorn 1984, Hitchcock and Cronquist 1973, Hitchcock et al. 1977a, Jaques 1976, Kartesz 1999, Koterba and Habeck 1971, Lesica 2002, Lynch 1955, MTNHP 2002b, Mueggler and Stewart 1980, Western Ecology Working Group n.d., Willoughby et al. 1998

***Festuca campestris* - *Festuca idahoensis* - *Geranium viscosissimum* Herbaceous Vegetation PRAIRIE FESCUE - IDAHO FESCUE - STICKY GERANIUM HERBACEOUS VEGETATION**

IDENTIFIER: CEG005870

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d.)
Alliance	<i>Festuca idahoensis</i> Herbaceous Alliance (A.1251)
Alliance (English name)	Idaho Fescue Herbaceous Alliance
Association	<i>Festuca campestris</i> - <i>Festuca idahoensis</i> - <i>Geranium viscosissimum</i> Herbaceous Vegetation
Association (English name)	Prairie Fescue - Idaho Fescue - Sticky Geranium Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040)

ELEMENT CONCEPT

GLOBAL SUMMARY: This dry-mesic, mid-height grassland is found in the northwestern Great Plains and mountain and foothill slopes on both sides of the Continental Divide of Montana. It occurs on mesic sites from 900-2100 m (3000-7000 feet) elevation on any aspect, becoming restricted to west- and southwest-facing slopes farther north. Slopes vary from flat to gentle toeslopes and lowslopes, generally less than 30%. Soils are loamy and moderately deep on a variety of soil parent materials. This midgrass community is dominated by *Festuca campestris* and *Festuca idahoensis*, but *Festuca campestris* generally has the greater canopy cover and can be more abundant on undisturbed sites. A diverse assemblage of herbaceous species, with a significant forb component, has a combined cover ranging from 30-85%. *Carex obtusata* may be common, especially on more mesic sites. Other graminoids may also be found, including *Danthonia intermedia*, *Koeleria macrantha*, *Phleum pratense*, *Achnatherum nelsonii*, and *Achnatherum occidentale* (= *Stipa occidentalis*). The diagnostic forb for this association is *Geranium viscosissimum*, which is often in association with, in varying combinations, *Potentilla gracilis*, *Potentilla glandulosa*, and *Carex petasata* that individually or in the aggregate have >1% cover. Other forbs may include *Achillea millefolium*, *Galium boreale*, *Selaginella densa*, *Lupinus sericeus*, *Balsamorhiza sagittata*, *Castilleja rhexiifolia*, *Calamagrostis rubescens*, and *Geum triflorum*. Shrubs are typically present, though in low stature and cover, generally <10%. Shrub species that may be present include *Artemisia frigida*, *Artemisia campestris*, *Dasiphora fruticosa* ssp. *floribunda*, *Rosa arkansana*, *Amelanchier alnifolia*, and *Arctostaphylos uva-ursi*. This association is distinguished from the similar *Festuca campestris* - *Festuca idahoensis* Herbaceous Vegetation (CEGL005875) by the characterized presence of *Geranium viscosissimum* and *Potentilla gracilis*, with a greater abundance of *Achnatherum occidentale* (= *Stipa occidentalis*) and *Pseudoroegneria spicata* than generally present in the former.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This mesic to subxeric association occurs on mostly flat to gentle basin floors, toeslopes, and lowslopes with variable aspects at elevations between 1300 and 1980 m (4260-6600 feet) on the east side of the Continental Divide and near 1100 m (3600 feet) west of the Continental Divide. Soils are typically moderately to well-drained sandy loams (characterized as Orthic Black Chernozems and Cumulic Regosols in Waterton Lakes National Park), but soil texture may also be silt loam, sandy clay loam, or loamy sand. These soils are moderately well-developed, moderately acidic to moderately alkaline and formed on coarse-textured glaciofluvial, morainal, and colluvial landforms that generally contain argillite. Litter, gravel, and moss comprise 40-100% of the ground cover.

GLOBAL ENVIRONMENT: This dry-mesic, mid-height grassland is found in the northwestern Great Plains and mountain and foothill slopes on both sides of the Continental Divide. It occurs on mesic sites from 900-2100 m (3000-7000 feet) elevation on any aspect, becoming restricted to west- and southwest-facing slopes farther north. Slopes vary from flat to gentle toeslopes and lowslopes, generally less than 30%. Soils are loamy and moderately deep on a variety of soil parent materials.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: A high diversity of native grasses and forbs dominate this herbaceous grassland association. Overall herbaceous cover ranges from 30-90% with heights less than 0.5 m. *Festuca campestris* with 1-75% (17% average) cover and *Festuca idahoensis* with 0-30% (5% average) cover are the diagnostic grasses and dominate the vegetation. *Achillea millefolium*, *Penstemon confertus*, *Lupinus sericeus*, *Fragaria virginiana*, *Galium boreale*, and *Phleum pratense* are common, high-constancy forbs with 1-15% cover. Other high-constancy forbs with 1-5% (1% average) cover include *Potentilla gracilis*, *Cerastium arvense*, *Campanula rotundifolia*, *Agoseris glauca*, *Taraxacum officinale*, and *Lomatium triternatum*. *Koeleria macrantha*, *Poa pratensis*, *Geranium viscosissimum*, *Dodecatheon conjugens*, *Eriogonum umbellatum*, *Danthonia intermedia*, *Elymus trachycaulus*, *Anemone multifida*, and *Selaginella densa* are also relatively common, present on half of the surveyed areas with 1-2% average cover. The diagnostic forb for this association is *Geranium viscosissimum*, which is often in association with, in varying combinations, *Potentilla gracilis*, *Potentilla glandulosa*, and *Carex petasata* that individually or in the aggregate have >1% cover. Other species infrequently present include *Danthonia parryi*, *Balsamorhiza sagittata*, *Castilleja rhexiifolia*, *Calamagrostis rubescens*, *Geum triflorum*, *Monarda fistulosa*, *Oxytropis sericea*, *Achnatherum richardsonii*, and *Eurybia conspicua* (= *Aster conspicuus*). Shrub cover is low, ranging from 1-5%, although it can reach a high 20% cover, and includes *Amelanchier alnifolia*, *Dasiphora fruticosa* ssp. *floribunda*, and *Arctostaphylos uva-ursi* that each have low cover. Nonvascular cover is variable, ranging from 5-60%.

GLOBAL VEGETATION: This midgrass community is dominated by *Festuca campestris* and *Festuca idahoensis*, but *Festuca campestris* generally has the greater canopy cover and can be more abundant on undisturbed sites. A diverse assemblage of herbaceous species has a combined cover ranging from 30-85%. *Carex obtusata* may be common, especially on more mesic sites. Other graminoids may also be found, including *Danthonia intermedia*, *Koeleria macrantha*, *Phleum pratense*, *Achnatherum nelsonii*, and *Achnatherum occidentale* (= *Stipa occidentalis*). The diagnostic forb for this association is *Geranium viscosissimum*, which is often in association with, in varying combinations, *Potentilla gracilis*, *Potentilla glandulosa*, and *Carex petasata* that individually or in the aggregate have >1% cover. Other forbs may include *Achillea millefolium*, *Galium boreale*, *Selaginella densa*, *Lupinus sericeus*, *Balsamorhiza sagittata*, *Castilleja rhexiifolia*, *Calamagrostis rubescens*, and *Geum triflorum*. Shrubs are typically present, though in low stature and cover, generally <10%. Shrub species that may be present include *Artemisia frigida*, *Artemisia campestris*, *Dasiphora fruticosa* ssp. *floribunda*, *Rosa arkansana*, *Amelanchier alnifolia*, and *Arctostaphylos uva-ursi*. This association is distinguished from the similar *Festuca campestris* - *Festuca idahoensis* Herbaceous Vegetation (CEGL005875) by the characterized presence of *Geranium viscosissimum* and *Potentilla gracilis*, with a greater abundance of *Achnatherum occidentale* (= *Stipa occidentalis*) and *Pseudoroegneria spicata* than generally present in the former.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i>
Herb (field)	Dwarf-shrub	<i>Arctostaphylos uva-ursi</i>
Herb (field)	Forb	<i>Achillea millefolium</i> , <i>Fragaria virginiana</i> , <i>Galium boreale</i> , <i>Lupinus sericeus</i> , <i>Penstemon confertus</i>
Herb (field)	Graminoid	<i>Festuca campestris</i> , <i>Festuca idahoensis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Geranium viscosissimum</i> , <i>Potentilla gracilis</i>
Herb (field)	Graminoid	<i>Festuca campestris</i> , <i>Festuca idahoensis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex petasata*, *Cerastium arvense*, *Festuca campestris*, *Festuca idahoensis*, *Galium boreale*, *Geranium viscosissimum*, *Potentilla glandulosa*, *Potentilla gracilis*

GLOBAL: *Carex petasata*, *Festuca campestris*, *Festuca idahoensis*, *Geranium viscosissimum*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Astragalus bourgovii*, *Calochortus apiculatus*, *Hedysarum sulphurescens*, *Phleum pratense*, *Poa pratensis*, *Taraxacum officinale*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3? (5-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: *Festuca scabrella* (rough fescue) is now generally recognized as a complex, consisting of three separate species (*Festuca campestris*, *Festuca altaica* and *Festuca hallii*) (Aiken and Darbyshire 1990). Kartesz (1999) treats *Festuca scabrella* as *Festuca altaica*, and *Festuca scabrella* var. *major* as *Festuca campestris*. Of the species within the former *Festuca scabrella* complex, *Festuca campestris* is the one most likely to be found with *Festuca idahoensis* at the western edge of the Great Plains (Aiken et al. 1996, Kartesz 1999). Confirmation is required that *Festuca campestris* is the species of fescue that occurs in this vegetation type.

In Flora of the Pacific Northwest (Hitchcock et al. 1977a), *Festuca scabrella* Torr. in Hook includes *Festuca scabrella* var. *major* and *Festuca altaica* ssp. *scabrella*, basically combining both *Festuca altaica* and *Festuca scabrella*, if we follow Kartesz (1999). Lesica (2002) also equates *Festuca campestris* and *Festuca altaica* ssp. *scabrella* to *Festuca scabrella*. Kartesz (1999) equates *Festuca scabrella* var. *major* to *Festuca campestris*, and *Festuca scabrella*, *Festuca altaica* ssp. *scabrella* and *Festuca altaica* var. *scabrella* to *Festuca altaica*. This apparent confusion is cleared up in Festuca of North America by Aiken et al. (1996). Distribution maps clearly show that *Festuca altaica* occurs well north of the U.S.-Canada line, while *Festuca campestris* occurs in Washington, Oregon, Idaho, Montana, south-central and eastern British Columbia, and in southern Alberta (there is no overlap between these two maps). In addition, none of the U.S. floras for this region (Hitchcock and Cronquist 1973, Cronquist et al. 1977, Dorn 1984, Lesica 2002) list *Festuca altaica*. In conclusion, we can assume Mueggler and Stewart's (1980) *Festuca scabrella* (from which this association was originally based) really equals *Festuca scabrella* var. *major*, and, therefore, we can follow Kartesz (1999) and call it *Festuca campestris*. Montana Heritage Ecologist Steve Cooper (pers. comm.) agrees with calling it *Festuca campestris*.

The dominance of *Festuca campestris* with a significant cover of *Festuca idahoensis* defines this type, along with a significant forb component indicative of relatively mesic situations. The absence or low cover of *Danthonia parryi* is also significant. *Danthonia parryi* is commonly a third codominant in the Alberta foothills, forming a *Festuca campestris* - *Festuca idahoensis* - *Danthonia parryi* type, usually associated with deeper soils. *Danthonia parryi* has been noted as occasionally codominant with *Festuca scabrella* in northern Montana, east of the Continental Divide, but Mueggler and Stewart (1980) did not note enough other differences to define a separate type. Additional work is needed, but these likely should be considered two separate communities, given the extensive occurrence of the *Festuca campestris* - *Festuca idahoensis* - *Danthonia parryi* type in Alberta.

Mueggler and Stewart (1980) recognize two phases of the *Festuca campestris* - *Festuca idahoensis* type. The *Geranium viscosissimum* phase is characterized by the presence of *Geranium viscosissimum* and *Potentilla gracilis*, with a greater abundance of *Achnatherum occidentale* (= *Stipa occidentalis*) and *Pseudoroegneria spicata* than generally present in the rest of the type. This phase is now recognized as this association, based on recent data (1999-2002) from Glacier National Park. The *Achnatherum richardsonii* (= *Stipa richardsonii*) phase is found on moist sites. It is similar to the *Geranium viscosissimum* phase, but with conspicuous cover of *Achnatherum richardsonii* and substantial *Carex filifolia* and *Danthonia intermedia*. This phase has also been elevated to an association, *Festuca campestris* - (*Festuca idahoensis*) - *Achnatherum richardsonii* Herbaceous Vegetation (CEGL005869), again from 1999-2002 data from Glacier National Park.

GLOBAL SIMILAR ASSOCIATIONS:

- *Festuca campestris* - (*Festuca idahoensis*) - *Achnatherum richardsonii* Herbaceous Vegetation (CEGL005869)
- *Festuca campestris* - *Festuca idahoensis* Herbaceous Vegetation (CEGL005875)
- *Festuca campestris* - *Pseudoroegneria spicata* Herbaceous Vegetation (CEGL001629)

GLOBAL RELATED CONCEPTS:

- *Festuca scabrella* / *Festuca idahoensis* habitat type, *Geranium viscosissimum* Phase (Mueggler and Stewart 1980) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: INTERNATIONAL PEACE PARK Range: This association is common on the east side of Glacier National Park, along the western boundary of the Blackfeet Reservation, and within Waterton Lakes National Park. It is less common on the west side of Glacier National Park, localized to certain areas within Big Prairie in the North Fork subdistrict.

Known locations on the east side of Glacier National Park are within the Many Glacier subdistrict above and below Poia Lake, on southeast Apikuni Mountain, on Swiftcurrent Ridge, on Cracker Flats, at Windy Creek, and on Lower Henkel Mountain. Within the Saint Mary subdistrict, stands occur on the west portion of Two Dog Flats, on St. Mary Flats, near the 1913 ranger station, near Silver Dollar Beach, and along the eastern Red Eagle Trail. Within the Two Medicine subdistrict, stands occur near the ranger station, on the Oldman Trail, on Spot Mountain, on the south shore of Two Medicine Lake, and on the Firebrand Pass Trail. Within the Belly River subdistrict sampled stands occur on the Belly River Trail and near Cosley Lake campground, in Cut Bank watershed at the Cut Bank Ridge trailhead, on Cut Bank Ridge, on Whitecalf Mountain, and near the old Cut Bank chalet.

On the Blackfeet Reservation, this association has been documented on Looking Glass Hill and on the Cut Bank access road.

In Waterton Lakes National Park, this type occurs within the Waterton River watershed in the Bison Paddock 1 and Oil Basin 2 ecosites, within the Dungarven Creek watershed in the Lakeview 1 ecosite, and within the Blakiston Creek watershed in the Belly River 8 ecosite.

GLOBAL RANGE: This association is documented in Montana, and may occur in Oregon and Washington which have the *Festuca campestris* - *Festuca idahoensis* type, but it is unknown if those occurrences have the *Geranium viscosissimum* forb indicator.

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S3?, OR?, WA?

USFS ECOREGIONS: M332A:CP, M332B:CP, M332C:CC, M333B:CP, M333C:CC, M333D:CP

FEDERAL LANDS: BIA (Blackfeet); NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.19, GLAC.160, GLAC.164, GLAC.171, GLAC.187, GLAC.2621, GRAS-00-001, GRAS-00-003, GRAS-00-004, GRAS-00-010, GRAS-00-012, GRAS-00-015, GRAS-00-020, GRAS-00-023, GRAS-00-036, GRAS-00-048, GRAS-01-003, GRAS-01-004, GRAS-01-005, GRAS-01-007, GRAS-01-009, GRAS-01-010, GRAS-01-011, GRAS-01-014, GRAS-01-015, GRAS-01-016, GRAS-01-021, GRAS-01-023, GRAS-01-028, GRAS-01-034, GRAS-01-037, GRAS-01-044, GRAS-01-046, GRAS-01-047, GRAS-01-048, GRAS-99-001, GRAS-99-008, GRAS-99-002, GRAS-99-005, GRAS-99-010, GRAS-99-013, GRAS-99-018, GRAS-99-019, GRAS-99-020, GRAS-99-021, GRAS-99-024, GRAS-99-029, GRAS-99-030, GRAS-99-031, GRAS-99-032, GRAS-99-033, GRAS-99-035, GRAS-99-038, GRAS-99-039, GRAS-99-044, GRAS-99-046, GRAS-99-049, GRAS-99-052, GRAS-99-055, WATE.4018, WATE.4038, WATE.5065, WATE.5140.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Aiken and Darbyshire 1990, Aiken et al. 1996, Cooper pers. comm., Cronquist et al. 1977, Dorn 1984, Hitchcock and Cronquist 1973, Hitchcock et al. 1977a, Kartesz 1999, Lesica 2002, Mueggler and Stewart 1980, Western Ecology Working Group n.d.

Festuca idahoensis - *Achnatherum richardsonii* Herbaceous Vegetation IDAHO FESCUE - RICHARDSON'S NEEDLEGRASS HERBACEOUS VEGETATION

IDENTIFIER: CEGL001625

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d.)

Alliance *Festuca idahoensis* Herbaceous Alliance (A.1251)
 Alliance (English name) Idaho Fescue Herbaceous Alliance
 Association *Festuca idahoensis* - *Achnatherum richardsonii* Herbaceous Vegetation
 Association (English name) Idaho Fescue - Richardson's Needlegrass Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040)

ELEMENT CONCEPT

GLOBAL SUMMARY: This montane grassland association occurs in scattered locations in the mountains of southwestern Montana and northern Wyoming on both sides of the Continental Divide. Stands are found infrequently on relatively mesic, gentle terrain with deep soils. Elevation ranges from 1100-2100 m. This association has a dense and diverse herbaceous layer dominated by medium-tall perennial graminoids with perennial forbs. Dominant graminoids are *Achnatherum richardsonii* (= *Stipa richardsonii*), *Festuca idahoensis*, *Achnatherum occidentale* (= *Stipa occidentalis*), and *Danthonia intermedia*. Perennial forbs are abundant and diverse. Consistent forbs are *Geranium viscosissimum*, *Achillea millefolium*, and *Heterotheca villosa*. Scattered *Rosa arkansana* shrubs are often present. The dominance of *Stipa* spp. and the lack of *Pseudoroegneria spicata*, *Pascopyrum smithii*, or *Elymus caninus* as a codominant species make this association distinct.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: The lone IPP exemplar of this association is found on a foothill at 1525 m (5000 feet) elevation on a moderately steep southeast-facing slope mantled with glacial drift.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The shrub component has less than 5% cover, with *Amelanchier alnifolia* comprising most of the cover. The graminoid component of this stand corresponds fairly well with the vegetation description of the Mueggler and Stewart (1980) habitat type of the same name, with *Achnatherum richardsonii* dominant (40% cover), *Festuca idahoensis*, *Achnatherum nelsonii ssp. dorei*, and *Danthonia intermedia* the next most abundant (combined cover 15-20%, in that order), and *Pseudoroegneria spicata* being absent. The forb component is dominated by *Balsamorhiza sagittata* (30%); the mesic nature is reflected by the considerable presence of *Geranium richardsonii* and *Potentilla glandulosa*.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Achnatherum richardsonii</i> , <i>Festuca idahoensis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Achnatherum richardsonii*, *Festuca idahoensis*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3 (21-Dec-1999). This grassland association occurs in scattered locations in the mountains of southwestern Montana and in Yellowstone National Park in northwestern Wyoming. Stands are local and infrequent because they are restricted to relatively uncommon topography and edaphic conditions, occurring on relatively mesic, gentle terrain with deep soils. The major threat is overgrazing by livestock because it can degrade the condition of these grasslands. More survey work is needed to determine the extent and condition of this association.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

- *Festuca idahoensis*-*Stipa richardsonii* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:V.B.4.b. (Driscoll et al. 1984) B

OTHER COMMENTS

OTHER COMMENTS: The presence of this community is not unexpected in this area. What is unexpected is the fact that *Festuca campestris* is absent; in other words, why is this not a *Festuca campestris* - *Achnatherum richardsonii* community (*Achnatherum richardsonii* being at least as requiring of mesic conditions as *Festuca campestris*). Being immediately adjacent to the Blackfeet Indian Reservation and an NPS campground, it is easy to envision livestock trespass; such trespass would strongly disproportionately impact the *Festuca campestris*, which is extremely susceptible to over-grazing.

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: Documented only from the eastside of Glacier National Park, this community could well occur within Waterton Lakes National Park and the westside of Glacier National Park based on species ranges and potential habitats.

GLOBAL RANGE: This association occurs in the mountains of southwestern Montana and Yellowstone National Park in northwestern Wyoming on both sides of the Continental Divide.

NATIONS: CA?, US

STATES/PROVINCES: AB?, MT:S3, WY:S2?

USFS ECOREGIONS: M331A:CC, M332B:CC, M332D:CC, M332E:CC

FEDERAL LANDS: NPS (Glacier, Yellowstone); PC (Waterton Lakes?)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.1107.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, MTNHP 2002b, Mueggler and Stewart 1980, Western Ecology Working Group n.d.

***Festuca idahoensis* - *Carex filifolia* Herbaceous Vegetation** **IDAHO FESCUE - THREADLEAF SEDGE HERBACEOUS VEGETATION**

IDENTIFIER: CEGLO01898

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d.)
Alliance	<i>Festuca idahoensis</i> Herbaceous Alliance (A.1251)
Alliance (English name)	Idaho Fescue Herbaceous Alliance
Association	<i>Festuca idahoensis</i> - <i>Carex filifolia</i> Herbaceous Vegetation
Association (English name)	Idaho Fescue - Threadleaf Sedge Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040)
Northern Rocky Mountain Subalpine-Upper Montane Grassland (CES306.806)

ELEMENT CONCEPT

GLOBAL SUMMARY: This montane grassland association occurs in the mountains of western Montana and north-central Wyoming. Stands are found infrequently on gentle terrain (5-20% slope) in or near mountain saddles or on alluvial fans. Elevation ranges from 1280-2800 m (4200-9200 feet). Soils are rapidly drained and have coarse textures. The vegetation has a dense and diverse herbaceous layer codominated by medium-tall perennial graminoids and perennial forbs. The dominant species are *Festuca idahoensis*, *Carex filifolia*, *Danthonia intermedia*, *Geum triflorum*, *Gentiana affinis*, *Antennaria rosea*, and *Achillea millefolium*. The lack of *Pseudoroegneria spicata*, *Pascopyrum smithii*, or *Elymus caninus* as a codominant species makes this association distinct.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs on gentle midslopes along fluvial fans at elevations near 1280 m (4200 feet) on south-facing slopes. Soils are rapidly drained Orthic Regosols. These are weakly developed, slightly acidic to moderately alkaline, coarse-textured soils that are formed by post-glacial fluvial deposits that are high in gravel content. Coarse fragments consist of red and green argillites, sandstone, and limestone. Bedrock geology is exclusively Mesozoic sediments. Litter, small rock, and bare soil cover most of the ground surface.

GLOBAL ENVIRONMENT: This association occur on rolling gentle topography (5-20% slopes) in or near mountain saddles or fluvial fans from 1280-2800 m (4200-9200 feet) elevation. Soils are rapidly drained with coarse textures. Stands tend to have a high litter content. No environmental description is available from the Wyoming stands.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This herbaceous, montane, subxeric association is moderately high in species diversity and dominated by several grasses and forbs. Herbaceous cover is 85% with heights less than 0.5 m. Species with cover ranging from 10-20% include *Selaginella densa*, *Festuca idahoensis*, *Koeleria macrantha*, *Lupinus sericeus*, *Antennaria parvifolia*, *Cerastium arvense*, and *Erigeron caespitosus*. Other common sedges and forbs include *Carex filifolia*, *Achillea millefolium*, *Artemisia frigida*, *Campanula rotundifolia*, *Heterotheca villosa*, *Musineon divaricatum*, and *Oxytropis sericea*. Low cover of the shrub *Dasiphora fruticosa* ssp. *floribunda* may be present. Nonvascular cover is 20% and is dominated by the moss *Tortula ruralis*.

GLOBAL VEGETATION: This herbaceous, montane, subxeric association is moderately high in species diversity and dominated by several grasses and forbs. The absence of a dominant *Elymus* or *Pseudoroegneria* (= *Agropyron*) species and the constant presence and high abundance of *Carex filifolia*, *Danthonia intermedia*, *Lupinus sericeus*, *Geum triflorum*, and *Gentiana affinis* with *Festuca idahoensis* delineate this type. Other common forbs include *Selaginella densa*, *Antennaria parvifolia*, *Cerastium arvense*, *Erigeron caespitosus*, *Achillea millefolium*, *Artemisia frigida*, *Campanula rotundifolia*, *Heterotheca villosa*, *Musineon divaricatum*, and *Oxytropis sericea*. Shrubs are typically absent, but *Dasiphora fruticosa* ssp. *floribunda* was observed in one stand.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Antennaria parvifolia</i> , <i>Cerastium arvense</i> , <i>Erigeron caespitosus</i> , <i>Lupinus sericeus</i>
Herb (field)	Graminoid	<i>Festuca idahoensis</i> , <i>Koeleria macrantha</i>
Herb (field)	Fern or fern ally	<i>Selaginella densa</i>
Nonvascular	Moss	<i>Tortula ruralis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Geum triflorum</i> , <i>Lupinus sericeus</i>
Herb (field)	Graminoid	<i>Carex filifolia</i> , <i>Danthonia intermedia</i> , <i>Festuca idahoensis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Antennaria parvifolia*, *Carex filifolia*, *Cerastium arvense*, *Erigeron caespitosus*, *Festuca idahoensis*, *Koeleria macrantha*, *Lupinus sericeus*, *Selaginella densa*

GLOBAL: *Festuca idahoensis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3 (21-Dec-1999). This association is known from three mountain ranges in Montana and one in Wyoming. Stands are found in and near mountain saddles between 2400-2800 m elevation, and are infrequent because they are restricted to this relatively uncommon topography. Overgrazing by livestock can degrade these grasslands and is the major threat. Current extent and condition of these grasslands is unknown, but there are at least 6 stands sampled and over 100 occurrences estimated.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This association was identified for the IPP based on its considerable similarity to an association described by Mueggler and Stewart (1980) for greater western Montana.

GLOBAL COMMENTS: This association should be compared to and possibly merged with *Festuca idahoensis* - *Carex inops* ssp. *heliophila* Herbaceous Vegetation (CEGL001610).

Somewhat similar communities of *Festuca idahoensis* / *Lupinus sericeus* (Hurd 1961) and *Festuca idahoensis* community (Despain 1973) both have significant *Carex obtusata* but no mention of *Carex filifolia*.

GLOBAL SIMILAR ASSOCIATIONS:

- *Festuca idahoensis* - *Carex inops* ssp. *heliophila* Herbaceous Vegetation (CEGL001610)
- *Festuca idahoensis* - *Danthonia intermedia* Herbaceous Vegetation (CEGL001612)
- *Festuca idahoensis* - *Pseudoroegneria spicata* Herbaceous Vegetation (CEGL001624)

GLOBAL RELATED CONCEPTS:

- *Festuca idahoensis*-*Carex filifolia* (Bourgeron and Engelking 1994) =
- *Festuca idahoensis*/*Carex filifolia* Habitat Type (Mueggler and Stewart 1980) =
- DRISCOLL FORMATION CODE:V.C.6.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon in Waterton Lakes National Park in Blakiston ecoregions within the Waterton River watershed. These ecoregions occur on rapidly to moderately well-drained fluvial landforms in the northeastern and east-central portions of the park, including Oil Basin, lower Blakiston Creek, and areas adjacent to the Lower and Middle Waterton Lakes.

GLOBAL RANGE: These montane grasslands have been found in Waterton Lakes National Park, Alberta, in the Bull Mountains, Pioneer Mountains and Gravelly Range in southwestern Montana, and in the Bighorn Mountains in north-central Wyoming.

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S3, WY:S3

USFS ECOREGIONS: M331A:CC, M332B:CC, M332C:C?, M332E:CC

FEDERAL LANDS: PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.5134.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz, mod. G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Despain 1973a, Driscoll et al. 1984, Hansen et al. 1988b, Hurd 1961, MTNHP 2002b, Mueggler and Stewart 1980, Western Ecology Working Group n.d.

***Festuca idahoensis* - *Elymus trachycaulus* Herbaceous Vegetation**
IDAHO FESCUE - SLENDER WILD RYE HERBACEOUS VEGETATION

IDAHO FESCUE - SLENDER WILD RYE MIXEDGRASS PRAIRIE

IDENTIFIER: CEGL001614

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d.)
Alliance	<i>Festuca idahoensis</i> Herbaceous Alliance (A.1251)
Alliance (English name)	Idaho Fescue Herbaceous Alliance
Association	<i>Festuca idahoensis</i> - <i>Elymus trachycaulus</i> Herbaceous Vegetation
Association (English name)	Idaho Fescue - Slender Wild Rye Herbaceous Vegetation
Association (Common name)	Idaho Fescue - Slender Wild Rye Mixedgrass Prairie

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Subalpine-Upper Montane Grassland (CES306.806)

ELEMENT CONCEPT

GLOBAL SUMMARY: This grassland occurs in Montana, Wyoming and Colorado on relatively high mountain slopes and alluvial terraces of gentle terrain (4-12%) from 1100- 3322 m (3600-10,900 feet). It occurs in mesic habitats with 45-79 cm (18-31 inches) annual average precipitation. Soils are deep, well-drained loams with a variety of parent materials. Ground cover has 4-13% bare ground, as much as 40% litter, and some nonvascular cover. This is a mesic grassland with low stature (<0.5 m), high species diversity, and a high proportion of forb cover (30-70% cover), more than other western Montana grassland types. *Elymus trachycaulus* (= *Agropyron caninum*) and *Festuca idahoensis* are consistently present, and both are dominant grasses within stands. Other important graminoids include *Carex* spp., *Koeleria macrantha*, *Danthonia intermedia*, *Achnatherum occidentale* (= *Stipa occidentalis*), *Achnatherum lettermanii*, *Melica spectabilis*, *Bromus ciliatus* (= *Bromus canadensis*), and *Poa fendleriana*. Usually abundant forbs include *Geum triflorum*, *Potentilla gracilis*, *Achillea millefolium*, *Geranium viscosissimum*, *Agoseris glauca*, and *Campanula rotundifolia*.

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs on flat alluvial benches within basins at elevations between 1100 and 1370 m (3600-4500 feet). Soils are well-drained sandy loams derived from glacial-fluvial deposits. Soils tend to be light brown with rounded argillite gravel. Litter comprises 40% of the ground surface, although moss, lichen, and *Selaginella* spp. are also common.

GLOBAL ENVIRONMENT: This grassland association occurs in Montana, Wyoming and Colorado on relatively high mountain slopes and alluvial terraces of gentle terrain (4-12%) from 1100- 3322 m (3600-10,900 feet). It occurs in mesic habitats with 45-79 cm (18-31 inches) annual average precipitation. Soils are deep, well-drained loams with a variety of parent materials. Ground cover has 4-13% bare ground, as much as 40% litter, and some nonvascular cover.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This montane, mesic herbaceous association typically has lower species diversity than many other grassland associations. Herbaceous cover ranges from 60-90% with heights less than 0.5 m. Consistently dominant species are *Festuca idahoensis* with 20-40% cover, *Danthonia intermedia* with 3-5% cover, and *Achnatherum nelsonii* with 1% cover. *Antennaria rosea* may be dominant in some grasslands with 20% average cover. *Elymus trachycaulus*, *Bromus marginatus*, *Pseudoroegneria spicata*, and *Potentilla gracilis* may also be conspicuous with 3-5% cover. Other herbaceous species that may be present include *Eriogonum umbellatum*, *Geum triflorum*, *Heterotheca villosa*, *Koeleria macrantha*, *Lithospermum ruderales*, *Penstemon confertus*, *Lupinus sericeus*, *Selaginella densa*, and the exotic grass *Phleum pratense*. Some areas may have shrub cover averaging 10%. *Symphoricarpos albus*, *Rosa woodsii*, and *Rosa acicularis* each averaged 3-5% cover in one area with heights between 0.5-2 m. Nonvascular cover is 10%.

GLOBAL VEGETATION: This grassland has low stature (<0.5 m), high species diversity, and a high proportion of forb cover (30-70% cover), more than other western Montana grassland types. *Elymus trachycaulus* (= *Agropyron caninum*) and *Festuca idahoensis* are consistently present, and both are dominant grasses within stands. Other important graminoids include *Carex* spp., *Koeleria macrantha* (= *Koeleria cristata*), *Danthonia intermedia*, *Achnatherum occidentale* (= *Stipa occidentalis*), *Achnatherum lettermanii*, *Melica spectabilis*, *Bromus ciliatus* (= *Bromus canadensis*), and *Poa fendleriana*. Usually abundant forbs include *Geum triflorum*, *Potentilla gracilis*, *Achillea millefolium*, and *Campanula rotundifolia*.

MOST ABUNDANT SPECIES**WATERTON-GLACIER INTERNATIONAL PEACE PARK**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Antennaria rosea</i>

Herb (field) Graminoid *Danthonia intermedia, Elymus trachycaulus, Festuca idahoensis*

Global

Stratum

Herb (field)

Herb (field)

Lifeform

Forb

Graminoid

Species

Geum triflorum, Potentilla gracilis

Danthonia intermedia, Elymus trachycaulus, Festuca idahoensis

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Danthonia intermedia, Elymus trachycaulus, Festuca idahoensis*

GLOBAL: *Festuca idahoensis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Phleum pratense*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This association has been well-documented and described from western Montana by Mueggler and Stewart (1980); the graminoid component closely matches the type portrayed by these authors, but the forb component differs (is more species-poor) and lacks the critical indicator species *Geranium viscosissimum* and *Potentilla gracilis*.

GLOBAL COMMENTS: Major species shifts due to past and current abusive grazing practices make correct identification of *Festuca*-dominated grassland associations problematic.

GLOBAL SIMILAR ASSOCIATIONS:

- *Festuca idahoensis* - *Carex obtusata* Herbaceous Vegetation (CEGL001611)
- *Festuca idahoensis* - *Danthonia intermedia* Herbaceous Vegetation (CEGL001612)
- *Festuca idahoensis* - *Geranium viscosissimum* Herbaceous Vegetation (CEGL001618)
- *Festuca idahoensis* - *Koeleria macrantha* Herbaceous Vegetation (CEGL001620)
- *Festuca idahoensis* - *Pseudoroegneria spicata* Herbaceous Vegetation (CEGL001624)
- *Festuca roemerii* - *Delphinium glareosum* Herbaceous Vegetation (CEGL001613)

GLOBAL RELATED CONCEPTS:

- *Bromopsis inermis*-*Koeleria macrantha* habitat type (Komarkova 1986) F
- *Elymus trachycaulus*-*Koeleria macrantha* habitat type (Komarkova 1986) F
- *Festuca idahoensis* - *Poa fendleriana* habitat type (Komarkova 1986) F
- *Festuca idahoensis*-*Elymus trachycaulus* (Bourgeron and Engelking 1994) =
- *Festuca idahoensis*/*Agropyron caninum* Habitat Type (Mueggler and Stewart 1980) =
- *Festuca idahoensis*/*Agropyron trachycaulum* Habitat Type (Hess and Wasser 1982) =
- DRISCOLL FORMATION CODE:V.B.4.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association occurs on both the east and west sides of the Continental Divide in Glacier National Park but is uncommon. It has been specifically documented northwest of Big Prairie in the North Fork subdistrict on low-elevation, well-drained alluvial benches along the North Fork of the Flathead River and north of St. Mary Lake shore in the St. Mary subdistrict.

GLOBAL RANGE: This grassland is documented from the high mountains of southwestern and northwestern Montana, northern and central Wyoming, and western slopes of Colorado.

NATIONS: US

STATES/PROVINCES: CO:S1, MT:S3S4, WY:S3

USFS ECOREGIONS: M331A:CC, M332D:CC, M332E:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); USFS (Shoshone)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2087, AAGL.1160.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Driscoll et al. 1984, Hess and Wasser 1982, Johnston 1987, Jones and Ogle 2000, Komarkova 1986, MTNHP 2002b, Mueggler and Stewart 1980, Western Ecology Working Group n.d.

***Festuca idahoensis* - *Pseudoroegneria spicata* Herbaceous Vegetation**
IDAHO FESCUE - BLUEBUNCH WHEATGRASS HERBACEOUS VEGETATION**IDAHO FESCUE - BLUEBUNCH WHEATGRASS MIXEDGRASS PRAIRIE****IDENTIFIER: CEG001624****NVC Classification**

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d.)
Alliance	<i>Festuca idahoensis</i> Herbaceous Alliance (A.1251)
Alliance (English name)	Idaho Fescue Herbaceous Alliance
Association	<i>Festuca idahoensis</i> - <i>Pseudoroegneria spicata</i> Herbaceous Vegetation
Association (English name)	Idaho Fescue - Bluebunch Wheatgrass Herbaceous Vegetation
Association (Common name)	Idaho Fescue - Bluebunch Wheatgrass Mixedgrass Prairie

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040)
Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824)

ELEMENT CONCEPT

GLOBAL SUMMARY: This mid-grassland is abundant in western Montana, southern Idaho and eastern Washington near the Snake River. It also occurs in northeastern California. It occurs at 900 to 2300 m (2950-7500 feet) elevation, on mostly gently rolling to flat topography, but can be found on relatively steep slopes as well. It tends to occur more on northerly exposures at the lower elevations and on southerly exposures at the higher elevations. The vegetation is characterized by the presence and dominance of *Festuca idahoensis* and *Pseudoroegneria spicata* (= *Agropyron spicata*) and usually *Poa secunda* (= *Poa sandbergii*). Cover ranges from 5-60% for each species, and their combined cover is usually much greater than any forb component present. Commonly associated graminoid species include *Carex filifolia*, *Danthonia intermedia*, *Leymus cinereus* (= *Elymus cinereus*), *Poa cusickii*, *Koeleria macrantha*, *Hesperostipa comata* and *Achnatherum occidentale* (= *Stipa occidentalis*). Forb species composition varies, depending on aspect and geographic distribution. Total forb cover ranges from 3 to 33%. Common forb species include *Achillea millefolium*, *Antennaria rosea*, *Lupinus sericeus*, *Arenaria congesta*, *Lithophragma glabrum* (= *Lithophragma bulbiferum*), and *Phlox hoodii*. Scattered low-stature shrubs may be present and include *Chrysothamnus viscidiflorus*, *Ericameria nauseosa*, and *Artemisia tridentata*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs at elevations between 1350 and 1900 m (3500-4700 feet) on mostly flat to sometimes steep toeslopes, low slopes, and midslopes at various aspects. Soils range from loamy sand to silt or sandy loam that are moderately well-drained to rapidly drained. These soils have also been classified as Orthic Humic Regosols and Black Chernozems that generally occur on fluvial fans, alluvial terraces, or colluvial landforms. These soils are course-textured and often have deep topsoil layers with only weak to moderate B horizons. Litter often comprises 40% or more of the ground surface, however, moss, small rock, and bare soil are also common.

GLOBAL ENVIRONMENT: This grassland is known from 900 to 2300 m (2950-7500 feet) elevation, on mostly gently rolling to flat topography, but can be found on relatively steep slopes as well. It tends to occur more on northerly exposures at the lower elevations and on southerly exposures at the higher elevations. Soils are primarily Mollisols, deep and dark-colored, with varying degrees of calcium carbonate buildup. pH runs from slightly acidic (6.0) to neutral or alkaline.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Herbaceous species are diverse with overall cover ranging from 60-95% and heights less than 0.5 m. *Festuca idahoensis*, ranging from 5-25% cover, and *Pseudoroegneria spicata*, ranging from 10-30% cover, dominate this montane to lower subalpine, mesic to subxeric herbaceous association. Other high-constancy forbs and grasses that generally range in cover from 1-15% include *Achillea millefolium*, *Koeleria macrantha*, *Gaillardia aristata*, *Antennaria rosea*, *Selaginella densa*, *Eriogonum flavum*, *Lupinus sericeus*, *Galium boreale*, and *Agoseris glauca*. Lower constancy herbaceous species that may have high cover in certain areas include *Hedysarum sulphurescens*, *Sedum lanceolatum*, *Danthonia californica*, *Monarda fistulosa*, *Nassella viridula*, *Bromus inermis*, *Fragaria virginiana*, *Geranium viscosissimum*, and *Oxytropis splendens*. Shrubs are sometimes present within this association with cover averaging less than 5%. *Juniperus communis*, *Dasiphora fruticosa* ssp. *floribunda*, and *Spiraea betulifolia* are the most common shrubs. Nonvascular cover ranges from 5-30%.

GLOBAL VEGETATION: This grassland is characterized by the presence and dominance of *Festuca idahoensis* and *Pseudoroegneria spicata* (= *Agropyron spicata*) and usually *Poa secunda* (= *Poa sandbergii*). Cover ranges from 5-60% for each species, and their combined cover is usually much greater than any forb component present. Commonly associated graminoid species include *Carex filifolia*, *Danthonia intermedia*, *Leymus cinereus* (= *Elymus cinereus*), *Poa cusickii*, *Koeleria macrantha* (= *Koeleria cristata*), *Hesperostipa comata* (= *Stipa comata*), and *Achnatherum occidentale* (= *Stipa occidentalis*) (some stands in southwestern Montana with significantly abundant *Stipa occidentalis* are considered a *Stipa occidentalis* phase of the *Festuca idahoensis* - *Pseudoroegneria spicata* type by Mueggler and Stewart (1980)). Forb species composition varies, depending on aspect and geographic distribution. Total forb cover ranges from 3 to 33% (average in eastern Washington is 14%). Common forb species include *Achillea millefolium*, *Antennaria rosea*, *Lupinus sericeus*, *Arenaria congesta*, *Lithophragma glabrum* (= *Lithophragma bulbiferum*), and *Phlox hoodii*. Scattered low-stature shrubs may be present and include *Chrysothamnus viscidiflorus*, *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), and *Artemisia tridentata*. Invasive, non-native species will be present and even abundant in heavily disturbed stands; these include *Centaurea biebersteinii* (= *Centaurea maculosa*), *Cirsium vulgare*, *Taraxacum officinale*, *Tragopogon dubius*, *Descurainia pinnata*, *Lactuca serriola*, *Bromus tectorum*, and *Draba verna*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Antennaria rosea</i> , <i>Eriogonum flavum</i> , <i>Galium boreale</i> , <i>Lupinus sericeus</i>
Herb (field)	Graminoid	<i>Festuca idahoensis</i> , <i>Koeleria macrantha</i> , <i>Pseudoroegneria spicata</i>
Herb (field)	Fern or fern ally	<i>Selaginella densa</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Achillea millefolium</i> , <i>Lupinus sericeus</i>
Herb (field)	Graminoid	<i>Festuca idahoensis</i> , <i>Poa secunda</i> , <i>Pseudoroegneria spicata</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Festuca idahoensis*, *Gaillardia aristata*, *Pseudoroegneria spicata*

GLOBAL: *Festuca idahoensis*, *Pseudoroegneria spicata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Bromus inermis*, *Calochortus apiculatus*, *Hedysarum sulphurescens*, *Linaria vulgaris*, *Senecio megacephalus*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This is an especially common mountain grassland type in southwestern Montana (Mueggler and Stewart 1980), less so in greater western Montana. In IPP this type is relatively uncommon because the prevailing climate is sufficiently moist that *Festuca campestris* supplants *Festuca idahoensis* as both an indicator and dominant species.

GLOBAL COMMENTS: Several authors (Daubenmire 1970, Mueggler and Stewart 1980, Tisdale 1986) note that the forb component is the most variable between studies in different geographic regions in these *Festuca idahoensis*, *Pseudoroegneria spicata*, and *Poa secunda*-dominated grasslands. From a rangewide perspective, and in comparing these grasslands to others with different graminoid dominants and codominants, the *Festuca idahoensis* - *Pseudoroegneria spicata* types described from eastern Washington, Idaho and Montana are more similar than different.

GLOBAL SIMILAR ASSOCIATIONS:

- *Festuca idahoensis* - *Carex filifolia* Herbaceous Vegetation (CEGL001898)
- *Festuca idahoensis* - *Elymus trachycaulus* Herbaceous Vegetation (CEGL001614)

GLOBAL RELATED CONCEPTS:

- *Agropyron spicatum* Vegetation Type (Achuff et al. 2002a) I
- *Festuca idahoensis* / *Agropyron spicatum* Habitat Type (Tisdale 1979) =
- *Festuca idahoensis* / *Agropyron spicatum* Habitat Type (Tisdale 1986) =
- *Festuca idahoensis* / *Agropyron spicatum* Habitat Type (Mueggler and Stewart 1980) =
- *Festuca idahoensis* / *Agropyron spicatum* Habitat Type, *Stipa occidentalis* Phase (Mueggler and Stewart 1980) F
- *Festuca idahoensis*-*Pseudoroegneria spicata* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:V.B.4.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon in Waterton Lakes National Park and on the east and west sides of Glacier National Park. It is also present on the Blackfeet Reservation. Specifically, this association can be found in Fisher Cemetery on the Blackfeet Reservation and on low-elevation, fluvial landforms in and north of Big Prairie in the North Fork subdistrict of Glacier National Park. This association is present in Waterton Lakes National Park in the Blakiston 2 ecosite within the Waterton River watershed and the Rowe 4 ecosite within the BAU watershed.

GLOBAL RANGE: This grassland is known from eastern Washington, southern Idaho, western Montana, Wyoming, and southern Alberta. It is likely to occur in northeastern California on the Modoc Plateau.

NATIONS: CA, US

STATES/PROVINCES: AB, CA, ID:S3, MT:S4, WA:S2, WY:S3

USFS ECOREGIONS: M331A:CC, M331J:CC, M332A:CC, M332C:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333C:CC, M333D:CC

FEDERAL LANDS: BIA (Blackfeet); NPS (Glacier); PC (Waterton Lakes); USFS (Bighorn, Kootenai, Medicine Bow, Shoshone)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.178, GLAC.2248, GLAC.2630, WATE.4082, WATE.5056.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Achuff et al. 2002a, Bourgeron and Engelking 1994, Cooper 2003, Daubenmire 1970, Driscoll et al. 1984, Jones and Ogle 2000, MTNHP 2002b, Mueggler and Stewart 1980, Tisdale 1979, Tisdale 1986, Western Ecology Working Group n.d.

***Poa pratensis* Semi-natural Herbaceous Alliance**

***Phleum pratense* - *Poa pratensis* - *Bromus inermis* Semi-natural Herbaceous Vegetation
TIMOTHY - KENTUCKY BLUEGRASS - SMOOTH BROME SEMI-NATURAL HERBACEOUS
VEGETATION**

IDENTIFIER: CEGL005874

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)

Formation	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d.)
Alliance	<i>Poa pratensis</i> Semi-natural Herbaceous Alliance (A.3562)
Alliance (English name)	Kentucky Bluegrass Semi-natural Herbaceous Alliance
Association	<i>Phleum pratense</i> - <i>Poa pratensis</i> - <i>Bromus inermis</i> Semi-natural Herbaceous Vegetation
Association (English name)	Timothy - Kentucky Bluegrass - Smooth Brome Semi-natural Herbaceous Vegetation
ECOLOGICAL SYSTEM(S):	Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is a very common type of disturbed grassland and forest opening on the east side of Glacier National Park, within Waterton Lakes National Park, in the major valleys of Grand Teton National Park and on the Blackfoot Reservation. It is a mesic to dry association located mostly on flat to gentle toeslopes, lowslopes and valley bottoms at variable aspects, and can occur on moderately steep midslopes and on flat basin floors. Elevations range from 945 to 2250 m (3100-7300 feet). Soil texture is typically moderately well- to well-drained sandy loams, silt loams, poorly drained clay loams or sandy clay loams. These soils are also characterized as Orthic and Rego Black Chernozems and Orthic Humic Regosols within Waterton Lakes National Park. These are weakly to well-developed, medium- to coarse-textured soils that have developed on glacio-fluvial and morainal landforms that contain quartzite and argillite. Litter comprises 40-95% of the ground cover. The vegetation, dominated by both non-native grasses and native forbs, is a result of historic and current disturbance. Disturbance includes seeding of pasture grasses, light to intense grazing, and development of out buildings, corrals and housing. Typical herbaceous cover is 40-60%; however, cover can be as low as 20% or as high as 100%. *Phleum pratense* and *Poa pratensis*, both non-native grasses, dominate the vegetation, and *Bromus inermis* is occasionally abundant. Other common species include native forbs *Achillea millefolium*, *Potentilla gracilis*, *Galium boreale*, *Fragaria virginiana*, *Geranium viscosissimum*, *Perideridia gairdneri*, *Potentilla gracilis*, *Symphyotrichum laeve* (= *Aster laevis*), and the exotic forb *Taraxacum officinale*. *Campanula rotundifolia*, *Cerastium arvense*, *Penstemon confertus*, *Lomatium triternatum*, and *Vicia americana* are often present. *Koeleria macrantha*, *Festuca campestris*, and *Festuca idahoensis* may be abundant within this association as well and may indicate this type's original composition in upland sites. Other herbaceous species that may have high cover include *Lupinus sericeus*, *Bromus carinatus*, *Lithospermum ruderales*, *Erigeron speciosus*, *Solidago missouriensis*, *Elymus repens*, *Monarda fistulosa*, *Cirsium arvense*, *Eurybia conspicua* (= *Aster conspicuus*), *Pseudoroegneria spicata*, *Hedysarum sulphurescens*, and *Hedysarum alpinum*. Shrub cover is low within this association, typically averaging <5%, but it can be as high as 15%. The most common shrubs, when they are present, include *Amelanchier alnifolia*, *Rosa woodsii*, and *Dasiphora fruticosa* ssp. *floribunda*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This mesic to dry association is located mostly on flat to gentle toeslopes and lowslopes at variable aspects, and can occur on moderately steep midslopes and on flat basin floors. Elevations range from 1280 to 1680 m (4200-5520 feet) east of the Continental Divide and 945 to 1100 m (3100-3620 feet) west of the Continental Divide. Soil texture is typically moderately well- to well-drained sandy loam, silt loams, poorly drained clay loams or sandy clay loams. These soils are also characterized as Orthic and Rego Black Chernozems and Orthic Humic Regosols within Waterton Lakes National Park. These are weakly to well-developed, medium- to coarse-textured soils that have developed on glaciofluvial and morainal landforms that contain quartzite and argillite. Litter comprises 40-95% of the ground cover.

GLOBAL ENVIRONMENT: This semi-natural meadow association occurs on valley floors and gentle slopes with a 2-29% gradient. Elevations range from 945 to 2225 m (3100-7300 feet). Sites may be flooded for short periods during the early part of the growing season, usually as part of an irrigation regime. Soils are variable in texture and develop from a range of substrates, including glacial till, lake and stream deposits.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This herbaceous association that is dominated by both non-native grasses and native forbs is a result of historic and current disturbance. Disturbance includes light to intense grazing and development of out buildings, corrals and other park housing. Typical herbaceous cover is 40-60%, however, cover can be as low as 20% or as high as 100%. *Phleum pratense* and *Poa pratensis*, both non-native grasses, dominate the vegetation with 1-80% (19% average) cover and 0-80% (9% average) cover, respectively. Other common species include native forbs *Achillea millefolium*, *Potentilla gracilis*, *Galium boreale*, *Fragaria virginiana*, *Geranium viscosissimum*, and *Symphyotrichum laeve* (= *Aster laevis*), and exotic forb *Taraxacum officinale* with 2-25% cover. *Campanula rotundifolia*, *Cerastium arvense*, *Penstemon confertus*, *Lomatium triternatum*, and *Vicia americana* are usually present with 1% cover. *Festuca campestris* (up to 40%) and *Festuca idahoensis* (up to 10%) are common within this association as well, and may indicate this type's original composition. Other herbaceous species that may have high cover include *Lupinus sericeus*, *Bromus carinatus*, *Bromus inermis*, *Lithospermum ruderales*, *Erigeron speciosus*, *Solidago missouriensis*, *Elymus repens*, *Monarda fistulosa*, *Cirsium arvense*, *Eurybia conspicua* (= *Aster conspicuus*), *Pseudoroegneria spicata*, *Hedysarum sulphurescens*, and *Hedysarum alpinum*. Shrub cover is low within this association, typically

averaging <5%, but it can be as high as 15%. The most common shrubs when they are present include *Amelanchier alnifolia*, *Rosa woodsii*, and *Dasiphora fruticosa ssp. floribunda*. Nonvascular cover is also low at 0-5%.

GLOBAL VEGETATION: The vegetation, dominated by both non-native grasses and native forbs, is a result of historic and current disturbance. Disturbance includes seeding of pasture grasses, light to intense grazing, and development of out buildings, corrals and housing. Typical herbaceous cover is 40-60%; however, cover can be as low as 20% or as high as 100%. *Phleum pratense* and *Poa pratensis*, both non-native grasses, dominate the vegetation, and *Bromus inermis* is occasionally abundant. Other common species include native forbs *Achillea millefolium*, *Potentilla gracilis*, *Galium boreale*, *Fragaria virginiana*, *Geranium viscosissimum*, *Symphotrichum laeve* (= *Aster laevis*), *Perideridia gairdneri*, and the exotic forb *Taraxacum officinale*. *Campanula rotundifolia*, *Cerastium arvense*, *Penstemon confertus*, *Potentilla gracilis*, *Lomatium triternatum*, and *Vicia americana* are often present. *Koeleria macrantha*, *Festuca campestris*, and *Festuca idahoensis* are occasionally abundant within this association as well and may indicate this type's original composition in upland sites. Other herbaceous species that may have high cover include *Lupinus sericeus*, *Bromus carinatus*, *Lithospermum ruderales*, *Erigeron speciosus*, *Solidago missouriensis*, *Elymus repens*, *Monarda fistulosa*, *Cirsium arvense*, *Eurybia conspicua* (= *Aster conspicuus*), *Pseudoroegneria spicata*, *Hedysarum sulphurescens*, and *Hedysarum alpinum*. Shrub cover is low within this association, typically averaging <5%, but it can be as high as 15%. The most common shrubs, when they are present, include *Amelanchier alnifolia*, *Artemisia tridentata ssp. vaseyana*, *Rosa woodsii*, and *Dasiphora fruticosa ssp. floribunda*

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Amelanchier alnifolia</i>
Herb (field)	Forb	<i>Achillea millefolium</i> , <i>Fragaria virginiana</i> , <i>Galium boreale</i> , <i>Potentilla gracilis</i> , <i>Symphotrichum laeve</i> , <i>Taraxacum officinale</i>
Herb (field)	Graminoid	<i>Festuca campestris</i> , <i>Phleum pratense</i> , <i>Poa pratensis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Achillea millefolium</i>
Herb (field)	Graminoid	<i>Phleum pratense</i> , <i>Poa pratensis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Achillea millefolium*, *Bromus inermis*, *Campanula rotundifolia*, *Cerastium arvense*, *Galium boreale*, *Geranium viscosissimum*, *Lomatium triternatum*, *Penstemon confertus*, *Phleum pratense*, *Poa pratensis*, *Potentilla gracilis*, *Taraxacum officinale*

GLOBAL: *Achillea millefolium*, *Bromus inermis*, *Phleum pratense*, *Poa pratensis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Centaurea biebersteinii*, *Cirsium arvense*, *Elymus repens*, *Hedysarum sulphurescens*, *Hypericum perforatum*, *Poa compressa*, *Trifolium pratense*, *Trifolium repens*

GLOBAL: *Bromus inermis*, *Centaurea biebersteinii*, *Cirsium arvense*, *Elymus repens*, *Hedysarum sulphurescens*, *Hypericum perforatum*, *Linaria vulgaris*, *Medicago sativa*, *Phleum pratense*, *Poa compressa*, *Poa pratensis*, *Taraxacum laevigatum*, *Taraxacum officinale*, *Tragopogon dubius*, *Trifolium hybridum*, *Trifolium pratense*, *Trifolium repens*

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: GNA (invasive) (9-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This type is defined by having non-native perennial grasses constituting $\geq 25\%$ of the total graminoid cover. It is considered that these non-native species have permanently altered the ecosystem functioning of the original native fescue grasslands and, hence, are unlikely to ever be restorable to their original species composition and ecological functioning.

GLOBAL SIMILAR ASSOCIATIONS:

- *Poa pratensis* - (*Pascopyrum smithii*) Semi-natural Herbaceous Vegetation (CEGL005265)
- *Poa pratensis* Semi-natural Seasonally Flooded Herbaceous Vegetation [Placeholder] (CEGL003081)
- *Poa pratensis* Sierran Seasonally Flooded Herbaceous Vegetation (CEGL003159)

GLOBAL RELATED CONCEPTS:

- H24: *Bromus inermis* - *Phleum pratense* Vegetation Type (Achuff et al. 2002a) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is a very common type of disturbed grassland and forest opening on the east side of Glacier National Park, within Waterton Lakes National Park, and on the Blackfoot Reservation. Stands are less common on the west side of Glacier National Park where it has only been known from a horse corral near Quarter Circle Bridge. In East Glacier National Park, sampled stands occur in the St. Mary subdistrict in Two Dog Flats, in St. Mary Flats, along the Red Eagle Trail, and near the St. Mary campground. Within the Two Medicine subdistrict, it occurs near the old Two Medicine ranger station, in Ashline meadow, east of Marias Pass, near Lubec Lake near the old Lubec ranger station, and along the park boundary. Within the Many Glacier subdistrict along Swiftcurrent Ridge, stands occur near the horse corral, and near Cassidy Creek. Within the Belly River subdistrict, it occurs along the Belly River Trail, near Jule's Creek, and near the Belly River ranger station, and in the Cut Bank watershed near the ranger station and near the old chalet site.

On the Blackfoot Reservation, this association is likely very common in the many areas that are currently grazed. It has been documented north of the Lake Sherburne Dam, on the Chief Mountain Road, and on the Slide Lake access road.

In Waterton Lakes National Park, this type has been documented in the Waterton River watershed in the Oil Basin 2 ecosite, in the Dungraven Creek watershed in the Blakiston 4 ecosite, in the Belly River and Yarrow Creek watersheds in Belly River 8 ecosite, and in the Galwey Brook and Crooked Creek watersheds in the Lookout Butte 4 ecosite.

GLOBAL RANGE: This association has been documented from northern Montana and adjacent Alberta, as well as from northwestern Wyoming. It is widespread throughout the interior western United States as an irrigated hay-producing meadow, but few stands have been sampled, as most are on private lands.

NATIONS: CA, US

STATES/PROVINCES: AB, MT, WY

USFS ECOREGIONS: M331D:CC, M332C:CC, M333C:CC

FEDERAL LANDS: BIA (Blackfoot); NPS (Glacier, Grand Teton, Rockefeller); PC (Waterton Lakes); USFS (Bridger-Teton)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.1001, GLAC.117, GLAC.180, GLAC.191, GLAC.194, GLAC.2088, GLAC.40, GRAS-00-002, GRAS-00-009, GRAS-00-011, GRAS-00-013, GRAS-00-017, GRAS-00-018, GRAS-00-021, GRAS-00-024, GRAS-00-033, GRAS-00-046, GRAS-01-001, GRAS-01-006, GRAS-01-008, GRAS-01-013, GRAS-01-019, GRAS-01-022, GRAS-01-024, GRAS-01-025, GRAS-01-026, GRAS-01-036, GRAS-99-003, GRAS-99-004, GRAS-99-006, GRAS-99-007, GRAS-99-009, GRAS-99-014, GRAS-99-016, GRAS-99-017, GRAS-99-022, GRAS-99-028, GRAS-99-036, GRAS-99-037, GRAS-99-043, GRAS-99-045, GRAS-99-047, GRAS-99-048, GRAS-99-051, GRAS-99-054, WATE.4013, WATE.4057, WATE.4065, WATE.5081, WATE.5094, WATE.5120, WATE.9020.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: J. Coles

REFERENCES: Achuff et al. 1997, Achuff et al. 2002a, Western Ecology Working Group n.d., Youngblood et al. 1985a

***Pseudoroegneria spicata* Herbaceous Alliance**

***Bromus marginatus* - *Pseudoroegneria spicata* Herbaceous Vegetation [Provisional]**

LARGE MOUNTAIN BROME - BLUEBUNCH WHEATGRASS HERBACEOUS VEGETATION

IDENTIFIER: C EGL005861

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d.)

Alliance	<i>Pseudoroegneria spicata</i> Herbaceous Alliance (A.1265)
Alliance (English name)	Bluebunch Wheatgrass Herbaceous Alliance
Association	<i>Bromus marginatus</i> - <i>Pseudoroegneria spicata</i> Herbaceous Vegetation [Provisional]
Association (English name)	Large Mountain Brome - Bluebunch Wheatgrass Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is a mesic to subhygric, diverse grassland found uncommonly in the lower subalpine region of Waterton Lakes National Park, Alberta. This association occurs on moderately steep midslopes at elevations near 1725 m (5650 feet) on easterly aspects. Soils are derived from coarse fluvial or hard rock calcareous parent material and are characterized as either Cumulic Humic Regosols or Eluviated Eutric Brunisols. These are generally moderately well-drained, coarse-textured soils developed on morainal or rock landforms. Litter and small rock dominate the ground surface. This herbaceous association is dominated by several grass and forb species. Overall herbaceous cover ranges between 90-100% with heights less than 0.5 m. Dominant species, averaging between 8-25% cover, include *Pseudoroegneria spicata*, *Bromus marginatus*, *Lomatium triternatum*, *Phleum pratense*, *Poa palustris*, and *Eurybia conspicua* (= *Aster conspicuus*). Other common herbaceous species include *Lupinus sericeus*, *Osmorhiza occidentalis*, *Calochortus apiculatus*, *Valeriana dioica*, *Achillea millefolium*, *Aquilegia flavescens*, *Fragaria virginiana*, *Galium boreale*, *Hedysarum sulphurescens*, *Thalictrum occidentale*, and *Zigadenus elegans*. Cover of *Erigeron peregrinus*, *Anemone multifida*, and *Geranium viscosissimum* may be conspicuous in certain areas. Low shrubs may also be present with very low cover. Cover of nonvascular species averages 5%.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs on moderately steep midslopes at elevations near 1725 m (5650 feet) on easterly aspects. Soils are derived from coarse fluvial or hard rock calcareous parent material and are characterized as either Cumulic Humic Regosols or Eluviated Eutric Brunisols. These are generally moderately well-drained, coarse-textured soils developed on morainal or rock landforms. Litter and small rock dominate the ground surface.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This mesic to subhygric, lower subalpine, high diversity, herbaceous association is dominated by several grass and forb species. Overall herbaceous cover ranges between 90-100% with heights less than 0.5 m. Dominant species, averaging between 8-25% cover, include *Pseudoroegneria spicata*, *Bromus marginatus*, *Lomatium triternatum*, *Phleum pratense*, *Poa palustris*, and *Eurybia conspicua* (= *Aster conspicuus*). Other common herbaceous species include *Lupinus sericeus*, *Osmorhiza occidentalis*, *Calochortus apiculatus*, *Valeriana dioica*, *Achillea millefolium*, *Aquilegia flavescens*, *Fragaria virginiana*, *Galium boreale*, *Hedysarum sulphurescens*, *Thalictrum occidentale*, and *Zigadenus elegans*. Cover of *Erigeron peregrinus*, *Anemone multifida*, and *Geranium viscosissimum* may be conspicuous in certain areas. Low shrubs may also be present with very low cover. Cover of nonvascular species averages 5%.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Eurybia conspicua</i> , <i>Lomatium triternatum</i> , <i>Lupinus sericeus</i> , <i>Osmorhiza occidentalis</i>
Herb (field)	Graminoid	<i>Bromus marginatus</i> , <i>Phleum pratense</i> , <i>Poa palustris</i> , <i>Pseudoroegneria spicata</i>

Global Stratum

Lifeform

Species

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Bromus marginatus*, *Calochortus apiculatus*, *Eurybia conspicua*, *Lomatium triternatum*, *Lupinus sericeus*, *Phleum pratense*, *Poa palustris*, *Pseudoroegneria spicata*, *Valeriana dioica*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Hedysarum sulphurescens*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2? (2-Feb-2004).

CLASSIFICATION

STATUS: Provisional

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: The two stands placed into this provisionally identified association were classified by Achuff et al. (1997, 2002a) as part of the H42: *Agropyron spicatum* Vegetation Type. Our treatment gives high indicator value to the presence and abundance of *Bromus marginatus*. Further work in Alberta may more clearly identify what association these stands belong to.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

- H42: *Agropyron spicatum* Vegetation Type (Achuff et al. 2002a) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon in the lower subalpine ecoregion of Waterton Lakes National Park. It specifically occurs in the Belly River watershed within the Bauerman 2 and the Ruby 4 ecosections.

GLOBAL RANGE:

NATIONS: CA

STATES/PROVINCES: AB

USFS ECOREGIONS:

FEDERAL LANDS: PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.5045, WATE.5047.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Achuff et al. 1997, Achuff et al. 2002a, Western Ecology Working Group n.d.

***Pseudoroegneria spicata* - *Poa secunda* Herbaceous Vegetation**

BLUEBUNCH WHEATGRASS - CURLY BLUEGRASS HERBACEOUS VEGETATION

IDENTIFIER: C EGL001677

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d.)
Alliance	<i>Pseudoroegneria spicata</i> Herbaceous Alliance (A.1265)
Alliance (English name)	Bluebunch Wheatgrass Herbaceous Alliance
Association	<i>Pseudoroegneria spicata</i> - <i>Poa secunda</i> Herbaceous Vegetation
Association (English name)	Bluebunch Wheatgrass - Curly Bluegrass Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Columbia Basin Palouse Prairie (CES304.792)
Western Great Plains Foothill and Piedmont Grassland (CES303.817)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association has been described from lower montane to subalpine elevations in British Columbia, Washington, Oregon, Idaho, Utah, Colorado, Wyoming, and Montana. Stands of this association occupy loamy, rocky, often shallow soils on slopes and ridges, generally around the edges of basins and in the foothills of the mountains. Sites usually are ridges and slopes, sometimes alluvial fans, scree slopes, sloped rocky cliff faces, and bedrock outcrops of any aspect, although southerly and westerly aspects are most common in the Northwest. Throughout its geographic range this is a bunch grassland with minor cover of forbs and, often, sparse shrubs. *Pseudoroegneria spicata* dominates or codominates the vegetation; *Poa secunda* and *Koeleria macrantha* usually are present in substantial amounts, and *Festuca idahoensis* is absent or present in very small amounts. The common shrubs are *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), *Chrysothamnus viscidiflorus*, and *Artemisia tridentata* (subspecies unknown). Associated forbs are highly variable, given the broad geographic and elevational range. This association was at one time common throughout its wide geographic range, but much of it in Washington and Oregon has been converted to agricultural fields. In many of the remaining stands, the cover of *Pseudoroegneria spicata* has decreased and the cover of *Hesperostipa comata* (= *Stipa comata*) and shrubs have increased, and exotics (especially *Bromus tectorum*, *Tragopogon* spp., and *Alyssum* spp.) have become common members of the vegetation; these changes are attributed in large part to livestock grazing.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs on low to mid scree slopes at elevations between 1220 and 1920 m (4000-6300 feet). Slopes tend to be steep and south-facing, although this association tends to occur on flat rocky cliffs or bedrock outcrops along these slopes. Soils are rapidly to well- drained loamy sands or sandy loams developed on colluvial or siltstone landforms. The thin soil layers tend to be very gravelly with red and green argillite. Litter and rock dominate the ground cover in some areas, while moss, *Selaginella* spp., and litter dominate the ground surface in other areas.

GLOBAL ENVIRONMENT: Stands of this association grow on well-drained, often shallow, and frequently gravelly or rocky soils generally of loam, clay loam, silt loam, or sandy loam textural classes. Sites usually are ridges and slopes, sometimes alluvial fans, scree slopes, sloped rocky cliff faces, and bedrock outcrops of any aspect, although southerly and westerly aspects are most common in the northwestern (British Columbia, Washington, Idaho) and northern (Montana) parts of the geographic range. In Wyoming and Colorado, many of the sites supporting this association are windswept slopes and ridges. This association grows over a very broad elevational range, from 213 to 854 m (700-2800 feet) in the northwestern part of the range, 915 to 2288 m (3000-7500 feet) in the north-central part, and 2867 to 3050 m (9400-10,000 feet) in central Colorado.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This montane to subalpine, xeric herbaceous association has variable vegetative cover but is generally low in species diversity. Overall herbaceous cover ranges from 30-70% with heights of less than 0.5 m. *Pseudoroegneria spicata* and *Selaginella densa* dominate the vegetation, each with 20% average cover (1-40% cover range). *Cryptogramma acrostichoides* (= *Cryptogramma crispa*) and *Heuchera cylindrica* are other high-constancy forbs with an average of 2% cover. Other conspicuous herbaceous species that may be present in the plot include *Calamagrostis purpurascens*, *Eriogonum flavum*, and *Festuca occidentalis*, each with 3% average cover. Shrubs may be present within this association but cover is very low. *Juniperus communis* may provide the most evident shrub cover.

GLOBAL VEGETATION: As would be expected for an association whose geographic range includes such a broad range of climates and prehistoric grazing regimes, the composition of the vegetation varies, but a number of traits are constant. Throughout, this is a bunch grassland with minor cover of forbs and, often, sparse shrubs. *Pseudoroegneria spicata* dominates or codominates the vegetation; *Poa secunda* and *Koeleria macrantha* usually are present in substantial amounts, and *Festuca idahoensis* is absent or present in very small amounts. *Hesperostipa comata* (= *Stipa comata*) often is present in substantial amounts and may codominate, due (at least in part of the range) to prolonged grazing. *Bromus tectorum*, *Tragopogon* spp., and *Alyssum* spp. also are common members of the vegetation, due at least in part to disturbance. The common shrubs are *Ericameria nauseosa* (= *Chrysothamnus nauseosus*), *Chrysothamnus viscidiflorus*, and *Artemisia tridentata* (subspecies unknown). In southern British Columbia (Tisdale 1947), eastern Washington (Daubenmire 1988), and northeastern Oregon (Poulton 1955, Anderson 1956), the undisturbed vegetation of this type consists of *Pseudoroegneria spicata* and *Poa secunda*, with few other vascular plants (*Lomatium macrocarpum*, *Draba verna*, *Artemisia frigida*, *Gutierrezia sarothrae*, and a number of annuals), and substantial cover of epigeous cryptogams. *Hesperostipa comata* is present in most stands and may codominate with *Pseudoroegneria spicata*, as a result of heavy grazing. In western Idaho (Tisdale 1986), xeric sites support open vegetation with little *Poa secunda* and with *Opuntia polyacantha*, *Phacelia heterophylla*, and *Scutellaria angustifolia*. Stands on mesic sites are denser and usually contain *Balsamorhiza sagittata*, *Lomatium triternatum*, and *Lupinus sericeus*. In Utah (Christensen 1963, Christensen and Welsh 1963), *Gutierrezia sarothrae* is a common but minor species; *Hesperostipa comata* and *Achnatherum hymenoides* (= *Oryzopsis hymenoides*) are now common and often contribute substantial cover, apparently in stands disturbed by prolonged grazing. Montana stands (Mueggler and Stewart 1980, Cooper et al. 1995) often contain *Artemisia frigida*, *Gutierrezia sarothrae*, *Heuchera cylindrica*, *Achillea millefolium*, *Phlox hoodii*, *Eriogonum flavum*, *Stenotus acaulis* (= *Haplopappus acaulis*), and a number of other forbs as well as the fern *Cryptogramma acrostichoides*;

Hesperostipa comata or *Hesperostipa spartea* (= *Stipa spartea*) often codominate with *Pseudoroegneria spicata*, apparently even in stands that have not been markedly disturbed. *Calamagrostis purpurascens* and *Festuca occidentalis* may also be present. In northwestern Wyoming (Tweit and Houston 1980), the vegetation is much like that in Montana (but without *Hesperostipa spartea*), while in central Wyoming (Williams 1961, Fisser 1964) and northeastern Wyoming (Terwilliger et al. 1979a), nearer to the eastern edge of the geographic range, *Bouteloua gracilis*, *Rhus trilobata*, *Pascopyrum smithii*, and *Carex filifolia* may be present as minor species. In Colorado (Hess and Wasser 1982), species present in greater than trace amounts are *Achillea millefolium*, *Arenaria fendleri*, *Oxytropis lambertii*, *Potentilla gracilis*, and *Taraxacum officinale*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Heuchera cylindrica</i>
Herb (field)	Graminoid	<i>Pseudoroegneria spicata</i>
Herb (field)	Fern or fern ally	<i>Cryptogramma acrostichoides</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Koeleria macrantha</i> , <i>Poa secunda</i> , <i>Pseudoroegneria spicata</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Cryptogramma acrostichoides*, *Pseudoroegneria spicata*

GLOBAL: *Poa secunda*, *Pseudoroegneria spicata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4? (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: The examples of this type as found within the IPP extend the known environmental range of the association. The fact that *Poa secunda* was not recorded for IPP plots does not contravene the concept of the type as described and defined by Mueggler and Stewart (1980). However, with further sampling in northwestern Montana, and the IPP in particular, it may prove that these stands in Glacier National Park represent a different association. All the plots initially identified by Achuff et al. (1997, 2002a) as the H42: *Agropyron spicatum* Vegetation Type in Waterton Lakes National Park were placed into other associations.

GLOBAL COMMENTS: Relationships between this association and several others are unclear. *Pseudoroegneria spicata* - *Balsamorhiza sagittata* - *Poa secunda* Herbaceous Vegetation (CEGL001662) from Idaho and Oregon, apparently taken from Tisdale's (1986) *Agropyron spicatum* / *Poa secunda* / *Balsamorhiza sagittata* habitat type of western Idaho, is included here. *Pseudoroegneria spicata* - *Poa secunda* Lithosolic Herbaceous Vegetation (CEGL001678) of Idaho, Oregon, and Washington may be based on the lithosolic phase of Daubenmire's (1988) habitat type; this association presently includes that vegetation. If these types are to be considered separate associations, clear distinctions must be made between them.

In *Pseudoroegneria spicata* - *Pascopyrum smithii* Herbaceous Vegetation (CEGL001675), rhizomatous wheatgrasses (*Pascopyrum smithii* or *Elymus lanceolatus*) are subdominant or codominant and clearly contribute more cover than does *Poa secunda*. Similarly, in *Pseudoroegneria spicata* - *Hesperostipa comata* Herbaceous Vegetation (CEGL001679), *Hesperostipa comata* is subdominant or codominant and clearly contributes more cover than does *Poa secunda*. *Pseudoroegneria spicata* - Cushion Plants Herbaceous Vegetation (CEGL001666) contains a substantial amount of *Pseudoroegneria spicata* and often contains *Poa secunda*, but forbs generally provide more cover than do the grasses. The relationship between this association and the *Pseudoroegneria spicata* - *Poa fendleriana* Herbaceous Vegetation (CEGL001676) is unclear.

The examples of this type as found within the Waterton-Glacier International Peace Park (IPP) extend the known environmental range of the association. The fact that *Poa secunda* was not recorded for IPP plots does not contravene the concept of the type as described and defined by Mueggler and Stewart (1980). However, with further sampling in northwestern Montana, and the IPP in particular, it

may prove that these stands in Glacier National Park represent a different association. All the plots initially identified by Achuff et al. (1997, 2002a) as the H42: *Agropyron spicatum* Vegetation Type in Waterton Lakes National Park were placed into other associations.

GLOBAL SIMILAR ASSOCIATIONS:

- *Aristida purpurea* var. *longiseta* - *Pseudoroegneria spicata* - *Sporobolus cryptandrus* Herbaceous Vegetation (CEGL001589)
- *Pseudoroegneria spicata* - *Balsamorhiza sagittata* - *Poa secunda* Herbaceous Vegetation (CEGL001662)
- *Pseudoroegneria spicata* - Cushion Plants Herbaceous Vegetation (CEGL001666)--contains a substantial amount of *Pseudoroegneria spicata* and often contains *Poa secunda*, but forbs generally provide more cover than do the grasses.
- *Pseudoroegneria spicata* - *Pascopyrum smithii* Herbaceous Vegetation (CEGL001675)--rhizomatous wheatgrasses (*Pascopyrum smithii* or *Elymus lanceolatus*) are subdominant or codominant and clearly contribute more cover than does *Poa secunda*.
- *Pseudoroegneria spicata* - *Poa fendleriana* Herbaceous Vegetation (CEGL001676)--relationship is unclear.
- *Pseudoroegneria spicata* - *Poa secunda* Lithosolic Herbaceous Vegetation (CEGL001678)

GLOBAL RELATED CONCEPTS:

- *Agropyron* - *Poa* Grassland Zone, Climax Vegetation (Tisdale 1947) F
- *Agropyron* - *Poa* Zone, Climatic Climax (Poulton 1955) F
- *Agropyron spicatum* - *Poa secunda* Habitat Type (Daubenmire 1970) F
- *Agropyron spicatum* / *Opuntia polyacantha* Habitat Type (Tisdale 1986) F
- *Agropyron spicatum* / *Poa sandbergii* / *Balsamorhiza sagittata* Habitat Type (Tisdale 1986) F
- *Agropyron spicatum* / *Poa sandbergii* (MONT) Habitat Type (Mueggler and Stewart 1980) F
- *Agropyron spicatum* / *Poa sandbergii* Habitat Type (Tweit and Houston 1980) F
- *Agropyron spicatum* / *Poa sandbergii* Habitat Type (Hess and Wasser 1982) F
- *Agropyron spicatum* / *Poa secunda* Habitat Type (Terwilliger et al. 1979a) F
- *Pseudoroegneria spicata*-*Poa secunda* (Bourgeron and Engelking 1994) =
- *Roegneria spicata* / *Poa secunda* Plant Association (Johnston 1987) F
- Central Utah Foothill Bunchgrass Vegetation (Christensen 1963) F
- DRISCOLL FORMATION CODE:V.B.4.b. (Driscoll et al. 1984) B
- Northern Utah Palouse Grassland Association (Stoddart 1941) F
- Upland Prairie (Christensen and Welsh 1963) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association occurs east and west of the Continental Divide in Glacier National Park but is uncommon. It occurs on steep, south-facing rocky cliffs or outcrops on low to midslopes. Specific locations of this association in Glacier National Park include northeast of St. Mary Lake near Dead Horse Point in the St. Mary subdistrict and on the southeast flank of Heavens Peak in the Lake McDonald subdistrict.

GLOBAL RANGE: This association has been described from British Columbia, Washington, Oregon, Idaho, Utah, Colorado, Wyoming, and Montana.

NATIONS: CA?, US

STATES/PROVINCES: BC?, CO:S1, ID, MT:S4?, OR:S1, UT:S2S4, WA:S2, WY:S2

USFS ECOREGIONS: 331A:CC, 331F:CC, 331G:CP, 342A:CC, 342C:CC, 342F:CC, 342I:CC, M331A:CC, M331D:CC, M331G:CP, M331H:CP, M332A:CC, M332B:CP, M332C:CC, M332D:CP, M332E:CC, M332G:CC, M333C:CC, M341C:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton); USFS (Custer?, Kootenai, Medicine Bow, Shoshone, Thunder Basin, Wallowa-Whitman)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.210, GLAC.2066.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Achuff et al. 1993, Achuff et al. 1997, Achuff et al. 2002a, Anderson 1956, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Christensen 1963, Christensen and Welsh 1963, Cooper 2003, Cooper et al. 1995, Daubenmire 1970, Daubenmire 1988, Driscoll et al. 1984, Fisser 1964, Fisser et al. 1965, Hall 1973, Hess and Wasser 1982, Johnson and Simon 1985, Johnson and Simon 1987, Johnston 1987, Jones and Ogle 2000, Kagan et al. 2000, Kleiner 1968, MTNHP 2002b, Mueggler and Stewart 1980, Poulton 1955, Price and Brotherson 1987, Stoddart 1941, Terwilliger et al. 1979a, Tisdale 1947, Tisdale 1986, Twit and Houston 1980, WNHP unpubl. data, Western Ecology Working Group n.d., Williams 1961

V.A.5.N.e. Short sod temperate or subpolar grassland***Carex geyeri* Herbaceous Alliance*****Carex geyeri* Herbaceous Vegetation****GEYER'S SEDGE HERBACEOUS VEGETATION****IDENTIFIER: C EGL005864****NVC Classification**

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Short sod temperate or subpolar grassland (V.A.5.N.e.)
Alliance	<i>Carex geyeri</i> Herbaceous Alliance (A.2639)
Alliance (English name)	Geyer's Sedge Herbaceous Alliance
Association	<i>Carex geyeri</i> Herbaceous Vegetation
Association (English name)	Geyer's Sedge Herbaceous Vegetation

ECOLOGICAL SYSTEM(S):**ELEMENT CONCEPT**

GLOBAL SUMMARY: This small-patch vegetation type is found at lower alpine and mid to upper subalpine zones from 1770 to 2301 m (5800-7550 feet) elevation in Glacier National Park, Montana, and Grand Teton National Park in Wyoming. It occurs on gentle to steep slopes (1-65%) having predominantly southerly exposures. It is often found on gully slopes where streambeds are deeply incised in colluvium, resulting in unstable surfaces. In winter these gullies can fill with snow, which persists long into the growing season, assuring ample soil moisture well into August. Though the vegetation pattern can be regular, these sites are most often heterogeneous with patches of vegetation interspersed with bare gravel, scattered talus, as well as exposed bedrock. Because of persistent sheet erosion, soil development is restricted to the clumps or patches of grass and sedge. Vascular plant cover ranges from around 10% on the rockiest of southerly exposures to over 75% where soil is more extensive and litter mantles the surface. Shrubs may be absent or may include scattered individuals of *Spiraea betulifolia*, *Mahonia repens*, *Artemisia tridentata* ssp. *spiciformis*, *Amelanchier alnifolia*, *Symphoricarpos oreophilus*, and *Rubus parviflorus*, none with more than 5% cover. The diverse graminoid component is dominated by *Carex geyeri*; other common species include *Poa cusickii*, *Pseudoroegneria spicata*, *Elymus elymoides*, *Koeleria macrantha*, and *Festuca idahoensis*. The forb component is also diverse but often has low cover. In Glacier National Park, the forbs grow in tall clumps dominated by *Hieracium cynoglossoides* (= *Hieracium albertinum*), *Senecio megacephalus*, *Arnica rydbergii*, *Lomatium dissectum*, *Aquilegia flavescens*, *Potentilla diversifolia*, *Cirsium hookerianum*, and *Symphyotrichum foliaceum* (= *Aster foliaceus*). Shorter and less conspicuous, but occurring with as much cover and constancy, are *Arenaria capillaris*, *Eriogonum flavum*, *Galium boreale*, *Antennaria rosea*, *Sedum stenopetalum*, and *Campanula rotundifolia*. In Grand Teton National Park, *Balsamorhiza sagittata* and *Eriogonum umbellatum* are the only species that occur regularly with more than trace cover. Combined moss and lichen cover does not exceed 20% and usually is less than 5%.

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This small-patch vegetation type is found at lower alpine and mid to upper subalpine zones from 1770 to 2190 m (5800-7185 feet) on moderate to mostly steep slopes (32-65%) having predominantly southerly exposures, but east- and west-facing aspects are represented. It is often found on protected gully slopes near stream headwaters where streambeds are deeply incised in colluvial slopes, resulting in unstable surfaces. In winter these gullies can fill with snow, or at least their upper to midslopes develop large snow-drifts, which persist long into the growing season, assuring ample soil moisture well into August. Though the vegetation pattern can be regular, these sites are most often heterogeneous with patches of vegetation interspersed with scattered talus of red and green argillite and quartzite, bedrock that can cover up to 50% of the surface, and exposed soil that can comprise as much as 10-20% of the surface. Due to active slopewash the organic and fine materials are eroded from these sites, and soil development is restricted to the clumps of vegetation, predominantly the tussocks or patches of grass and sedge.

GLOBAL ENVIRONMENT: This small-patch vegetation type is found at lower alpine and mid to upper subalpine zones from 1770 to 2301 m (5800-7550 feet) elevation in Glacier National Park, Montana, and Grand Teton National Park in Wyoming. It occurs on gentle to steep slopes (1-65%) having predominantly southerly exposures. It is often found in the protected upper reaches of gullies

where streambeds are deeply incised in colluvial slopes, resulting in unstable surfaces. In winter these gullies can fill with snow, which persists long into the growing season, assuring ample soil moisture well into August. Though the vegetation pattern can be regular, these sites are most often heterogeneous with patches of vegetation interspersed with scattered talus of red and green argillite and quartzite, bedrock that can cover up to 60% of the surface, and exposed soil that can comprise as much as 10-20% of the surface. Soils may be loess or derived from alluvium or colluvium. Due to sheet erosion, the organic and fine materials are eroded from these sites, and soil development is restricted to tussocks or patches of grass and sedge.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The vascular plant cover ranges from approaching the scarce category (15%) on the rockiest of southerly exposures to over 75% where soil is more extensive and litter mantles the surface. Shrubs are often completely absent and, of those that do occur, *Spiraea betulifolia*, *Amelanchier alnifolia*, and *Rubus parviflorus*, none exhibit more than 1-5% cover. The graminoid component is dominated by *Carex geyeri*, with 100% constancy and cover, which is mostly in excess of 25%; others with constancy greater than 50% include *Poa cusickii*, *Pseudoroegneria spicata*, and *Festuca idahoensis*. The forb fraction is diverse, often occurring in tall clumps dominated by *Hieracium cynoglossoides* (= *Hieracium albertinum*), *Senecio megacephalus*, *Arnica rydbergii*, *Lomatium dissectum*, *Aquilegia flavescens*, *Potentilla diversifolia*, *Cirsium hookerianum*, and *Symphyotrichum foliaceum* (= *Aster foliaceus*). Shorter and less conspicuous, but occurring with as much cover and constancy, are *Arenaria capillaris*, *Eriogonum flavum*, *Galium boreale*, *Antennaria rosea*, *Sedum stenopetalum*, and *Campanula rotundifolia*. The combined moss and lichen cover has not been noted to exceed 20% and mostly is less than 5%.

GLOBAL VEGETATION: This association is a sparse montane grassland community that occurs on subxeric sites. In Wyoming, stands may occur as openings in *Pinus contorta* stands. The vascular plant cover ranges from around 10% on the rockiest of southerly exposures to over 75% where soil is more extensive and litter mantles the surface. Shrubs are often completely absent and, of those that do occur, *Spiraea betulifolia*, *Mahonia repens*, *Artemisia tridentata* ssp. *spiciformis*, *Amelanchier alnifolia*, *Symphoricarpos oreophilus*, and *Rubus parviflorus*, none exhibit more than 1-5% cover. The diverse graminoid component is dominated by *Carex geyeri*, with 100% constancy and cover ranging between 10 and 60%; other common species include *Poa cusickii*, *Pseudoroegneria spicata*, *Elymus elymoides*, *Koeleria macrantha*, and *Festuca idahoensis*. The forb fraction is also diverse but often has low cover. In Glacier National Park, the forb component occurs in tall clumps dominated by *Hieracium cynoglossoides* (= *Hieracium albertinum*), *Senecio megacephalus*, *Arnica rydbergii*, *Lomatium dissectum*, *Aquilegia flavescens*, *Potentilla diversifolia*, *Cirsium hookerianum*, and *Symphyotrichum foliaceum* (= *Aster foliaceus*). Shorter and less conspicuous, but occurring with as much cover and constancy, are *Arenaria capillaris*, *Eriogonum flavum*, *Galium boreale*, *Antennaria rosea*, *Sedum stenopetalum*, and *Campanula rotundifolia*. In Grand Teton National Park, *Balsamorhiza sagittata* and *Eriogonum umbellatum* are the only species that occur regularly with more than trace cover. The combined moss and lichen cover does not exceed 20% and mostly is less than 5%.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Spiraea betulifolia</i>
Herb (field)	Forb	<i>Arenaria capillaris</i> , <i>Eriogonum flavum</i> , <i>Galium boreale</i> , <i>Hieracium cynoglossoides</i> , <i>Lomatium dissectum</i> , <i>Potentilla diversifolia</i> , <i>Sedum stenopetalum</i> , <i>Senecio megacephalus</i>
Herb (field)	Graminoid	<i>Carex geyeri</i> , <i>Festuca idahoensis</i> , <i>Pseudoroegneria spicata</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Carex geyeri</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex geyeri*, *Hieracium cynoglossoides*, *Lomatium dissectum*, *Sedum stenopetalum*

GLOBAL: *Carex geyeri*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4? (3-Feb-2004).

CLASSIFICATION**STATUS:** Standard**CLASSIFICATION CONFIDENCE:** 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: Damm (2001) is the first to describe a vegetation type (*Hieracio albertini* - *Caricetum geyeri* Association) characterized by the dominance of *Carex geyeri* in the tallest layer; *Carex geyeri* has been employed as an indicator species many times in forested and woodland communities. *Hieracium cynoglossoides* (= *Hieracium albertinum*) has been dropped as an epithet as it has a very broad distribution, is only 70% constant, and not even the most abundant forb (equally good name might have been *Lomatium dissectum* or *Senecio megacephalus*). Should more *Carex geyeri* types from a wider geographic range be described, then a more appropriate and broadly considered forb component name could be considered. Two plots assigned by Damm (2001) to this type had bunchgrass cover considerably greater than that of *Carex geyeri*, which had less than 5% cover, and were reallocated to bunchgrass-dominated types.

GLOBAL COMMENTS: Damm (2001) is the first to describe a vegetation type (*Hieracio albertini* - *Caricetum geyeri* Association) characterized by the dominance of *Carex geyeri* in the tallest layer; *Carex geyeri* has been employed as an indicator species many times in forest and woodland communities. *Hieracium cynoglossoides* has been dropped as an epithet as it has a very broad distribution, is only 70% constant, and not even the most abundant forb (equally good name might have been *Lomatium dissectum* or *Senecio megacephalus*). Should more *Carex geyeri* types from a wider geographic range be described, then a more appropriate and broadly considered forb component name could be considered. Two plots assigned by Damm (2001) to this type had bunchgrass cover considerably greater than that of *Carex geyeri*, which had less than 5% cover, and were reallocated to bunchgrass-dominated types.

GLOBAL SIMILAR ASSOCIATIONS:**GLOBAL RELATED CONCEPTS:**

- *Hieracio albertini* - *Caricetum geyeri* Association (Damm 2001) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This community is found in Glacier National Park east of the Continental Divide in valleys not far removed from the adjacent prairie foothills; it has not been demonstrated from Waterton Lakes National Park but should be found there based on habitat.

GLOBAL RANGE: This vegetation type is found at lower alpine and mid to upper subalpine zones in Montana, Wyoming, Idaho, and possibly Alberta, Canada.

NATIONS: CA?, US**STATES/PROVINCES:** AB?, ID, MT, WY**USFS ECOREGIONS:** M331D:CC, M332C:CC**FEDERAL LANDS:** NPS (Glacier, Grand Teton); PC (Waterton Lakes?); USFS (Caribou-Targhee)**ELEMENT SOURCES****WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2633, CD294, CD252, CD251, CD241, CD233, CD478, CD247, CD702, GRAS-00-045.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper**GLOBAL DESCRIPTION AUTHORS:** J. Coles**REFERENCES:** Damm 2001, Western Ecology Working Group n.d.***Carex paysonis* Herbaceous Alliance*****Carex paysonis* - *Sibbaldia procumbens* Herbaceous Vegetation****PAYSON'S SEDGE - CREEPING GLOW-WORT HERBACEOUS VEGETATION****IDENTIFIER:** CEG005865**NVC Classification**

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)

Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Short sod temperate or subpolar grassland (V.A.5.N.e.)
Alliance	<i>Carex paysonis</i> Herbaceous Alliance (A.2640)
Alliance (English name)	Payson's Sedge Herbaceous Alliance
Association	<i>Carex paysonis</i> - <i>Sibbaldia procumbens</i> Herbaceous Vegetation
Association (English name)	Payson's Sedge - Creeping Glow-wort Herbaceous Vegetation
ECOLOGICAL SYSTEM(S):	Rocky Mountain Alpine Fell-Field (CES306.811)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is a small-patch herbaceous association found in Glacier National Park, Montana, and Grand Teton National Park, Wyoming. It occurs on relatively exposed alpine ridgelines and flats from 2180 to 3120 m (7150-10,236 feet) elevation. Surface relief is smooth to moderately rolling with slopes not exceeding 18% and no particular slope aspect being preferred; however, sites are apparently aligned with microtopographic depressions, such as lee slopes, otherwise disposed to accumulate deep snowdrifts. Despite the high to very high wind exposure of the landscape, the drifted snow has a moderately long duration into summer. Meltwaters create an early-season soil saturation which is rapidly dried out due to well-drained soils and desiccating winds. This community is found on red and green argillite and quartzite. The ground surface is blanketed by a dense cover of mosses (10-50% cover) and lichens (10-35% cover) with the remainder being litter. Being relatively stressful sites, the vascular cover is relatively low, ranging from 15 to 45%. *Salix arctica* and *Salix petrophila* are dwarf-shrubs present. *Carex paysonis*, ranging in cover from 10 to 25%, is the dominant herb; other graminoids of high constancy include *Carex phaeocephala*, *Carex pyrenaica*, *Agrostis variabilis*, *Juncus parryi*, *Luzula piperi*, and *Luzula spicata*. The forb component is relatively depauperate in species richness and cover; those with greater than 50% constancy include the chionophilous (snow-loving) species *Antennaria umbrinella*, *Arenaria capillaris*, *Sibbaldia procumbens*, and *Antennaria alpina*, and the high-elevation generalists *Erigeron peregrinus*, *Hieracium gracile*, and *Polygonum bistortoides*. Moss cover, ranging up to 45%, is important for soil formation and is dominated by *Polytrichum piliferum* followed by *Polytrichastrum alpinum* and *Tortula ruralis*. Snow cover persisting long into summer favors lichen development (10-30% cover), among which are the circumpolar species *Cladonia ecmocyna* and *Cladonia borealis*, and *Solorina crocea*, a colorful foliose soil lichen.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This is a small-patch type occurring on relatively exposed alpine ridgelines and flats from 2180 to 2410 m (7150-7950 feet). Surface relief is smooth to moderately rolling with slopes not exceeding 18% and no particular slope aspect being preferred; however, sites are apparently aligned with the microtopographic depressions or positions, such as lee slopes, otherwise disposed to accumulate deep snowdrifts. Despite the high to very high wind exposure of the landscape, the drifted snow has a moderately long duration into summer. Meltwaters create an early-season soil saturation which is rapidly dried out due to well-drained soils and desiccating winds. It is found on red and green argillite and quartzite. The ground surface is blanketed by a dense cover of mosses (10-50% cover) and lichens (10-35% cover) with the remainder being litter.

GLOBAL ENVIRONMENT: It occurs on relatively exposed alpine ridgelines and flats from 2180 to 3120 m (7150-10,236 feet) elevation. Surface relief is smooth to moderately rolling with slopes not exceeding 18% and no particular slope aspect being preferred; however, sites are apparently aligned with microtopographic depressions, such as lee slopes, otherwise disposed to accumulate deep snowdrifts. Despite the high to very high wind exposure of the landscape, the drifted snow has a moderately long duration into summer. Meltwaters create an early-season soil saturation which is rapidly dried out due to well-drained soils and desiccating winds. This community is found on red and green argillite and quartzite.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Being relatively stressful sites, the vascular cover is relatively low, ranging from 15 to 45%. *Salix arctica* is the only dwarf-shrub present and only in trace amounts. *Carex paysonis*, ranging in cover from 10 to 25%, is the dominant herb; other graminoids of high constancy include *Carex phaeocephala*, *Carex pyrenaica*, *Agrostis variabilis*, and *Luzula spicata*. The forb component is relatively depauperate in species richness and cover; those with greater than 50% constancy include the chionophilous species *Arenaria capillaris*, *Sibbaldia procumbens*, and *Antennaria alpina* and the high-elevation generalists *Erigeron peregrinus*, *Hieracium gracile*, and *Polygonum bistortoides*. Moss cover, ranging up to 45%, is important for soil formation and is dominated by *Polytrichum piliferum* followed by *Polytrichastrum alpinum* and *Tortula ruralis*. Snow cover persisting long into summer favors lichen development (10-30% cover), among which the most indicative of this condition are the circumpolar species *Cladonia ecmocyna* and *Cladonia borealis* and *Solorina crocea*, a colorful foliose soil lichen.

GLOBAL VEGETATION: *Carex paysonis*, ranging in cover from 10 to 25%, is the dominant graminoid. The ground surface is blanketed by a dense cover of mosses (10-50% cover) and lichens (10-35% cover) with the remainder being litter. Being relatively stressful sites, the vascular cover is relatively low, ranging from 15 to 45%. *Salix arctica* and *Salix petrophila* are dwarf-shrubs present. Other graminoids of high constancy include *Carex phaeocephala*, *Carex pyrenaica*, *Agrostis variabilis*, *Juncus parryi*, *Luzula piperi*, and *Luzula spicata*. The forb component is relatively depauperate in species richness and cover and includes the chionophilous (snow-loving) species *Antennaria umbrinella*, *Arenaria capillaris*, *Sibbaldia procumbens*, and *Antennaria alpina*, and the high-elevation generalists *Erigeron peregrinus*, *Hieracium gracile*, *Artemisia scopulorum*, *Hieracium gracile*, *Polygonum bistortoides*, *Potentilla diversifolia*, *Silene acaulis*, and *Polygonum bistortoides*. Moss cover, ranging up to 45%, is important for soil formation and is dominated by *Polytrichum piliferum* followed by *Polytrichastrum alpinum* and *Tortula ruralis*. Snow cover persisting long into summer favors lichen development (10-30% cover), among which are the circumpolar species *Cladonia ecmocyna* and *Cladonia borealis*, and *Solorina crocea*, a colorful foliose soil lichen.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Arenaria capillaris</i> , <i>Sibbaldia procumbens</i>
Herb (field)	Graminoid	<i>Carex paysonis</i> , <i>Carex phaeocephala</i> , <i>Carex pyrenaica</i>
Nonvascular	Moss	<i>Polytrichum piliferum</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Sibbaldia procumbens</i>
Herb (field)	Graminoid	<i>Carex paysonis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Arenaria capillaris*, *Carex paysonis*, *Carex phaeocephala*, *Carex pyrenaica*, *Sibbaldia procumbens*

GLOBAL: *Carex paysonis*, *Erigeron peregrinus*, *Polygonum bistortoides*, *Salix arctica*, *Salix petrophila*, *Sibbaldia procumbens*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4? (3-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This vegetation type was first described by Damm (2001) as the *Polytrichum piliferum* - *Carex paysonis* snow drift community which has been renamed *Carex paysonis* / *Sibbaldia procumbens* to avoid the impracticality of using a moss as a defining species when a highly significant vascular indicator, *Sibbaldia procumbens* (strongly associated with persistent snowbeds), is 100% constant and highly recognizable.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Sibbaldia procumbens* - *Polygonum bistortoides* Herbaceous Vegetation (CEGL001933)

GLOBAL RELATED CONCEPTS:

- *Polytrichum piliferum* - *Carex paysonis* snow drift community (Damm 2001) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This community has been described from the north-central portion of Glacier National Park, but its distribution is speculated to include the high-elevation valleys or landscapes where glacial retreat creates new sites for its establishment. It is documented by a minimum number of samples and should be further sampled to ensure its validity and distribution.

GLOBAL RANGE: This alpine association is known from Glacier National Park in Montana and Grand Teton National Park in northwestern Wyoming.

NATIONS: US

STATES/PROVINCES: MT, WY

USFS ECOREGIONS: M331D:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2652, CD193, CD192, CD195, CD97, CD96.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper, mod G. Kittel

REFERENCES: Damm 2001, Western Ecology Working Group n.d.

V.A.5.N.g. Short alpine or subalpine sod grassland

***Carex albonigra* Herbaceous Alliance**

***Carex albonigra* - *Myosotis asiatica* Herbaceous Vegetation**

BLACK-AND-WHITE SCALE SEDGE - ASIAN FORGET-ME-NOT HERBACEOUS VEGETATION

IDENTIFIER: CEGL005863

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Short alpine or subalpine sod grassland (V.A.5.N.g.)
Alliance	<i>Carex albonigra</i> Herbaceous Alliance (A.2638)
Alliance (English name)	Black-and-white Scale Sedge Herbaceous Alliance
Association	<i>Carex albonigra</i> - <i>Myosotis asiatica</i> Herbaceous Vegetation
Association (English name)	Black-and-White Scale Sedge - Asian Forget-Me-Not Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine Fell-Field (CES306.811)

ELEMENT CONCEPT

GLOBAL SUMMARY: This fell-field association has been sampled in the alpine of Glacier National Park, Montana, and Waterton Lakes National Park, Alberta. It is predominantly a small- (to large-) patch fell-field community, characteristic and extensive at the highest elevations and most extreme and exposed alpine environments; its recorded elevation range is from 2060 to 2630 m (6755-8625 feet), though most of the sites are above 2400 m (7870 feet). It usually is dispersed across expansive rolling upland and frost rubble-mantled summits; topographic positions include flat mountain summits, ridges, exposed upper slopes and rolling uplands. Because of high elevations and exceedingly exposed positions, this is one of the most wind-impacted environments (prevailing winds being from the southwest); xeric conditions are in effect through most of the year. Being swept free of snow and protective cover facilitates frost action, which results in patterned ground features with the polygonal arrangement of rocks. The ground surface is dominated by exposed rock, mostly in excess of 60% cover, with undeveloped and well-drained soils restricted to pockets and vegetation-covered patches. The modal aspect is a very low-growing turf, scattered in small patches across an undulating landscape. The vascular plant cover is highly variable, from 1% to approaching 60%, with most of the sampled occurrences having less than 30% cover; there is not one species or species group that can be considered strictly characteristic. *Dasiphora fruticosa* ssp. *floribunda* is the only dwarf-shrub of note with cover usually less than 5%; for its cover to exceed 10% would be indicative of a different community. The most diagnostic graminoids are *Carex albonigra* and *Carex rupestris* with *Carex nardina* occurring sporadically; their single or combined cover seldom exceeds 5%. *Festuca brachyphylla*, *Trisetum spicatum*, *Luzula spicata*, *Poa alpina*, and *Poa glauca* also exhibit high constancy and low cover, and *Calamagrostis purpurascens* is present in the lower elevation examples of the type. The distinctive cushion plant *Silene acaulis* attains its greatest constancy and cover in this type, often constituting the dominant forb. Four forbs, *Myosotis asiatica* (= *Myosotis alpestris*), *Potentilla nivea*, *Rhodiola rosea* (= *Sedum roseum*), and *Minuartia rossii* (= *Arenaria rossii*), are more consistently present in this than other types. Other high-constancy forbs include *Minuartia obtusiloba* (= *Arenaria*

obtusiloba), *Smelowskia calycina*, *Sedum lanceolatum*, *Erigeron compositus*, *Oxytropis campestris*, and *Selaginella densa* var. *standleyi* (= *Selaginella standleyi*).

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This predominantly small- (to large-) patch fell-field community is characteristic and extensive at the highest elevations and most extreme and exposed alpine environments; its recorded elevation range is from 2060 to 2630 m (6755-8625 feet), though most of the sites are above 2400 m (7870 feet). It usually is dispersed across expansive rolling upland and frost rubble-mantled summits; topographic positions include flat mountain summits, ridges, exposed upper slopes and rolling uplands. It occupies predominantly west- and southwest-facing surfaces, but all aspects are represented; gentle to moderate slopes (to 40%) are the norm, though steep slopes are present, particularly those of westerly exposure. Because of high elevations and exceedingly exposed positions, this is one of the most wind-impacted environments (prevailing winds being from the southwest); xeric conditions are in effect through most of the year. Being swept free of snow and protective cover facilitates frost action, which results in patterned ground features with the polygonal arrangement of rocks. The ground surface is dominated by exposed rock, mostly in excess of 60% cover, with undeveloped and well-drained soils restricted to pockets and vegetation-covered patches. Rock types include mostly red and green argillites with lesser amounts of quartzite and arenites.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The modal aspect is a very low-growing turf, scattered in small patches across an undulating landscape. Though occurring in stripes and rarely evenly dispersed, it usually occurs with no detectable pattern, just erratically dispersed vegetation patches. The vascular plant cover is highly variable, from 1% to approaching 60%, with most of the sampled occurrences having less than 30% cover; there is not one species or species group that can be considered strictly characteristic. *Dasiphora fruticosa* ssp. *floribunda* is the only dwarf-shrub of note with cover usually less than 5%; for its cover to exceed 10% would be indicative of a different community. The most diagnostic graminoids are *Carex albonigra* and *Carex rupestris* with *Carex nardina* occurring sporadically; their single or combined cover seldom exceeds 5%. *Festuca brachyphylla*, *Trisetum spicatum*, *Luzula spicata*, *Poa alpina*, and *Poa glauca* also exhibit high constancy and low cover, and *Calamagrostis purpurascens* is present in the lower elevation examples of the type. The distinctive cushion plant *Silene acaulis* attains its greatest constancy and cover in this type, often constituting the dominant forb. Other high-constancy forbs include *Minuartia obtusiloba* (= *Arenaria obtusiloba*), *Smelowskia calycina*, *Sedum lanceolatum*, *Erigeron compositus*, *Oxytropis campestris*, and *Selaginella densa* var. *standleyi* (= *Selaginella standleyi*); four forbs, *Potentilla nivea*, *Rhodiola rosea* (= *Sedum roseum*), *Myosotis asiatica* (= *Myosotis alpestris*), and *Minuartia rossii* (= *Arenaria rossii*), are more consistently present in this than other types. Another suite of forbs is distinctive to lower elevation examples of this type, and *Polemonium viscosum* and *Elymus alaskanus* ssp. *latiglumis* (= *Agropyron latiglume*) are diagnostic of higher elevation sites.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i>
Herb (field)	Forb	<i>Erigeron compositus</i> , <i>Minuartia obtusiloba</i> , <i>Myosotis asiatica</i> , <i>Silene acaulis</i> , <i>Smelowskia calycina</i>
Herb (field)	Graminoid	<i>Carex albonigra</i> , <i>Carex rupestris</i> , <i>Festuca brachyphylla</i> , <i>Luzula spicata</i> , <i>Trisetum spicatum</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex albonigra*, *Carex rupestris*, *Minuartia rossii*, *Potentilla nivea*, *Rhodiola rosea*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2G3 (3-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: Damm (2001) has a broadly defined association, *Myosotido alpestris* - *Caricetum albonigrae* Association (with seven variants recognized below the level of association), from which we have abstracted the *Carex albonigra* / *Myosotis asiatica* community. Damm's plots with appreciable amounts of dwarf-shrubs or bunch grasses have been allocated to other vegetation types, principally *Dryas octopetala* - *Carex rupestris* Dwarf-shrub Herbaceous Vegetation (CEGL001892), *Festuca idahoensis* - (*Festuca campestris*) / *Potentilla diversifolia* Herbaceous Vegetation (CEGL001623), and *Dasiphora fruticosa* ssp. *floribunda* / *Artemisia michauxiana* Shrub Herbaceous Vegetation [Provisional] (CEGL005833). For example, at least 20 plots in Damm's *Myosotido alpestris* - *Caricetum albonigrae* Association had *Dryas octopetala* dominant or with greater than 25% cover; these plots were reallocated to *Dryas octopetala* - *Carex rupestris* Dwarf-shrub Herbaceous Vegetation (CEGL001892) defined herein.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Geum rossii* - *Carex albonigra* Herbaceous Vegetation (CEGL001966)

GLOBAL RELATED CONCEPTS:

- *Myosotido alpestris* - *Caricetum albonigrae* Association (Damm 2001) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: Damm (2001) notes that sampled plots of this type almost without exception come from one Glacier National Park massif, Otokomi-East Flattop Ridge; this type is expected to occur throughout the park's alpine as well as that of Waterton Lakes National Park, there being no compelling environmental factor that would preclude its occurrence.

GLOBAL RANGE:

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S2?

USFS ECOREGIONS: M332B:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: CD359, CD457, CD174, CD173, CD188, CD189, CD190, CD302, CD303, CD523, CD522, CD725, CD728, CD61, CD274, CD299, CD636, CD58, CD50, CD60, CD49, CD57, CD69, CD275, CD89, CD640, CD133, CD164, CD4, CD6, CD471, CD472, CD144, CD55, WATE.9035, WATE.4076, WATE.4077, WATE.4083, WATE.5060.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Damm 2001, Western Ecology Working Group n.d.

***Carex scirpoidea* Herbaceous Alliance**

***Carex scirpoidea* - *Zigadenus elegans* Herbaceous Vegetation**

SCIRPUS-LIKE SEDGE - MOUNTAIN DEATHCAMAS HERBACEOUS VEGETATION

IDENTIFIER: CEGL005866

NVC Classification

Physiognomic Class Herbaceous Vegetation (V)

Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Short alpine or subalpine sod grassland (V.A.5.N.g.)
Alliance	<i>Carex scirpoidea</i> Herbaceous Alliance (A.1308)
Alliance (English name)	Scirpus-like Sedge Herbaceous Alliance
Association	<i>Carex scirpoidea</i> - <i>Zigadenus elegans</i> Herbaceous Vegetation
Association (English name)	Scirpus-like Sedge - Mountain Deathcamas Herbaceous Vegetation
ECOLOGICAL SYSTEM(S):	Rocky Mountain Alpine Turf (CES306.816)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is a small-patch herbaceous community found in Glacier National Park, Montana. It is associated with seep conditions providing a mesic to hygric moisture regime. Possibly the strongest determinant of this community is a strongly bimodal moisture regime; saturated and even having overland flow in spring and early summer and by mid to late summer subsurface flow ceases and soils dry rapidly due to warm site exposures. Within-type vegetation differences are explained by differences in water regime (considerable variation in when sites become dry, if ever) and amount of exposed rock. Plant cover is high (90+%) where continuous soils have developed but can be as low as 10% where rock cover exceeds 90%. The documented elevation range is from 1640 to 2190 m (5380-7185 feet). It is found primarily on west- to southwest-facing, moderate to steep slopes, mostly having greater than 45% inclination. This community often occurs in terrain with irregular relief owing to rock outcrops, stabilized fell-fields or talus with appreciable soil, or as a broad zone paralleling rivulets and the most incipient of first-order streams. Microsites of relatively flat outcrops of layered sedimentary rock accumulates organic humus with a high water-retention capacity providing in the aggregate an extensive substrate for this community.

The vascular plant cover is highly variable (8% to 98%) in this type, and more or less inversely proportional to rock exposure in the drier expressions of the type and on moister sites in inverse proportion to the bryophyte/lichen cover. Dwarf-shrubs are scattered, comprising not much more than 5% cover; the most constant being *Dasiphora fruticosa* ssp. *floribunda* and *Arctostaphylos uva-ursi*. On the more lush sites, *Carex scirpoidea*, the dominant, highly constant and diagnostic sedge, can approach a sward-like aspect, but on the rockier sites its cover may scarcely exceed a few percent. Other graminoids of high constancy but generally of low cover include *Danthonia intermedia*, *Festuca idahoensis*, *Festuca campestris* (= *Festuca scabrella*), and *Poa alpina*. Alternatively, *Carex podocarpa*, *Carex spectabilis*, and *Deschampsia caespitosa* are present in the moister sites. Though generally typifying moist to hygric sites, this type can range to relatively wet environments as indicated by the presence of *Allium schoenoprasum*, *Triantha glutinosa* (= *Tofieldia glutinosa*), *Packera streptanthifolia* (= *Senecio cymbalarioides*), *Dodecatheon pulchellum*, *Parnassia fimbriata*, *Symphyotrichum foliaceum* (= *Aster foliaceus*), and *Suksdorfia ranunculifolia*. A number of other mesic, high constancy forbs occur with low cover, including *Zigadenus elegans*. Forb cover tends to occur in patches and overall it seldom exceeds 30% cover, with individual species very seldom having more than 10% cover.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This is a small-patch community that is associated with seep conditions providing a mesic to hygric moisture regime. Possibly the strongest determinant of this community is a strongly bimodal moisture regime; saturated and even having overland flow in spring and early summer and by mid to late summer subsurface flow ceases and soils dry rapidly due to warm site exposures. Within-type vegetation differences are explained by differences in water regime (considerable variation in when sites become dry, if ever) and amount of exposed rock. Plant cover is high (90+%) where continuous soils have developed but can be as low as 10% where rock cover exceeds 90%. The documented elevation range is from 1640 to 2190 m (5380-7185 feet). It is found primarily on west- to southwest-facing, moderate to steep slopes, mostly having greater than 45% inclination. This community often occurs in terrain with irregular relief owing to rock outcrops, stabilized fell-fields or talus with appreciable soil, or as a broad zone paralleling rivulets and the most incipient of first-order streams. Near-surface bedrock paralleling the slope can impede deeper drainage providing seep conditions along the slope. Microsites of relatively flat outcrops of layered sedimentary rock accumulates organic humus with a high water-retention capacity providing in the aggregate an extensive substrate for this community. Snow duration and wind exposure have been rated as moderate (Damm 2001), but since prevailing winds are from the southwest and most of the sites also face this direction, it is difficult to see how this could be the case. Probably a stronger case can be made that these sites are in receiving positions favored by early snowmelt and subsurface flow.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The vascular plant cover is highly variable (98 to 8%) in this type and more or less inversely proportional to rock exposure in the drier expressions of the type and on moister sites in inverse proportion to the bryophyte/lichen cover. Dwarf-shrubs are scattered, comprising not much more than 5% cover; the most

constant being *Dasiphora fruticosa* ssp. *floribunda* and *Arctostaphylos uva-ursi*. On the more lush sites (which are not necessarily the wetter sites), *Carex scirpoidea*, the dominant, highly constant and diagnostic sedge, can approach a sward-like aspect, but on the rockier sites its cover may scarcely exceed a few percent. Other graminoids of high constancy but generally of low cover include *Danthonia intermedia*, *Festuca idahoensis*, *Festuca campestris* (= *Festuca scabrella*), and *Poa alpina*. *Carex podocarpa*, *Carex spectabilis*, and *Deschampsia caespitosa* are present in the moister sites and the forenamed graminoids tend not to be. Though generally typifying moist to hygric sites, this type can range to relatively wet environments as indicated by the presence of *Allium schoenoprasum*, *Triantha glutinosa* (= *Tofieldia glutinosa*), *Packera streptanthifolia* (= *Senecio cymbalarioides*), *Dodecatheon pulchellum*, *Parnassia fimbriata*, *Symphyotrichum foliaceum* (= *Aster foliaceus*), and *Suksdorfia ranunculifolia*. High-constancy forbs with more mesic or generalist tendencies include *Zigadenus elegans*, *Potentilla diversifolia*, *Cirsium hookerianum*, *Galium boreale*, *Polygonum bistortoides*, *Crepis runcinata*, *Hedysarum sulphurescens*, and *Solidago multiradiata*. Forb cover tends to occur in patches and overall it seldom exceeds 30% cover, with individual species very seldom having more than 10% cover.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Arctostaphylos uva-ursi</i> , <i>Dasiphora fruticosa</i> ssp. <i>floribunda</i>
Herb (field)	Forb	<i>Hedysarum sulphurescens</i> , <i>Polygonum bistortoides</i> , <i>Potentilla diversifolia</i> , <i>Symphyotrichum foliaceum</i> , <i>Zigadenus elegans</i>
Herb (field)	Graminoid	<i>Carex scirpoidea</i> , <i>Danthonia intermedia</i> , <i>Festuca campestris</i> , <i>Festuca idahoensis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex scirpoidea*, *Hedysarum sulphurescens*, *Polygonum bistortoides*, *Potentilla diversifolia*, *Zigadenus elegans*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Euphrasia subarctica*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4G5 (4-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: The similarity, both environmentally and floristically, between this community (CEGL005866) and *Carex scirpoidea* - *Potentilla diversifolia* Herbaceous Vegetation (CEGL001867) (as defined for southwestern Montana) is appreciable, though this community occupies, on the average, more mesic sites. The type as defined here is an amalgamation of plots drawn from several of C. Damm's (2001) plant associations, namely all three variants of *Zigadeno elegantis* - *Caricetum scirpoideae*, *Trollio* - *Parnassietum*, and *Dodecatheo* - *Suksdorfietum ranunculifoliae*. The last-named association is more typical of stabilized talus, but nevertheless has a full complement of species associated with the community described here, with the exception of *Suksdorfia ranunculifolia* being relatively abundant and indicative of a seeping water source that delivers well into mid to late summer; however, seepage water of varying temporal longevity is what characterizes the type in general.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Carex scirpoidea* - *Potentilla diversifolia* Herbaceous Vegetation (CEGL001867)

GLOBAL RELATED CONCEPTS:

- *Dodecatheo* - *Suksdorfietum ranunculifoliae* Association (Damm 2001) I
- *Trollio* - *Parnassietum fimbriatae* Association (Damm 2001) I
- *Zigadeno elegantis* - *Caricetum scirpoideae* Association (Damm 2001) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: Most of the samples documenting this type came from the Appistoki Valley and Red Gap Pass vicinity (Damm 2001) of Glacier National Park, but it is expected to occur throughout Glacier National Park, as well as Waterton Lakes National Park.

GLOBAL RANGE:

NATIONS: CA?, US

STATES/PROVINCES: AB?, MT:S4S5

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes?)

ELEMENT SOURCES**WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: CD88, CD232, CD98, CD513, CD479, CD228, CD138, CD139, CD230, CD227, CD112, CD177, CD518, CD117, CD118, CD113, CD292, CD242, CD37, CD480.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Damm 2001, Western Ecology Working Group n.d.

Carex spectabilis Herbaceous Alliance**Carex spectabilis - Arnica X diversifolia Herbaceous Vegetation****NORTHWESTERN SHOWY SEDGE - RAYLESS ARNICA HERBACEOUS VEGETATION**

IDENTIFIER: CEGL005867

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Short alpine or subalpine sod grassland (V.A.5.N.g.)
Alliance	<i>Carex spectabilis</i> Herbaceous Alliance (A.1300)
Alliance (English name)	Northwestern Showy Sedge Herbaceous Alliance
Association	<i>Carex spectabilis</i> - <i>Arnica X diversifolia</i> Herbaceous Vegetation
Association (English name)	Northwestern Showy Sedge - Rayless Arnica Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is a small-patch herbaceous association of the alpine of northwestern Montana, in Glacier National Park. It is characterized as a pioneer chionophilic community of recently deglaciated substrates in glacier-scoured cirque basins or on morainal or other talus slopes. The noted elevation span is from 2000 to 2400 m (6560-7870 feet), and all aspects are represented. Cirque basin margins are usually gently sloping or undulating and the colluvial slopes and newly exposed morainal walls do not much exceed a 20% grade. The community is found on soil patches having minimal development with large barren rock or gravel areas between patches. The total rock cover varies from 90% in earliest successional expressions to less than 40%, in later successional stages. Vegetation is restricted to the soil patches, which are often humus-rich and fine-textured. All sites have a moderate to mostly long-persisting snowpack approaching snowbed conditions and resulting in a mesic to hygric moisture regime. Meltwaters from adjacent snowbanks is virtually constant, supplied well into late summer. Vascular plant cover ranges from 10% to 65%, presumably following a gradient in time since exposure; these presumed younger stages have a low species richness of around 20 whereas older sites have up to 40 species. Prominent clumps of *Carex spectabilis* are the first vascular species to colonize these gravel barrens and rocky slopes, generating their own humus layers via decomposition of abundant foliage. Other graminoids with at least 50% constancy include *Luzula piperi*, *Phleum alpinum*, *Poa cusickii*, *Poa alpina*, *Juncus drummondii*, and *Carex nigricans*; the last two named species are faithful indicators of snowbed environments, whereas the first four are found on many area moraines as the first pioneering species. Forbs of high constancy and also known as colonizers are *Arnica X diversifolia*, *Epilobium anagallidifolium* (= *Epilobium*

alpinum), *Oxyria digyna*, and *Ranunculus eschscholtzii*. Forbs with moderate to high constancy and indicative of high moisture status/snow persistence include *Veronica wormskjoldii*, *Senecio triangularis*, *Erigeron peregrinus*, *Hieracium gracile*, and *Sibbaldia procumbens*. Moss and lichen cover is less than 5% regardless of site age.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This small-patch type is characterized as a pioneer chionophilic community of recently deglaciated substrates in glacier-scoured cirque basins or on morainal or other talus slopes. The noted elevation span is from 2000 to 2400 m (6560-7870 feet). Cirque basin margins are usually gently sloping or undulating and the colluvial slopes and newly exposed morainal walls do not much exceed a 20% grade. Aspects representing all cardinal directions are represented. The community is found on soil patches having minimal development with large barren rock or gravel areas between patches. The total rock cover varies from 90% in earliest successional expressions to less than 40%, in later successional stages. Vegetation is restricted to the soil patches, which are often humus-rich and fine-textured. All sites have a moderate to mostly long-persisting snowpack approaching snowbed conditions (witness species allied with *Carex nigricans* communities) and resulting in a mesic to hygric moisture regime. Meltwaters from adjacent snowbanks is virtually constant, supplied well into late summer.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Vascular plant cover ranges from 10% to 65%, presumably following a gradient in time since exposure; these presumed younger stages have a low species richness of around 20 whereas older sites have up to 40 species (and higher soil cover). Prominent clumps of *Carex spectabilis* are the first vascular species to colonize these gravel barrens and rocky slopes, generating their own humus layers via decomposition of abundant foliage. Other graminoids with at least 50% constancy include *Luzula piperi*, *Phleum alpinum*, *Poa cusickii*, *Poa alpina*, *Juncus drummondii*, and *Carex nigricans*; the last two named species are faithful indicators of snowbed environments, whereas the first four are characterized as colonizer species in this type of habitat, found on many area moraines as the first pioneering species. Forbs of high constancy and also known for colonizer proclivities are *Arnica X diversifolia*, *Epilobium anagallidifolium* (= *Epilobium alpinum*), *Oxyria digyna*, and *Ranunculus eschscholtzii*; forbs with moderate to high constancy and indicative of high moisture status/snow persistence include *Veronica wormskjoldii*, *Senecio triangularis*, *Erigeron peregrinus*, *Hieracium gracile*, and *Sibbaldia procumbens*. Moss and lichen cover is less than 5% regardless of site age.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Salix arctica</i>
Herb (field)	Forb	<i>Arnica x diversifolia</i> , <i>Epilobium anagallidifolium</i> , <i>Erigeron peregrinus</i> , <i>Oxyria digyna</i> , <i>Ranunculus eschscholtzii</i>
Herb (field)	Graminoid	<i>Carex nigricans</i> , <i>Carex spectabilis</i> , <i>Luzula piperi</i> , <i>Poa alpina</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Arnica x diversifolia*, *Carex spectabilis*, *Luzula piperi*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4 (4-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This community was described directly from the treatment of C. Damm (2001), only his name for the type, *Arnica diversifoliae* - *Caricetum spectabilis* Association, was changed (order of species reversed) to reflect NVCS approach. It should be noted that *Arnica X diversifolia* is believed to be a hybrid taxon, a cross of *Arnica mollis* or *Arnica amplexicaulis* with *Arnica cordifolia* or *Arnica latifolia*. Damm (2001) also noted the taxonomic difficulty of field (and laboratory) identification of *Carex spectabilis*, some of which could pass as *Carex paysonis*.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Carex spectabilis* - *Polygonum bistortoides* Herbaceous Vegetation (CEGL001828)
- *Carex spectabilis* - *Sibbaldia procumbens* Herbaceous Vegetation (CEGL003140)
- *Carex spectabilis* Herbaceous Vegetation (CEGL001827)

GLOBAL RELATED CONCEPTS:

- *Arnica diversifoliae* - *Caricetum spectabilis* Association (Damm 2001) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: Though described based on sampling from only two areas in Glacier National Park, it is expected to be found in the hanging valleys and cirque basins throughout this park as well as Waterton Lakes National Park.

GLOBAL RANGE:

NATIONS: CA?, US

STATES/PROVINCES: AB?, MT:S3S4

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: CD164, CD628, CD629, CD625, CD615, CD648, CD890, CD654.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Damm 2001, Western Ecology Working Group n.d.

***Luzula glabrata* var. *hitchcockii* Herbaceous Alliance**

***Luzula glabrata* var. *hitchcockii* - *Erythronium grandiflorum* Herbaceous Vegetation
HITCHCOCK'S SMOOTH WOODRUSH / YELLOW AVALANCHE LILY HERBACEOUS
VEGETATION**

IDENTIFIER: CEGL005873

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Short alpine or subalpine sod grassland (V.A.5.N.g.)
Alliance	<i>Luzula glabrata</i> var. <i>hitchcockii</i> Herbaceous Alliance (A.2641)
Alliance (English name)	Hitchcock's Smooth Woodrush Herbaceous Alliance
Association	<i>Luzula glabrata</i> var. <i>hitchcockii</i> - <i>Erythronium grandiflorum</i> Herbaceous Vegetation
Association (English name)	Hitchcock's Smooth Woodrush / Yellow Avalanche Lily Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Mesic Meadow (CES306.829)

ELEMENT CONCEPT

GLOBAL SUMMARY: This vegetation type has only been documented from Glacier National Park, Montana, but it is highly likely to also occur in Waterton Lakes National Park, Alberta. This small-patch type is common in the upper subalpine and extends just into the lower alpine exhibiting a relatively narrow elevation range from 1900 to 2120 m (6230-6950 feet). It is a component of a complexly patterned environment representing those positions that accumulate a deep snowload and retain it long into the growing season. It generally occupies gently rolling terrain, particularly depressions within, and extends to gentle slopes and even steep slopes if conditions are conducive to snow accumulation and retention. It often occurs as narrow patches between tree-dominated atolls at the highest elevations of tree development. Parent materials include predominantly calcareous and noncalcareous fine-textured sedimentary rock. Soils are moderately well- to poorly drained. Exposed rock and soil generally do not exceed 10% cover with the great majority of the ground surface covered with litter from the abundant vegetation. There are virtually no shrubs, with the typical expression a lush herbaceous vegetation (average cover 82%) that is usually dominated by a discontinuous sward of *Luzula glabrata* var. *hitchcockii*. Other graminoids of high constancy and indicative of various degrees of snowbed conditions include *Carex nigricans* and *Carex spectabilis*. More sporadically represented snowbed graminoids include *Juncus drummondii* and *Juncus parryi*. *Vahlodea atropurpurea*, *Phleum alpinum*, and *Poa cusickii* also have high constancy. On the more poorly drained sites, a variable suite of forbs associated with mesic to subhygric moisture regimes may exceed the graminoid cover; these forbs include *Erigeron peregrinus*, *Hieracium gracile*, *Epilobium anagallidifolium* (= *Epilobium alpinum*), *Hypericum scouleri*, *Arnica X diversifolia*, *Arnica latifolia*, and *Valeriana sitchensis*. The spring ephemeral *Erythronium grandiflorum* is dominant (cover to 50+%) immediately following snow departure. Both lichen and bryophyte cover are minimal, seldom exceeding 5%.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This small-patch type is common in the upper subalpine and extends just into the lower alpine (just above timberline) exhibiting a relatively narrow elevation range from 1900 to 2120 m (6230-6950 feet). It is a component of a complexly patterned environment representing those positions that accumulate a deep snowload and retain it long into the growing season. It generally occupies gently rolling terrain, particularly depressions within, and extends to gentle slopes and even steep slopes if conditions are conducive to snow accumulation and retention. It often occurs as narrow patches intercalated between tree-dominated atolls at the highest elevations of tree development. Parent materials include predominantly calcareous and non-calcareous fine-textured sedimentary rock. Soils are moderately well- to poorly drained. Exposed rock and soil generally does not exceed 10% with the great majority of the ground surface (average 75%, ranging 45 to 90%) covered with litter from the abundant vegetation.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: There are virtually no shrubs in this type that is typified by lush herbaceous vegetation (average cover 82%) that is usually dominated by a discontinuous sward of *Luzula glabrata* var. *hitchcockii* (cover ranging from 10 to 90%, 62% average). Other graminoids of high constancy and indicative of various degrees of snowbed conditions include *Carex nigricans* and *Carex spectabilis*; there is usually an ecotonal area where *Carex nigricans* cover increases signaling a transition to *Carex nigricans* - *Sibbaldia procumbens* Herbaceous Vegetation (CEGL005824) of extreme snowbed conditions. More sporadically represented snowbed graminoids include *Juncus drummondii* and *Juncus parryi*. *Vahlodea atropurpurea*, *Phleum alpinum*, and *Poa cusickii* also have high constancy, though merely associated with a mesic moisture regime, not snowbeds. On the more poorly drained sites, a variable suite of forbs associated with mesic to subhygric moisture regimes are capable in the aggregate of exceeding the graminoid cover; these forbs include *Erigeron peregrinus*, *Hieracium gracile*, *Epilobium anagallidifolium* (= *Epilobium alpinum*), *Hypericum scouleri*, *Arnica X diversifolia*, *Arnica latifolia*, and *Valeriana sitchensis*. The spring ephemeral *Erythronium grandiflorum* is dominant (cover to 50+%) immediately following snow departure. In the face of abundant litter and high vascular plant cover, both lichen and bryophyte cover is minimal, seldom exceeding 5%.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Erigeron peregrinus</i> , <i>Erythronium grandiflorum</i> , <i>Hypericum scouleri</i> , <i>Valeriana sitchensis</i>
Herb (field)	Graminoid	<i>Carex nigricans</i> , <i>Carex spectabilis</i> , <i>Luzula glabrata</i> var. <i>hitchcockii</i>

Global

Stratum

Lifeform

Species

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex nigricans*, *Luzula glabrata* var. *hitchcockii*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: GNR (21-Apr-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: The name of this vegetation type and all plots occurring in this type were derived from C. Damm's (2001) *Luzulo hitchcockii* - *Erythronietum grandiflorae* Association; over half of the stands of the type as conceived of by Damm were allocated to other types, mostly *Carex nigricans* Herbaceous Vegetation (CEGL001816) and *Valeriana sitchensis* - *Veratrum viride* Herbaceous Vegetation (CEGL001998). *Carex nigricans* is indicative of yet longer persisting snowpacks, and the *Valeriana sitchensis* - *Veratrum viride* community was given precedence due to high forb coverages and a more extended period of mesic to hygric conditions.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

- *Luzulo hitchcockii* - *Erythronietum grandiflorae* Association (Damm 2001) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This vegetation type has only been documented from Glacier National Park, but it is highly improbable that it would not also occur in Waterton Lakes National Park as *Luzula glabrata* is a major component of the high-elevation woodland type *Larix lyallii* / *Vaccinium membranaceum* / *Luzula glabrata* var. *hitchcockii* Woodland (CEGL005884), which is well-documented for the Canadian park.

GLOBAL RANGE:

NATIONS: CA?, US

STATES/PROVINCES: AB?, MT

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes?)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: CD213, CD438, CD544, CD212, CD120, CD435, CD548, CD543, CD542, CD344, CD404, CD577, CD706, CD567, CD587, CD257, CD399, CD201.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper and C. Damm

REFERENCES: Damm 2001, Western Ecology Working Group n.d.

V.A.5.N.h. Short alpine or subalpine dry bunch grassland

Festuca idahoensis* Alpine Herbaceous Alliance**Festuca idahoensis* - (*Festuca campestris*) / *Potentilla diversifolia* Herbaceous Vegetation
IDAHO FESCUE - (PRAIRIE FESCUE) / MOUNTAIN MEADOW CINQUEFOIL HERBACEOUS
VEGETATION****IDENTIFIER: CEGL001623****NVC Classification**

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Short alpine or subalpine dry bunch grassland (V.A.5.N.h.)
Alliance	<i>Festuca idahoensis</i> Alpine Herbaceous Alliance (A.1313)
Alliance (English name)	Idaho Fescue Alpine Herbaceous Alliance
Association	<i>Festuca idahoensis</i> - (<i>Festuca campestris</i>) / <i>Potentilla diversifolia</i> Herbaceous Vegetation
Association (English name)	Idaho Fescue - (Prairie Fescue) / Mountain Meadow Cinquefoil Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Subalpine-Upper Montane Grassland (CES306.806)**ELEMENT CONCEPT**

GLOBAL SUMMARY: This association is described from alpine slopes of mountains of central Idaho and western Montana. Stands range from 1840-3072 m (6000-10,080 feet), the lower margin of the alpine zone. Soils are derived from granitic, limestone, and calcareous sandstone rocks. The association occurs on moderately steep north-facing slopes, east-facing and southerly exposures with all degrees of slope inclination represented including gently undulating and even depressed glacial moraine surfaces. On north-facing slopes winter snow accumulation is light to moderate and melts early in the growing season. However, on east and south exposures, augmented snow accumulation occurs due to predominantly west and southwest winds.

This is a mostly graminoid-dominated type, and cover varies from about 20 to 85% with a modal range being 40 to 60%; i.e., it ranges from sparse vegetation of fell-fields to a nearly continuous grass-dominated turf. *Festuca idahoensis* dominates relatively lush meadow vegetation, and under these conditions, *Potentilla diversifolia* is codominant. In more exposed settings, *Festuca idahoensis* sometimes relinquishes dominance to *Festuca campestris*. Other graminoids of high constancy are *Carex nova*, *Poa cusickii* ssp. *epilis* (= *Poa epilis*), *Poa cusickii*, *Luzula spicata*, and *Carex phaeocephala*. Other graminoids with lower constancy include *Calamagrostis purpurascens*, *Poa alpina*, and *Carex rupestris*. *Calamagrostis purpurascens* and *Carex rupestris* have been used as indicators in situations where *Festuca idahoensis* and/or *Festuca campestris* cover alone is insufficient to qualify stands as belonging to this type. Forb cover is highly variable, but notable species include *Potentilla diversifolia*, *Astragalus alpinus*, *Erigeron simplex*, *Phlox pulvinata*, *Polemonium viscosum*, and *Solidago multiradiata*.

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This type is highly variable in both vegetation and environment, being found from the upper subalpine at 1840 m (6035 feet) to well into the alpine, as high as 2330 m (7640 feet). It occurs primarily on east-facing through southerly exposures with all degrees of slope inclination represented (including gently undulating and even depressed glacial moraine surfaces); some northerly aspects are also represented, but west-facing slopes are conspicuously unrepresented. The standard presumption that the prevailing winds are westerly to southwesterly would place many of the inventoried sites in lee slope positions with augmented snow accumulations; this community also occurs in the lee of wind-barriers such as convex relief-forms, krummholz patches, and bedrock terraces. Damm (2001) asserts that the consistent cover provided by *Arenaria capillaris* and *Eriogonum flavum* is indicative of sites with long snow duration. Micro-terraces are a sign of frost- and gravity-induced soil creep; given the saturated soils of early summer gelifluction is likely one of the surface-configuring processes. Parent materials include red and green argillite, arenites and quartzite; usually slopes are composed of frost-structured rubble rather than unconsolidated or unstable colluvium. The amount of exposed rock is highly variable, approximately inversely associated with litter cover, ranging from as little as 1%, to mostly less than 30%, to as much as 80%.

GLOBAL ENVIRONMENT: This association is described from alpine slopes of mountains of central Idaho and western Montana. Stands range from 1840-3072 m (6000-10,080 feet). The association occurs at the lower margin of the alpine zone on moderately steep north-facing slopes, east-facing and southerly exposures with all degrees of slope inclination represented including gently undulating and even depressed glacial moraine surfaces. West-facing slopes are conspicuously unrepresented. In general it is assumed that prevailing winds are westerly to southwesterly where lee slope positions have augmented snow accumulations. In addition, this

community occurs in the lee of wind-barriers such as convex relief-forms, krummholz patches, and bedrock terraces. Micro-relief of the soil surface is likely frost- and gravity-induced soil creep; given the saturated soils of early summer, gelifluction is likely one of the surface-configuring processes. Slopes are composed of frost-structured rubble rather than unconsolidated or unstable colluvium. Soils are derived from granitic, limestone, and calcareous sandstone rocks. Winter snow accumulation is light to moderate and melts early in the growing season.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The general aspect of this community is not conveniently described because vascular plant cover, mostly graminoid-dominated, varies from about 20 to 85% with a modal range being 40 to 60%; i.e., it ranges from sparse vegetation of fell fields to a nearly continuous grass-dominated turf (see Classification Comments). *Dasiphora fruticosa* ssp. *floribunda* is the only dwarf-shrub consistently present and its cover does not exceed 5%. *Festuca idahoensis* is virtually 100% constant but not always the dominant graminoid, sharing or sometimes relinquishing that standing to *Festuca campestris*. The only other graminoids of note (high constancy) are *Luzula spicata* and *Carex phaeocephala*; other graminoids with constancy between 25 and 50% include *Calamagrostis purpurascens*, *Poa alpina*, *Poa cusickii*, and *Carex rupestris*. *Calamagrostis purpurascens* and *Carex rupestris* have been used as indicators to cover situations where *Festuca idahoensis* and/or *Festuca campestris* cover alone is insufficient to qualify plots as belonging to this type. Plots with *Calamagrostis purpurascens* and *Carex rupestris* prominent generally can be characterized as more stressful sites, usually having greater rock exposure and wind impact. Though there are no forbs unique to this type, there are a number that are highly constant and differentiate it, though not in absolute terms, from lower elevation *Festuca*-dominated sites; these include *Arenaria capillaris*, *Minuartia obtusiloba* (= *Arenaria obtusiloba*), *Antennaria umbrinella*, *Arnica rydbergii*, *Potentilla diversifolia*, *Eriogonum flavum*, *Erigeron simplex*, *Polygonum bistortoides*, *Silene parryi*, *Selaginella densa* var. *standleyi*, and *Astragalus bourgovii*. Other forbs are highly constant but have a much broader elevation range including, *Selaginella densa* var. *scopulorum*, *Achillea millefolium*, *Campanula rotundifolia*, *Pulsatilla patens* ssp. *multifida* (= *Anemone patens*), *Galium boreale*, *Sedum lanceolatum*, and *Pedicularis contorta*. Bryophyte cover ranges from none to 30% with over 80% of sites having less than 5% cover; lichen cover ranges from none to 40% with 60% of sites having less than 10% cover.

GLOBAL VEGETATION: Stands from central Idaho and southwestern Montana occur on slightly more protected sites and seem to have higher biomass and greater canopy cover. Sites studied in the alpine region of Glacier National Park are more often sparse, often with very low total canopy coverage, making an average or typical vegetative description difficult. In stands from central Idaho and southwestern Montana, *Festuca idahoensis* dominates the relatively lush meadow vegetation, and *Potentilla diversifolia* is codominant. *Astragalus alpinus*, *Carex nova*, *Erigeron simplex*, *Phlox pulvinata*, *Poa cusickii* ssp. *epilis* (= *Poa epilis*), *Polemonium viscosum*, and *Solidago multiradiata* frequently occur with moderate abundance. *Deschampsia caespitosa* is often present but occurs with low abundance.

In the alpine regions of Glacier National Park, *Festuca idahoensis* is virtually 100% constant but not always the dominant graminoid, sharing or sometimes relinquishing that standing to *Festuca campestris*. The only other graminoids of note (high constancy) are *Luzula spicata* and *Carex phaeocephala*; other graminoids with constancy between 25 and 50% include *Calamagrostis purpurascens*, *Poa alpina*, *Poa cusickii*, and *Carex rupestris*. High-consistency forbs include *Potentilla diversifolia*, *Eriogonum flavum*, *Erigeron simplex*, *Polygonum bistortoides*, *Silene parryi*, *Selaginella densa* var. *standleyi*, and *Astragalus bourgovii*. An inconsistent and low cover of presence of *Dasiphora fruticosa* ssp. *floribunda* is also noted. Other forbs are highly constant but have a much broader elevation range including *Selaginella densa* var. *scopulorum*, *Achillea millefolium*, *Campanula rotundifolia*, *Pulsatilla patens* ssp. *multifida* (= *Anemone patens*), *Galium boreale*, *Sedum lanceolatum*, and *Pedicularis contorta*. Bryophyte cover ranges from none to 30% with over 80% of sites having less than 5% cover; lichen cover ranges from none to 40% with 60% of sites having less than 10% cover.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i>
Herb (field)	Forb	<i>Achillea millefolium</i> , <i>Antennaria umbrinella</i> , <i>Arenaria capillaris</i> , <i>Arnica rydbergii</i> , <i>Eriogonum flavum</i> , <i>Potentilla diversifolia</i>
Herb (field)	Graminoid	<i>Calamagrostis purpurascens</i> , <i>Carex phaeocephala</i> , <i>Carex rupestris</i> , <i>Festuca campestris</i> , <i>Festuca idahoensis</i> , <i>Luzula spicata</i> , <i>Poa alpina</i> , <i>Poa cusickii</i>
Herb (field)	Fern or fern ally	<i>Selaginella densa</i> var. <i>scopulorum</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Arenaria capillaris</i> , <i>Potentilla diversifolia</i>
Herb (field)	Graminoid	<i>Festuca campestris</i> , <i>Festuca idahoensis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Antennaria umbrinella*, *Arenaria capillaris*, *Calamagrostis purpurascens*, *Carex rupestris*, *Festuca campestris*, *Festuca idahoensis*, *Potentilla diversifolia*

GLOBAL: *Festuca idahoensis*, *Potentilla diversifolia*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3 (15-Mar-1999). This regionally endemic plant association occurs in remote, high-elevation sites of southwestern Montana and central Idaho. The association occurs at the lower margin of the alpine zone on moderately steep north-facing slopes. Stands range from 9500 to 10,080 feet. Soils are derived from granitic, limestone, and calcareous sandstone rocks. Winter snow accumulation is light to moderate and melts early in the growing season. These isolated, specialized habitats are relatively well-protected from the impacts of resource utilization such as intensive livestock grazing and recreational use. Known occurrences are ranked as being in good to excellent condition. Appropriate inventories to determine the rangewide condition of stands, however, have not been conducted. No protected occurrences have been reported.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: For the IPP, *Calamagrostis purpurascens* and *Carex rupestris* have been used as indicators to cover situations where *Festuca idahoensis* and/or *Festuca campestris* cover alone is insufficient to qualify plots as belonging to this type. Damm (2001) classified many of the plots we categorized as this type as belonging to *Arenario capillaris* - *Festucetum idahoensis* Association; he included within this plant association even plots that had a conspicuous to dominant dwarf-shrub layer of *Dasiphora fruticosa* ssp. *floribunda*. Many of the plots of this association Damm (2001) had included within both his *Polytricho piliferi* - *Arenarietum capillaris* and *Oxytropido campestris* - *Bupleuretum americanum* associations, primarily fell-field environments. The first noted of these associations Damm (2001) indicated was more a snowbed community than a fell-field condition, as exemplified by the *Arenario capillaris* - *Festucetum idahoensis* Association. The second noted association Damm (2001) characterizes as a alpine prairie with turf predominating.

GLOBAL COMMENTS: The association is recognized in central Idaho on the basis of Caicco (1983) and Moseley (1985) but is not identified as an association by either author. This grassland type has been described from Idaho and southwestern Montana as simply *Festuca idahoensis* / *Potentilla diversifolia* and exhibits some floristic differences compared to the Glacier National Park occurrences. We feel the name change to *Festuca idahoensis* - (*Festuca campestris*) / *Potentilla diversifolia* Herbaceous Vegetation (CEGL001623) better captures the essence of the type. In Glacier National Park, *Calamagrostis purpurascens* and *Carex rupestris* have been used as indicators to cover situations where *Festuca idahoensis* and/or *Festuca campestris* cover alone is insufficient to qualify plots as belonging to this type. This association almost certainly is too broadly defined (as exemplified by the vegetation key developed for Glacier National Park, with a number of alternative indicators beyond the nominal species), but until an intensive analysis can be conducted, incorporating both floristic and abiotic variables, this type will remain as perhaps an amalgamation of several communities.

GLOBAL SIMILAR ASSOCIATIONS:

- *Festuca idahoensis* - *Carex scirpoidea* Herbaceous Vegetation (CEGL001899)
- *Festuca idahoensis* - *Deschampsia caespitosa* Herbaceous Vegetation (CEGL001900)
- *Festuca idahoensis* - *Leucopoa kingii* Herbaceous Vegetation (CEGL001901)
- *Festuca idahoensis* Herbaceous Vegetation (CEGL001897)

GLOBAL RELATED CONCEPTS:

- *Arenario capillaris* - *Festucetum idahoensis* Association (Damm 2001) =
- *Festuca idahoensis*-*Potentilla diversifolia* (Bourgeron and Engelking 1994) =
- *Festuca idahoensis*/*Potentilla diversifolia* Community Type (Cooper et al. 1997) =
- *Oxytropido campestris* - *Bupleuretum americanum* Association (Damm 2001) I
- *Polytricho piliferi* - *Arenarietum capillaris* Association (Damm 2001) I
- DRISCOLL FORMATION CODE:V.B.4.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This vegetation type has been sampled intensively in the southeastern portion of Glacier National Park as well as Many Glacier and Red Gap Pass to the north. It has not been documented from Waterton Lakes National Park, though there is appropriate habitat and it is expected to be recorded there.

GLOBAL RANGE: The association is reported only from the alpine habitats of western Montana and central Idaho.

NATIONS: CA?, US

STATES/PROVINCES: AB?, ID:S2, MT:S3

USFS ECOREGIONS: M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES**WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: CD240, CD25, CD26, CD220, CD34, CD150, CD131, CD24, CD283, CD306, CD641, CD642, CD500, CD288, CD105, CD160, CD81, CD262, CD19, CD226, CD515, CD237, CD18, CD20, CD487, CD223, CD493, CD263, CD102, CD103, CD99, CD106, CD107, CD639, CD282, CD285, CD280, CD21, CD221, CD217, CD104, CD258, CD110, CD483, CD470, CD219, CD79, CD129, CD86, CD489, CD260, CD255, CD256, CD284, CD158, CD51, CD52, CD371, CD264, CD253, CD254, CD590, CD87, CD152, CD271, CD279, CD298, GLAC.172, GLAC.2041, GRAS-99-012, GRAS-00-005, GRAS-00-025, GRAS-00-027, GRAS-00-037, GRAS-00-038, GRAS-00-039, GRAS-00-040, GRAS-01-017, GRAS-01-033, GRAS-01-038, GRAS-01-040, GRAS-01-042.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: S.K. Rust, mod. G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Caicco 1983, Cooper and Lesica 1992, Cooper et al. 1997, Damm 2001, Driscoll et al. 1984, MTNHP 2002b, Moseley 1985, Western Ecology Working Group n.d.

Juncus parryi* Herbaceous Alliance**Juncus parryi* / *Sibbaldia procumbens* Herbaceous Vegetation****PARRY'S RUSH / CREEPING GLOW-WORT HERBACEOUS VEGETATION**

IDENTIFIER: CEG005871

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Short alpine or subalpine dry bunch grassland (V.A.5.N.h.)
Alliance	<i>Juncus parryi</i> Herbaceous Alliance (A.1325)
Alliance (English name)	Parry's Rush Herbaceous Alliance
Association	<i>Juncus parryi</i> / <i>Sibbaldia procumbens</i> Herbaceous Vegetation
Association (English name)	Parry's Rush / Creeping Glow-wort Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

ELEMENT CONCEPT

GLOBAL SUMMARY: This alpine association has been described from northwestern Montana in Glacier National Park and adjacent Waterton Lakes National Park, Alberta, Grand Teton National Park in northwestern Wyoming, and Rocky Mountain National Park in Colorado in high subalpine and low alpine zones. It occurs predominantly on gently rolling to moderately steep glaciated terrain, often associated with depressions and broad saddles. Where it occurs on moderate to steep slopes, it is associated with areas where snow collects during the winter (lee slopes). Moderately well-drained to rapidly drained soils are derived from a wide variety of sedimentary parent materials. Ground cover is variable, with northern Rocky Mountain stands being mostly rock-free with an average of about 4% exposed soil, and litter cover varies widely with a modal value around 45 to 50%. Lichen and bryophyte cover is also highly variable, ranging from nil to 85%. Central and southern Rocky Mountain stands are mostly open and rocky, with exposed bare soil accounting for 5-20% of the ground surface and an additional 15-30% covered with large and small rock. Moss and lichen, when

present, can cover up to 15% of the ground surface. The vegetation cover is characterized by a moderately dense to dense herbaceous layer dominated by *Juncus parryi* and *Sibbaldia procumbens*. Other important species include *Antennaria parvifolia*, *Carex paysonis*, *Carex rupestris* var. *drummondiana*, *Danthonia intermedia*, *Poa cusickii* ssp. *epilis*, and *Viola labradorica*, though none of these species is consistently found with high cover.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This small-patch type is characteristic of snowbed positions from the upper subalpine to well into the alpine zone, from 2010 to 2350 m (6590-7710 feet). It occurs predominantly on gently rolling glaciated terrain, often associated with depressions, and evidences no relationship to aspect for the gently inclined surfaces; however, where it occurs on moderate to steep slopes, it apparently is associated with east- to south-facing slopes (those that might be expected to be receiving positions in the redistribution of snow by prevailing westerlies). Moderately well-drained to well-drained soils are derived from a wide variety of sedimentary parent materials, predominantly siltstone. The ground surface is mostly rock-free with an average of about 4% exposed soil, and litter cover varies widely, from 10 to 85%, with a modal value around 45 to 50%; lichen and bryophyte cover is also highly variable, ranging from nil to 85%.

GLOBAL ENVIRONMENT: This snowfield-supported wetland association has been described from northwestern Montana and north-central Colorado in high subalpine and alpine zones. Elevation ranges from 2010 to 2350 m (6590-7710 feet) in the northern part of the range and 3240-3480 m (10,640-11,420 feet) in the south. Central Rocky Mountain stands occur at intermediate elevations, between 2652 and 3063 m (8700-10,050 feet). It occurs predominantly on gentle to moderately steep glaciated terrain, on slopes, depressions and broad saddles. Stands occurring on moderate to steep slopes (to 50%) are in positions that collect wind-driven snow. Moderately well-drained to rapidly drained soils are derived from a wide variety of sedimentary parent materials. Northern Rocky Mountain stands have a ground surface that is mostly rock-free with an average of about 4% exposed soil, and litter cover varies widely, from 10 to 85%, with a modal value around 45 to 50%. Lichen and bryophyte cover is also highly variable, ranging from nil to 85%. Central and southern Rocky Mountain stands are open and rocky, with exposed bare soil accounting for 5-20% of the ground surface and an additional 10-30% covered with large and small rock. Moss and lichen, when present, can cover up to 15% of the ground surface.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Vascular plant cover varies widely from approaching a scarce vegetation to more than 80%; plant cover is generally less than in the comparable *Carex nigricans*-dominated snowbed sites, raising questions as to which of the two generally has the longest persisting snowpack. Shrubs, dwarf or otherwise, do not occur within the type. The dominant aspect is of a mini-tussock grassland with *Juncus parryi* and *Juncus drummondii* providing the most cover; other graminoids of high constancy but low cover include *Carex paysonis* and *Danthonia intermedia*. *Sibbaldia procumbens*, widely regarded to be chionophilous species, is consistently present with cover consistently in excess of 10%. Other forbs of high constancy include *Arenaria capillaris*, *Antennaria alpina*, *Hieracium gracile*, *Erigeron peregrinus*, and *Packera streptanthifolia* (= *Senecio cymbalarioides*); with the exception *Arenaria capillaris*, their coverages seldom exceed 5%.

GLOBAL VEGETATION: This high subalpine / low alpine association is characterized by a moderately dense to dense herbaceous layer dominated by *Juncus parryi*. *Sibbaldia procumbens* is often codominant. Other important species are *Antennaria parvifolia*, *Carex paysonis*, *Carex nigricans*, *Carex microptera*, *Carex rupestris* var. *drummondiana*, *Danthonia intermedia*, *Deschampsia caespitosa*, *Phleum alpinum*, *Poa cusickii* ssp. *epilis*, or *Viola labradorica*, though none of these species is consistently found with high cover. Constant species with low cover include *Antennaria alpina*, *Antennaria rosea*, *Arenaria capillaris*, *Erigeron peregrinus*, *Hieracium gracile*, *Packera streptanthifolia* (= *Senecio cymbalarioides*), *Phleum alpinum*, *Polygonum bistortoides*, *Potentilla diversifolia*, or *Trifolium parryi*. Short shrubs and dwarf-shrubs are generally absent but can include *Vaccinium caespitosum*, *Artemisia arctica* ssp. *arctica*, *Phyllodoce empetriformis*, and *Salix petrophila* in low densities. Low cover of moss and lichen is also common.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Antennaria alpina</i> , <i>Arenaria capillaris</i> , <i>Sibbaldia procumbens</i>
Herb (field)	Graminoid	<i>Juncus drummondii</i> , <i>Juncus parryi</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Sibbaldia procumbens</i>
Herb (field)	Graminoid	<i>Juncus drummondii</i> , <i>Juncus parryi</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Juncus drummondii*, *Juncus parryi*, *Sibbaldia procumbens*

GLOBAL: *Juncus parryi*, *Sibbaldia procumbens*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4 (9-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: Plots used to validate this type have come from three of C. Damm's (2001) associations, *Sibbaldio - Juncetum parryi*, *Polytricho piliferi - Arenarietum capillaris*, and *Leprario caesioalbae - Salicetum arcticae*. This type is environmentally very similar to both *Juncus parryi - Erigeron ursinus* Herbaceous Vegetation (CEGL001906) and *Juncus drummondii - Antennaria lanata* Herbaceous Vegetation (CEGL001904) of southwestern Montana (Cooper et al. 1997) but has a somewhat unique floristic composition, for which it has been recognized in this treatment.

GLOBAL COMMENTS: Plots used to validate this type have come from three of C. Damm's (2001) associations: *Sibbaldio - Juncetum parryi*, *Polytricho piliferi - Arenarietum capillaris*, and *Leprario caesioalbae - Salicetum arcticae*. This type is environmentally very similar to both *Juncus parryi - Erigeron ursinus* Herbaceous Vegetation (CEGL001906) and *Juncus drummondii - Antennaria lanata* Herbaceous Vegetation (CEGL001904) of southwestern Montana (Cooper et al. 1997, 1999) but has a somewhat unique floristic composition for which it has been recognized in this treatment. Plots from Rocky Mountain and Grand Teton national parks do not contain *Erigeron ursinus* but do contain *Sibbaldia procumbens* as a codominant and seem to fit well with the concept of this type described from the northern Rocky Mountains. Central and southern stands lack a few of the northern species, and *Juncus drummondii* and *Festuca idahoensis* appear to more important in northern stands. Relatively little is known about this type, and more alpine survey and classification work are needed to improve classification confidence.

GLOBAL SIMILAR ASSOCIATIONS:

- *Juncus drummondii - Antennaria lanata* Herbaceous Vegetation (CEGL001904)
- *Juncus parryi - Erigeron ursinus* Herbaceous Vegetation (CEGL001906)
- *Sibbaldia procumbens - Polygonum bistortoides* Herbaceous Vegetation (CEGL001933)

GLOBAL RELATED CONCEPTS:

- *Juncus parryi* (Holway and Ward 1963) ?
- *Leprario caesioalbae - Salicetum arcticae* Association (Damm 2001) I
- *Polytricho piliferi - Arenarietum capillaris* Association (Damm 2001) I
- *Sibbaldio - Juncetum parryi* Association (Damm 2001) I
- Association *Juncetum drummondii* (Willard 1963) (Willard 1979) B
- Association *Juncetum drummondii* (Willard 1963) (Komarkova 1979) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This type has been documented from the high subalpine and alpine zones of both Glacier National Park and Waterton Lakes National Park.

GLOBAL RANGE: This alpine association has been described from northwestern Montana in Glacier National Park and adjacent Waterton Lakes National Park, Alberta, and Rocky Mountain Park in Colorado. More survey and classification work are needed to determine the full range of distribution.

NATIONS: CA, US

STATES/PROVINCES: AB, CO, MT:S3?, WY

USFS ECOREGIONS: M331D:CC, M331I:CC, M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton, Rocky Mountain); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.112, GLAC.2067, GLAC.252, GLAC.2654, GLAC.2655, CD406, CD204, CD206, CD203, CD558, CD440, CD540, CD525, CD324, CD430, CD338, CD191, CD526, CD582, CD346, CD566, CD507, CD633, CD619, CD349, CD348, CD347, CD706, CD734, CD735, CD289, CD270, CD290, CD509, CD431, CD296, CD268, CD360, CD357, CD180, WATE.4111, WATE.5124.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz, mod. J. Coles

REFERENCES: Bourgeron and Engelking 1994, Cooper and Lesica 1992, Cooper et al. 1997, Cooper et al. 1999, Damm 2001, Holway and Ward 1963, Komarkova 1976, Komarkova 1979, Western Ecology Working Group n.d., Willard 1963, Willard 1979

***Kobresia myosuroides* Herbaceous Alliance**

***Kobresia myosuroides* - *Euphrasia disjuncta* Herbaceous Vegetation**

PACIFIC BOG SEDGE - POLAR EYEBRIGHT HERBACEOUS VEGETATION

IDENTIFIER: C EGL005872

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Short alpine or subalpine dry bunch grassland (V.A.5.N.h.)
Alliance	<i>Kobresia myosuroides</i> Herbaceous Alliance (A.1326)
Alliance (English name)	Pacific Bog Sedge Herbaceous Alliance
Association	<i>Kobresia myosuroides</i> - <i>Euphrasia disjuncta</i> Herbaceous Vegetation
Association (English name)	Pacific Bog Sedge - Polar Eyebright Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine Fell-Field (CES306.811)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is a relatively rare, small-patch, turf type found at the upper range of alpine environments in northwestern Montana, above 2200 m (7200 feet). The few examples were found on southerly exposures with low- to moderate-gradient slopes. It forms relatively thick mats of dense bog sedge vegetation that carpet terraced slopes, fell-fields, and colluvial slopes. Despite having a relatively early snow meltoff, this type receives an ample moisture supply, being subirrigated by waters percolating from surrounding snowfields. Soils are sufficiently moist to wet to promote slow soil creep or solifluction. Parent materials include argillites and limestone. The usually dense turf encourages the development of a humus-rich upper profile that has a dense root mat, which in turn promotes a coherent vegetation layer that persists under unstable slope conditions (solifluction). This uncommon type is one of the floristically richest alpine plant communities. The usually dense turf is composed of a variety of *Carex* and *Kobresia* species, but by far the dominant species is bunch-forming *Kobresia myosuroides*, the interlaced roots of which create a stable turf surface. Dwarf-shrubs, including *Dasiphora fruticosa* ssp. *floribunda*, *Dryas octopetala*, and *Salix arctica*, are consistently present in trace amounts. The presence of the diminutive annual *Euphrasia disjuncta* (= *Euphrasia arctica*), though not unique to this community, does set it apart from a host of other alpine communities. Other high-constancy forbs include *Gentiana prostrata*, *Polygonum viviparum*, *Polygonum bistortoides*, *Potentilla diversifolia*, *Rhodiola rosea* (= *Sedum roseum*), *Dodecatheon pulchellum*, *Solidago multiradiata*, *Hedysarum sulphurescens*, and *Zigadenus elegans*; only the last three named forbs were consistently represented with more than 5% cover. Graminoids consistently part of the mixed turf include *Festuca idahoensis*, *Festuca brachyphylla*, *Trisetum spicatum*, *Poa alpina*, *Poa nemoralis* ssp. *interior* (= *Poa interior*), *Luzula spicata*, and *Carex albonigra*; none of these with high cover. The bryophyte *Aulacomnium palustre* contributes appreciably to the impression of continuous vegetative cover.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This is a relatively rare, small-patch, turf type found at the upper range of alpine environments, above 2200 m (7200 feet). The few examples were found on southerly exposures with low- to moderate-gradient slopes. It forms relatively thick mats of dense bog sedge vegetation that carpet terraced slopes, fell-fields, and colluvial slopes. Despite having a relatively early snow meltoff (southerly exposures), this type receives an ample moisture supply, being subirrigated, at least early in the growing season, by waters percolating from surrounding snowfields. Soils are sufficiently moist to wet to promote slow soil creep or solifluction. Parent materials include argillites and limestone. The usually dense

turf encourages the development of a humus-rich upper profile that has a dense root mat, which in turn promotes a coherent vegetation layer that persists under unstable slope conditions (solifluction).

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This uncommon type is one of the floristically richest alpine plant communities. The usually dense turf is composed a variety of *Carex* and *Kobresia* species, but by far the dominant species is bunch-forming *Kobresia myosuroides*, the interlaced roots of which create a stable turf surface. Dwarf-shrubs, including *Dasiphora fruticosa* ssp. *floribunda*, *Dryas octopetala*, and *Salix arctica*, are consistently present in trace amounts. The presence of the diminutive annual *Euphrasia disjuncta* (= *Euphrasia arctica*), though not unique to this community, does set it apart from a host of other alpine communities. Other high-constancy forbs include *Gentiana prostrata*, *Polygonum viviparum*, *Polygonum bistortoides*, *Potentilla diversifolia*, *Rhodiola rosea* (= *Sedum roseum*), *Dodecatheon pulchellum*, *Solidago multiradiata*, *Hedysarum sulphurescens*, and *Zigadenus elegans*; only the last three named forbs were consistently represented with more than 5% cover. Graminoids consistently part of the mixed turf include *Festuca idahoensis*, *Festuca brachyphylla*, *Trisetum spicatum*, *Poa alpina*, *Poa nemoralis* ssp. *interior* (= *Poa interior*), *Luzula spicata*, and *Carex albonigra*; none of these with high cover. The bryophyte *Aulacomnium palustre* contributes appreciably to the impression of continuous vegetative cover.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Euphrasia disjuncta</i> , <i>Gentiana prostrata</i> , <i>Hedysarum sulphurescens</i> , <i>Polygonum viviparum</i> , <i>Solidago multiradiata</i>
Herb (field)	Graminoid	<i>Carex albonigra</i> , <i>Festuca idahoensis</i> , <i>Kobresia myosuroides</i> , <i>Trisetum spicatum</i>
Nonvascular	Moss	<i>Aulacomnium palustre</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex scirpoidea*, *Euphrasia disjuncta*, *Kobresia myosuroides*, *Kobresia simpliciuscula*, *Zigadenus elegans*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2? (9-Feb-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: The vegetation type described is abstracted from the *Euphrasia arctica* - *Kobresietum myosuroides* Association of Damm (2001); however, Damm (2001) included plots in this type that were dominated by the dwarf-shrubs *Dryas octopetala* and *Salix arctica*. Such plots have been reallocated to vegetation types characterized by the dominance of these species. Note that we have used *Kobresia simpliciuscula* in the key despite the fact that it is not encountered in the plots to support this type; this species is a close ecological analogue of *Kobresia myosuroides*, and it is also relatively rare in the IPP.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Kobresia myosuroides* - *Carex rupestris* var. *drummondiana* Herbaceous Vegetation (CEGL001907)
- *Kobresia myosuroides* - *Geum rossii* Herbaceous Vegetation (CEGL001908)
- *Kobresia myosuroides* - *Thalictrum alpinum* Herbaceous Vegetation (CEGL002900)

- *Kobresia myosuroides* - *Trifolium dasyphyllum* Herbaceous Vegetation (CEGL001909)

GLOBAL RELATED CONCEPTS:

- *Euphrasio arcticae* - *Kobresietum myosuroides* Association (Damm 2001) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This type has been described from two alpine locations east of the Continental Divide.

GLOBAL RANGE:

NATIONS: US

STATES/PROVINCES: MT

USFS ECOREGIONS: M332C:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: CD311, CD291.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Damm 2001, Western Ecology Working Group n.d.

V.A.5.N.k. Seasonally flooded temperate or subpolar grassland

***Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance**

***Calamagrostis canadensis* Western Herbaceous Vegetation**

BLUEJOINT WESTERN HERBACEOUS VEGETATION

BLUEJOINT WESTERN WET MEADOW

IDENTIFIER: CEGL001559

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Calamagrostis canadensis</i> Seasonally Flooded Herbaceous Alliance (A.1400)
Alliance (English name)	Bluejoint Seasonally Flooded Herbaceous Alliance
Association	<i>Calamagrostis canadensis</i> Western Herbaceous Vegetation
Association (English name)	Bluejoint Western Herbaceous Vegetation
Association (Common name)	Bluejoint Western Wet Meadow

ECOLOGICAL SYSTEM(S): Boreal Wet Meadow (CES103.873)
North American Arid West Emergent Marsh (CES300.729)
Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998)

ELEMENT CONCEPT

GLOBAL SUMMARY: This wet grassland association occurs widely throughout mountainous areas of the western United States and Canada. These grasslands are a relatively small, meadow association that occurs in broad glaciated valleys, openings in moist forests, silted-in beaver ponds, and narrow floodplains of lower montane canyons. Elevations range from 670 to 3415 m (2200-11,200 feet). Parent material is generally coarse alluvium or fine glacial tills. Soils are Inceptisols, Entisols, and occasionally Mollisols. Textures range from clay loam, silty clay and silt loam to sand. Occurrences may have an organic layer on the surface as well as

significant amounts of sand and rock in the lower layers, and are poorly to moderately well-drained. Stands generally stay relatively wet to moist throughout the growing season, are often flooded in the spring, and the water table drops 50-80 cm from the surface by late summer. This association is typically a dense sward of graminoid cover dominated by *Calamagrostis canadensis*. Other graminoid species usually present include *Carex aquatilis* and *Glyceria* spp. Other *Carex* spp. that can be present in low amounts, depending on geographic location, include *Carex utriculata*, *Carex nebrascensis*, *Carex canescens* and *Carex saxatilis*. Forb cover is variable, from nearly absent to over 25%. Species include *Caltha leptosepala*, *Senecio triangularis*, *Heracleum maximum*, *Mentha arvensis*, *Geum macrophyllum*, *Epilobium* spp., plus many other species, depending on location. Shrubs may be present with 1-5% cover and may include *Alnus incana*, *Symphoricarpos* spp., and *Salix* spp. Trees are rare but can include 1-3% cover of *Pinus contorta*, *Abies lasiocarpa*, and *Picea engelmannii*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This herbaceous association occupies gentle slopes, swales and alluvial terraces on or near basin floors. Hygic to hydric (wet to very wet) conditions prevail throughout much of the growing season, the result of temporary flooding and/or poor soil drainage. The association may develop following severe fire where the tree canopy has been destroyed. Elevations range from 1080-1520 m (3542-4986 feet). Geologic parent material is noncalcareous glacial-fluvial material or till. The association can also occur over sedimentary shale deposits. The soil is moderately well-drained to somewhat poorly drained, depending on the amount of clay it contains, and is typically well-developed. However, the association has been documented on poorly developed soil with significant amounts of sand and rock. Soil texture ranges from loamy sand to clay loam and usually contains a moderate amount of silt. Ground cover is primarily litter. Wood, bare soil and rock of various sizes may be present in trace amounts.

GLOBAL ENVIRONMENT: These grasslands are a relatively small, meadow association that occurs in broad glaciated valleys, openings in moist forests, silted-in beaver ponds, and narrow floodplains of lower montane canyons. Elevations range from 670 to 3400 m (2200-11,200 feet). Sites are flat to gently sloping. Parent material is generally coarse alluvium or fine glacial tills. Soils are Inceptisols, Entisols, and occasionally Mollisols. Textures range from clay loam, silty clay and silt loam to sand. Stands may have an organic layer on the surface as well as significant amounts of sand and rock in the lower layers. Stands are poorly to moderately well-drained. Stands generally stay relatively wet to moist throughout the growing season, are often flooded in the spring, and the water table drops 50-80 cm from the surface by late summer.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Trees are usually absent in this association. Standing dead trees may be present in areas where intense fire has recently destroyed the tree canopy. Shrub cover is sparse and may be entirely absent. When present, shrubs such as *Symphoricarpos albus* and *Symphoricarpos occidentalis* may have a combined canopy cover of 1-20%. Dwarf-shrubs may be present, typically *Mahonia repens* and *Linnaea borealis*. *Vaccinium caespitosum* occurred in one plot with 20% cover. Herbaceous cover is dense, approaching 100% in most examples. The most dominant species in the herbaceous layer is *Calamagrostis canadensis*, which forms a tall (to 1 m) sward over much of the ground. A variety of graminoid species can also be present, including *Elymus glaucus*, *Carex microptera*, *Danthonia intermedia*, *Juncus balticus*, and *Festuca* spp., these usually in low cover (1-10%). A wide variety of moist-site forbs, such as *Angelica arguta*, *Heracleum maximum*, *Fragaria virginiana*, and *Veronica* spp., are represented with cover ranging from 1-20%. *Chamerion angustifolium* was present in all but one stand, with average cover of almost 10%, reflecting the recent disturbance that characterizes this association.

GLOBAL VEGETATION: This association is typically a dense sward of graminoid cover dominated by *Calamagrostis canadensis*. Other graminoid species usually present include *Carex aquatilis* and *Glyceria* spp. Other *Carex* spp. that can be present in low amounts, depending on location, include *Carex utriculata*, *Carex microptera*, *Carex nebrascensis*, *Carex canescens* and *Carex saxatilis*. Forb cover is variable, from nearly absent to over 25%. Species include *Caltha leptosepala*, *Senecio triangularis*, *Heracleum maximum*, *Mentha arvensis*, *Geum macrophyllum*, and *Epilobium* spp. Shrubs may be present with 1-5% cover and may include *Alnus incana* and *Salix* spp. Trees are rare but can include *Pinus contorta*, *Abies lasiocarpa*, and *Picea engelmannii*. *Chamerion angustifolium* may be abundant (10%) reflecting recent disturbance (fire).

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Angelica arguta</i> , <i>Chamerion angustifolium</i> , <i>Fragaria virginiana</i>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Geum macrophyllum</i> , <i>Mentha arvensis</i>
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Angelica arguta*, *Calamagrostis canadensis*, *Chamerion angustifolium*, *Fragaria virginiana*, *Heracleum maximum*

GLOBAL: *Calamagrostis canadensis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (26-Apr-2000).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: One plot placed here, GRAS-00-019, has significant cover of *Vaccinium caespitosum* along with high cover of *Calamagrostis canadensis*. This plot may represent a *Vaccinium caespitosum* dwarf-shrubland association, but no other plots from the IPP match it in species composition. For now, it is included in this *Calamagrostis canadensis* type.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Calamagrostis canadensis* - *Carex scopulorum* - *Mertensia ciliata* Herbaceous Vegetation (CEGL001560)--is closely related.
- *Calamagrostis canadensis* - *Senecio triangularis* Herbaceous Vegetation (CEGL001561)
- *Calamagrostis canadensis* Sierran Herbaceous Vegetation (CEGL003484)

GLOBAL RELATED CONCEPTS:

- *Calamagrostis canadensis* - *C. canadensis* Habitat Type (Mattson 1984) =
- *Calamagrostis canadensis* - *Carex scopulorum* / *Mertensia ciliata* Plant Association (Johnston 1987) B
- *Calamagrostis canadensis* - *Deschampsia cespitosa* Habitat Type (Mattson 1984) F
- *Calamagrostis canadensis* Herbaceous Vegetation (Kittel et al. 1999b) =
- *Calamagrostis canadensis* (Crowe and Clausnitzer 1997) =
- *Calamagrostis canadensis* (Bourgeron and Engelking 1994) =
- *Calamagrostis canadensis* (Murray 2000) =
- *Calamagrostis canadensis* (bluejoint) Community Type (Batten et al. 1978) ?
- *Calamagrostis canadensis* (bluejoint) meadow (Viereck et al. 1992) ?
- *Calamagrostis canadensis* Association (Kovalchik 1993) =
- *Calamagrostis canadensis* Association (Crowe et al. 2004) =
- *Calamagrostis canadensis* Association (Christy 2004) =
- *Calamagrostis canadensis* Community (Cooper and Cottrell 1990) =
- *Calamagrostis canadensis* Community (Cooper 1986a) =
- *Calamagrostis canadensis* Community Type (DeVelice et al. 1994) ?
- *Calamagrostis canadensis* Community Type (Boggs 2000) ?
- *Calamagrostis canadensis* Community Type (Padgett et al. 1989) =
- *Calamagrostis canadensis* Habitat Type (Hansen et al. 1995) B
- *Calamagrostis canadensis* Herbaceous Vegetation (Cooper et al. 1999) =
- *Calamagrostis canadensis* Herbaceous Vegetation (Carsey et al. 2003a) =
- *Calamagrostis canadensis* Western Herbaceous Vegetation (Carsey et al. 2003b) =
- Association: *Agropyro trachycauli* - *Calamagrostietum canadensis* (Komarkova 1976) (Komarkova 1979) I
- Bluejoint reedgrass association (Kovalchik 1987) =
- DRISCOLL FORMATION CODE:V.B.4.a. (Driscoll et al. 1984) B
- Mesic Grass Meadow (Bierly 1972) B
- Montane meadow Habitat (Sawyer and Keeler-Wolf 1995) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association occurs on both sides of the Continental Divide in Glacier National Park. Specifically, it has been documented in the Many Glacier, Belly River and North Fork Flathead River drainages. The association has also been documented in Waterton Lakes National Park.

GLOBAL RANGE: This type occurs widely throughout mountainous areas of the western United States and probably into Canada.

NATIONS: CA, US

STATES/PROVINCES: AB, BC:S3S4, CA, CO:S4, ID:S4, MT:S4, ND, OR:S3S4, SD, UT:S2S3, WA:S3S4, WY:S2

USFS ECOREGIONS: 242A:CC, M242B:C?, M242C:CC, M261A:CC, M261D:CC, M261E:CC, M331A:CC, M331D:C?, M331G:CC, M331H:CC, M331I:CC, M331J:C?, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC

FEDERAL LANDS: NPS (Glacier, Rocky Mountain); PC (Waterton Lakes); USFS (Bighorn, Black Hills, Medicine Bow, Shoshone, Umatilla, Wallowa-Whitman)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.127, GLAC.2077, GLAC.2239, GLAC.266, WATE.9021; GRAS-00-019.

LOCAL DESCRIPTION AUTHORS: S. Kimball

GLOBAL DESCRIPTION AUTHORS: D. Faber-Langendoen, mod. G. Kittel and K.A. Schulz

REFERENCES: Batten et al. 1978, Bierly 1972, Boggs 2000, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Carsey et al. 2003b, Christy 2004, Cole 1977b, Cooper 1986a, Cooper and Cottrell 1990, Cooper et al. 1999, Crowe and Clausnitzer 1997, Crowe et al. 2004, DeVelice et al. 1994, Driscoll et al. 1984, Gysel 1960, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995, IDCDC 2005, Jankovsky-Jones et al. 1999, Johnston 1987, Jones and Ogle 2000, Kagan et al. 2000, Kittel et al. 1999b, Komarkova 1976, Komarkova 1979, Kovalchik 1987, Kovalchik 1993, Kovalchik 2001, MTNHP 2002b, Mattson 1984, Murray 2000, Mutel 1976, Mutel and Marr 1973, Mutz and Queiroz 1983, NDNHI n.d., Padgett et al. 1989, Sawyer and Keeler-Wolf 1995, Viereck et al. 1992, WNHP unpubl. data, Western Ecology Working Group n.d., Wilson 1969, Youngblood et al. 1985a

Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance**Carex utriculata* Herbaceous Vegetation****NORTHWEST TERRITORY SEDGE HERBACEOUS VEGETATION****BEAKED SEDGE WET MEADOW**

IDENTIFIER: CEGL001562

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Carex (rostrata, utriculata)</i> Seasonally Flooded Herbaceous Alliance (A.1403)
Alliance (English name)	(Beaked Sedge, Northwest Territory Sedge) Seasonally Flooded Herbaceous Alliance
Association	<i>Carex utriculata</i> Herbaceous Vegetation
Association (English name)	Northwest Territory Sedge Herbaceous Vegetation
Association (Common name)	Beaked Sedge Wet Meadow

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Interdunal Swale Wetland (CES304.059)
 Boreal Wet Meadow (CES103.873)
 North American Arid West Emergent Marsh (CES300.729)
 Northern Columbia Plateau Basalt Pothole Ponds (CES304.058)
 Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
 Rocky Mountain Subalpine-Montane Fen (CES306.831)
 Temperate Pacific Freshwater Emergent Marsh (CES200.877)

ELEMENT CONCEPT

GLOBAL SUMMARY: This herbaceous wetland association is found throughout much of the western U.S. Stands occur in montane and subalpine areas around the edges of lakes and beaver ponds, along the margins of slow-moving reaches of streams and rivers, and in marshy swales and overflow channels on broad floodplains. Sites are flat to undulating, often with a hummocky microtopography. The water table is usually near the surface for most of the growing season. There are a wide variety of soil types for this association. The vegetation is characterized by a moderately dense to dense perennial graminoid layer dominated or codominated by *Carex utriculata* (20-99% cover). Stands often appear to be nearly pure *Carex utriculata*, but a variety of other graminoid species may be present as well. Other *Carex* species present include *Carex aquatilis*, *Carex canescens*, *Carex lenticularis*, *Carex aquatilis*, and *Carex microptera*, but usually with low cover. Other graminoid species that may be present include *Calamagrostis canadensis*, *Eriophorum angustifolium*, *Glyceria striata*, and *Juncus balticus*. The sparse forb cover can include *Geum macrophyllum*, *Fragaria virginiana*, *Mentha arvensis*, and *Mimulus guttatus*. Scattered *Salix* spp. shrubs may be present because these riparian shrublands are often adjacent. *Salix* species vary depending on elevation and geography. This association is distinguished from *Carex aquatilis* - *Carex utriculata* Herbaceous Vegetation (CEGL001803) by the dominance of *Carex utriculata*. *Carex aquatilis*, if present, is not more than one-third of the total cover.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs from 1115 to 1650 m (3660-5400 feet). It is typically found in wet meadows and swales, and on lakeshores with flat to gently sloped topography. It is also known from at least one peatland (fen) site. Sites supporting this association are located in wide, low-elevation river valleys. The wet meadows and fens dominated by *Carex utriculata* are seasonally flooded, but can drain by mid summer in dry years. Soils are poorly drained, usually silty and/or clayey loams (Gleysols) with an organic surface layer, derived from mixed glacial, fluvial, and lacustrine deposits. Eight of the ten plots sampled had organic soils (peat and muck).

GLOBAL ENVIRONMENT: This herbaceous wetland association is found throughout much of the western U.S. Elevation ranges from 1060 to 3230 m (3500-10,600 feet). Stands occur in montane and subalpine areas around the edges of lakes and beaver ponds, along the margins of slow-moving reaches of streams and rivers, and in marshy swales and overflow channels on broad floodplains (Kittel et al. 1999b). Sites are flat to undulating, often with a hummocky microtopography (Kovalchik 1993). The water table is usually near the surface for most of the growing season. There are a wide variety of soil types for this association ranging from saturated organics or fine silty clays to clays over cobbles and alluvium to fine-loamy and sandy-skeletal, with an organic surface layer. Many stands occur on organic muck or peat soils. Mottling and gleying often occur near the surface because of the high water table.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Across the IPP, sites characterized by dense swards of *Carex utriculata* vary in species composition according to soil moisture. Moderate to high cover (averaging 58%) and 100% constancy of *Carex utriculata* defines this association. Shrubs, such as *Salix* spp., are rare and marginal. *Schoenoplectus tabernaemontani* and *Eleocharis palustris*, sometimes present with low to moderate cover, are characteristic of more deeply flooded lakeshores or depressions on the margins of wetter versions of the association. Although only recorded in one plot (with 30% cover), the forb *Comarum palustre* is probably indicative of fen sites with saturated organic soils. Bare soil or standing water, with few mosses, is typical of the ground of wet sites. The exotic species *Linaria vulgaris* and *Poa pratensis*, both present in about 20% of the plots with 40% and 38% average cover, respectively, colonize drier meadows (such as those near Round Prairie), and indicate past disturbance. A variety of native mesic forbs may also indicate less frequently flooded meadows. These slightly drier meadows usually have high cover of litter. Some sequence of events may have caused formerly wetter *Carex utriculata* meadows near Round Prairie to dry considerably, allowing establishment and invasion by exotic species and grasses common on less wet soils. The cover of *Carex utriculata* is expected to decrease as these sites transition to drier meadow communities.

GLOBAL VEGETATION: This plant association is characterized by a moderately dense to dense perennial graminoid layer dominated or codominated by *Carex utriculata* (20-99% cover). Stands often appear to be nearly pure *Carex utriculata*, but a variety of other graminoid species may be present as well. Other *Carex* species present include *Carex aquatilis*, *Carex canescens*, *Carex lenticularis*, *Carex microptera*, *Carex nebrascensis*, and *Carex scopulorum*, but usually with low cover. Other graminoid species that may be present include *Calamagrostis canadensis*, *Deschampsia caespitosa*, *Eriophorum angustifolium*, *Glyceria striata*, and *Juncus balticus*. Sparse forb cover may include *Epilobium* spp., *Geum macrophyllum*, *Fragaria virginiana*, *Mentha arvensis*, *Mimulus guttatus*, and *Polemonium occidentale*. Scattered *Salix* spp. shrubs may be present because these riparian shrublands are often adjacent. *Salix* species vary depending on elevation and geography. *Salix monticola*, *Salix drummondiana*, *Salix geyeriana*, *Salix planifolia*, *Salix wolfii*, and *Salix exigua* are common species.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

Stratum

Herb (field)
Herb (field)

Lifform

Forb
Graminoid

Species

Comarum palustre, *Linaria vulgaris*, *Senecio hydrophilus*
Carex utriculata, *Poa pratensis*, *Schoenoplectus tabernaemontani*

Global

Stratum

Herb (field)

Lifform

Graminoid

Species

Carex utriculata

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex aquatilis*, *Eleocharis palustris*, *Equisetum fluviatile*, *Linaria vulgaris*, *Mentha arvensis*

GLOBAL: *Carex utriculata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: The *Carex utriculata* association (CEGL001562) is distinguished from the mixed *Carex aquatilis* - *Carex utriculata* association (CEGL001803) and the *Carex aquatilis* association (CEGL001802) by having a clear dominance of *Carex utriculata*. *Carex aquatilis* can be present but can have no more than one-third the cover of *Carex utriculata*. *Carex aquatilis* Herbaceous Vegetation (CEGL001802) can have up to one-third the cover by *Carex utriculata*, in both cases the dominant sedge is at least two-thirds the total cover in the stand. In *Carex aquatilis* - *Carex utriculata* Herbaceous Vegetation (CEGL001803), there is an even mix, such that the two species have even abundance and distribution throughout the stand, so that it is difficult to say one is more dominant over the other. In addition, *Carex utriculata* occurs on wetter sites than *Carex aquatilis*-dominated stands, and often, but not exclusively, occupies organic soils.

GLOBAL COMMENTS: *Carex rostrata* var. *utriculata* (Boott) Bailey was recognized as a distinct species from *Carex rostrata* Stokes and named *Carex utriculata* Boott (Kartesz 1999). This taxonomic change has led to confusion in some of the earlier vegetation classification literature where no distinction was made between the subspecies. *Carex utriculata* Herbaceous Vegetation (CEGL001562) is known only from the western U.S., and for now, *Carex rostrata* communities are known only from the midwestern U.S. and Canada. According to Kartesz (1999), *Carex rostrata* is reported from most of Canada, some Great Lakes states, and Montana, Idaho, and Washington in the western U.S. There is significant overlap in the species ranges, and additional survey work is needed to help clarify this.

This association (CEGL001562) is distinguished from the mixed *Carex aquatilis* - *Carex utriculata* Herbaceous Vegetation (CEGL001803) and *Carex aquatilis* Herbaceous Vegetation (CEGL001802) by having a clear dominance of *Carex utriculata*. *Carex aquatilis* can be present but can have no more than one-third the cover of *Carex utriculata*. *Carex aquatilis* Herbaceous Vegetation (CEGL001802) can have up to one-third the cover by *Carex utriculata*; in both cases the dominant sedge is at least two-thirds the total cover in the stand. In *Carex aquatilis* - *Carex utriculata* Herbaceous Vegetation (CEGL001803), there is an even mix, such that the two species have even abundance and distribution throughout the stand, so that it is difficult to say one is more dominant over the other. In addition, *Carex utriculata* occurs on wetter sites than *Carex aquatilis*-dominated stands and often, but not exclusively, occupies organic soils.

GLOBAL SIMILAR ASSOCIATIONS:

- *Carex aquatilis* - *Carex utriculata* Herbaceous Vegetation (CEGL001803)

GLOBAL RELATED CONCEPTS:

- *Carex aquatilis* - *Carex utriculata* Vegetation Type (Achuff et al. 2002a) I
- *Carex rossii* Community (Franklin and Dyrness 1973) =
- *Carex rostrata* - *Carex aquatilis* Community Type (Tuhy and Jensen 1982) B
- *Carex rostrata* (Kovalchik 1987) =
- *Carex rostrata* (Bourgeron and Engelking 1994) =
- *Carex rostrata* Association (Benedict 1983) =

- *Carex rostrata* Community Type (Norton et al. 1981) ?
- *Carex rostrata* Community Type (Mutel 1973) ?
- *Carex rostrata* Community Type (Manning and Padgett 1995) =
- *Carex rostrata* Community Type (Padgett et al. 1988b) =
- *Carex rostrata* Community Type (Youngblood et al. 1985a) ?
- *Carex rostrata* Community Type (Youngblood et al. 1985b) ?
- *Carex rostrata* Community Type (Padgett et al. 1989) =
- *Carex rostrata* Habitat Type (Hall and Hansen 1997) B
- *Carex rostrata* Habitat Type (Hansen et al. 1995) B
- *Carex rostrata* Habitat Type, *Carex rostrata* Phase (Mattson 1984) =
- *Carex rostrata* Transitions Community Type (Mutz and Graham 1982) B
- *Carex utriculata* (Kittel et al. 1999b) =
- *Carex utriculata* (Murray 2000) =
- *Carex utriculata* (Crowe and Clausnitzer 1997) =
- *Carex utriculata* Association (Crowe et al. 2004) =
- *Carex utriculata* Association (Kovalchik 1993) =
- *Carex utriculata* Association (Christy 2004) =
- *Carex utriculata* Herbaceous Vegetation (Carsey et al. 2003b) =
- *Carex utriculata* Herbaceous Vegetation (Carsey et al. 2003a) =
- *Carisetum rostratae* Association (Nachlinger 1985) =
- Beaked sedge (*Carex utriculata*) Plant Association (Kittel et al. 1999a) =
- Beaked sedge (*Carex utriculata*) Plant Association (Kittel et al. 1997a) =
- DRISCOLL FORMATION CODE:V.B.4.a. (Driscoll et al. 1984) B
- Natural Wet Meadows (Mutel 1976) B
- Wet Meadows (Andrews 1983) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is known from a limited number of wetlands in the IPP. It is known from three wet meadow complexes at low elevations scattered across the west slope in the North Fork Flathead River valley. From north to south, sites include the Kintla Lake meadow complex, the meadows southeast of Round Prairie at the north end of Big Prairie, and the lower Camas Creek basin. The association is also known on the east slope in the Waterton River valley, in the wetland complex around the shores of Maskinonge Lake. Within the IPP, this association is probably more widespread than represented by the seven wetland complexes sampled.

GLOBAL RANGE: This wetland association is found at montane and subalpine elevations throughout much of the western U.S.

NATIONS: CA, US

STATES/PROVINCES: AB, AZ?, CA:S4, CO:S4, ID:S4, MT:S5, NM:S3, NV, OR:S4, UT:S3S4, WA:S3S4, WY:S3

USFS ECOREGIONS: 331D:CC, 331G:CC, 341B:CC, 342B:CC, 342I:C?, M242C:CC, M261A:CC, M261D:CC, M261E:CC, M261G:CC, M331A:CC, M331B:CC, M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341A:C?, M341B:CC, M341C:CC

FEDERAL LANDS: NPS (Curecanti, Florissant Fossil Beds, Glacier, Grand Teton, Rocky Mountain, Sequoia, Yosemite, Zion); PC (Waterton Lakes); USFS (Arapaho-Roosevelt, Bighorn, Deschutes, Fremont, Gunnison, Hells Canyon, Inyo, Malheur, Medicine Bow, Ochoco, Rio Grande, Routt, San Juan, Shoshone, Umatilla, Wallowa-Whitman, White River NF, Winema)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.92, GLAC.280, GLAC.2072, GLAC.2292, GLAC.2521, GLAC.2525, WATE.5074, WATE.9013, WATE.9044, WATE.9054.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz, mod. G. Kittel

REFERENCES: Achuff et al. 2002a, Andrews 1983, Baker 1983a, Benedict 1983, Boggs 2000, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Carsey et al. 2003b, Christy 2004, Cogan et al. 2004, Cole 1977b, Cole 1982, Crowe and Clausnitzer 1997, Crowe et al. 2004, Driscoll et al. 1984, Evans 1989b, Franklin and Dyrness 1973, Frenkel et al. 1986, Hall and Hansen 1997, Halpern 1986, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995, Hess and Wasser 1982, IDCDC 2005, Jankovsky-Jones et al. 1999, Johnson and Simon 1987, Jones and Ogle 2000, Kagan et al. 2000, Kartesz 1999, Kauffman 1982,

Kauffman et al. 1985, Kerr and Henderson 1979, Kittel et al. 1997a, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1993, Kunze 1994, Looman 1982, MTNHP 2002b, Manning and Padgett 1995, Mattson 1984, Moseley 1998, Murray 2000, Mutel 1973, Mutel 1976, Mutel and Marr 1973, Mutz and Graham 1982, Mutz and Queiroz 1983, NVNHP 2003, Nachlinger 1985, Norton et al. 1981, Padgett 1982, Padgett et al. 1988b, Padgett et al. 1989, Ramaley 1919a, Ramaley and Robbins 1909, Ratliff 1982, Schlatterer 1972, Seyer 1979, Seyer 1981, Stuth 1975, Taylor 1984, Titus and Christy 1996a, Titus and Christy 1999, Titus unpubl. data 1996, Tuhy 1981, Tuhy and Jensen 1982, Viereck et al. 1992, WNHP unpubl. data, Western Ecology Working Group n.d., Wohl and Hammack 1995, Youngblood et al. 1985a, Youngblood et al. 1985b

***Carex aquatilis* Seasonally Flooded Herbaceous Alliance**

***Carex aquatilis* - *Carex utriculata* Herbaceous Vegetation**

AQUATIC SEDGE - NORTHWEST TERRITORY SEDGE HERBACEOUS VEGETATION

IDENTIFIER: CEGL001803

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Carex aquatilis</i> Seasonally Flooded Herbaceous Alliance (A.1404)
Alliance (English name)	Aquatic Sedge Seasonally Flooded Herbaceous Alliance
Association	<i>Carex aquatilis</i> - <i>Carex utriculata</i> Herbaceous Vegetation
Association (English name)	Aquatic Sedge - Northwest Territory Sedge Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

ELEMENT CONCEPT

GLOBAL SUMMARY: This common wetland vegetation is located throughout the Mountain West. It generally occurs in small to moderate-sized patches in very shallow, slow-moving to still water or on saturated soils near low-order streams, lakes, and backwater areas of larger rivers. It occurs in flat or gently sloped wet meadows and swales located in broad, glaciated, subalpine meadows that remain saturated with snowmelt runoff for most of the growing season between 1122 and 3385 m (3680-11,100 feet) elevation. It is also often associated with beaver activity. Meadows supporting this association are seasonally flooded with soil saturated or flooded through the summer. Soils are often organic, thick peat or sandy clays, sandy clay loams originating from glacial till. This association is recognized by the presence of both *Carex aquatilis* and *Carex utriculata* in roughly equal proportions in the herbaceous layer. This plant association has relatively low species diversity due to saturated soil conditions. *Carex aquatilis* and *Carex utriculata* codominate the association. Both species are present in equal or near-equal amounts. For example, a stand with 10% cover of each *Carex* species would classify as this type, however, a stand with 10% *Carex aquatilis* and 80% *Carex utriculata* would classify as *Carex utriculata* Herbaceous Vegetation (CEGL001562). Other graminoid and forb species may also be present.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is known from wet meadows at relatively low elevations in the IPP, ranging from 1122-1500 m (3680-4920 feet). Stands typically occur in flat or gently sloped wet meadows and swales located in the bottoms of glacial troughs and on moraines. Soil supporting this association is usually poorly drained organic muck or deeply accumulated peat. The association is also known from silty clay loam soil derived from glacial or fluvial deposits, but this soil also had a 12-cm thick organic surface horizon. Meadows supporting this association are seasonally flooded with soil saturated or flooded through the summer. Standing water occurred in one of the stands.

GLOBAL ENVIRONMENT: This plant association occurs in flat or gently sloped wet meadows and swales located in broad, glaciated, subalpine meadows that remain saturated with snowmelt runoff for most of the growing season between 1122 and 3400 m (3680-11,100 feet) elevation. It is also often associated with beaver activity. Meadows supporting this association are seasonally flooded with soil saturated or flooded through the summer. Some standing water or bare soil may be present. Stream channels are narrow, deep, and sinuous, or wide and shallow. Soils are often organic, thick peat or sandy clays, sandy clay loams originating from glacial till, or loamy, clayey or sandy Typic and Cumulic Cryaquolls.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This wetland association is characterized by a dense sward of evenly mixed *Carex aquatilis* and *Carex utriculata*, less than 1.0 m (3.3 feet) tall, having 90% total cover. *Carex utriculata* is always present (averaging 43% cover), and *Carex aquatilis* is also always present (averaging 48% cover). Other herbaceous species present had much lower cover and included *Carex diandra*, *Calamagrostis canadensis*, *Juncus balticus*, *Eleocharis quinqueflora*, *Polygonum amphibium*, *Scutellaria galericulata*, each with no more than 5% cover. Short-shrub species (usually less than 1 m tall), especially *Betula nana*, *Dasiphora fruticosa* ssp. *floribunda*, and various *Salix* spp., occasionally invade the less wet margins of this association, but their total cover is less than 5%. The proportional ground cover of litter, nonvascular plants (0-60%), and bare soil is highly variable across the stands, possibly reflecting the amount of standing water present throughout the growing season (0-30% at the time of sampling).

GLOBAL VEGETATION: This plant association has relatively low species diversity due to saturated soil conditions. *Carex aquatilis* (10-90%) and *Carex utriculata* (10-40%) codominate the association. Both species are present in equal or near-equal amounts. For example, a stand with 10% cover of each *Carex* species would classify as this type; however, a stand with 10% *Carex aquatilis* and 80% *Carex utriculata* would classify as a *Carex utriculata* plant association. Other graminoid and forb species may also be present. Graminoid species include *Calamagrostis canadensis*, *Carex microptera*, *Carex diandra*, *Carex rossii*, *Deschampsia caespitosa*, *Poa pratensis*, *Juncus balticus*, *Carex nebrascensis*, and *Carex canescens*. Forb species include *Caltha leptosepala*, *Scutellaria galericulata*, *Galium trifidum*, *Polemonium foliosissimum*, *Rhodiola rhodantha* (= *Sedum rhodanthum*), *Cardamine cordifolia*, *Senecio triangularis*, *Pedicularis groenlandica*, *Epilobium* spp., and *Rhodiola rhodantha*. In Montana, shrub species were observed at the margins of the wetland, such as *Betula nana*, *Dasiphora fruticosa* ssp. *floribunda*, and various *Salix* spp.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Betula nana</i> , <i>Dasiphora fruticosa</i> ssp. <i>floribunda</i> , <i>Salix candida</i>
Herb (field)	Forb	<i>Polygonum amphibium</i> , <i>Scutellaria galericulata</i>
Herb (field)	Graminoid	<i>Carex aquatilis</i> , <i>Carex utriculata</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Carex aquatilis</i> , <i>Carex utriculata</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex aquatilis*, *Carex diandra*, *Carex utriculata*, *Eleocharis quinqueflora*, *Juncus balticus*

GLOBAL: *Carex aquatilis*, *Carex utriculata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (9-Apr-1998).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This association (CEGL001803) is distinguished from *Carex aquatilis* Herbaceous Vegetation (CEGL001802) and *Carex utriculata* Herbaceous Vegetation (CEGL001562) by having an equal to near-equal amount of the two *Carex* species. *Carex aquatilis* Herbaceous Vegetation can have up to one-third total cover by *Carex utriculata*, and *Carex utriculata* Herbaceous Vegetation can have up to one-third of the total cover by *Carex aquatilis*. In both cases the dominant sedge is at least two-thirds the total cover in the stand. Consequently, in the mixed association, the two species have such an even abundance and distribution throughout the stand that it is difficult to say one is more dominant over the other.

All plots sampled by Achuff et al. (1997, 2002a) in the H11: *Carex aquatilis*-*Carex utriculata* Vegetation Type for Waterton Lakes National Park were placed into either pure *Carex aquatilis* Herbaceous Vegetation (CEGL001802), *Carex utriculata* Herbaceous Vegetation (CEGL001562), or *Carex lasiocarpa* Herbaceous Vegetation (CEGL001810).

GLOBAL COMMENTS: This association (CEGL001803) is distinguished from *Carex aquatilis* Herbaceous Vegetation (CEGL001802) and *Carex utriculata* Herbaceous Vegetation (CEGL001562) by having an equal to near-equal amount of the two *Carex* species. *Carex aquatilis* Herbaceous Vegetation (CEGL001802) can have up to one-third total cover by *Carex utriculata*, and *Carex utriculata* Herbaceous Vegetation (CEGL001562) can have up to one-third of the total cover by *Carex aquatilis*. In both cases the dominant sedge is at least two-thirds the total cover in the stand. Consequently, in the mixed association, the two species have such an even abundance and distribution throughout the stand that it is difficult to say one is more dominant over the other. This association may also occur in New Brunswick.

GLOBAL SIMILAR ASSOCIATIONS:

- *Carex (rostrata, utriculata) - Carex lacustris - (Carex vesicaria)* Herbaceous Vegetation (CEGL002257)
- *Carex aquatilis* Herbaceous Vegetation (CEGL001802)
- *Carex buxbaumii* Herbaceous Vegetation (CEGL001806)
- *Carex utriculata* Herbaceous Vegetation (CEGL001562)

GLOBAL RELATED CONCEPTS:

- *Carex aquatilis - Carex utriculata* Herbaceous Vegetation (Carsey et al. 2003b) =
- *Carex aquatilis - Carex utriculata* Herbaceous Vegetation (Carsey et al. 2003a) =
- *Carex aquatilis / Carex utriculata* Plant Association (Johnston 1987) =
- *Carex aquatilis-Carex rostrata* (Bourgeron and Engelking 1994) =
- *Carex aquatilis-Carex utriculata* (Kittel et al. 1999b) =
- *Carex aquatilis* Community Type (Manning and Padgett 1995) =
- *Carex rostrata - Carex aquatilis* Community Type (Hess and Wasser 1982) =
- *Carex rostrata - Carex aquatilis* Habitat Type (Hess 1981) =
- *Carex rostrata - Carex aquatilis* Habitat Type (Wasser and Hess 1982) =
- *Carex rostrata* Habitat Type, *Carex aquatilis* Phase (Hansen et al. 1995) =
- *Carex rostrata* Habitat Type, *Carex aquatilis* Phase (Hansen et al. 1989) =
- *Carex utriculata - Carex aquatilis* (Cooper 1986b) =
- DRISCOLL FORMATION CODE:V.C.6.a. (Driscoll et al. 1984) B
- Water sedge-beaked sedge (*Carex aquatilis-Carex utriculata*) Plant Association (Kittel et al. 1999a) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is known from only two locations, but is probably widely distributed at lower elevations across the IPP. Known stands are evenly distributed between west-slope and east-slope locations. Sites range from 1122-1500 m (3680-4920 feet), mostly in wide valley bottoms, on flat to gentle slopes.

GLOBAL RANGE: This association is known from Montana, Wyoming, Colorado, and Alberta. It may occur in New Brunswick.

NATIONS: CA, US

STATES/PROVINCES: AB, CO:S4, MT:S3, NB?, WY?

USFS ECOREGIONS: M331F:CC, M331G:CC, M331H:CC, M331I:CC, M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier, Rocky Mountain); PC (Waterton Lakes); USFS (Routt, San Juan, Shoshone)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2527, WATE.4043.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Achuff et al. 1997, Achuff et al. 2002a, Bierly 1972, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Carsey et al. 2003b, Cooper 1986a, Cooper 1986b, Driscoll et al. 1984, Hansen et al. 1989, Hansen et al. 1995, Hess 1981, Hess and Wasser 1982, Johnson 1939, Johnston 1987, Jones and Ogle 2000, Kittel et al. 1999a, Kittel et al. 1999b, Komarkova 1986, Langenheim 1962, Manning and Padgett 1995, Wasser and Hess 1982, Western Ecology Working Group n.d., Wilson 1969

***Carex aquatilis* Herbaceous Vegetation**
AQUATIC SEDGE HERBACEOUS VEGETATION

IDENTIFIER: CEGL001802

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Carex aquatilis</i> Seasonally Flooded Herbaceous Alliance (A.1404)
Alliance (English name)	Aquatic Sedge Seasonally Flooded Herbaceous Alliance
Association	<i>Carex aquatilis</i> Herbaceous Vegetation
Association (English name)	Aquatic Sedge Herbaceous Vegetation

ECOLOGICAL SYSTEM(S):	Boreal Wet Meadow (CES103.873)
	Western Great Plains Open Freshwater Depression Wetland (CES303.675)
	Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
	Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998)

ELEMENT CONCEPT

GLOBAL SUMMARY: This common, widespread herbaceous vegetation occurs as large, mesic meadows in high montane valleys or as narrow strips bordering ponds and streams at lower elevations throughout the western U.S. It occurs in a variety of environmental settings in the montane and subalpine zones. Some of the largest expanses occur in broad, low-gradient valleys where large snowmelt-fed swales and slopes dominate the landscape. It can also grow in fine sediments at the margins of lakes and beaver ponds. Presence of *Carex aquatilis* typically indicates wet soils with high organic matter or histic epipedons. This plant association is characterized by a dense rhizomatous meadow of *Carex aquatilis* (10-80% cover), usually accompanied by a few other graminoids species such as *Calamagrostis canadensis*, *Deschampsia caespitosa*, *Juncus balticus*, and *Poa palustris*. *Eleocharis quinqueflora* can be abundant on organic substrates at high elevations. Woody species rarely occur in these sites. A clear dominance by *Carex aquatilis* and low cover of *Carex utriculata* or *Pedicularis groenlandica* set this plant association apart from closely related types.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs on seasonally flooded mixed glacial and fluvial deposits. The soils are poorly drained, with a silty clay loam texture and moderately (3-5 cm) thick organic surface horizon. The soil was very wet at the time of sampling in early summer. Two locations were found in the park, one stand is in a wet meadow complex located at 1335 m (4380 feet) in a flat-bottomed glacial trough, in Glacier National Park, and the other in Waterton Lakes National Park on gentle to flat slope at 1500 m (4920 feet).

GLOBAL ENVIRONMENT: This plant association occurs in a variety of valley types, but the largest expanses occur in broad, low-gradient valleys where large snowmelt-fed swales and slopes dominate the landscape. It can also grow in fine sediments at the margins of lakes and beaver ponds. These palustrine wetlands have a range of hydrologic regimes, though all stands are saturated for a significant enough period during the growing season to cause a build up of organic material in the soil. Soils are organic mucks and peats and are poorly to very poorly drained.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: *Carex aquatilis* is the dominant *Carex* with 60-75% cover. Other *Carices* present include *Carex buxbaumii*, *Carex utriculata*, and *Carex capillaris* with 1-20% cover. Other graminoids present are *Calamagrostis canadensis*, *Juncus balticus*, *Poa palustris*, *Eleocharis quinqueflora* with 0.5-5% cover. Average height of this sedge sward was less than 0.5 m tall. Forb diversity was low, with *Menyanthes trifoliata* with 0-15%, *Symphytotrichum eatonii* (= *Aster eatonii*) and *Packera paupercula* (= *Senecio pauperculus*) present with less than 1% cover. *Picea engelmannii*, characteristic of forests adjacent to the fen, was also present. A few shrubs can be present (<1%) including *Betula nana* and *Salix maccalliana*. Litter covered only 6% of the ground, and nonvascular species were absent.

GLOBAL VEGETATION: This plant association is characterized by a dense rhizomatous meadow of *Carex aquatilis* (10-80% cover), usually accompanied by a few other graminoids species such as *Calamagrostis canadensis* (1-40%) or *Deschampsia caespitosa* (1-16%), *Juncus balticus*, and *Poa palustris*. *Eleocharis quinqueflora* can be abundant on organic substrates (1-49% cover) at high elevations. *Carex utriculata* (1-20% cover) may be present. When present, *Carex utriculata* is usually not more than one-third the cover of *Carex aquatilis* cover. If it is more than that, the stand may be classified as *Carex aquatilis* - *Carex utriculata* Herbaceous Vegetation (CEGL001803) or *Carex utriculata* Herbaceous Vegetation (CEGL001562). Forbs are often present, although sometimes inconspicuous (generally <10%, but can be as high as 40%). Species include *Epilobium* spp., *Pedicularis groenlandica*, *Caltha leptosepala*, *Menyanthes trifoliata*, *Cardamine cordifolia*, and *Mertensia ciliata*. Shrubs and trees have been observed invading the wetland from surrounding areas, including *Betula nana*, *Salix maccalliana*, and *Picea engelmannii*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Menyanthes trifoliata</i>
Herb (field)	Graminoid	<i>Carex aquatilis</i> , <i>Carex buxbaumii</i> , <i>Poa palustris</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Carex aquatilis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex aquatilis*, *Carex buxbaumii*, *Carex utriculata*

GLOBAL: *Carex aquatilis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: The *Carex aquatilis* association (CEGL001802) is distinguished from *Carex aquatilis* - *Carex utriculata* Herbaceous Vegetation (CEGL001803) by the dominance of *Carex aquatilis*, with at least two-thirds as much cover as any other *Carex* species present, including *Carex utriculata*.

GLOBAL COMMENTS: This association (CEGL001802) is distinguished from *Carex aquatilis* - *Carex utriculata* Herbaceous Vegetation (CEGL001803) and *Carex aquatilis* - *Pedicularis groenlandica* Herbaceous Vegetation (CEGL001804) by the dominance of *Carex aquatilis*. If *Carex utriculata* is present, it is no more than one-third of the total cover.

GLOBAL SIMILAR ASSOCIATIONS:

- *Carex aquatilis* - *Carex utriculata* Herbaceous Vegetation (CEGL001803)
- *Carex aquatilis* - *Pedicularis groenlandica* Herbaceous Vegetation (CEGL001804)
- *Carex aquatilis* var. *dives* Herbaceous Vegetation (CEGL001826)
- *Carex limosa* Herbaceous Vegetation (CEGL001811)
- *Carex praegracilis* - *Carex aquatilis* Herbaceous Vegetation (CEGL001821)

GLOBAL RELATED CONCEPTS:

- *Carex aquatilis* - *Carex utriculata* Vegetation Type (Achuff et al. 2002a) I
- *Carex aquatilis* (Crowe and Clausnitzer 1997) =
- *Carex aquatilis* (Bourgeron and Engelking 1994) =
- *Carex aquatilis* (Kittel et al. 1999b) =
- *Carex aquatilis* (Kovalchik 1987) =
- *Carex aquatilis* Association (Kovalchik 1993) =
- *Carex aquatilis* Community Type (Padgett et al. 1989) =
- *Carex aquatilis* Community Type (Cooper and Cottrell 1990) =
- *Carex aquatilis* Community Type (Manning and Padgett 1995) =
- *Carex aquatilis* Community Type (Girard et al. 1997) =
- *Carex aquatilis* Community Type (Youngblood et al. 1985a) =
- *Carex aquatilis* Habitat Type (Hansen et al. 1988b) =
- *Carex aquatilis* Habitat Type (Hansen et al. 1995) =
- *Carex aquatilis* Herbaceous Vegetation (Carsey et al. 2003b) =
- *Carex aquatilis* Herbaceous Vegetation (Carsey et al. 2003a) =
- *Carex aquatilis* Plant Association (Sanderson and Kettler 1996) =
- *Carex aquatilis* var. *aquatilis* (*C. aquatilis*) Association (Crowe et al. 2004) =
- *Carex aquatilis* var. *aquatilis* Association (Christy 2004) =
- *Carex aquatilis*-*Carex aquatilis* Habitat Type (Mattson 1984) =

- DRISCOLL FORMATION CODE:V.C.6.a. (Driscoll et al. 1984) B
- Water sedge (*Carex aquatilis*) Plant Association (Kittel et al. 1999a) =
- Water sedge (*Carex aquatilis*) Plant Association (Kittel et al. 1997a) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: One stand is located in the bottom of Waterton Valley, approximately 0.5 mile south of the Goat Haunt Ranger Station and Waterton Lake. It is located in a wet meadow complex to the east of the Waterton Valley Trail. The second location occurs in Waterton Lakes National Park.

GLOBAL RANGE: This association is common and located in mountainous areas throughout the western U.S. and Canada.

NATIONS: CA, US

STATES/PROVINCES: AB, AZ?, CA:S3, CO:S4, ID:S4, MT:S4, NM:S4, NV, OR:S4, UT:S3?, WA:S3, WY:S3

USFS ECOREGIONS: 331D:CC, 331E:CC, 331F:CC, 341B:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342F:CC, 342G:CC, M242C:CC, M261A:CC, M261D:CC, M261E:CC, M261G:CC, M331A:CC, M331B:CC, M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341A:CC, M341B:CC

FEDERAL LANDS: NPS (Florissant Fossil Beds, Glacier, Grand Teton, Rocky Mountain); PC (Waterton Lakes); USFS (Arapaho-Roosevelt, Bighorn, Fremont, Gunnison, Malheur, Medicine Bow, Ochoco, Rio Grande, Routt, Shoshone, Umatilla, Wallowa-Whitman, White River NF)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES: This association is known from only two plots, one in Glacier National Park and one in Waterton Lakes. Additional plot data from wet meadows and fens may be necessary for a more complete description of the association's vegetation composition, environment, and range in the IPP.

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.85, WATE.4044.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Achuff et al. 2002a, Baker 1983c, Baker 1984a, Baker and Kennedy 1985, Bierly 1972, Bourgeron and Engelking 1994, Briggs and MacMahon 1983, Bunin 1975c, CONHP unpubl. data 2003, Carsey et al. 2003a, Carsey et al. 2003b, Christy 2004, Cooper and Cottrell 1990, Cox 1933, Crowe and Clausnitzer 1997, Crowe et al. 2004, Driscoll et al. 1984, Giese 1975, Girard et al. 1997, Hall 1971, Hall 1973, Hansen et al. 1988b, Hansen et al. 1995, Hess and Wasser 1982, Hopkins 1979a, IDCDC 2005, Jankovsky-Jones et al. 1999, Johnson 1932a, Johnson 1932b, Johnson 1936, Johnson 1939, Johnson and Simon 1987, Jones 1992b, Jones and Ogle 2000, Kagan et al. 2000, Kauffman 1982, Kauffman et al. 1985, Kittel et al. 1997a, Kittel et al. 1999a, Kittel et al. 1999b, Komarkova 1976, Kovalchik 1987, Kovalchik 1993, Kovalchik 2001, Kovalchik and Elmore 1992, Lewis 1970, MTNHP 2002b, Manning and Padgett 1991, Manning and Padgett 1992, Manning and Padgett 1995, Mattson 1984, NVNHP 2003, Norton et al. 1981, Padgett and Manning 1988, Padgett et al. 1988b, Padgett et al. 1989, Ramaley 1919a, Ramaley 1920, Robbins 1918, Sanderson and Kettler 1996, Stuth 1975, Terwilliger et al. 1979a, Titus and Christy 1996a, Titus and Christy 1999, Tuhy 1981, Tuhy and Jensen 1982, Volland 1976, WNHP unpubl. data, Western Ecology Working Group n.d., Wilson 1969, Young 1982, Youngblood et al. 1985a, Youngblood et al. 1985b

***Carex atherodes* Seasonally Flooded Herbaceous Alliance**

***Carex atherodes* Herbaceous Vegetation**

AWNED SEDGE HERBACEOUS VEGETATION

AWNED SEDGE WET MEADOW

IDENTIFIER: CEGL002220

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Carex atherodes</i> Seasonally Flooded Herbaceous Alliance (A.1396)

Alliance (English name) Awned Sedge Seasonally Flooded Herbaceous Alliance
 Association *Carex atherodes* Herbaceous Vegetation
 Association (English name) Awned Sedge Herbaceous Vegetation
 Association (Common name) Awned Sedge Wet Meadow

ECOLOGICAL SYSTEM(S): Eastern Great Plains Wet Meadow, Prairie, and Marsh (CES205.687)
 North-Central Interior Wet Meadow-Shrub Swamp (CES202.701)
 Western Great Plains Open Freshwater Depression Wetland (CES303.675)

ELEMENT CONCEPT

GLOBAL SUMMARY: This awned sedge wet meadow occurs in the northern tallgrass prairie region of the United States and Canada. Stands occur on lowland sites that have standing water for several weeks each year. These sites are typically in depressions or basins but can be along streams and rivers. The water may be fresh or moderately saline. Soils can be mineral but mucks often form through the buildup of organic material. Vegetation cover is usually high but can vary in wet or dry years. Dominant species are herbaceous and typically between 0.5 and 1 m tall. Forb diversity is moderate to high. *Carex atherodes* may form essentially monotypic stands or just be the dominant species. Common associated species include *Alisma triviale*, *Symphyotrichum lanceolatum* (= *Aster lanceolatus*), *Eleocharis palustris*, *Glyceria grandis* (in drier stands), *Mentha arvensis*, *Phalaris arundinacea*, *Polygonum amphibium*, *Scolochloa festucacea*, *Sium suave*, and *Sparganium eurycarpum*. Shrubs, including *Salix* spp., can invade this community, especially in the eastern portions of its range.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT:

GLOBAL ENVIRONMENT: This community is found on lowland sites that have standing water for several weeks each year. These sites are typically in depressions or basins but can be along streams and rivers (MNNHP 1993). The water may be fresh or mildly saline. Soils can be mineral but mucks often form through the buildup of organic material (Looman 1982).

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION:

GLOBAL VEGETATION: Vegetation cover is usually high but can vary in wet or dry years. Dominant species are herbaceous and typically between 0.5 and 1 m tall. Forb diversity is moderate to high (MNNHP 1993). *Carex atherodes* can form almost monotypic stands or it may be dominant. Common associated species are *Alisma triviale*, *Symphyotrichum lanceolatum* (= *Aster lanceolatus*), *Eleocharis palustris*, *Glyceria grandis* (in drier stands), *Mentha arvensis*, *Phalaris arundinacea*, *Polygonum amphibium*, *Scolochloa festucacea* (especially on mildly saline stands), *Sium suave*, and *Sparganium eurycarpum*. Shrubs, including *Salix* spp., can invade this community, especially in the eastern portions of its range. *Beckmannia syzigachne* often is an indicator of disturbance (Walker and Coupland 1970).

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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<u>Global Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G5 (22-Jun-1998).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: See Dix and Smeins (1967) for a discussion of the hydrology of this type, which borders on temporarily vs. seasonally flooded. See also Stewart and Kantrud (1972, including photos on pp. 34-35). Brotherson (1969) performed an ordination of pothole and drainage communities on a prairie in northwestern Iowa and found a community with 55% cover by *Carex atherodes*. The only other species with more than 4% cover was *Polygonum amphibium*, at 30%. *Schoenoplectus fluviatilis* (= *Scirpus fluviatilis*), *Calamagrostis canadensis*, *Carex lasiocarpa*, *Spartina pectinata*, and *Carex aquatilis* all had between 1 and 3% cover. This community occurred as a narrow band around potholes or sometimes in wide patches.

The relationship of this community and *Scolochloa festucacea* Herbaceous Vegetation needs to be better defined. *Carex atherodes* tends to be on non-saline sites while *Scolochloa festucacea* tends to do better on mildly to moderately saline sites (Walker and Coupland 1970). However, the two can co-occur or codominate on mildly saline sites. *Carex atherodes* tends to occur on drier sites (Smith 1973).

GLOBAL SIMILAR ASSOCIATIONS:

- *Scolochloa festucacea* Herbaceous Vegetation (CEGL002260)

GLOBAL RELATED CONCEPTS:

- *Carex atherodes* association (Looman 1982) =
- Groups 9, 10, 17, 25, and 26 (Walker and Coupland 1970) =
- Meadows (Dix and Smeins 1967) B
- Seasonal ponds and lakes, fresh, central shallow marsh phase (Stewart and Kantrud 1971) I
- Seasonal ponds and lakes, slightly brackish, central shallow marsh phase (Stewart and Kantrud 1971) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE:

GLOBAL RANGE: This awned sedge wet meadow occurs in the northern tallgrass prairie region of the United States and Canada, from Minnesota and Iowa, north and west into the Dakotas, Manitoba and perhaps other provinces.

NATIONS: CA, US

STATES/PROVINCES: CO:S2?, IA, ID, MB:S2, MN, MT:S3S5, ND, SD

USFS ECOREGIONS: 222Na:CCC, 251Aa:CCC, 251Ba:CCC, 251Bb:CCC

FEDERAL LANDS: PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS:

LOCAL DESCRIPTION AUTHORS:

GLOBAL DESCRIPTION AUTHORS: J. Drake, mod. D. Faber-Langendoen

REFERENCES: Brotherson 1969, CONHP unpubl. data 2003, Dix and Smeins 1967, Greenall 1996, IDCDC 2005, INAI unpubl. data, Looman 1982, MNNHP 1993, MTNHP 2002b, Midwestern Ecology Working Group n.d., NDNHI n.d., Smith 1973, Stewart and Kantrud 1971, Stewart and Kantrud 1972, Walker and Coupland 1970

***Carex buxbaumii* Seasonally Flooded Herbaceous Alliance**

***Carex buxbaumii* Herbaceous Vegetation**

BROWN BOG SEDGE HERBACEOUS VEGETATION

BUXBAUM'S SEDGE WET MEADOW

IDENTIFIER: CEGL001806

NVC Classification

Physiognomic Class Herbaceous Vegetation (V)
Physiognomic Subclass Perennial graminoid vegetation (V.A.)

Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Carex buxbaumii</i> Seasonally Flooded Herbaceous Alliance (A.1413)
Alliance (English name)	Brown Bog Sedge Seasonally Flooded Herbaceous Alliance
Association	<i>Carex buxbaumii</i> Herbaceous Vegetation
Association (English name)	Brown Bog Sedge Herbaceous Vegetation
Association (Common name)	Buxbaum's Sedge Wet Meadow

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Fen (CES306.831)

ELEMENT CONCEPT

GLOBAL SUMMARY: This vegetation has been found in fens and wet meadows in the mountains of Utah, Idaho, Montana, and western Wyoming at elevations 1700-3200 m. Sites are flat and range from moderately broad valley bottoms to forest openings. Size of wetland is dependent on the presence of permanently saturated soils and it often occurs along streams and in the wettest portion of the wetland complex. Soils are mineral from alluvium with accumulations of well-decomposed organic matter throughout the upper soil horizon (20-50 cm deep). Stands have a dense perennial graminoid layer characterized by 25% or more cover of *Carex buxbaumii*. *Carex aquatilis*, *Carex saxatilis* and *Carex utriculata* are usually present and occasionally codominant. Other common species include *Deschampsia caespitosa*, *Caltha leptosepala*, *Pedicularis groenlandica*, and *Ligusticum tenuifolium*. Occasional shrubs such as *Salix planifolia* (= *Salix phylicifolia*), *Vaccinium uliginosum* (= *Vaccinium occidentale*), and *Dasiphora fruticosa* ssp. *floribunda* (= *Pentaphylloides floribunda*) may be scattered in the stand. Adjacent stands are often dominated by sedges such as *Carex utriculata* and *Carex aquatilis*. This vegetation is separated from adjacent wetlands by the dominance or codominance of *Carex buxbaumii*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: One stand of this association was observed at 1046 m (3430 feet) elevation in a wet meadow on a bench. Several streams fed the meadow. The association occurred on poorly drained muck at the edge of a small beaver pond.

GLOBAL ENVIRONMENT: This vegetation has been found in fens and wet meadows in the mountains of Utah, Idaho, Montana, and western Wyoming at elevations of 1046-3200 m (3430-10,500 feet). Sites are flat and range from moderately broad valley bottoms to forest openings. Size of wetland is dependent on the presence of permanently saturated soils, and it often occurs along streams and in the wettest portion of the wetland complex. Soils are mineral from alluvium with accumulations of well-decomposed organic matter throughout the upper soil horizon (20-50 cm deep).

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: *Carex buxbaumii* and *Carex utriculata* codominated the one wet meadow sampled. Each had 40% cover and was up to 1 meter tall. *Salix drummondiana* and the mesic forb *Petasites frigidus* var. *sagittatus* (= *Petasites sagittatus*) were each recorded with 3% cover, and no other species had more than 1% cover observed. Mosses were present with trace cover. The ground was predominately litter and duff with a small amount of water. Shrubs and young conifers had invaded the edges of the meadow, but fire and flooding had prevented them from becoming more dominant.

GLOBAL VEGETATION: Stands have a dense perennial graminoid layer characterized by 25% or more cover of *Carex buxbaumii*. *Carex aquatilis*, *Carex saxatilis*, and *Carex utriculata* are usually present and occasionally codominant. Other common species include *Deschampsia caespitosa*, *Caltha leptosepala*, *Pedicularis groenlandica*, and *Ligusticum tenuifolium*. Occasional shrubs, such as *Salix planifolia* (= *Salix phylicifolia*), *Salix drummondiana*, *Vaccinium uliginosum* (= *Vaccinium occidentale*), and *Dasiphora fruticosa* ssp. *floribunda* (= *Pentaphylloides floribunda*), may be scattered in the stand. Adjacent areas are often dominated by sedges such as *Carex utriculata* and *Carex aquatilis*. This vegetation is separated from adjacent wetlands by the dominance or codominance of *Carex buxbaumii*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Salix drummondiana</i>
Herb (field)	Forb	<i>Petasites frigidus</i> var. <i>sagittatus</i>
Herb (field)	Graminoid	<i>Carex buxbaumii</i> , <i>Carex utriculata</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Carex buxbaumii</i> , <i>Carex utriculata</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex buxbaumii*

GLOBAL: *Carex buxbaumii*, *Carex utriculata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3 (3-Jan-2000). This naturally rare wetland vegetation is found in mountains of Utah, Idaho, Montana, and western Wyoming. Although it occurs over relatively wide range, stands are uncommon. Stands typically occur on valley bottoms where the water table is at or near the surface. Soils have a surface organic layer and are saturated seasonally. Habitats are similar to those of the more common *Carex aquatilis* wetland. These wetlands are threatened by presence of invasive non-native plants, and human activity which results in alterations of natural wetland processes, such as diversions, pumping ground water, roads, and clear cutting. Soils are usually too wet for livestock, but alteration of hydrology causing dewatering may result in increased cattle use and invasion of introduced forage species from pastures.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: In an earlier analysis, this stand was classified as *Carex aquatilis* - *Carex utriculata* Herbaceous Vegetation (CEGL001803). The *Carex buxbaumii* association lacks *Carex aquatilis* and has a different composition than the *Carex aquatilis* - *Carex utriculata* association.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Carex aquatilis* - *Carex utriculata* Herbaceous Vegetation (CEGL001803)

GLOBAL RELATED CONCEPTS:

- *Carex buxbaumii* (Bourgeron and Engelking 1994) =
- *Carex buxbaumii* Association (Crowe et al. 2004) =
- *Carex buxbaumii* Association (Christy 2004) =
- DRISCOLL FORMATION CODE:V.C.6.a. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is known only from one low-elevation wet meadow near Rubideau Creek on the west side of Glacier National Park.

GLOBAL RANGE: This wetland is found in mountains of Utah, Idaho, Montana, western Wyoming, and possibly western Alberta. Occurrences have a relatively broad range, but are uncommon. *Carex buxbaumii* is a circumboreal species, and this association possibly occurs in other western states and further north in Canada.

NATIONS: CA?, US

STATES/PROVINCES: AB?, CO:SU, ID:S1, MT:S3, OR:S3, UT:S2?, WY:S2?

USFS ECOREGIONS: 342D:CC, M331A:CC, M331D:CC, M332A:CC, M332E:CC, M332F:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier, Yellowstone)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES: If additional stands of this association exist in the IPP, further sampling will provide data necessary for better characterizing the vegetation and environmental conditions of this association.

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2502.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz, mod. Western Ecology Group

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Christy 2004, Crowe et al. 2004, Driscoll et al. 1984, Hansen et al. 1988b, IDCDC 2005, Jankovsky-Jones et al. 1999, MTNHP 2002b, Mattson 1984, Moseley et al. 1991, Moseley et al. 1994, Padgett et al. 1989, Pierce 1986, Pierce and Johnson 1986, Titus and Christy 1996a, Titus and Christy 1999, Tuhy 1981, Western Ecology Working Group n.d.

***Carex lasiocarpa* Seasonally Flooded Herbaceous Alliance**

***Carex lasiocarpa* Herbaceous Vegetation**

WIREGRASS SEDGE HERBACEOUS VEGETATION

IDENTIFIER: C EGL001810

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Carex lasiocarpa</i> Seasonally Flooded Herbaceous Alliance (A.1415)
Alliance (English name)	Wiregrass Sedge Seasonally Flooded Herbaceous Alliance
Association	<i>Carex lasiocarpa</i> Herbaceous Vegetation
Association (English name)	Wiregrass Sedge Herbaceous Vegetation

ECOLOGICAL SYSTEM(S):	Boreal Fen (CES103.872)
	Boreal Wet Meadow (CES103.873)
	Rocky Mountain Subalpine-Montane Fen (CES306.831)
	Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998)

ELEMENT CONCEPT

GLOBAL SUMMARY: This herbaceous-dominated peatland is known from the lowlands of Washington's Puget Trough to high subalpine basins in Utah, Montana and Colorado, where it occurs in low-gradient, wide valleys and in topographic depressions. Elevation ranges from below 600 to over 3000 m (1900-9800 feet). Soils are deep organic peat in various degrees of decomposition. Sites are flooded seasonally, are poorly to very poorly drained, and remain saturated for the entire growing season, except in drought years. It occurs both as bogs (no in or outflows) and as fens (some contact with drainage from surrounding mineral soil). Species richness is naturally low in this wet herbaceous association. The indicator species is *Carex lasiocarpa*, the dominant graminoid, with 30-100% cover. Other sedge species that may be present with 0-30% cover include *Carex aquatilis*, *Carex utriculata*, *Carex canescens*, *Carex microptera*, and *Carex buxbaumii*. Forb species are generally in low abundance, but can include species of *Nuphar*, *Drosera*, *Menyanthes*, *Potentilla*, and many others, depending on geographic location.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs in fens at low elevations in wide river valley bottoms. Stands are known at about 1330 m (3700 feet) elevation on the west slope of the IPP and at about 1540 m (5050 feet) on the east slope in Waterton Lakes National Park. Sites are flat fens with very poorly drained peat and muck soils, sometimes situated over alluvial deposits. Other than during extreme drought, the soil in these fens is continuously saturated and usually has standing water during the summer.

GLOBAL ENVIRONMENT: This wetland herbaceous association occurs on low-gradient, wide valleys and topographic depressions. Elevation ranges from below 600-3000 m (1900-9800 feet). Soils are deep organic peat in various degrees of decomposition. Sites are flooded seasonally, are poorly to very poorly drained, and can remain saturated for the entire growing season, except in drought years. This association has been described as a bog (peatland with no in or out flow of water) and as a fen (peatland with some contact with drainage from surrounding mineral soils), depending on the degree of surface water flow through stands. Both have deep organic peat, anaerobic conditions required to develop deep peat soils, highly saturated conditions, and similar species composition.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Dense swards of *Carex lasiocarpa* clearly define this fen association. *Carex lasiocarpa* is always present, averaging 65% cover and less than 0.5 m height. *Carex utriculata* is also characteristic, present in 83% of stands, averaging 23% cover. Other good indicators of *Carex lasiocarpa* fens are *Menyanthes*

trifoliata and *Triglochin maritima*, both with 33% constancy and averaging 10% and 20% cover, respectively. Other species characteristic of peatlands, such as *Carex buxbaumii*, *Comarum palustre*, *Drosera* species, and *Eriophorum* species, are occasionally present, usually with low cover. Woody species, composed of short and prostrate shrubs, have less than 5% total cover. Although flooding often precludes growth of mosses, when mosses are present, *Limprichtia revolvens* is the abundant species.

GLOBAL VEGETATION: Species richness is naturally low in this wet herbaceous association. The indicator species is *Carex lasiocarpa*, the dominant graminoid, with 30-100% cover. Other sedge species that may be present with 0-15% cover include *Carex aquatilis*, *Carex utriculata*, *Carex canescens*, *Carex microptera*, and *Carex buxbaumii*. Forb species are generally in low abundance, but can include species of *Nuphar*, *Drosera*, *Menyanthes*, *Potentilla*, and many others, depending on geographic location.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Menyanthes trifoliata</i>
Herb (field)	Graminoid	<i>Carex lasiocarpa</i> , <i>Carex utriculata</i> , <i>Triglochin maritima</i>
Nonvascular	Moss	<i>Limprichtia revolvens</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Carex lasiocarpa</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex lasiocarpa*, *Carex utriculata*, *Menyanthes trifoliata*

GLOBAL: *Carex lasiocarpa*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4? (27-Apr-2000).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: *Carex lasiocarpa* is the indicator species for this association. Several other *Carex* spp. may have up to equal or slightly higher cover than *Carex lasiocarpa*. With the presence and abundance of *Carex lasiocarpa*, it is unlikely to be confused with any other peatland/fen associations in the IPP.

GLOBAL COMMENTS: This association (CEGL001810) is characterized by *Carex lasiocarpa* (var. *americana*, although it is generally listed just as *Carex lasiocarpa*), which is not to be confused with *Carex lasiocarpa* var. *latifolia*, which, along with *Carex lanuginosa*, is now called *Carex pellita* by Kartesz (1999).

GLOBAL SIMILAR ASSOCIATIONS:

- *Carex lasiocarpa* - (*Carex rostrata*) - *Equisetum fluviatile* Herbaceous Vegetation (CEGL005229)
- *Carex lasiocarpa* - *Carex buxbaumii* - *Trichophorum caespitosum* Boreal Herbaceous Vegetation (CEGL002500)

GLOBAL RELATED CONCEPTS:

- *Carex aquatilis* - *Carex utriculata* Vegetation Type (Achuff et al. 2002a) I
- *Carex lasiocarpa* (Crowe and Clausnitzer 1997) =
- *Carex lasiocarpa* (Bourgeron and Engelking 1994) =
- *Carex lasiocarpa* (Kovalchik 1987) =
- *Carex lasiocarpa* Association (Christy 2004) =
- *Carex lasiocarpa* Association (Kovalchik 1993) =
- *Carex lasiocarpa* Association (Crowe et al. 2004) =
- *Carex lasiocarpa* Community Type (Kunze 1994) =
- *Carex lasiocarpa* Community Type (Padgett et al. 1989) =
- *Carex lasiocarpa* Habitat Type (Hansen et al. 1995) B
- *Carex pellita* (= *lanuginosa*) Herbaceous Vegetation (Carsey et al. 2003a) B
- DRISCOLL FORMATION CODE: V.C.6.a. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is known from five locations: three are in low-elevation fens on the west slope in the North Fork Flathead River valley. One site is at the southern end of McGee Meadow, one is southwest of Bowman Lake, and the other is just north of Big Prairie. One stand was found 1000 feet higher in the Lincoln Creek drainage, also on the western slope. Two stands of the *Carex lasiocarpa* association have been sampled at low elevations on the east slope in Waterton Lakes National Park, probably in the Waterton River basin.

GLOBAL RANGE: This association is known from the lowlands of Washington's Puget Trough, north into British Columbia, south to south-central Cascades in Oregon, east to subalpine basins of Utah, Idaho, Montana and Colorado. Christy (2004) reports this association from California to Alaska and eastward.

NATIONS: CA, US

STATES/PROVINCES: AB, AK?, BC:S4, CA?, CO:S1, ID:S2, MT:S4, OR:SU, UT:S1, WA:S3?

USFS ECOREGIONS: 242A:CC, 342B:CC, M242C:CC, M331A:CC, M331D:CC, M332B:CC, M332C:C?, M332D:CC, M332E:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes); USFS (Deschutes, Wallowa-Whitman, Winema)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2016, GLAC.2220, GLAC.2232, GLAC.2272, WATE.5073, WATE.5076.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Achuff et al. 2002a, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Christy 2004, Crowe and Clausnitzer 1997, Crowe et al. 2004, Driscoll et al. 1984, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995, IDCDC 2005, Jankovsky-Jones et al. 1999, Kagan et al. 2000, Kartesz 1999, Kovalchik 1987, Kovalchik 1993, Kovalchik 2001, Kunze 1994, MTNHP 2002b, Padgett et al. 1989, Titus and Christy 1996a, Titus and Christy 1999, WNHP unpubl. data, Western Ecology Working Group n.d.

Carex limosa* Seasonally Flooded Herbaceous Alliance**Carex limosa* Herbaceous Vegetation****MUD SEDGE HERBACEOUS VEGETATION**

IDENTIFIER: CEG001811

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Carex limosa</i> Seasonally Flooded Herbaceous Alliance (A.1416)
Alliance (English name)	Mud Sedge Seasonally Flooded Herbaceous Alliance
Association	<i>Carex limosa</i> Herbaceous Vegetation
Association (English name)	Mud Sedge Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): North Pacific Bog and Fen (CES204.063)
Rocky Mountain Subalpine-Montane Fen (CES306.831)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is currently reported from the Rocky Mountains west into Utah, California and Washington at mid to high elevations. Stands occur in some of the wettest sites in fens that have formed in glacial kettles, on pond margins, along low-gradient lake inlets or outlets, in association with springs in broad valleys. Soils are typically highly organic and composed of deep fibric peat, with very little decomposition because of saturated conditions. Vegetation is characterized by the dominance of *Carex limosa* with 50% or greater cover (often occurring as a near monoculture) and may occur as a floating mat. Several other

species that are adapted to nutrient-poor conditions, including *Drosera* spp., *Eriophorum* spp., *Menyanthes trifoliata*, and *Trichophorum caespitosum* (= *Scirpus cespitosus*), are sometimes present. In addition, *Carex aquatilis*, *Carex rostrata*, *Carex utriculata*, and *Comarum palustre* (= *Potentilla palustris*) may be present. A dense layer of moss that often includes *Sphagnum* spp. occurs in some stands, and some stands may be codominated by *Eleocharis quinqueflora* or *Carex aquatilis*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: The lone IPP representative of this association occurs as an anchored mat on peat deposits on the shoreline of Johns Lake at 1010 m (3320 feet) elevation, a glacial kettle hole. Though water chemistry and peat depth were not explicitly characterized, the predominance of *Sphagnum* moss almost certainly qualifies this occurrence as a fen (toward the poor fen end of the spectrum).

GLOBAL ENVIRONMENT: This association is currently reported from the Rocky Mountains west into Utah, California and Washington at mid to high elevations ranging from 1787-3235 m (5860-10,600 feet). However, one occurrence in Glacier National Park, Montana, is found at 1010 m (3320 feet). *Carex limosa* is widespread, occurring at mid to high elevations in boreal regions of the Northern Hemisphere. Stands occur in some of the wettest sites in fens that have formed in glacial kettles, on pond margins, along low-gradient lake inlets or outlets, in association with springs in broad valleys. It often occurs as floating organic mats held together by long rhizomes and roots of mostly graminoids (Padgett et al. 1989, Cooper 1990). Soils are typically highly organic and composed of deep fibric peat, with very little decomposition because of saturated conditions (Hansen et al. 1995). If a site get drier from water diversion, etc., *Carex aquatilis* will become more competitive and abundant (Padgett et al. 1989). Soils are classified as Borofibrists or Cryohemists.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: With *Sphagnum* moss forming a virtually continuous blanket and graminoids (principally *Carex limosa*, *Carex arcta*, *Carex vesicaria*, and *Eriophorum chamissonis*) comprising less than 40% cover, this stand is perhaps atypical for the type. The most prevalent forbs, *Menyanthes trifoliata* and *Viola macloskeyi*, are both notably associated with fens.

GLOBAL VEGETATION: Vegetation is characterized by the dominance of *Carex limosa* with 50% or greater cover (often occurring as a near monoculture) and may form floating organic mats held together by long rhizomes and roots of mostly graminoids (Padgett et al. 1989, Cooper 1990). Several other species that are adapted to nutrient-poor conditions, including *Drosera linearis*, *Drosera rotundifolia*, *Eriophorum scheuchzeri*, *Eriophorum chamissonis*, *Menyanthes trifoliata*, and *Trichophorum caespitosum* (= *Scirpus cespitosus*), are sometimes present. In addition, *Carex aquatilis*, *Carex buxbaumii*, *Carex lasiocarpa*, *Carex rostrata*, *Carex utriculata*, and *Comarum palustre* (= *Potentilla palustris*) may be present. A dense layer of moss that often includes *Sphagnum* spp. occurs in some stands. Scattered shrubs of *Betula nana* (= *Betula glandulosa*), *Dasiphora fruticosa* ssp. *floribunda*, *Salix candida*, or *Salix planifolia* may be present (Hansen et al. 1995).

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Carex arcta</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Carex limosa</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex limosa*, *Eriophorum chamissonis*, *Menyanthes trifoliata*

GLOBAL: *Carex aquatilis*, *Carex limosa*, *Drosera linearis*, *Drosera rotundifolia*, *Menyanthes trifoliata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2 (19-Oct-2000). This plant association is naturally rare being restricted to the specialized habitat of nutrient-poor fens. Stands occupy very small areas of the landscape with the sum of patches usually being less than a few (5) acres. Homes and cabins are frequently located along shores of lakes supporting this association. In some locations boat docks are cut into peat mats, and access across unstable substrates is provided by primitive boardwalks (created with palettes or wood scraps). In

addition, nutrients from faulty sewage systems and sediment from activities (roads and logging) within the watershed may impact water chemistry of sites. Drought years may make stands accessible to both domestic and wild grazing animals, which creates bare mud tracks or rutted and hummocky soils. Loss of waterfowl habitat may concentrate foraging and bedding within stands.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: The IPP concept of this association accords *Carex limosa* greater indicator status than any other dominant wet-site sedge occurring in these parks. *Carex limosa* is known only from well-defined fens, usually poor fens, whereas the other *Carex* spp. have broader distributions with regard to water chemistry and moisture gradient.

GLOBAL COMMENTS: This plant association has been characterized in numerous studies in the Great Lakes Region, in Canada, northern Europe, and northern Asia (Mattson 1984). It appears closely related to *Carex aquatilis* Herbaceous Vegetation (CEGL001802) with which it is commonly associated (Padgett et al. 1989). Hansen et al. (1995) indicate that *Carex limosa* has indicator priority over *Carex lasiocarpa* but not *Carex aquatilis* or *Carex utriculata*. Mattson's (1984) *Carex limosa* series described for the central portion of Yellowstone National Park are included in this broader association. A stand described from Rocky Mountain National Park was codominated by *Eleocharis quinqueflora* and fits the broader Mattson (1984) concept of *Eleocharis pauciflora* (= *Eleocharis quinqueflora*) phase of the *Carex limosa* - *Carex aquatilis* Habitat Type.

GLOBAL SIMILAR ASSOCIATIONS:

- *Carex aquatilis* Herbaceous Vegetation (CEGL001802)

GLOBAL RELATED CONCEPTS:

- *Carex limosa* - *Carex aquatilis* Habitat Type (Mattson 1984) =
- *Carex limosa* - *Carex aquatilis* Habitat Type, *Carex aquatilis* Phase (Mattson 1984) F
- *Carex limosa* - *Carex aquatilis* Habitat Type, *Eleocharis quinqueflora* Phase (Mattson 1984) F
- *Carex limosa* (Bourgeron and Engelking 1994) =
- *Carex limosa* Association (Kovalchik 1993) =
- *Carex limosa* Association (Christy 2004) =
- *Carex limosa* Community Type (Cooper 1990) =
- *Carex limosa* Community Type (Padgett et al. 1989) =
- *Carex limosa* Dominance Type (Hansen et al. 1988b) =
- *Carex limosa* Habitat Type (Hansen et al. 1995) =
- *Carex limosa* Series (Mattson 1984) B
- DRISCOLL FORMATION CODE:V.C.6.a. (Driscoll et al. 1984) B

OTHER COMMENTS

OTHER COMMENTS: This occurrence at 1010 m (3320 feet) elevation considerably extends the cited (Hansen et al. 1995) Montana elevation range of 1789 to 2420 m (5850-7950 feet), as well as the global parameter.

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is currently described from only west of the Continental Divide in Glacier National Park, but there is no distributional or environmental requirement prohibiting its occurrence on the eastside as well.

GLOBAL RANGE: This association is known from scattered locations across the Rocky Mountains and parts of western North America from western Montana west to Washington and possibly British Columbia, south into California, Utah, Colorado and New Mexico. *Carex limosa* is widespread, occurring at mid to high elevations in boreal regions of the Northern Hemisphere, so range may be wider yet.

NATIONS: CA?, US

STATES/PROVINCES: AK?, BC?, CA:S1, CO:S1S2, ID:S1, MT:S2, NM, OR:S2, UT:S1S2, WA:S2?, WY:S2?

USFS ECOREGIONS: M331A:CC, M331D:CC, M331I:CC, M333A:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier, Rocky Mountain, Yellowstone)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.C130.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: M. Jankovsky-Jones, mod. K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Christy 2004, Cooper 1990, Driscoll et al. 1984, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995, IDCDC 2005, Kovalchik 1993, MTNHP 2002b, Mattson 1984, Padgett et al. 1989, WNHP unpubl. data, Western Ecology Working Group n.d.

***Carex microptera* Seasonally Flooded Herbaceous Alliance**

***Carex microptera* Herbaceous Vegetation**

SMALL-WING SEDGE HERBACEOUS VEGETATION

IDENTIFIER: C EGL001792

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Carex microptera</i> Seasonally Flooded Herbaceous Alliance (A.1411)
Alliance (English name)	Small-wing Sedge Seasonally Flooded Herbaceous Alliance
Association	<i>Carex microptera</i> Herbaceous Vegetation
Association (English name)	Small-wing Sedge Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

ELEMENT CONCEPT

GLOBAL SUMMARY: This wet meadow community occurs on gently sloping stream benches and terraces on small streams. All reported stands occur on alluvial surfaces. Elevation ranges from 1920 to 3570 m (6300-11,700 feet). Soils are mineral with fine textures ranging from sandy to silts to clayey. Some soils have an organic layer. This herbaceous meadow type is dominated by *Carex microptera*. Other sedges are typically present in lower abundances and include *Carex aquatilis*, *Carex utriculata*, *Carex praegracilis*, and *Carex pellita* (= *Carex lanuginosa*). Other graminoids that can have significant cover include *Juncus hallii*, *Juncus longistylis*, *Deschampsia caespitosa*, *Festuca idahoensis*, and *Poa pratensis*. Forbs are few and include *Symphotrichum foliaceum* (= *Aster foliaceus*), *Fragaria virginiana*, *Geum macrophyllum*, *Argentina anserina*, *Arnica chamissonis* var. *andina*, *Eurybia integrifolia*, and *Hymenoxys hoopesii* (= *Helenium hoopesii*). Disturbed stands can have *Agrostis scabra*, *Phleum pratense*, and *Taraxacum officinale*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: The lone IPP example of this association occurs on a subirrigated stream terrace of fluvially worked glacial drift at 1675 m (5500 feet) elevation in the vicinity of Poia Lake.

GLOBAL ENVIRONMENT: This wet meadow community occurs on gently sloping stream benches and terraces on small streams. All reported stands occur on alluvial surfaces. Elevation ranges from 1920 to 3570 m (6300-11,700 feet). Soils are mineral with fine textures ranging from sandy to silts to clayey. Some soils have an organic layer.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The herbaceous component corresponds well with the global description, with *Carex microptera* being decidedly dominant, and other graminoids, including *Carex aquatilis*, *Carex utriculata*, *Calamagrostis canadensis*, and *Deschampsia caespitosa*, clearly subordinate. *Symphotrichum foliaceum* (= *Aster foliaceus*) is characteristically present; reconnaissance indicates the forb component can vary from highly diverse to rather pedestrian as in this example. Though not abundant, the presence of tall shrubs, including *Salix boothii*, *Salix drummondiana*, *Salix farriae*, *Salix sitchensis*, *Vaccinium membranaceum*, and seedling *Populus balsamifera* ssp. *trichocarpa*, is not in accord with the general type description.

GLOBAL VEGETATION: This herbaceous meadow type is dominated by *Carex microptera*. Other sedges are typically present in lower abundances and include *Carex aquatilis*, *Carex utriculata*, *Carex praegracilis*, and *Carex pellita* (= *Carex lanuginosa*). Other graminoids that can have significant cover include *Juncus hallii*, *Juncus longistylis*, *Deschampsia caespitosa*, *Festuca idahoensis*, and *Poa pratensis*. Forbs are few and include *Symphotrichum foliaceum* (= *Aster foliaceus*), *Fragaria virginiana*, *Geum macrophyllum*,

Argentina anserina, *Arnica chamissonis* var. *andina*, *Eurybia integrifolia*, and *Hymenoxys hoopesii* (= *Helenium hoopesii*). Disturbed stands can have *Agrostis scabra*, *Phleum pratense*, and *Taraxacum officinale*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Carex microptera</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Carex microptera</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex microptera*, *Deschampsia caespitosa*, *Symphotrichum foliaceum*

GLOBAL: *Carex aquatilis*, *Carex microptera*, *Deschampsia caespitosa*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

- *Carex microptera* (Bourgeron and Engelking 1994) =
- *Carex microptera* (Kittel et al. 1999b) =
- *Carex microptera* Herbaceous Vegetation (Carsey et al. 2003a) =
- DRISCOLL FORMATION CODE:V.C.5.b. (Driscoll et al. 1984) B

OTHER COMMENTS

OTHER COMMENTS: The presence of at least 20% *Phleum pratense* and *Poa pratensis* along with abundant *Taraxacum officinale* is testimony to past (and possibly ongoing) disturbance; these species are especially aggressive in mesic meadows, though not in long-term saturated soils.

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The representative plot is in the vicinity of Poia Lake, an east-of-the-divide hiking destination; the same or similar communities were noted in reconnaissance west of the Continental Divide.

GLOBAL RANGE: This small wetland meadow is known from Colorado, Montana, Wyoming, Utah, Idaho and possibly Oregon.

NATIONS: US

STATES/PROVINCES: CO:S2?, ID, OR?, UT:S2S3, WY:S3

USFS ECOREGIONS: 342B:CC, M331A:CC, M331D:CC, M331G:CC, M331I:CC, M332E:CC, M332G:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton, Rocky Mountain); USFS (Bridger-Teton)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.1196.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Driscoll et al. 1984, Hansen et al. 1988b, IDCDC 2005, Kittel 1994, Kittel et al. 1999b, Padgett et al. 1988b, Padgett et al. 1989, Western Ecology Working Group n.d., Youngblood et al. 1985a, Youngblood et al. 1985b

***Carex nigricans* Seasonally Flooded Herbaceous Alliance**

***Carex nigricans* - *Sibbaldia procumbens* Herbaceous Vegetation**

BLACK ALPINE SEDGE - CREEPING GLOW-WORT HERBACEOUS VEGETATION

IDENTIFIER: C EGL005824

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Carex nigricans</i> Seasonally Flooded Herbaceous Alliance (A.1418)
Alliance (English name)	Black Alpine Sedge Seasonally Flooded Herbaceous Alliance
Association	<i>Carex nigricans</i> - <i>Sibbaldia procumbens</i> Herbaceous Vegetation
Association (English name)	Black Alpine Sedge - Creeping Glow-wort Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is well documented from throughout Glacier National Park, Montana, and it occurs as well in the alpine of Waterton Lakes National Park, Alberta. It occurs only in the highest subalpine to alpine zone where it occupies sites that retain their snowload extremely late into the growing season. Often these sites are swales or lee slope positions that receive much greater snowloads than other landscape positions. The patches occur in gently rolling terrain with slopes seldom exceeding 20% and all aspects being represented; elevations represented range from 2000 to 2400 m (6100-7870 feet). The fact that melt-off occurs so late in the season produces a very reduced growing season, though the abundant meltwater creates soils that are almost always continuously saturated. The amount of exposed rock and soil generally does not exceed 10% with the great majority of the ground surface covered by litter or basal vegetation. *Carex nigricans*, an indicator of snowbed conditions, has at least 10% cover, but can have well over 80% cover, and forms a low-growing (<0.08 m high) turf. Other snowbed-associated graminoids consistently present include *Juncus drummondii*, *Juncus mertensianus*, *Carex spectabilis*, *Luzula glabrata*, and *Phleum alpinum*. Where moist to wet conditions follow snowpack melt-off, forbs may attain appreciable cover, including *Erigeron peregrinus*, *Hypericum scouleri* (= *Hypericum formosum*), *Trollius laxus*, *Parnassia fimbriata*, *Senecio triangularis*, and *Triantha glutinosa* (= *Tofieldia glutinosa*). The forbs most consistently present and indicative of more modal conditions include *Sibbaldia procumbens*, *Epilobium anagallidifolium* (= *Epilobium alpinum*), *Packeria streptanthifolia* (= *Senecio cymbalarioides*), *Symphyotrichum foliaceum* (= *Aster foliaceus*), and *Ranunculus eschscholtzii*; the combined cover within the forb layer is usually in the range of 5 to 20%. The dwarf-shrub component, if present, has less than 5% cover, with *Salix arctica* and *Phyllodoce glanduliflora* being those most consistently present.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs only in the highest subalpine to alpine zone where it occupies sites that retain their snowload extremely late into the growing season. Often these sites are swales or lee slope positions that receive much greater snowloads than other landscape positions. The patches occur in gently rolling terrain with slopes seldom exceeding 20% and all aspects being represented; elevations represented range from 2000 to 2400 m (6100-7870 feet). The fact that melt-off occurs so late in the season produces a very reduced growing season, though the abundant meltwater creates soils that are almost always continuously saturated. Parent material is often drift derived from both calcareous and noncalcareous sedimentary rock. The amount of exposed rock and soil generally does not exceed 10% with the great majority of the ground surface covered by litter or basal vegetation.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Recognition of this herbaceous association is predicated upon *Carex nigricans*, an indicator of snowbed conditions, having at least 10% cover. This species forms a low-growing (<0.08 m high) turf that ranges widely in cover, from greater than 75% to slightly more than 10%. Other snowbed-associated graminoids consistently present include *Juncus drummondii*, *Juncus mertensianus*, *Carex spectabilis*, *Luzula glabrata*, and *Phleum alpinum*. Where moist to wet conditions follow snowpack melt-off, mesic to hydric forbs, including *Erigeron peregrinus*, *Hypericum scouleri* (= *Hypericum formosum*), *Trollius laxus*, *Parnassia fimbriata*, *Senecio triangularis*, and *Triantha glutinosa* (= *Tofieldia glutinosa*), may attain appreciable cover. The forbs most consistently present and indicative of more modal conditions include *Sibbaldia procumbens*, *Epilobium anagallidifolium* (= *Epilobium alpinum*), *Packera streptanthifolia* (= *Senecio cymbalarioides*), *Symphotrichum foliaceum* (= *Aster foliaceus*), and *Ranunculus eschscholtzii*; the combined cover within the forb layer is usually in the range of 5 to 20%. The dwarf-shrub component, if present, has less than 5% cover, with *Salix arctica* and *Phyllodoce glanduliflora* being those most consistently present.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Salix arctica</i>
Herb (field)	Forb	<i>Epilobium anagallidifolium</i> , <i>Hypericum scouleri</i> , <i>Packera streptanthifolia</i> , <i>Sibbaldia procumbens</i> , <i>Veronica wormskjoldii</i>
Herb (field)	Graminoid	<i>Carex nigricans</i> , <i>Carex spectabilis</i> , <i>Juncus drummondii</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex nigricans*, *Epilobium anagallidifolium*, *Sibbaldia procumbens*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4G5 (16-Apr-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE:

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: Much of what constitutes this association in the IPP has been designated the *Sibbaldia procumbentis* - *Caricetum nigricantis* Association by C. Damm (2001) using Braun-Blanquet principles. This syntaxon has affinities with a *Carex nigricans* association that has been documented from southwestern Montana (Cooper et al. 1997) but is uniquely different, as noted by Damm, from what has also been identified as *Carex nigricans* Herbaceous Vegetation (CEGL001816) from coastal British Columbia. It is recommended that the regional specificity of this type (northern Rocky Mountains) be recognized by using Damm's name (reversed in accordance with the NVC), i.e., *Carex nigricans* - *Sibbaldia procumbens*.

GLOBAL COMMENTS: This association, as identified for Glacier and Waterton Lakes national parks, is floristically somewhat distinct from the *Carex nigricans* communities sampled by Cooper et al. (1997) from the Beaverhead National Forest. The presence of *Carex spectabilis*, *Luzula glabrata*, *Trollius laxus*, *Parnassia fimbriata*, *Senecio triangularis*, and *Triantha glutinosa* (= *Tofieldia glutinosa*) in the Glacier plots suggest a different plant association than that found by Cooper et al. (1997); hence it has been accorded its own name as a distinct plant association. There are affinities between the two, a reflection of their occurrence in very similar ecological niches, and also affinities with the *Carex nigricans* communities found in the northern Cascades and coastal mountains of British Columbia. However, the *Carex nigricans* association identified by Cooper et al. (1997) is more similar floristically to *Carex nigricans* - *Juncus drummondii* Herbaceous Vegetation (CEGL001818) from the central Rocky Mountains in Colorado (Carsey et al. 2003) and may represent the northerly extent of that type.

GLOBAL SIMILAR ASSOCIATIONS:

- *Carex nigricans* - *Erythronium montanum* Herbaceous Vegetation (CEGL001817)
- *Carex nigricans* - *Juncus drummondii* Herbaceous Vegetation (CEGL001818)
- *Carex nigricans* - *Luetkea pectinata* Herbaceous Vegetation (CEGL001819)
- *Carex nigricans* Herbaceous Vegetation (CEGL001816)
- *Sibbaldia procumbens* - *Polygonum bistortoides* Herbaceous Vegetation (CEGL001933)

GLOBAL RELATED CONCEPTS:

- *Sibbaldio procumbentis* - *Caricetum nigricantis* Association (Damm 2001) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: Due to the intensive sampling by C. Damm (2001), this type is exceedingly well documented from throughout Glacier National Park. It occurs as well in the alpine of Waterton Lakes National Park, but its documentation there is much weaker.

GLOBAL RANGE: This alpine graminoid association is well documented from throughout Glacier National Park, Montana, and it occurs as well in the alpine of Waterton Lakes National Park, Alberta. It is highly likely to occur further north in the alpine zone of the Canadian Rockies.

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S4?

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES: The documentation for this type comes almost exclusively from the dissertation of C. Damm (2001); sampling was conducted with 16-m² plots.

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: CD583, CD743, CD528, CD425, CD561, CD427, CD423, CD730, CD342, CD749, CD184, CD785, CD330, CD185, CD395, CD731, CD748, CD752, CD729, CD798, CD198, CD329, CD333, CD201, CD316, CD197, CD207, CD356, CD343, CD743, CD209, CD614, CD194, CD506, CD767, CD781, CD2, WATE.4127.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Cooper et al. 1997, Damm 2001, Western Ecology Working Group n.d.

***Carex vesicaria* Seasonally Flooded Herbaceous Alliance**

***Carex vesicaria* Herbaceous Vegetation**

INFLATED SEDGE HERBACEOUS VEGETATION

IDENTIFIER: CEGL002661

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Carex vesicaria</i> Seasonally Flooded Herbaceous Alliance (A.2501)
Alliance (English name)	Inflated Sedge Seasonally Flooded Herbaceous Alliance
Association	<i>Carex vesicaria</i> Herbaceous Vegetation
Association (English name)	Inflated Sedge Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): North American Arid West Emergent Marsh (CES300.729)
Northern Columbia Plateau Basalt Pothole Ponds (CES304.058)
Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

ELEMENT CONCEPT

GLOBAL SUMMARY: Stands of this vegetation type are commonly found in wet meadows, around the edges of montane lakes and beaver ponds, along the margins of slow-moving reaches of streams and rivers, and in marshy swales and overflow channels on broad floodplains throughout the western United States. Elevations range from 1075-2900 m (3525-9500 feet). These communities can occur in standing water or on sites that become relatively dry during the later part of the growing season. Many sites are located where beaver ponds have filled with sediment. A wide range of soils are associated with this association. Histosols are most common and often have organic accumulations greater than 1 meter thick. Mollisols and Entisols are also associated with this type. Soil texture varies widely from loamy clay to sandy loam. This association is characterized by the dominance of *Carex vesicaria*, with 20-98% cover. Other graminoids can be present and can be codominant. *Juncus balticus*, *Deschampsia caespitosa*, *Carex nebrascensis*, *Carex utriculata*, *Eleocharis palustris*, and *Glyceria* spp. are some of the more common associated species. Forbs can include *Epilobium* sp., *Galium trifidum*, *Camassia quamash*, *Symphyotrichum foliaceum* (= *Aster foliaceus*), *Equisetum arvense*, and *Mentha arvensis*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Two stands of the *Carex vesicaria* association were sampled at one wet meadow complex located on a toeslope bench at the bottom of a wide river valley. The stands were at an elevation of about 1075 m (3525 feet). The association occurred on mostly poorly drained mineral soil derived from mixed glacial and fluvial deposits. The soil texture was silty clay loam with minimal organic material. The low-lying sites supporting this association were temporarily flooded, but dry by September.

GLOBAL ENVIRONMENT: Stands of this vegetation type are commonly found in wet meadows, around the edges of montane lakes and beaver ponds, along the margins of slow-moving reaches of streams and rivers, and in marshy swales and overflow channels on broad floodplains throughout the western United States. Elevations range from 1075-2900 m (3525-9500 feet). They can occur in standing water or on sites that become relatively dry during the later part of the growing season. Many sites are located where beaver ponds have filled with sediment. A wide range of soils are associated with this association. Histosols are most common and often have organic accumulations greater than 1 meter thick. Mollisols and Entisols are also associated with this type. Soil texture varies widely from loamy clay to sandy loam.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Tufts of *Carex vesicaria*, up to about 1 m tall, having an average cover of 27%, characterize this association. In the two plots sampled, the exotic grass *Poa palustris* was always subdominant between or under *Carex vesicaria* tufts, colonizing the bare soil with an average cover of 25%. The forb *Petasites frigidus* var. *sagittatus* (= *Petasites sagittatus*) was also subdominant in one plot. The mesic forbs *Mentha arvensis* and *Arnica chamissonis*, as well as the grass *Calamagrostis stricta*, were each recorded in both plots, but each with only trace cover. Due to fluctuating water levels or prolonged deep flooding, the ground was about half barren soil and half litter. Nonvascular plant cover was no more than 10%.

GLOBAL VEGETATION: This association is characterized by the dominance of *Carex vesicaria*, with 20-98% cover. Other graminoids can be present and can be codominant. *Juncus balticus*, *Deschampsia caespitosa*, *Carex nebrascensis*, *Carex utriculata*, *Calamagrostis stricta*, *Eleocharis palustris*, and *Glyceria* spp. are some of the more common associated species. Forbs can include *Epilobium* sp., *Galium trifidum*, *Camassia quamash*, *Symphyotrichum foliaceum* (= *Aster foliaceus*), *Equisetum arvense*, and *Mentha arvensis*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Petasites frigidus</i> var. <i>sagittatus</i>
Herb (field)	Graminoid	<i>Carex vesicaria</i> , <i>Poa palustris</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Carex vesicaria</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Arnica chamissonis*, *Calamagrostis stricta*, *Carex vesicaria*

GLOBAL: *Carex vesicaria*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Poa pratensis*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4Q (2-Dec-1998).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: The association needs crosswalking between stands in the Pacific Northwest states and Colorado to determine if this is the same type, thus the G4Q rank. This type appears to be a simple dominance type with *Carex vesicaria* and occasionally *Carex utriculata* as the only species of significance. Some authors have treated communities dominated by *Carex vesicaria* as being analogous to *Carex utriculata* (example Hansen et al. (1995) for Montana). Further work is needed to clarify the distribution of this type due to this treatment.

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

- *Carex rostrata* (*Deschampsia caespitosa* Phase) (Hansen et al. 1995) I
- *Carex vesicaria* (Bourgeron and Engelking 1994) =
- *Carex vesicaria* (Kovalchik 1987) =
- *Carex vesicaria* (Kittel et al. 1999b) =
- *Carex vesicaria* Herbaceous Vegetation (Carsey et al. 2003a) =
- *Carex vesicaria* var. *vesicaria* (Crowe and Clausnitzer 1997) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is known only from low-elevation wetlands at Sullivan Meadow, a toeslope glacial-fluvial bench above the North Fork Flathead River floodplain, in Glacier National Park.

GLOBAL RANGE: This association is known from stands throughout the montane western United States.

NATIONS: US

STATES/PROVINCES: CA, CO:S1, ID:S3, MT, NV?, OR:S4, WA

USFS ECOREGIONS: 3311:CC, M261E:CC, M331G:CC, M331H:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier, Yosemite); USFS (Deschutes?, Fremont, Malheur, Ochoco?, Umatilla, Wallowa-Whitman, Winema?)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES: Only two wetlands with the *Carex vesicaria* association were sampled. Further inventory of temporarily flooded wet meadows is necessary to gain additional vegetation and environmental data helpful for adequately describing this association in the IPP.

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2081, GLAC.2082.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: T. Keeler-Wolf, mod. G. Kittel

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Christy and Cornelius 1980, Cooper and Severn 1992, Crowe and Clausnitzer 1997, Hansen et al. 1995, Henderson and McAllister 1983, IDCDC 2005, Kagan et al. 2000, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1993, Manning and Padgett 1991, NVNHP 2003, Sanderson and Kettler 1996, WNHP unpubl. data, Western Ecology Working Group n.d.

***Deschampsia caespitosa* Seasonally Flooded Herbaceous Alliance**

***Deschampsia caespitosa* Herbaceous Vegetation**

TUFTED HAIRGRASS HERBACEOUS VEGETATION

TUFTED HAIRGRASS MEADOW

IDENTIFIER: C EGL001599**NVC Classification**

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Deschampsia caespitosa</i> Seasonally Flooded Herbaceous Alliance (A.1408)
Alliance (English name)	Tufted Hairgrass Seasonally Flooded Herbaceous Alliance
Association	<i>Deschampsia caespitosa</i> Herbaceous Vegetation
Association (English name)	Tufted Hairgrass Herbaceous Vegetation
Association (Common name)	Tufted Hairgrass Meadow

ECOLOGICAL SYSTEM(S):	Boreal Wet Meadow (CES103.873)
	Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
	Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824)
	Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998)

ELEMENT CONCEPT

GLOBAL SUMMARY: This herbaceous vegetation is dominated by a circumboreal species which is common in alpine wet meadows and wetland margin habitats. Stands are found in moist, low-gradient valley bottoms and along streams throughout the mountainous areas of the western U.S. at elevations ranging from 800 to 3550 m (2625-11,650 feet). Typically, these communities occur in areas of abundant snowfall where snowmelt saturates soils from late spring through early summer. In the alpine tundra, this association is commonly found in snowmelt basins and around the edges of alpine wetlands. At lower elevations, the communities are typically wetlands, requiring wet or moist soils throughout most of the growing season. Soils are variable. Fine-textured soils retain soil moisture longer in areas of seasonal drought, and coarse substrates allow aeration in areas with perennial high water tables. This vegetation is characterized by a moderately dense to dense herbaceous layer dominated by the perennial bunchgrass *Deschampsia caespitosa*. Commonly associated graminoid species include *Agrostis scabra*, *Carex aquatilis*, *Carex nebrascensis*, *Carex microptera*, *Carex utriculata*, *Carex vesicaria*, *Danthonia intermedia*, *Elymus trachycaulus*, *Juncus balticus*, *Juncus alpinoarticulatus*, *Phleum alpinum*, *Poa* spp., *Trisetum spicatum*, and *Trisetum wolfii*. Common forbs include *Geum rossii*, *Ligusticum tenuifolium*, *Polygonum bistortoides*, *Ranunculus flammula*, and low cover of *Caltha leptosepala*. Diagnostic of this herbaceous association is the dominance or codominance of *Deschampsia caespitosa* and the presence of surface water for extended periods during the growing season.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This small-patch type usually occurs as a discontinuous concentric zone about depressions and pond margins; a very limited sample indicates an elevation range of 1270 to 1950 m (4165-6400 feet), which extends by 200 m the known lower elevational range as previously documented for Montana. These level to gradually sloped sites are flooded in the spring and, as the growing season progresses, then dry to the point of being saturated to the surface, or nearly so with a water table being at a depth of about 1 m. The moisture regime is rated as subhygric to hygric with mineral soils having a thin surface organic accumulation and being poorly to very poorly drained.

GLOBAL ENVIRONMENT: This plant association occurs in moist, low-gradient valley bottoms throughout the mountainous areas of the western United States at elevations ranging from 800 to 3550 m (2625-11,650 feet). *Deschampsia caespitosa* requires relatively cool, moist conditions. Typically, stands occur in areas of abundant snowfall where snowmelt saturates soils from late spring through early summer. The vegetation occurs at higher elevations in the southern part of its range and in dry interior locations. Communities occur in the alpine tundra where stands grow in snowmelt basins and around the edges of alpine wetlands. At lower elevations, it occurs as wetlands, requiring wet or moist soils throughout most of the growing season. Soils are diverse. In perennially wet soils, stands of this association occur on sand or gravel lenses which allow adequate aeration of roots. In sites with seasonal drought, the vegetation generally occurs on finer-textured soils which drain slowly and retain moisture. Ground cover is variable, with litter and duff ranging from 1-90% cover. Stands in rocky alpine areas can contain up to 50% exposed large and small rock, and many stands have between 1-50% bare soil. Moss is also variable and can have up to 40% cover in wet meadow stands.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: These sites are exclusively wet meadows and generally have no representation of shrubs, except for accidental specimens such as *Dasiphora fruticosa* ssp. *floribunda* (= *Pentaphylloides floribunda*). Overall, this association is relatively species-poor. *Deschampsia caespitosa* is consistently dominant, varying in cover from 20 to 40%. The only other graminoids of note are *Carex vesicaria*, *Carex aperta*, *Carex flava*, and *Juncus alpinoarticulatus*, obligate wetland species identified with yet wetter marsh environments that have 1-5% cover. The forb composition

is limited to a few species associated with continuously saturated conditions. The most consistently present forb is *Ranunculus flammula* with 1-10% cover. Other wetland-type forbs that are present with low to moderate cover include *Argentina anserina*, *Mentha arvensis*, *Eleocharis palustris*, *Allium schoenoprasum*, and *Equisetum arvense*. As stands grade into drier meadows, species such as *Poa nemoralis* ssp. *interior* (= *Poa interior*), *Dodecatheon pulchellum*, and *Artemisia ludoviciana* may also be present.

GLOBAL VEGETATION: This association is typified by a lush growth of *Deschampsia caespitosa*, a perennial bunchgrass which forms an open canopy of culms and nodding panicles. Typically *Deschampsia caespitosa* strongly dominates the herbaceous layer without significant codominants. Commonly associated graminoid species include *Agrostis scabra*, *Carex aquatilis*, *Carex nebrascensis*, *Carex microptera*, *Carex utriculata*, *Carex vesicaria*, *Danthonia intermedia*, *Eleocharis quinqueflora*, *Elymus trachycaulus*, *Juncus balticus*, *Juncus alpinoarticulatus*, *Luzula campestris*, *Phleum alpinum*, *Poa* spp., *Trisetum spicatum*, and *Trisetum wolfii*. Common forbs include *Castilleja cusickii*, *Geum rossii*, *Ligusticum tenuifolium*, *Polygonum bistortoides*, *Ranunculus flammula*, and low cover of *Caltha leptosepala*. The vegetation often occurs adjacent to perennially saturated sedge wetlands dominated by *Carex aquatilis*, *Carex simulata*, *Carex utriculata*, and others. Stands also generally grade into drier meadows of forbs (*Senecio integerrimus*, *Achillea millefolium*, and others) and grasses (*Festuca*, *Muhlenbergia*, *Poa* spp.). *Poa pratensis* may be codominant in disturbed stands.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Allium schoenoprasum</i> , <i>Myriophyllum sibiricum</i> , <i>Ranunculus flammula</i>
Herb (field)	Graminoid	<i>Carex aperta</i> , <i>Carex vesicaria</i> , <i>Deschampsia caespitosa</i> , <i>Juncus alpinoarticulatus</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Deschampsia caespitosa</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Deschampsia caespitosa*, *Ranunculus flammula*

GLOBAL: *Deschampsia caespitosa*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (9-Apr-1998).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: There are numerous permutations of *Deschampsia caespitosa* combined with another graminoid or forb to define unique types; in the present case there are no other indicator or dominant species to pair with *Deschampsia caespitosa* to describe a type and thus the catchall *Deschampsia caespitosa* Herbaceous Vegetation (CEGL001599) was cited. This type has been described from only two plots collected in Waterton Lakes National Park; however, it has been noted to occur in Glacier National Park as a narrow zone or ecotone around depression wetlands.

GLOBAL COMMENTS: The temporarily flooded, seasonally flooded, and saturated *Deschampsia caespitosa* alliances are weakly separated hydrologically. Descriptions in the literature for the associations in these three alliances are poorly differentiated with respect to soils, hydrology, and vegetation. Further review of the classification of *Deschampsia caespitosa* communities is required to clarify their differences. Stands with over 10% *Phleum alpinum* are similar to *Deschampsia caespitosa* - *Phleum alpinum* Herbaceous Vegetation (CEGL001888) described from Wyoming and may need further review.

GLOBAL SIMILAR ASSOCIATIONS:

- *Deschampsia caespitosa* - *Achillea millefolium* var. *occidentalis* Herbaceous Vegetation (CEGL001880)
- *Deschampsia caespitosa* - *Artemisia lindleyana* Herbaceous Vegetation (CEGL003425)
- *Deschampsia caespitosa* - *Caltha leptosepala* Herbaceous Vegetation (CEGL001882)
- *Deschampsia caespitosa* - *Carex douglasii* Herbaceous Vegetation (CEGL001602)

- *Deschampsia caespitosa* - *Carex microptera* Herbaceous Vegetation (CEGL001883)
- *Deschampsia caespitosa* - *Carex nebrascensis* Herbaceous Vegetation (CEGL001601)
- *Deschampsia caespitosa* - *Carex* spp. Herbaceous Vegetation (CEGL001603)
- *Deschampsia caespitosa* - *Danthonia californica* Herbaceous Vegetation (CEGL001604)
- *Deschampsia caespitosa* - *Geum rossii* Herbaceous Vegetation (CEGL001884)
- *Deschampsia caespitosa* - *Horkelia marinensis* Herbaceous Vegetation (CEGL003461)
- *Deschampsia caespitosa* - *Ligusticum tenuifolium* Herbaceous Vegetation (CEGL001885)
- *Deschampsia caespitosa* - *Luzula multiflora* Herbaceous Vegetation (CEGL001886)
- *Deschampsia caespitosa* - *Mertensia ciliata* Herbaceous Vegetation (CEGL001887)
- *Deschampsia caespitosa* - *Phleum alpinum* Herbaceous Vegetation (CEGL001888)
- *Deschampsia caespitosa* - *Polygonum bistortoides* Herbaceous Vegetation (CEGL003485)
- *Deschampsia caespitosa* - *Potentilla diversifolia* Herbaceous Vegetation (CEGL001889)
- *Deschampsia caespitosa* - *Symphyotrichum foliaceum* Herbaceous Vegetation (CEGL001881)

GLOBAL RELATED CONCEPTS:

- *Carex* - *Isoetes* Plant Community (Hall 1971) =
- *Deschampsia caespitosa* Herbaceous Vegetation (Carsey et al. 2003b) =
- *Deschampsia caespitosa* Herbaceous Vegetation (Carsey et al. 2003a) =
- *Deschampsia caespitosa* (Bourgeron and Engelking 1994) =
- *Deschampsia caespitosa* (Crowe and Clausnitzer 1997) =
- *Deschampsia caespitosa* (Kovalchik 1987) =
- *Deschampsia caespitosa* (Kittel et al. 1999b) =
- *Deschampsia caespitosa* Community Type (Youngblood et al. 1985a) =
- *Deschampsia caespitosa* Community Type (Tuhy and Jensen 1982) =
- *Deschampsia caespitosa* Community Type (Padgett et al. 1989) =
- *Deschampsia caespitosa* Community Type (Manning and Padgett 1995) =
- *Deschampsia caespitosa* Habitat Type (Hansen et al. 1995) =
- *Deschampsia caespitosa* Habitat Type (Hall and Hansen 1997) =
- *Deschampsia caespitosa* Herbaceous Vegetation (Cooper et al. 1999) =
- *Deschampsia caespitosa* Moist Sedge (Johnson and Simon 1987) B
- DRISCOLL FORMATION CODE:V.B.4.b. (Driscoll et al. 1984) B
- Tufted hairgrass (*Deschampsia caespitosa*) Plant Association (Kittel et al. 1999a) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: Though occurring in Waterton Lakes and Glacier national parks, only the sparsest of descriptions and localities of occurrence can be cited. Currently the three sites that have been documented are east of the Continental Divide, including southwest of Poia Lake Campground in Glacier National Park.

GLOBAL RANGE: This association is known from throughout the western U.S. and Alberta, Canada.

NATIONS: CA, US

STATES/PROVINCES: AB, AZ:S2?, CA?, CO:S4, ID:S3, MT:S4, NM, NV?, OR:S2, UT:S3S4, WA, WY

USFS ECOREGIONS: 261A:CC, 331A:CC, 331D:CC, 331E:C?, 331G:CC, 341D:CC, 342B:CC, M242A:C?, M242C:CC, M261C:CC, M261D:CC, M261E:CC, M262B:CC, M313A:CC, M331A:CC, M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341:C

FEDERAL LANDS: NPS (Glacier, Grand Teton, Rocky Mountain); PC (Waterton Lakes); USFS (Deschutes, Fremont, Hells Canyon, Malheur, Ochoco, Rio Grande, Routt, San Juan, Umatilla, Wallowa-Whitman, Winema)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.9043, WATE.9052, AAGL.439.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper, mod. J. Asebrook

GLOBAL DESCRIPTION AUTHORS: G. Kittel, mod. K.A. Schulz

REFERENCES: Bonham and Ward 1970, Bourgeron and Engelking 1994, Briggs and MacMahon 1983, CONHP unpubl. data 2003, Carsey et al. 2003a, Carsey et al. 2003b, Cooper et al. 1999, Crowe and Clausnitzer 1997, Daubenmire and Daubenmire 1968, Driscoll et al. 1984, Franklin and Dyrness 1973, Hall 1971, Hall 1973, Hall and Hansen 1997, Hamann 1972, Hansen et al. 1995, IDCDC

2005, Johnson and Simon 1985, Johnson and Simon 1987, Kagan et al. 2000, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1987, MTNHP 2002b, Manning and Padgett 1995, Mutz and Queiroz 1983, NVNHP 2003, Padgett et al. 1988b, Padgett et al. 1989, Richard et al. 1996, Sanderson and Kettler 1996, Tiedemann 1972, Tuhy and Jensen 1982, WNHP unpubl. data, Western Ecology Working Group n.d., Youngblood et al. 1985a, Youngblood et al. 1985b

***Dulichium arundinaceum* Seasonally Flooded Herbaceous Alliance**

***Dulichium arundinaceum* Seasonally Flooded Herbaceous Vegetation THREWAY SEDGE SEASONALLY FLOODED HERBACEOUS VEGETATION**

IDENTIFIER: CEGL001831

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Dulichium arundinaceum</i> Seasonally Flooded Herbaceous Alliance (A.1398)
Alliance (English name)	Threway Sedge Seasonally Flooded Herbaceous Alliance
Association	<i>Dulichium arundinaceum</i> Seasonally Flooded Herbaceous Vegetation
Association (English name)	Threway Sedge Seasonally Flooded Herbaceous Vegetation

ECOLOGICAL SYSTEM(S):	Boreal Wet Meadow (CES103.873)
	Boreal Depressional Bog (CES103.871)
	North Pacific Bog and Fen (CES204.063)
	Rocky Mountain Subalpine-Montane Fen (CES306.831)
	Temperate Pacific Freshwater Emergent Marsh (CES200.877)

ELEMENT CONCEPT

GLOBAL SUMMARY: This herbaceous vegetation association is known from British Columbia, Canada, the western states of California, Idaho, Montana, Oregon, Washington, and possibly occurs in Wyoming. The community occurs over fibrous peat or mineral soils in areas that are seasonally or permanently flooded with shallow water. In Idaho and Montana stands are typically present in fens and may occur on fixed or floating mats. West of the Cascades it occurs in freshwater marshes as well as in fens. *Dulichium arundinaceum* may occur as a monoculture, but stands are sometimes moderately species-rich with *Carex viridula* ssp. *viridula* (= *Carex oederi*), *Carex exsiccata*, *Carex aquatilis*, *Carex limosa*, *Carex lasiocarpa*, *Eleocharis palustris*, *Juncus balticus*, *Lycopus uniflorus*, *Mentha arvensis*, *Menyanthes trifoliata*, *Comarum palustre* (= *Potentilla palustris*), *Rhynchospora alba*, *Schoenoplectus subterminalis* (= *Scirpus subterminalis*), and/or *Utricularia macrorhiza* (= *Utricularia vulgaris*) present.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs at 1265 m (4150 feet) elevation on semipermanently flooded organic deposits fringing a freshwater lake; environmental data were insufficient to establish whether this setting might qualify as a fen.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The herbaceous component has about 60% combined cover with dominance shared by *Dulichium arundinaceum* and *Scheuchzeria palustris*; other graminoids (*Carex rostrata*, *Carex utriculata*, *Carex limosa*) and forbs (*Drosera anglica*) are indicative of a fen-like environment.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Dulichium arundinaceum</i> , <i>Scheuchzeria palustris</i>

Global

Stratum

Lifeform

Species

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Dulichium arundinaceum*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex rostrata*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3 (20-Oct-2000). This plant association is known from the western United States and British Columbia, Canada. Stands are uncommon on the eastern side of the Cascades and more common west of the Cascades. Stands range from small patches in fens to larger occurrences in freshwater marshes. Stands are usually too wet for most uses, but alteration of hydrology and water quality may change species composition. Drought years may make stands accessible to both domestic and wild grazing animals causing rutted and hummocky soils on margins of stands. In addition, loss of waterfowl habitat may concentrate foraging and bedding in stands. Homes and cabins are frequently located along shores of lakes supporting stands. In some locations boat docks are cut into shoreline vegetation, and access across unstable substrates is provided by primitive boardwalks (created with palettes or wood scraps). In addition, nutrients from faulty sewage systems and sediment from activities (roads and logging) within the watershed may impact water chemistry and hydrology. The global rank has been changed from G4?

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This plant association is described based on limited data in Idaho and Montana and is uncommon in these states (Pierce 1986, Bursik and Moseley 1995). It is more common west of the Cascades in Oregon and Washington (Christy 1993, Kunze 1994, Christy et al. 1998, Titus and Christy 1999). A comparison of data from stands east and west of the Cascades may indicate that two distinct associations should be recognized.

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

- *Dulichium arundinaceum* (Bourgeron and Engelking 1994) =
- *Dulichium arundinaceum* Association (Christy 2004) =
- *Dulichium arundinaceum* Association (Crowe et al. 2004) =
- *Dulichium arundinaceum* Community Type (Kunze 1994) =
- DRISCOLL FORMATION CODE:V.C.6.a. (Driscoll et al. 1984) B
- Threeway Sedge Herbaceous Vegetation (*Dulichium arundinaceum*) (Christy et al. 1998) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The lone example of this association is documented from Fish Lake within the greater Lake McDonald drainage (west of the Continental Divide).

GLOBAL RANGE: This association is a minor type in the western United States of Montana, Idaho, Oregon, Washington, California and possibly Wyoming. It is also reported from British Columbia, Canada, and Alaska (Christy 2004).

NATIONS: CA, US

STATES/PROVINCES: AK?, BC:S2, CA:S1?, ID:S2, MT:S2, OR:S3, WA:S2S3, WY?

USFS ECOREGIONS: 242A:CC, M242A:??, M331A:CC, M333A:CC, M333B:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); USFS (Oregon Dunes, Siuslaw)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.C136.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: M. Jankovsky-Jones

REFERENCES: Bourgeron and Engelking 1994, Bursik and Moseley 1995, Christy 1993, Christy 2001a, Christy 2004, Christy et al. 1998, Crowe et al. 2004, Driscoll et al. 1984, IDCDC 2005, Jankovsky-Jones et al. 1999, Kagan et al. 2000, Kunze 1994, MTNHP 2002b, Pierce 1986, Titus and Christy 1996a, Titus and Christy 1999, WNHP unpubl. data, Western Ecology Working Group n.d.

***Eleocharis palustris* Seasonally Flooded Herbaceous Alliance**

***Eleocharis palustris* Herbaceous Vegetation**

MARSH SPIKERUSH HERBACEOUS VEGETATION

MARSH SPIKERUSH WET MEADOW

IDENTIFIER: C EGL001833

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Eleocharis palustris</i> Seasonally Flooded Herbaceous Alliance (A.1422)
Alliance (English name)	Marsh Spikerush Seasonally Flooded Herbaceous Alliance
Association	<i>Eleocharis palustris</i> Herbaceous Vegetation
Association (English name)	Marsh Spikerush Herbaceous Vegetation
Association (Common name)	Marsh Spikerush Wet Meadow

ECOLOGICAL SYSTEM(S):	Boreal Wet Meadow (CES103.873)
	Inter-Mountain Basins Greasewood Flat (CES304.780)
	Northwestern Great Plains Mixedgrass Prairie (CES303.674)
	Western Great Plains Open Freshwater Depression Wetland (CES303.675)
	Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
	Western Great Plains Closed Depression Wetland (CES303.666)
	Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998)
	Willamette Valley Wet Prairie (CES204.874)

ELEMENT CONCEPT

GLOBAL SUMMARY: This spikerush wet meadow community is found in the central Great Plains of the United States and Canada and in the western United States. Elevations range from near sea level to 3050 m (0-10,000 feet). Stands occur in small depressions in intermittent streambeds or depression ponds that flood early in the season and may dry out by summer. Soils are generally fine-textured. Stands are composed of submersed and emergent rooted vegetation under 1 m tall that is dominated by *Eleocharis palustris*, often in nearly pure stands. Vegetative cover can be sparse to dense (10-90%), but *Eleocharis palustris* is the dominant species, and the only species with 100% constancy. Other species, when present, can contribute as much as 40% cover, but never exceed that of the *Eleocharis palustris* cover.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Two plots of the *Eleocharis palustris* association were sampled at 1270 and 1520 m (4167-4987 feet) elevation in Waterton Lakes National Park, while one plot was sampled at 1012 m (3320 feet) in Glacier National Park. Stands occur on seasonally flooded or semipermanently flooded wetlands located in foothill/valley bottom positions. The wetlands are flat or gently sloped low-lying sites, including a lakeshore, a river terrace, and a fen. Lakeshore and river communities tend to be narrow strips at the edge of the water that occur on mudflats. The soil is very poorly drained, organic in two plots, and mineral Gleysol, with a clay and gravel component derived from glacial, lacustrine, and fluvial deposits, in the other plot. One plot sampled was flooded in mid-July and the other was without water in September.

GLOBAL ENVIRONMENT: This wetland occurs across the central and northwestern Great Plains and western United States. Elevations range from near sea level to 3050 m (0-10,000 feet). In the western mountains, it occurs in valleys and canyon bottoms on the banks and in the overflow channels of low-gradient streams, as well as along the margins of ponds and lakes. On the Great Plains, this community occurs in small depressions in intermittent streambeds, depression ponds that flood early in the season and dry out by summer, and small prairie potholes. It can also occur in the bottom of ephemeral ponds or playas on floodplain terraces of large rivers.

In wet years, stands may remain ponded throughout the growing season. Soils range from organic to silty clay to fine loam formed from weathered siltstone and shale or eolian loess. Soils are reported as slightly alkaline.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: *Eleocharis palustris* is the only species with high cover and 100% constancy in this low-diversity association of semipermanently flooded areas. *Eleocharis palustris* forms an open to dense sward less than 0.5 m tall, with cover ranging from 20% to over 80% in the three plots sampled. *Equisetum fluviatile* and *Equisetum palustre* are each noticeable in one plot with 3-5% cover. Other mesic sedges, rushes, and grasses may also be present, including *Glyceria borealis*, *Glyceria striata*, *Calamagrostis canadensis*, *Carex canescens*, *Juncus confusus*, *Juncus ensifolius*, *Juncus alpinoarticulatus*, and *Juncus nodosus*, each with trace cover. Trace cover of willow species, which are sometimes found adjacent to this association, may also be present in low amounts. Aquatic forbs, especially *Potamogeton* spp., but also *Ranunculus aquatilis* and *Sagittaria cuneata*, are sometimes present in the plots sampled, but they always have less than 1% cover. Moss and algae are also minor elements of this association and woody vegetation is absent. Instead, large areas of exposed soil or standing water are present in plots sampled.

GLOBAL VEGETATION: This wetland association is dominated by submersed and emergent rooted vegetation under 1 m tall. The species composition can be quite variable, but this community is easy to recognize by the bright green, nearly pure stands of *Eleocharis palustris*. Vegetation cover can be sparse to dense (10-90%), but *Eleocharis palustris* is the dominant species, and the only species with 100% constancy. Other species, when present, can contribute as much as 40% cover, but never exceed that of the *Eleocharis palustris* cover. Some of this variation is described from Colorado (Baker and Kennedy 1985, Kittel et al. 1999b). Co-occurring species in low-elevation stands on the western slope can include *Phalaris arundinacea* (= *Phalaroides arundinacea*), *Juncus balticus*, *Hordeum jubatum*, *Equisetum* spp., *Pascopyrum smithii*, *Schoenoplectus americanus* (= *Scirpus americanus*), *Sparganium angustifolium*, species of *Lemna* and *Potamogeton*, as well as the introduced *Melilotus officinalis* and *Bromus inermis*. On the eastern plains of Colorado co-occurring species can include *Leersia oryzoides*, *Schoenoplectus pungens* (= *Scirpus pungens*), *Panicum virgatum*, *Carex pellita* (= *Carex lanuginosa*), and *Spartina pectinata*. At montane elevations, other graminoids, such as *Carex aquatilis*, *Carex utriculata*, and *Deschampsia caespitosa*, are present. Forb cover is typically low but can be occasionally abundant (30%) in some stands. Forb species include *Pedicularis groenlandica*, *Rhodiola integrifolia*, and *Caltha leptosepala*.

In stands from eastern Washington, associates include *Carex utriculata*, *Cicuta douglasii*, and species of *Glyceria* and *Potamogeton*. In northwestern Nebraska, stands are dominated by *Eleocharis acicularis* and *Eleocharis palustris* which commonly cover the bottoms of the pools and emerge above the water as the pools dry out. Ephemeral submersed aquatics, such as *Callitriche palustris* (= *Callitriche verna*), *Potamogeton diversifolius*, and *Marsilea vestita*, may be present. As the pools dry out in mid-summer, ephemeral annual forbs, such as *Limosella aquatica* and *Plagiobothrys scouleri*, may appear. By late summer *Amaranthus californicus* and *Gnaphalium palustre* may dominate in the lowest parts of the depression (Steinauer and Rolfsmeier 2000). In southwestern South Dakota, vegetation is composed of nearly homogeneous stands of *Eleocharis palustris*. Other emergents, such as *Polygonum amphibium*, *Marsilea vestita*, and *Eleocharis ovata*, are occasionally found. Herbaceous cover is greater than 75% except in areas of deeper open water where floating and submerged aquatic plants occur, including *Bacopa rotundifolia* and *Heteranthera limosa* (H. Marriott pers. comm. 1999). In lower elevation Utah stands, *Glaux maritima*, *Distichlis spicata*, and *Juncus balticus* are important associates (Brotherson and Barnes 1984).

Few stand data are available for Colorado examples. Generally, it appears that this community is dominated by *Eleocharis palustris*, forming a scattered to dense overstory, often with few associated species. Commonly associated graminoids include *Hordeum jubatum* and *Pascopyrum smithii*. Forbs present may include *Atriplex argentea*, *Polygonum aviculare*, and *Rorippa sinuata* (Baker and Kennedy 1985). The higher elevation stands may include a slightly different suite of species, but no stand data are available. Ramaley (1942) described a *Distichlis spicata*-dominated salt meadow on a lakeshore in the San Luis Valley which was ringed by *Eleocharis palustris*. Communities in Utah include *Eleocharis acicularis* and *Alopecurus aequalis* as likely associates (Padgett et al. 1989).

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Eleocharis palustris</i>
Herb (field)	Fern or fern ally	<i>Equisetum fluviatile</i> , <i>Equisetum palustre</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Eleocharis palustris</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Eleocharis palustris*

GLOBAL: *Eleocharis palustris*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Eleocharis palustris* - (*Eleocharis compressa*) - *Leptochloa fusca* ssp. *fascicularis* Herbaceous Vegetation (CEGL002259)
- *Eleocharis palustris* - *Distichlis spicata* Herbaceous Vegetation (CEGL001834)
- *Eleocharis palustris* - *Juncus balticus* Herbaceous Vegetation (CEGL001835)

GLOBAL RELATED CONCEPTS:

- *Eleocharis palustris* / *Hippuris vulgaris* Community Type (Heusser 1960) ?
- *Eleocharis palustris* / *Myriophyllum spicatum* Community Type (Crow 1968) ?
- *Eleocharis palustris* Association (Cooper and Severn 1992) =
- *Eleocharis palustris* Community Type (Youngblood et al. 1985a) =
- *Eleocharis palustris* Plant Association (Cooper 1993) =
- *Eleocharis palustris* Plant Association (Johnston 1987) =
- *Eleocharis palustris* (Hansen et al. 1995) =
- *Eleocharis palustris* (Bourgeron and Engelking 1994) =
- *Eleocharis palustris* (Kittel et al. 1999b) =
- *Eleocharis palustris* (Kovalchik 1987) =
- *Eleocharis palustris* (Durkin et al. 1995a) =
- *Eleocharis palustris* (Murray 2000) =
- *Eleocharis palustris* (Crowe and Clausnitzer 1997) =
- *Eleocharis palustris* (common spike-rush) Community Type (Crow 1977) ?
- *Eleocharis palustris* Association (Kittel and Lederer 1993) =
- *Eleocharis palustris* Association (Christy 2004) =
- *Eleocharis palustris* Community Type (Shephard 1995) ?
- *Eleocharis palustris* Community Type (Boggs 2000) ?
- *Eleocharis palustris* Community Type (Padgett et al. 1989) =
- *Eleocharis palustris* Habitat Type (Hall and Hansen 1997) ?
- *Eleocharis palustris* Herbaceous Vegetation (Carsey et al. 2003a) =
- *Eleocharis palustris* Stream/Perennial Pond Association (Crowe et al. 2004) =
- *Eleocharis palustris* Wetland (Baker and Kennedy 1985) =
- Creeping Spikerush Association (Kovalchik 1993) =
- Creeping spikerush (*Eleocharis palustris*) Plant Association (Kittel et al. 1999a) =
- DRISCOLL FORMATION CODE:V.C.6.a. (Driscoll et al. 1984) B
- Spike rush (*Eleocharis palustris*) Plant Association (Kittel et al. 1997a) =
- Spikerush Community (Brotherson and Barnes 1984) =
- Zone of Spikerush of the Vegetation surrounding San Luis Lakes (Ramaley 1942) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association was sampled three times in the IPP. Two samples are on the east slope in low-elevation valley bottoms within Waterton Lakes National Park. These stands are in the Waterton River Basin; one occurs in the Maskinonge Lake wetland complex. The third site occurs on the west side of Glacier National Park on a river terrace of the Middle Fork of the Flathead River near Moccasin Creek.

GLOBAL RANGE: This spikerush wet meadow community is found in the central Great Plains of the United States and Canada and throughout the western United States.

NATIONS: CA, US

STATES/PROVINCES: AB, AK?, BC:S4, CA?, CO:S4, ID:S3, MT:S5, NE, NM, NV?, OR:S5, SD, SK, UT:S3?, WA:S3?, WY:S3

USFS ECOREGIONS: 242A:CC, 331D:CC, 331F:CC, 331G:CC, 341B:CC, 341C:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342G:CC, 342I:C?, M242C:CC, M261G:CC, M331A:CC, M331D:CC, M331E:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC, M341B:CC

FEDERAL LANDS: NPS (Badlands, Capitol Reef, Dinosaur, Fossil Butte, Grand Teton, Wind Cave); PC (Waterton Lakes); USFS (Black Hills, Deschutes, Fremont, Hells Canyon, Malheur, Routt, San Juan, Umatilla, Wallowa-Whitman, Winema?); USFWS (Ouray)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES: Only two plots of the *Eleocharis palustris* association were sampled, both in Waterton Lakes National Park. Further inventory may locate other stands in the IPP and add vegetation and environmental data useful for better describing this association.

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.5071, WATE.9045, AAGL.C182.

LOCAL DESCRIPTION AUTHORS: C. Murphy, mod. J. Asebrook

GLOBAL DESCRIPTION AUTHORS: D. Faber-Langendoen, mod. K. Schulz, M.S. Reid, G. Kittel, J. Coles

REFERENCES: Baker 1983c, Baker and Kennedy 1985, Billings 1945, Boggs 2000, Bork 1978, Boss 1983, Bourgeron and Engelking 1994, Brotherson and Barnes 1984, Bunin 1985, CONHP unpubl. data 2003, Carsey et al. 2003a, Christy 2004, Cooper 1993, Cooper and Severn 1992, Crow 1968, Crow 1977, Crowe and Clausnitzer 1997, Crowe et al. 2004, Driscoll et al. 1984, Durkin et al. 1995a, Easterday and Mamone 1980, Ellis et al. 1979, Evans 1989b, Evenden 1990, Flowers 1962, Hall and Hansen 1997, Hansen et al. 1988a, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995, Harris 1954, Henderson and McAllister 1983, Heusser 1960, IDCDC 2005, Jankovsky-Jones et al. 1999, Jankovsky-Jones et al. 2001, Johnston 1987, Kagan et al. 2000, Kettler and McMullen 1996, Kierstead and Pogson 1976, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1997a, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1993, Kovalchik 2001, Kunze 1994, MTNHP 2002b, Manning and Padgett 1991, Manning and Padgett 1995, Marriott 1985, Marriott pers. comm., Moseley 1998, Murray 2000, Mutel 1973, Mutel and Marr 1973, NVNHP 2003, Padgett 1981, Padgett et al. 1988b, Padgett et al. 1989, Penfound 1953, Ramaley 1919a, Ramaley 1942, Seyer 1981, Shephard 1995, Stearns-Roger, Inc. 1978, Steinauer and Rolfsmeier 2000, Stewart 1940, Titus and Christy 1996a, Titus and Christy 1999, Von Loh 2000, WNHP unpubl. data, Western Ecology Working Group n.d., Youngblood et al. 1985a

***Juncus balticus* Seasonally Flooded Herbaceous Alliance**

***Juncus balticus* Herbaceous Vegetation**

BALTIC RUSH HERBACEOUS VEGETATION

BALTIC RUSH WET MEADOW

IDENTIFIER: CEGL001838

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Juncus balticus</i> Seasonally Flooded Herbaceous Alliance (A.1374)
Alliance (English name)	Baltic Rush Seasonally Flooded Herbaceous Alliance
Association	<i>Juncus balticus</i> Herbaceous Vegetation
Association (English name)	Baltic Rush Herbaceous Vegetation
Association (Common name)	Baltic Rush Wet Meadow

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Interdunal Swale Wetland (CES304.059)
 Boreal Wet Meadow (CES103.873)
 North American Arid West Emergent Marsh (CES300.729)
 Northern Columbia Plateau Basalt Pothole Ponds (CES304.058)
 Western Great Plains Open Freshwater Depression Wetland (CES303.675)
 Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
 Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998)

ELEMENT CONCEPT

GLOBAL SUMMARY: This Baltic rush wet meadow community is found widely throughout the western United States and into western Canada. This wet meadow vegetation occurs as small, open to typically dense patches on flat stream benches, along overflow channels, and near springs. Soils are variable and range from poorly to well-drained, sandy clay loam to fine sand-textured and are usually mottled or gleyed. Stands are characterized by a dense sward of *Juncus balticus* and often minor cover of *Carex* species, including *Carex aquatilis*, *Carex praegracilis*, *Carex nebrascensis*, or *Carex utriculata*. Other common species include *Deschampsia caespitosa*, *Distichlis spicata*, *Glyceria striata*, *Hordeum jubatum*, *Muhlenbergia asperifolia*, *Pascopyrum smithii*, *Phleum alpinum*, and *Sporobolus airoides*. The introduced perennial sod grasses *Poa pratensis* or *Agrostis stolonifera* codominate some stands. Forb cover is generally low and includes wetland species such as *Caltha leptosepala*, *Rumex aquaticus*, and *Dodecatheon pulchellum*. *Iris missouriensis* can be common in heavily grazed stands. Shrubs are not common. This association is often considered to be a grazing-induced community since it increases with disturbance.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Although *Juncus balticus*-characterized communities are exceedingly common in western Montana, this one stand, at 2100 m (6900 feet) elevation on the subalpine-alpine ecotone, testifies to the type's presence in the IPP. This stand is positioned on a gently inclined midslope bench, near a first-order rivulet that keeps soils saturated for most of growing season. Soils have accumulated a significant organic component (due to retarded decompositional processes in a wet, cold environment).

GLOBAL ENVIRONMENT: This widespread herbaceous wetland community is found throughout western North America. Elevation ranges from 1420 to 3500 m (4655-11,475 feet). Far northern stands in the Boreal Plains are at about 800 m (2625 feet). Stands usually occur as small, dense patches on flat to gently sloping sites near seeps and streams. Stream channels are highly variable in size and type, ranging from narrow to moderately wide, and deeply entrenched to very sinuous (Kittel et al. 1999b). In the boreal this community occurs more commonly on gradual sandy shorelines. Soils are also variable and range from sandy and well-drained to poorly drained silty clay loam or silty clay alluvium to organic; however, soils tend to be finer-textured, alkaline and may be saline (Brotherson and Barnes 1984, Padgett et al. 1989, Kittel et al. 1999b). Cobbles and gravel are common on many sites, and gleyed and mottled horizons are often present because of flooding or high water tables (Kittel et al. 1999b).

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Trees and shrubs occur with less than 5% total cover. The combined cover of the dominant *Juncus balticus* and *Equisetum variegatum* and other scattered graminoids (*Carex podocarpa*, *Carex utriculata*, *Juncus mertensianus*, and *Phleum alpinum*) is about 30%, slightly greater than that of the considerably diverse forb component; those with the most cover include (in declining order) *Triantha glutinosa* (= *Tofieldia glutinosa*), *Hypericum scouleri*, *Veratrum viride*, *Valeriana sitchensis*, *Zigadenus elegans*, *Angelica arguta*, and *Senecio triangularis*.

GLOBAL VEGETATION: This association is characterized by a low (<50 cm), open to typically dense graminoid layer dominated by the rhizomatous perennial *Juncus balticus*. Minor cover of *Carex* species, including *Carex aquatilis*, *Carex praegracilis*, *Carex microptera*, *Carex nebrascensis*, or *Carex utriculata*, is often present. Other common graminoids include *Deschampsia caespitosa*, *Distichlis spicata*, *Glyceria striata*, *Hordeum jubatum*, *Muhlenbergia asperifolia*, *Pascopyrum smithii*, *Poa nemoralis* ssp. *interior*, *Phleum alpinum*, and *Sporobolus airoides*. Forb cover is generally low but may include *Caltha leptosepala*, *Glaux maritima*, *Maianthemum stellatum*, *Rumex aquaticus*, *Cirsium scariosum* (= *Cirsium tioganum*), *Achillea millefolium*, *Artemisia ludoviciana*, *Potentilla plattensis*, *Polygonum bistortoides*, *Dodecatheon pulchellum*, and *Iris missouriensis*. Shrubs and dwarf-shrubs are not common; however, *Artemisia frigida* cover may be significant in some stands, and occasional *Artemisia tridentata* ssp. *tridentata*, *Ericameria nauseosa*, *Dasiphora fruticosa* ssp. *floribunda*, *Populus* spp., *Salix* spp., or *Sarcobatus vermiculatus* shrubs may occur. Some stands may be codominated by the introduced perennial sod grasses *Poa pratensis* or *Agrostis stolonifera*. Other introduced species, such as *Cirsium arvense*, *Erodium cicutarium*, *Iva axillaris*, *Lactuca serriola*, *Phleum pratense*, *Taraxacum officinale*, *Thinopyrum intermedium*, *Trifolium* spp., *Tragopogon dubius*, and *Xanthium strumarium*, may occur in disturbed stands.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Juncus balticus</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Juncus balticus</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Juncus balticus*

GLOBAL: *Juncus balticus*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: Regarding the Global Classification Comments, it should be more strongly stated that some consider (Montana example being Hansen et al. (1995)) this community to exist only as a grazing-induced type. This sample from IPP should stand in contradiction to that interpretation as there is little to no indication of grazing in this remote location and yet *Juncus balticus* is the dominant component.

GLOBAL COMMENTS: This association is often considered to be a grazing-induced community since it increases with grazing disturbance. Based on the extensive geographic and environmental range (from alpine meadows to sagebrush-dominated landscapes), it verges on astonishing that any number of *Juncus balticus* associations have not been recognized.

GLOBAL SIMILAR ASSOCIATIONS:

- *Eleocharis palustris* - *Juncus balticus* Herbaceous Vegetation (CEGL001835)
- *Juncus balticus* - (*Juncus mexicanus*) Herbaceous Vegetation (CEGL003486)
- *Juncus balticus* - *Carex rossii* Herbaceous Vegetation (CEGL001839)

GLOBAL RELATED CONCEPTS:

- *Juncus arcticus* / *Carex* spp. Plant Association (Johnston 1987) =
- *Juncus balticus* / *Carex* spp. Habitat Subtype (Olson and Gerhart 1982) =
- *Juncus balticus* / *Carex* spp. Habitat Type (Wasser and Hess 1982) ?
- *Juncus balticus* (Murray 2000) =
- *Juncus balticus* (Crowe and Clausnitzer 1997) =
- *Juncus balticus* (Bourgeron and Engelking 1994) =
- *Juncus balticus* Association (Crowe et al. 2004) =
- *Juncus balticus* Association (Christy 2004) =
- *Juncus balticus* Community Type (Padgett et al. 1989) =
- *Juncus balticus* Community Type (Youngblood et al. 1985a) =
- *Juncus balticus* Community Type (Hansen et al. 1995) =
- *Juncus balticus* Community Type (Thompson and Hansen 2002) =
- *Juncus balticus* Community Type (Hall and Hansen 1997) =
- *Juncus balticus* Community Type (Tuhy and Jensen 1982) ?
- *Juncus balticus* Plant Association (Jankovsky-Jones et al. 2001) =
- *Juncus balticus* Vegetation Type (Mutz and Graham 1982) =
- *Juncus balticus* Wetland Plant Association (Baker 1984a) =
- *Juncus balticus* dominated (Zone 3) (Shupe et al. 1986) =
- *Juncus balticus* var. *montanus* Herbaceous Vegetation (Carsey et al. 2003b) =
- *Juncus balticus* var. *montanus* (Kittel et al. 1999b) =
- *Juncus balticus* var. *montanus* Herbaceous Vegetation (Carsey et al. 2003a) =
- Baltic Rush (*Juncus balticus*) Dominance Type (Jones and Walford 1995) =
- Baltic Rush Alliance (Muldavain et al. 2000a) B
- Baltic rush community type (Kovalchik 1987) =
- DRISCOLL FORMATION CODE: V.C.6.a. (Driscoll et al. 1984) B
- Mountain rush (*Juncus balticus* var. *montanus*) Plant Association (Kittel et al. 1999a) =
- Palustrine (Cowardin et al. 1979) B
- Saline Meadow (Brotherson and Barnes 1984) =
- Wiregrass (*Juncus balticus*) Plant Association (Kittel et al. 1997a) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The lone instance is documented from Katoya Lake just east of the Continental Divide; however, given the distribution and environmental parameters of *Juncus balticus*, there is no reason not to expect this community on the westside as well.

GLOBAL RANGE: This Baltic rush wet meadow community is found widely throughout the western United States, ranging from South Dakota and Nebraska west to Washington, south to possibly California, and east to New Mexico. It also occurs in western Canada.

NATIONS: CA, US

STATES/PROVINCES: AB:S5, BC:S3, CA, CO:S5, ID:S5, MT:S5, NE, NM:S4, NV, OR:S5, SD, UT:S3S4, WA:S3S4, WY:S3

USFS ECOREGIONS: 242A:CC, 313A:CC, 331D:CC, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 332C:CP, 341B:CC, 341C:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342F:CC, 342G:CC, 342I:C?, M261G:CC, M262A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC, M341B:CC, M341C:CC

FEDERAL LANDS: NPS (Agate Fossil Beds, Canyonlands, Colorado, Curecanti, Dinosaur, Florissant Fossil Beds, Glacier, Grand Teton, Mesa Verde, Pinnacles, Rocky Mountain, Zion); USFS (Arapaho-Roosevelt, Black Hills, Deschutes?, Fremont, Gunnison, Malheur, Ochoco, Pike-San Isabel, Rio Grande, Routt, San Juan, Umatilla, Uncompahgre, Wallowa-Whitman, Winema?); USFWS (Bosque del Apache, Lacreek, Ouray)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.B300.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: J. Drake, mod. D. Faber-Langendoen, K.A. Schulz, L. Allen

REFERENCES: ANHIC 2005, Baker 1984a, Bourgeron and Engelking 1994, Brotherson and Barnes 1984, Bunin 1985, Butler et al. 2002, CONHP unpubl. data 2003, Carsey et al. 2003a, Carsey et al. 2003b, Christy 2004, Cogan et al. 2004, Cowardin et al. 1979, Crowe and Clausnitzer 1997, Crowe et al. 2004, Donnelly et al. 2006, Driscoll et al. 1984, Evans 1989b, Evenden 1990, Faber-Langendoen 2001, Flowers 1962, Hall and Hansen 1997, Hansen et al. 1995, Henderson and McAllister 1983, Hess 1981, IDCDC 2005, Jankovsky-Jones et al. 1999, Jankovsky-Jones et al. 2001, Johnston 1987, Jones 1992b, Jones and Walford 1995, Kagan et al. 2000, Kartesz 1994a, Kierstead and Pogson 1976, Kittel and Lederer 1993, Kittel et al. 1997a, Kittel et al. 1999a, Kittel et al. 1999b, Komarkova 1986, Kovalchik 1987, Kunze 1994, MTNHP 2002b, Manning 1988, Manning and Padgett 1991, Manning and Padgett 1992, Muldavin et al. 2000a, Murray 2000, Mutel 1973, Mutz and Graham 1982, NVNHP 2003, Olson and Gerhart 1982, Padgett 1981, Padgett 1982, Padgett et al. 1989, Rector 1979, Richard et al. 1996, Shupe et al. 1986, Stewart 1940, Taylor 1980, Taylor and Teare 1979, Thompson and Hansen 2002, Titus and Christy 1996a, Tuhy and Jensen 1982, Volland 1976, WNHP unpubl. data, Wasser and Hess 1982, Western Ecology Working Group n.d., Youngblood et al. 1985a

Phalaris arundinacea* Seasonally Flooded Herbaceous Alliance**Phalaris arundinacea* Western Herbaceous Vegetation****REED CANARYGRASS WESTERN HERBACEOUS VEGETATION****REED CANARYGRASS WET MEADOW**

IDENTIFIER: CEG001474

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Phalaris arundinacea</i> Seasonally Flooded Herbaceous Alliance (A.1381)
Alliance (English name)	Reed Canarygrass Seasonally Flooded Herbaceous Alliance
Association	<i>Phalaris arundinacea</i> Western Herbaceous Vegetation

Association (English name) Reed Canarygrass Western Herbaceous Vegetation
 Association (Common name) Reed Canarygrass Wet Meadow

ECOLOGICAL SYSTEM(S): North American Arid West Emergent Marsh (CES300.729)
 Northern Columbia Plateau Basalt Pothole Ponds (CES304.058)
 Western Great Plains Open Freshwater Depression Wetland (CES303.675)

ELEMENT CONCEPT

GLOBAL SUMMARY: This herbaceous association is reported from throughout Washington, Colorado, Nebraska, Montana, Idaho, and into northeastern Utah, but is likely more widespread in the western United States. It also occurs in Canada, in the southern two-thirds of British Columbia in areas with warm and relatively dry summers and in Alberta, from the Great Plains north into the Boreal Plains. Its distribution as a natural type is complicated because this native species is widely cultivated as a forage crop and has escaped and established in wetlands and riparian areas, displacing the local flora. Elevations range from near sea level to 2307 m. Stands are found along riparian areas, pond and lake margins, wet meadows, and intermittent drainages. The poorly drained alluvial soils are commonly fine-textured (occasionally coarse-textured) and may be flooded for brief to extended periods. The vegetation is characterized by a dense, tall herbaceous layer (often >80% canopy cover and 1.5-2 m tall) that is dominated by *Phalaris arundinacea*, which tends to occur in monocultures. Associated species may include *Equisetum arvense*, *Muhlenbergia asperifolia*, *Mentha arvensis*, *Schoenoplectus acutus* (= *Scirpus acutus*), and many other species in trace amounts where disturbed. Introduced species such as *Agrostis gigantea*, *Bromus inermis*, *Bromus tectorum*, *Cirsium arvense*, *Elymus repens*, *Euphorbia esula*, *Hordeum brachyantherum*, *Lepidium latifolium*, *Melilotus officinalis*, *Phleum pratense*, *Poa pratensis*, and *Sonchus oleraceus* are common in some disturbed stands.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT:

GLOBAL ENVIRONMENT: This association is reported from throughout Washington, Colorado, Nebraska, Montana, Idaho, and northeastern Utah, but is likely more widespread in the western United States. It also occurs in Alberta, Canada. Elevations range from near sea level to 2307 m (7564 feet). Stands are found along riparian areas, pond and lake margins, wet meadows, and intermittent drainages. Sites are flat to rolling. The poorly drained soils are derived from alluvium and are commonly fine-textured but can also be coarser in texture. Subsoil is often mottled and gleyed (Crawford 2001). Sites are generally flooded from brief to extended periods, and soils remain saturated throughout the growing season.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION:

GLOBAL VEGETATION: This association is characterized by a dense, tall herbaceous layer (often >90% canopy cover and 1.5-2 m tall) that is dominated by *Phalaris arundinacea*, which tends to occur in monocultures. Associated species such as *Equisetum arvense*, *Muhlenbergia asperifolia*, *Mentha arvensis*, *Schoenoplectus acutus* (= *Scirpus acutus*), *Polygonum amphibium*, *Solidago canadensis*, *Urtica dioica*, and many other species may be present in trace amounts especially where disturbed. Occasional *Populus tremuloides*, *Salix exigua*, *Rubus idaeus*, or *Symphoricarpos albus* may be present in some stands. Introduced species such as *Agrostis gigantea*, *Bromus inermis*, *Bromus tectorum*, *Cirsium arvense*, *Elymus repens*, *Euphorbia esula*, *Hordeum brachyantherum*, *Lepidium latifolium*, *Melilotus officinalis*, *Phleum pratense*, *Poa pratensis*, and *Sonchus oleraceus* are common in some disturbed stands.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Global		
<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Phalaris arundinacea</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL: *Phalaris arundinacea*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (3-Mar-1999).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Other natural associations included in this alliance are found throughout the northeastern United States, but this western association's distribution as a natural type is not clear because of extensive planting as a forage crop (Hansen et al. 1995, Hall and Hansen 1997). The species is native and widespread in Alberta, although some introduced genotypes may be present. Further work is required to resolve the natural versus introduced nature of this type in western North America.

GLOBAL SIMILAR ASSOCIATIONS:

- *Calamagrostis canadensis* - *Phalaris arundinacea* Herbaceous Vegetation (CEGL005174)
- *Phalaris arundinacea* Eastern Herbaceous Vegetation (CEGL006044)

GLOBAL RELATED CONCEPTS:

- *Phalaris arundinacea* (Bourgeron and Engelking 1994) =
- *Phalaris arundinacea* Association (Crawford 2001) =
- *Phalaris arundinacea* Habitat Type (Hansen et al. 1995) =
- *Phalaris arundinacea* Habitat Type (Hall and Hansen 1997) =
- *Phalaris arundinacea* Monotype (Muldavin et al. 2000a) =
- *Phalaris arundinacea* Western Herbaceous Vegetation (Carsey et al. 2003a) =
- DRISCOLL FORMATION CODE:V.A.4.a. (Driscoll et al. 1984) B
- Reed Canarygrass Marsh Site Association (MacKenzie and Moran 2004) ?

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE:

GLOBAL RANGE: This association is reported from Colorado, Nebraska, Montana, Idaho, Washington and northeastern Utah and is likely more widespread in the western United States. It has been documented to occur in British Columbia and Alberta, Canada, and is likely widespread elsewhere in southern parts of Canadian provinces. Its distribution as a natural type is complicated because this native species is widely cultivated as a forage crop and has escaped and established in many wetlands and riparian areas.

NATIONS: CA, US

STATES/PROVINCES: AB:S4, CO, ID:S4?, MT:S4, NM:S4?, UT, WA

USFS ECOREGIONS: 313B:C?, 313E:C?, 331D:CC, 331G:CC, 331J:C?, 341C:CC, 342I:CC, M331G:CC, M332D:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Black Canyon of the Gunnison, Curecanti, Florissant Fossil Beds, Glacier); USFWS (Ouray)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS:

LOCAL DESCRIPTION AUTHORS:

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz, mod. L. Allen and G. Kittel

REFERENCES: ANHIC 2005, Bourgeron and Engelking 1994, Carsey et al. 2003a, Cooper et al. 1995, Crawford 2001, Driscoll et al. 1984, Hall and Hansen 1997, Hansen et al. 1995, IDCDC 2005, MTNHP 2002b, MacKenzie and Moran 2004, Muldavin et al. 2000a, Thompson and Hansen 2002, Von Loh 2000, Western Ecology Working Group n.d., Willoughby et al. 2004

***Poa palustris* Semi-natural Seasonally Flooded Herbaceous Alliance**

***Poa palustris* Herbaceous Vegetation**

FOWL BLUEGRASS HERBACEOUS VEGETATION

FOWL BLUEGRASS MIXEDGRASS PRAIRIE

IDENTIFIER: C EGL001659**NVC Classification**

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	<i>Poa palustris</i> Semi-natural Seasonally Flooded Herbaceous Alliance (A.1409)
Alliance (English name)	Fowl Bluegrass Semi-natural Seasonally Flooded Herbaceous Alliance
Association	<i>Poa palustris</i> Herbaceous Vegetation
Association (English name)	Fowl Bluegrass Herbaceous Vegetation
Association (Common name)	Fowl Bluegrass Mixedgrass Prairie

ECOLOGICAL SYSTEM(S):	Central Mixedgrass Prairie (CES303.659)
	Northwestern Great Plains Mixedgrass Prairie (CES303.674)
	Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

ELEMENT CONCEPT

GLOBAL SUMMARY: This minor wet meadow association occurs in small patches in Idaho, Montana and northwestern Wyoming. *Poa palustris* colonizes and stabilizes wet sandy alluvial point bars, islands and streambanks at or below the high water line at elevations from 927 to 1829 m (3040-6000 feet), with a few stands occurring up to 2044 m (6700 feet). Soils alternate layers of silty clays with sands and cobbles. The water table tends to be near the surface early in the growing season, gradually falling through the summer. Intact examples appear as dense near-monocultures of *Poa palustris*, with scattered shrubs such as *Salix boothii*, *Salix geyeriana*, and *Alnus incana*. *Poa pratensis*, *Phleum pratense*, and *Agrostis stolonifera* are minor species in high-quality stands but may become dominant as domestic livestock grazing increases. Other native constituents of the community include *Juncus balticus*, *Deschampsia caespitosa*, *Carex aquatilis*, and *Pedicularis groenlandica*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT:

GLOBAL ENVIRONMENT: This minor wet meadow association occurs in small patches in Idaho, Montana and northwestern Wyoming. *Poa palustris* colonizes and stabilizes wet sandy alluvial point bars, islands and streambanks at or below the high water line (Jankovsky-Jones et al. 2001). Established stands occur on toeslopes, alluvial terraces and flat meadows, from 927 to 1829 m (3040-6000 feet) elevation, with a few stands occurring up to 2044 m (6700 feet). Soils alternate layers of silty clays with sands and cobbles. The water table tends to be near the surface early in the growing season, gradually falling through the summer.

VEGETATION DESCRIPTION**WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION:**

GLOBAL VEGETATION: This montane wet meadow association occurs primarily in riparian areas. Intact examples appear as dense near-monocultures of *Poa palustris*, with scattered shrubs such as *Salix boothii*, *Salix geyeriana*, and *Alnus incana*. *Poa pratensis*, *Phleum pratense*, and *Agrostis stolonifera* are minor species in high-quality stands but may become dominant as domestic livestock grazing increases. Other native constituents of the community include *Juncus balticus*, *Deschampsia caespitosa*, *Carex aquatilis*, and *Pedicularis groenlandica*.

MOST ABUNDANT SPECIES**WATERTON-GLACIER INTERNATIONAL PEACE PARK**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Global <u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Poa palustris</i>

CHARACTERISTIC SPECIES**WATERTON-GLACIER INTERNATIONAL PEACE PARK:**

GLOBAL: *Carex aquatilis*, *Deschampsia caespitosa*, *Juncus balticus*, *Phleum pratense*, *Poa palustris*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: GNA (invasive) (3-Dec-1998).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: Some authors assert that *Poa palustris* is a naturalized, introduced species. However, it is categorized as native by Kartesz (1999).

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

- *Poa palustris* (Bourgeron and Engelking 1994) =
- *Poa palustris* Community Type (Hansen et al. 1985) =
- *Poa palustris* Community Type (Youngblood et al. 1985a) =
- *Poa palustris* Community Type (Hansen et al. 1995) =
- DRISCOLL FORMATION CODE:V.B.4.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE:

GLOBAL RANGE: This association has been documented on the Owyhee Plateau of southwestern Idaho (Jankovsky-Jones et al. 2001), eastern Idaho (Youngblood et al. 1985a), and northwestern Wyoming.

NATIONS: US

STATES/PROVINCES: MT:S4, WY

USFS ECOREGIONS: 331D:CC, 331G:CC, M331A:CC, M331D:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS:

LOCAL DESCRIPTION AUTHORS:

GLOBAL DESCRIPTION AUTHORS: J. Coles

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Hansen et al. 1985, Hansen et al. 1991, Hansen et al. 1995, Jankovsky-Jones et al. 2001, Kartesz 1999, MTNHP 2002b, Western Ecology Working Group n.d., Youngblood et al. 1985a

V.A.5.N.I. Semipermanently flooded temperate or subpolar grassland

Schoenoplectus acutus - (*Schoenoplectus tabernaemontani*) Semipermanently Flooded Herbaceous Alliance

Schoenoplectus tabernaemontani Temperate Herbaceous Vegetation

SOFTSTEM BULRUSH TEMPERATE HERBACEOUS VEGETATION

IDENTIFIER: CEG002623

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Semipermanently flooded temperate or subpolar grassland (V.A.5.N.1.)
Alliance	<i>Schoenoplectus acutus</i> - (<i>Schoenoplectus tabernaemontani</i>) Semipermanently Flooded Herbaceous Alliance (A.1443)
Alliance (English name)	Hardstem Bulrush - (Softstem Bulrush) Semipermanently Flooded Herbaceous Alliance
Association	<i>Schoenoplectus tabernaemontani</i> Temperate Herbaceous Vegetation
Association (English name)	Softstem Bulrush Temperate Herbaceous Vegetation
ECOLOGICAL SYSTEM(S):	North American Arid West Emergent Marsh (CES300.729) Northern Columbia Plateau Basalt Pothole Ponds (CES304.058) Western Great Plains Open Freshwater Depression Wetland (CES303.675) Temperate Pacific Freshwater Emergent Marsh (CES200.877)

ELEMENT CONCEPT

GLOBAL SUMMARY: This relatively widespread wetland occurs on pond and lake margins, and in backwater areas. It also occupies basins where the water table may remain relatively high, but which can drop below the soil surface late in the growing season. Elevations range from sea level in coastal areas to 2045 m (6700 feet) in the Rocky Mountains. Stands are flooded for most or all of the growing season. Stands can have water from 0 (exposed soil) to approximately 1.5 m deep, but usually are less than 1 m. Within a stand, water levels can vary by up to 1 m during the year. The water can be fresh to mildly saline. Soils are deep, poorly drained muck, peat, or mineral. This association is often a monotypic stand of *Schoenoplectus tabernaemontani*, but is also often mixed with one or two other *Schoenoplectus* species. This association is described as only those stands where *Schoenoplectus tabernaemontani* (= *Schoenoplectus validus*; = *Scirpus validus*) is the dominant bulrush. *Schoenoplectus acutus* (= *Scirpus acutus*) may be present, but only in subdominant amounts. Other species are largely absent or present in limited amounts and include *Carex aquatilis*, *Carex buxbaumii*, *Carex utriculata*, *Eleocharis palustris*, *Nuphar lutea ssp. polysepala*, *Polygonum* spp., *Potamogeton* spp., *Mentha arvensis*, and *Galium triflorum*. Adjacent deeper water sites are typically dominated by *Typha latifolia*, while drier sites support herbaceous communities dominated by *Carex* spp., *Poa pratensis*, or other grasses.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs on gentle terrain along lakeshores at elevations near 1270 m (4165 feet). Soils are derived from lacustrine and fluvial deposits and are very poorly drained due to semipermanent flooding. Soils are characterized as Orthic Humic Gleysols that are predominantly silt deposits. Parent material is calcareous. Bare soil comprises 90% of the ground surface.

GLOBAL ENVIRONMENT: This relatively widespread wetland occurs on pond and lake margins, and in backwater areas. It also occupies basins where the water table may remain relatively high, but which can drop below the soil surface late in the growing season. Elevations range from sea level in coastal areas to 2025 m (0-6700 feet) in the Rocky Mountains. Stands are flooded for most or all of the growing season. Stands can have water from 0 (exposed soil) to approximately 1.5 m deep, but usually are less than 1 m. Within a stand, water levels can vary by up to 1 m during the year. The water can be fresh to mildly saline. Soils are deep, poorly drained muck, peat, or mineral. Adjacent deeper water sites are typically dominated by *Typha latifolia*, while drier sites support herbaceous communities dominated by *Carex* spp., *Poa pratensis*, or other grasses.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This association is a lowland, herbaceous wetland that occurs on regularly flooded or hygric to hydric sites. *Schoenoplectus tabernaemontani* unmistakably dominates the vegetation with 75% canopy cover at heights of 1-2 m. Other species that are present with trace cover include *Eleocharis palustris*, *Mentha arvensis*, *Sium suave*, and *Potamogeton gramineus*. Mosses *Dichelyma uncinatum* and *Bryum* spp. comprise 5% cover of the ground surface.

GLOBAL VEGETATION: This association is often a monotypic stand of *Schoenoplectus tabernaemontani*, but is also often mixed with one or two other *Schoenoplectus* species. This association is described as only those stands where *Schoenoplectus tabernaemontani* (= *Schoenoplectus validus*; = *Scirpus validus*) is the dominant bulrush. *Schoenoplectus acutus* (= *Scirpus acutus*) may be present, but only in subdominant amounts. Other species are largely absent or present in limited amounts and include *Carex aquatilis*, *Carex buxbaumii*, *Carex utriculata*, *Eleocharis palustris*, *Nuphar lutea ssp. polysepala* (= *Nuphar polysepalum*), *Polygonum* spp., *Potamogeton* spp., *Mentha arvensis*, and *Galium triflorum*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Schoenoplectus tabernaemontani</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Schoenoplectus tabernaemontani</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Eleocharis palustris*, *Mentha arvensis*, *Potamogeton gramineus*, *Schoenoplectus tabernaemontani*, *Sium suave*

GLOBAL: *Schoenoplectus tabernaemontani*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (3-May-2000).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This association is described as only those stands where *Schoenoplectus tabernaemontani* (= *Schoenoplectus validus*; = *Scirpus validus*) is the dominant bulrush. *Schoenoplectus acutus* (= *Scirpus acutus*) may be present, but only in subdominant amounts. The *Scirpus acutus* Habitat Type (Hansen et al. 1995), *Scirpus acutus* community type (Kunze 1994), and *Schoenoplectus acutus* var. *acutus* - *Schoenoplectus tabernaemontani* (Kittel et al. 1999b) each describe an association where either of the two species can be dominant, either alone or in any combination. The California reference only refers to several *Schoenoplectus* species but never *Schoenoplectus tabernaemontani*.

GLOBAL SIMILAR ASSOCIATIONS:

- *Schoenoplectus (tabernaemontani, acutus)* Eastern Herbaceous Vegetation (CEGL006275)
- *Schoenoplectus acutus* Herbaceous Vegetation (CEGL001840)
- *Schoenoplectus fluviatilis* Herbaceous Vegetation (CEGL006366)
- *Typha* spp. - *Schoenoplectus* spp. - Mixed Herbs Great Plains Herbaceous Vegetation (CEGL002228)

GLOBAL RELATED CONCEPTS:

- *Schoenoplectus acutus* var. *acutus* - *Schoenoplectus tabernaemontani* (Kittel et al. 1999b) B
- *Schoenoplectus validus* Association (Crowe et al. 2004) =
- *Scirpus acutus* Community Type (Kunze 1994) B
- *Scirpus acutus* Habitat Type (Hansen et al. 1995) B
- *Scirpus validus* (Bourgeron and Engelking 1994) =
- *Scirpus validus* Association (Kovalchik 1993) =
- DRISCOLL FORMATION CODE:V.C.6.a. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon in Waterton Lakes National Park, occurring only along lakeshores in the Foothills Parkland Ecoregion. The one sampled plot occurs along the shoreline of Maskinonge Lake.

GLOBAL RANGE: This is a relatively widespread wetland association, reported from throughout the Pacific Northwest, and the interior regions of Montana and Wyoming, south into California and Colorado.

NATIONS: CA, US

STATES/PROVINCES: AB, BC:S4, CA:S4, CO, ID:S2, MT:S3, OR:S5, WA:S3S4, WY:S2?

USFS ECOREGIONS: 242A:CC, 262A:CC, 322A:CC, 331D:CC, 331F:CC, 331G:CC, 331H:CC, 332C:CC, 342B:CC, 342C:CC, 342H:CC, M261C:CC, M262A:CC, M262B:CC, M332B:CC, M332C:CP, M332D:CC, M332E:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CP, M333D:CC

FEDERAL LANDS: PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.9042.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Boss 1983, Bourgeron and Engelking 1994, Crowe et al. 2004, Driscoll et al. 1984, Hansen et al. 1995, IDCDC 2005, Jankovsky-Jones et al. 2001, Kagan et al. 2000, Kittel et al. 1999b, Kovalchik 1993, Kovalchik 2001, Kunze 1994, MTNHP 2002b, Sanville et al. 1986, Smith and Smith 1976, Thomas 1980, Viereck et al. 1992, Western Ecology Working Group n.d.

Typha (angustifolia, latifolia) - (Schoenoplectus spp.) Semipermanently Flooded Herbaceous Alliance

Typha (latifolia, angustifolia) Western Herbaceous Vegetation (BROADLEAF CATTAIL, NARROWLEAF CATTAIL) WESTERN HERBACEOUS VEGETATION

BROADLEAF CATTAIL MARSH

IDENTIFIER: C EGL002010

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Semipermanently flooded temperate or subpolar grassland (V.A.5.N.I.)
Alliance	<i>Typha (angustifolia, latifolia) - (Schoenoplectus spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)</i>
Alliance (English name)	(Narrowleaf Cattail, Broadleaf Cattail) - (Clubrush species) Semipermanently Flooded Herbaceous Alliance
Association	<i>Typha (latifolia, angustifolia) Western Herbaceous Vegetation</i>
Association (English name)	(Broadleaf Cattail, Narrowleaf Cattail) Western Herbaceous Vegetation
Association (Common name)	Broadleaf Cattail Marsh

ECOLOGICAL SYSTEM(S):	North American Arid West Emergent Marsh (CES300.729)
	Inter-Mountain Basins Interdunal Swale Wetland (CES304.059)
	Northern Columbia Plateau Basalt Pothole Ponds (CES304.058)
	Western Great Plains Open Freshwater Depression Wetland (CES303.675)
	Temperate Pacific Freshwater Emergent Marsh (CES200.877)
	Western Great Plains Floodplain (CES303.678)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is widespread across the western United States and western Great Plains occurring near streams, rivers, and ponds. The soil is flooded or saturated for at least part of the growing season. The alluvial soils have variable textures ranging from sand to clay and usually with a high organic content. The dominant species, *Typha latifolia* or *Typha angustifolia*, often form dense, almost monotypic stands. Other species typical of wetlands may be found in lesser amounts in this community; among these are shallower water emergents such as *Carex* spp., *Eleocharis macrostachya*, *Eleocharis palustris*, *Glyceria* spp., *Juncus balticus*, *Juncus torreyi*, *Mentha arvensis*, *Schoenoplectus acutus*, and *Veronica* spp. In deeper water, *Lemna minor*, *Potamogeton* spp., *Sagittaria* spp., *Azolla filiculoides*, and other aquatics may be present in trace amounts.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is found at low elevations near 1280 m (4200 feet) on flat terrain. It is located on basin floors, generally at the edge of lakes and ponds in hydric areas where soils are semipermanently to permanently flooded. Soils of the one plot that was sampled were not developed but are likely muck derived from lacustrine and fluvial deposits. They are very poorly drained with 10-20 cm of standing water at the surface.

GLOBAL ENVIRONMENT: This widespread community is found along streams, rivers, canals, and the banks of ponds and lakes. Elevations range from near sea level to 2000 m. Sites are nearly level. The soil is saturated or flooded for much of the year from freshwater sources such as springs or streams. The alluvial soils have variable textures ranging from sand to clay and usually with a high organic content.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This montane, herbaceous wetland is dominated by *Typha latifolia* that has 65% canopy cover and heights of 1-2 m. Other species common in this association include *Carex aquatilis* with 15% cover and *Carex utriculata* with 5% cover. Overall herbaceous cover is high at 80%, although species diversity is low. *Amblystegium serpens*, a moss, has 2% cover.

GLOBAL VEGETATION: This community is dominated by hydrophytic macrophytes, especially *Typha latifolia* or *Typha angustifolia*, which grow from approximately 2-3 m tall. *Typha latifolia* and *Typha angustifolia* often form dense, near-monotypic stands (70-98% cover), almost to the exclusion of other species. In some stands the two *Typha* species are codominant. Other species typical of wetlands may be found in lesser amounts in this community; among these are shallower water emergents such as *Carex* spp., *Eleocharis macrostachya*, *Eleocharis palustris*, *Glyceria* spp., *Juncus balticus*, *Juncus torreyi*, *Mentha arvensis*, *Schoenoplectus acutus*, and *Veronica* spp. In deeper water, *Lemna minor*, *Potamogeton* spp., *Sagittaria* spp., *Azolla filiculoides*, and other aquatics may be present in trace amounts. Trace amounts of grasses like *Agrostis stolonifera*, *Beckmannia syzigachne*, *Hordeum jubatum*, *Muhlenbergia asperifolia*, and *Phalaris arundinacea* may also be present.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Carex aquatilis</i> , <i>Typha latifolia</i>
Nonvascular	Moss	<i>Amblystegium serpens</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Typha angustifolia</i> , <i>Typha latifolia</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL: *Typha angustifolia*, *Typha latifolia*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (23-Feb-1994).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This community is a common element found in many wetland systems, but has received little attention. Consequently, the diagnostic features and species of this community are not well known. Many ecologists (Hansen et al. 1995, Kittel et al. 1999b) have included *Typha angustifolia* as a codominant in this association. More classification work is needed to clarify the concept of this association.

GLOBAL SIMILAR ASSOCIATIONS:

- *Schoenoplectus acutus* - *Typha latifolia* - (*Schoenoplectus tabernaemontani*) Sandhills Herbaceous Vegetation (CEGL002030)-- occurs in Great Plains, but is codominated by *Schoenoplectus* spp.

- *Typha* (*angustifolia*, *domingensis*, *latifolia*) - *Schoenoplectus americanus* Herbaceous Vegetation (CEGL002032)--occurs in Great Plains, but is codominated by *Schoenoplectus* spp.
- *Typha latifolia* - *Equisetum hyemale* - *Carex* (*hystericina*, *pellita*) Seep Herbaceous Vegetation (CEGL002033)--occurs in Great Plains, but is codominated by *Equisetum* and *Schoenoplectus* spp.
- *Typha latifolia* Southern Herbaceous Vegetation (CEGL004150)--occurs in the southern Great Plains and is very similar, but has not been reported further west than Arkansas, Oklahoma and Texas; further review is need to clarify differences.
- *Typha* spp. - *Schoenoplectus* spp. - Mixed Herbs Great Plains Herbaceous Vegetation (CEGL002228)
- *Typha* spp. Great Plains Herbaceous Vegetation (CEGL002389)

GLOBAL RELATED CONCEPTS:

- *Typha angustifolia* - *Typha latifolia* - (*Typha domingensis*) Herbaceous Vegetation (Carsey et al. 2003a) =
- *Typha angustifolia*-*Typha latifolia* (Kittel et al. 1999b) =
- *Typha latifolia*/*Sagittaria latifolia* plant association (Johnston 1987) =
- *Typha latifolia* (Bourgeron and Engelking 1994) =
- *Typha latifolia* (Crowe and Clausnitzer 1997) =
- *Typha latifolia* Association (Christy 2004) =
- *Typha latifolia* Association (Crowe et al. 2004) =
- *Typha latifolia* Community (Kovalchik 1993) =
- *Typha latifolia* Community Type (Padgett et al. 1989) =
- *Typha latifolia* Habitat Type (Hansen et al. 1995) =
- *Typha latifolia* Plant Association (Bundy et al. 1996) ?
- *Typha latifolia* Wetland (Baker 1984a) =
- *Typha latifolia* community type (Kunze 1994) B
- *Typha latifolia* community type (Dethier 1990) =
- *Typha latifolia* wetlands (Titus et al. 1996) =
- Cattail (*Typha* sp.) Dominance Type (Jones and Walford 1995) B
- Coastal and Valley Freshwater Marsh (Holland 1986b) B
- DRISCOLL FORMATION CODE:V.E.1.b. (Driscoll et al. 1984) B
- Narrow-and broad leaf cattails (*Typha angustifolia*-*Typha latifolia*) Plant Association (Kittel et al. 1999a) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon with only one *Typha latifolia* community documented at the edge of a pond north of the park gate in Waterton Lakes National Park. It is likely that small or linear stands of this association occur on both the east and west sides of Glacier National Park but as mere fragments, too small to sample.

GLOBAL RANGE: This association is widely distributed, occurring across the western United States and western Great Plains.

NATIONS: CA, US

STATES/PROVINCES: AB, AZ:S3, BC:S5, CA:S3, CO:S4, ID:S4, MT:S5, NE, NM:S5, NV, OR:S5, UT:S2S4, WA:S5, WY

USFS ECOREGIONS: 242A:CC, 261A:CC, 262A:CC, 263A:CC, 331C:CC, 331H:CC, 331I:CC, 341B:CC, 341C:CC, 342:C, M331F:CC, M333C:CC

FEDERAL LANDS: NPS (Agate Fossil Beds, Capitol Reef, Fort Laramie); PC (Waterton Lakes); USFS (Wallowa-Whitman); USFWS (Ouray)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.9047.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: J. Drake, mod. K. Schulz, mod. M.S. Reid

REFERENCES: Baker 1984a, Boss 1983, Bourgeron and Engelking 1994, Bundy et al. 1996, Bunin 1985, CONHP unpubl. data 2003, Carsey et al. 2003a, Christy 1973, Christy 2004, Crowe and Clausnitzer 1997, Crowe et al. 2004, Dethier 1990, Driscoll et al. 1984, Hansen et al. 1991, Hansen et al. 1995, Holland 1986b, IDCDC 2005, Jankovsky-Jones et al. 2001, Johnston 1987, Jones 1992b, Jones and Walford 1995, Kagan et al. 2000, Kittel et al. 1996, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1993, Kovalchik 2001, Kunze 1994, Lindauer 1978, Lindauer and Christy 1972, MTNHP 2002b, Marriott and Faber-Langendoen 2000, Masek 1979, McEachern 1979, Muldavin et al. 1993b, Murray 2000, NVNHP 2003, Padgett et al. 1989, Ramaley 1939b, Sanville et al. 1986, Titus et al. 1996, Tolstead 1942, Von Loh 2000, WNHP unpubl. data, Western Ecology Working Group n.d., Youngblood et al. 1985a

V.A.7.N.e. Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer

Artemisia tridentata ssp. *vaseyana* Shrub Herbaceous Alliance

Artemisia tridentata ssp. *vaseyana* / *Festuca campestris* Shrub Herbaceous Vegetation

MOUNTAIN BIG SAGEBRUSH / PRAIRIE FESCUE SHRUB HERBACEOUS VEGETATION

BIG SAGEBRUSH / ROUGH FESCUE SHRUB PRAIRIE

IDENTIFIER: C EGL001531

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland with a sparse shrub layer (V.A.7.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland with a sparse shrub layer (V.A.7.N.)
Formation	Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer (V.A.7.N.e.)
Alliance	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> Shrub Herbaceous Alliance (A.1526)
Alliance (English name)	Mountain Big Sagebrush Shrub Herbaceous Alliance
Association	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Festuca campestris</i> Shrub Herbaceous Vegetation
Association (English name)	Mountain Big Sagebrush / Prairie Fescue Shrub Herbaceous Vegetation
Association (Common name)	Big Sagebrush / Rough Fescue Shrub Prairie

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)
Northwestern Great Plains Mixedgrass Prairie (CES303.674)

ELEMENT CONCEPT

GLOBAL SUMMARY: This big sagebrush shrub prairie type is found in Montana, Washington, southwestern Alberta, and adjacent British Columbia. Stands in Montana are usually found north of 46 degrees N latitude and between 1036 and 1950 m (3400-6400 feet) on southerly exposures with less than 40% slope, as well as alluvial flats. Precipitation within this zone ranges from 15 to more than 40 inches per year. Moderately deep soils are derived from a variety of parent materials. Its distribution outside Montana includes lower elevation sites (to 610 m [2000 feet]) within the Okanogan Valley (Washington) and the Colville country north of Spokane. The high productivity of this type results in comparatively little (<20%) exposed rock or soil. The vegetation description is based primarily on Montana occurrences. This association usually occurs as large patches in a mosaic with fescue grasslands and *Pseudotsuga menziesii*- or *Pinus flexilis*-dominated forests. Shrub layer dominance (10-30% canopy cover, average 20%) by *Artemisia tridentata* ssp. *vaseyana* characterizes the upper elevation examples of this type. *Artemisia tridentata* ssp. *wyomingensis* has been noted as a canopy dominant in lower elevation occurrences associated with central Montana ranges isolated within the Great Plains. As little as 5% canopy cover of the highly palatable *Festuca campestris* may be diagnostic for the type, but generally it dominates the herbaceous layer, ranging in canopy cover from 10% to as much as 70-80% on the least disturbed, most mesic sites. Other important and high-constancy (>75%) grasses are *Festuca idahoensis*, *Koeleria macrantha*, *Pseudoroegneria spicata*, and *Poa cusickii*; the cover of *Pseudoroegneria spicata* and *Festuca idahoensis* may exceed that of *Festuca campestris* on more intensively grazed sites. On overgrazed sites this type may be recognized by scattered remnant clumps of *Festuca campestris*. The forb layer is generally both diverse and abundant, constituting upwards of 20% of the standing crop biomass; those of high constancy include *Arenaria congesta*, *Eriogonum umbellatum*, *Antennaria microphylla*, *Geranium viscosissimum*, and *Cerastium arvense*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs on flat terrain on benches or alluvial terraces at elevations near 1130 m (3700 feet). Soils are derived from glacial outwash or glacial-fluvial deposits and are well-drained. Soil texture ranges from loamy sand to clay loam with rock and cobble content as high as 60-70%. Moss and lichen cover is high on one plot (90%) while litter, bare soil, and moss and lichens codominate the ground cover on the other plot. It is speculated that soil texture or past disturbance, specifically fire regimes or past grazing, in these areas has allowed the development of such dense shrublands. The area of both sampled plots burned in a natural wildfire in 1926.

GLOBAL ENVIRONMENT: Within Montana this type is usually found north of 46 degrees N latitude between 1036 and 1950 m (3400-6400 feet) on southerly exposures with less than 40% slope, as well as alluvial flats (Mueggler and Stewart 1980). Precipitation

within this zone ranges from 15 to more than 40 inches per year. Moderately deep soils are derived from a variety of parent materials. Its distribution outside Montana includes lower elevation sites (to 610 m [2000 feet]) within the Okanogan Valley (Washington) and the Colville country north of Spokane. This type's high productivity results in comparatively little (<20%) exposed rock or soil.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This association is a montane, cold-deciduous, dwarf-shrub steppe that occurs on subseric sites. *Artemisia tridentata* ssp. *vaseyana* is the only species in the shrub layer with 20-60% canopy cover and heights of 0.5-1 m. Despite the range of cover, it is very uniform in its distribution in both sampled stands. Herbaceous cover is 40% and is dominated by graminoids *Festuca campestris* and *Pseudoroegneria spicata* and forbs *Sedum lanceolatum* and *Antennaria rosea*. Other common or high-constancy herbaceous species include *Festuca idahoensis*, *Geum triflorum*, *Eriogonum umbellatum*, *Galium boreale*, *Achillea millefolium*, *Achnatherum richardsonii*, *Danthonia intermedia*, and *Koeleria macrantha*. Several *Pseudotsuga menziesii* trees have colonized in one of the plots, likely due to the lack of fire in this area. Overall tree cover is only 5% in this plot with trees measuring 2-5 m in height.

GLOBAL VEGETATION: The following description based primarily on Montana occurrences. This association usually occurs as large patches in a mosaic with fescue grasslands and *Pseudotsuga menziesii*- or *Pinus flexilis*-dominated forests. Shrub layer dominance (10-60% canopy cover, average 20%) by *Artemisia tridentata* ssp. *vaseyana* characterizes the upper elevation examples of this type. *Artemisia tridentata* ssp. *wyomingensis* has been noted as a canopy dominant in lower elevation occurrences associated with central Montana ranges isolated within the Great Plains. Mueggler and Stewart (1980) recognized as little as 5% canopy cover of the highly palatable *Festuca campestris* as diagnostic for the type, but generally it dominates the herbaceous layer, ranging in canopy cover from 10% to as much as 70-80% on the least disturbed, most mesic sites. Other important and high-constancy (>75%) grasses are *Festuca idahoensis*, *Koeleria macrantha*, *Pseudoroegneria spicata*, and *Poa cusickii*. Note that the cover of *Pseudoroegneria spicata* and *Festuca idahoensis* may exceed that of *Festuca campestris* on intensively grazed sites. On overgrazed sites this type may be recognized by scattered remnant clumps of *Festuca campestris*. The forb layer is generally both diverse and abundant, constituting upwards of 20% of the standing crop biomass; those of high constancy include *Arenaria congesta*, *Eriogonum umbellatum*, *Antennaria microphylla*, *Geranium viscosissimum*, and *Cerastium arvense*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>
Herb (field)	Forb	<i>Antennaria rosea</i> , <i>Eriogonum umbellatum</i> , <i>Geum triflorum</i> , <i>Sedum lanceolatum</i>
Herb (field)	Graminoid	<i>Festuca campestris</i> , <i>Festuca idahoensis</i> , <i>Pseudoroegneria spicata</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>
Herb (field)	Graminoid	<i>Festuca campestris</i> , <i>Festuca idahoensis</i> , <i>Pseudoroegneria spicata</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Antennaria rosea*, *Artemisia tridentata* ssp. *vaseyana*, *Festuca campestris*, *Festuca idahoensis*, *Pseudoroegneria spicata*, *Sedum lanceolatum*

GLOBAL: *Artemisia tridentata* ssp. *vaseyana*, *Festuca campestris*, *Pseudoroegneria spicata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Phleum pratense*, *Verbascum thapsus*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3Q (13-Dec-1999). Stipulating the particular subspecies of *Artemisia tridentata* that is diagnostic for this plant community is crucial to establishing the significance of its association with environment/habitat (and hence its rank).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This community has not been previously described from Montana as named, nor has *Festuca campestris* been explicitly recognized as a component of *Artemisia tridentata* ssp. *vaseyana*-dominated stands (though Mueggler and Stewart (1980) alluded to such species composition in northwestern Montana). *Festuca campestris* is an extremely palatable, readily grazing-impacted species used as an indicator of relatively mesic conditions within Palouse grasslands.

GLOBAL COMMENTS: This association, as now defined, potentially constitutes a combination of vegetation types recognized by the following dominant shrub taxa: *Artemisia tridentata* ssp. *vaseyana*, *Artemisia tridentata* ssp. *wyomingensis*, and even *Artemisia tridentata* ssp. *tridentata*, in the most mesic bottomland sites; each subspecies deserves to be recognized, whenever possible, at the association level. Mueggler and Stewart (1980), the most authoritative source for this syntaxon, were well aware that several big sagebrush taxa were involved and that this variability probably accounted for the broad elevational range (1100-1950 m [3600-6400 feet]) exhibited by the type. *Artemisia tridentata* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001530) occurs outside the range limits of *Festuca campestris*, but the abiotic settings and species composition of the two types are very similar.

GLOBAL SIMILAR ASSOCIATIONS:

- *Artemisia tridentata* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001530)--occurs outside the range limits of *Festuca campestris*, but the abiotic settings and species composition of the two types are very similar.
- *Artemisia tridentata* ssp. *vaseyana* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001533)

GLOBAL RELATED CONCEPTS:

- *Artemisia tridentata*/*Festuca scabrella* (Bourgeron and Engelking 1994) =
- *Artemisia tridentata*/*Festuca scabrella* Habitat Type (Mueggler and Stewart 1980) B
- DRISCOLL FORMATION CODE:V.B.2.f. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is very uncommon in the IPP and appears to be localized within Round Prairie in the North Fork of Glacier National Park. This prairie is along the far western boundary of Glacier National Park on a low-elevation bench along the North Fork of the Flathead River.

GLOBAL RANGE: This association has been described from Montana, Washington, southwestern Alberta, and British Columbia.

NATIONS: CA, US

STATES/PROVINCES: AB, BC, MT:S3, WA

USFS ECOREGIONS: 331D:CC, 331E:C?, M332B:C?, M332C:CC, M332D:CC, M332E:CP, M333A:CC, M333B:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2289, GLAC.2530.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper, mod. G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Hodgkinson and Young 1973, MTNHP 2002b, McNab and Avers 1994, Mueggler and Stewart 1980, Western Ecology Working Group n.d., Willms et al. 1985

***Artemisia tridentata* ssp. *vaseyana* / *Festuca idahoensis* Shrub Herbaceous Vegetation**

MOUNTAIN BIG SAGEBRUSH / IDAHO FESCUE SHRUB HERBACEOUS VEGETATION

IDENTIFIER: CEGL001533

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland with a sparse shrub layer (V.A.7.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland with a sparse shrub layer (V.A.7.N.)
Formation	Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer (V.A.7.N.e.)

Alliance	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> Shrub Herbaceous Alliance (A.1526)
Alliance (English name)	Mountain Big Sagebrush Shrub Herbaceous Alliance
Association	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Festuca idahoensis</i> Shrub Herbaceous Vegetation
Association (English name)	Mountain Big Sagebrush / Idaho Fescue Shrub Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is widespread in mountainous areas across the western U.S. The shrubland can form large, continuous stands on mid-elevation mountain slopes and foothills, and can extend above lower treeline as patches within montane or subalpine coniferous forests. Sites are variable and range from flats to steep slopes to ridgetops with deep to shallow rocky soil. The vegetation is characterized by an open (<25% cover on average) shrub layer of *Artemisia tridentata* ssp. *vaseyana*, but generally high cover of perennial graminoids (>20% total cover). Associated shrubs include *Artemisia arbuscula*, *Artemisia rigida*, *Ribes cereum*, *Purshia tridentata*, *Prunus virginiana*, and *Tetradymia canescens*. The herbaceous layer is typically abundant and dominated by perennial graminoids. The most common species is the bunchgrass *Festuca idahoensis*. Other locally important species include *Pseudoroegneria spicata*, *Festuca thurberi*, *Bromus carinatus*, *Elymus elymoides*, *Elymus trachycaulus*, *Koeleria macrantha*, *Achnatherum occidentale* (= *Stipa occidentalis*), and *Poa secunda*. Forb canopy cover and species composition are variable. Characteristic forb species include *Castilleja*, *Potentilla*, *Erigeron*, *Phlox*, *Astragalus*, *Geum*, *Lupinus*, and *Eriogonum*. Other forbs common, if less frequent, include *Balsamorhiza sagittata*, *Achillea millefolium*, *Eriogonum umbellatum*, *Antennaria rosea*, and *Geranium viscosissimum*. Some authors have noted different phases based on dominance of forb species. All phases are included within this one herbaceous shrubland concept. Trees are uncommon but individuals of *Pinus ponderosa*, *Cercocarpus ledifolius*, *Populus tremuloides*, *Juniperus occidentalis*, *Pinus albicaulis*, and *Abies lasiocarpa* may occasionally occur.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs on flat benches within valley floors at low elevations near 1098 m (3600 feet). Soil texture is a silt loam that is well-drained with little rock content. The dark brown soil is derived from glacial-fluvial deposits. Litter, moss and lichen cover 60% of the ground surface, although there are patches of rock and bare soil.

GLOBAL ENVIRONMENT: This *Artemisia tridentata* ssp. *vaseyana*-dominated shrub herbaceous association occupies the coolest and moistest climate zone of the *Artemisia tridentata* shrubland and shrub herbaceous complex. This open shrubland often occurs above lower treeline as patches within montane or subalpine coniferous forests. The climate regime is cool, semi-arid to subhumid, with yearly precipitation ranging from 25-60 cm. Much of the yearly precipitation falls as snow, which may cover the ground for long periods in winter. Temperatures are continental with large annual and diurnal variation. The elevation range for this type is wide, from about 1060 m (3500 feet) in eastern Oregon and Washington, 1800-2400 m (6000-8000 feet) on low mountain slopes and valleys in Montana, to well over 3000 m (9850 feet) in the mountains of northern Nevada, Idaho, Montana, Wyoming, and Colorado. Landscape positions are variable as well, but primarily are deep-soiled to stony flats, valley bottoms, flat terraces, ridges, nearly flat ridgetops, and mountain slopes. All aspects are represented, and slopes range from nearly flat to very steep. Soils generally are moderately deep to deep, somewhat well-drained, and of loam, sandy loam, clay loam, or gravelly loam textural classes, often having a substantial volume of coarse fragments. The soils are derived from a variety of parent materials, although sandstones, limestones, basalts, and crystalline rocks are commonest. In some cases, soils supporting stands of this association are unstable and prone to mass movement. In subalpine environments, these shrub herbaceous communities are found on deeper soils than *Artemisia arbuscula* subalpine shrublands. Trees are uncommon, but individuals of *Pinus ponderosa*, *Cercocarpus ledifolius*, *Populus tremuloides*, *Juniperus occidentalis*, *Juniperus scopulorum*, *Pinus albicaulis*, and *Abies lasiocarpa* may occasionally occur.

Adjacent vegetation is highly variable. In the Great Basin and Rocky Mountains, adjacent communities typically include *Pinus ponderosa* forests, *Pinus* - *Juniperus* or *Cercocarpus ledifolius* woodlands, *Populus tremuloides* forests, *Artemisia arbuscula*, *Artemisia rigida*, *Artemisia tridentata* ssp. *wyomingensis*, and *Artemisia tridentata* ssp. *tridentata* shrublands, and herbaceous meadows. In the Blue Mountains, East Cascade Mountains, and in the Okanogan Highlands, these shrublands are found in a matrix with *Juniperus occidentalis*, *Pinus ponderosa*, *Pinus albicaulis*, and *Abies lasiocarpa* forests and woodlands. In Montana, adjacent vegetation includes *Festuca idahoensis* and *Pseudoroegneria spicata* grasslands.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This cold-deciduous dwarf-shrub steppe occurs on montane, subxeric sites and has low overall diversity. The shrub layer is exclusively dominated by *Artemisia tridentata* ssp. *vaseyana* with 30% cover and 0.5- to 1-m heights. Cover of herbaceous species is 40% and is dominated by *Achnatherum occidentale* ssp. *occidentale* and *Festuca idahoensis* which each have 20% cover. *Antennaria rosea* is the most abundant forb with 3% cover. A few other herbaceous species that are common in *Artemisia tridentata* ssp. *vaseyana* / *Festuca campestris* Shrub Herbaceous

Vegetation (CEGL001531), such as *Festuca campestris*, *Sedum lanceolatum*, *Eriogonum umbellatum*, and *Galium triflorum*, are only present in this association with minimal cover. Overall, vegetation patterns can be patchy with high grass cover in certain areas and high shrub cover in others.

GLOBAL VEGETATION: This herbaceous shrubland is characterized by an open (10-40% cover) shrub layer of *Artemisia tridentata* ssp. *vaseyana* but generally with a high cover of perennial graminoids (>20% total cover). Associated shrubs can include *Artemisia arbuscula*, *Artemisia rigida*, *Ribes cereum*, *Purshia tridentata*, *Prunus virginiana*, *Symphoricarpos oreophilus*, and *Tetradymia canescens*. The herbaceous layer is typically abundant and dominated by perennial graminoids. The most common species is the bunchgrass *Festuca idahoensis*. Other locally important species include *Pseudoroegneria spicata*, *Festuca thurberi*, *Bromus carinatus*, *Elymus elymoides*, *Elymus trachycaulus*, *Koeleria macrantha*, *Achnatherum occidentale* (= *Stipa occidentalis*), and *Poa secunda*. Forb canopy cover and species composition are variable; species of *Castilleja*, *Potentilla*, *Erigeron*, *Phlox*, *Astragalus*, *Geum*, *Lupinus*, *Collinsia*, *Collomia* and *Eriogonum* are characteristic, and *Balsamorhiza sagittata*, *Achillea millefolium*, *Eriogonum umbellatum*, *Antennaria rosea*, and *Geranium viscosissimum* are common. Trees are uncommon, but individuals of *Pinus ponderosa*, *Cercocarpus ledifolius*, *Populus tremuloides*, *Juniperus occidentalis*, *Pinus albicaulis*, and *Abies lasiocarpa* may occasionally occur. Diagnostic of this shrub herbaceous association is the relatively sparse *Artemisia tridentata* ssp. *vaseyana* shrub layer (<25% cover on average) with an abundant graminoid layer.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>
Herb (field)	Forb	<i>Antennaria rosea</i>
Herb (field)	Graminoid	<i>Achnatherum occidentale</i> ssp. <i>occidentale</i> , <i>Festuca idahoensis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>
Herb (field)	Graminoid	<i>Festuca idahoensis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Achnatherum occidentale* ssp. *occidentale*, *Antennaria rosea*, *Artemisia tridentata* ssp. *vaseyana*

GLOBAL: *Artemisia tridentata* ssp. *vaseyana*, *Festuca idahoensis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Calochortus apiculatus*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Artemisia tridentata* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001530)
- *Artemisia tridentata* ssp. *vaseyana* / *Festuca campestris* Shrub Herbaceous Vegetation (CEGL001531)
- *Artemisia tridentata* ssp. *vaseyana* / *Leucopoa kingii* Shrubland (CEGL001025)

GLOBAL RELATED CONCEPTS:

- *Artemisia tridentata* / *Festuca idahoensis* Habitat Type (Mueggler and Stewart 1980) B
- *Artemisia tridentata* ssp. *vaseyana* / *Festuca idahoensis* (Bourgeron and Engelking 1994) =
- *Artemisia tridentata* ssp. *vaseyana* / *Festuca idahoensis* / *Stipa occidentalis* association (Mooney 1985) =
- *Artemisia tridentata* ssp. *vaseyana* / *Festuca idahoensis* Community Type (Jensen et al. 1988a) =
- *Artemisia tridentata* ssp. *vaseyana* / *Festuca idahoensis* Habitat Type (Lewis 1975a) =
- *Artemisia vaseyana* / *Festuca idahoensis* Habitat Type (Hironaka et al. 1983) =

- Big Sagebrush complex (Lewis 1971) =
- DRISCOLL FORMATION CODE:V.B.2.f. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: Although stands of this association can be extensive, this association is uncommon on the west side of Glacier National Park. It is localized within Big Prairie, a prairie along the far western boundary of Glacier National Park in the North Fork subdistrict. Large stands occur on low-elevation benches above the North Fork of the Flathead River.

GLOBAL RANGE: This is a wide-ranging association, known throughout the northern western U.S. It occurs in eastern Oregon, Nevada, Utah, Colorado, Wyoming, Montana, Idaho, possibly occurring further north into Alberta and British Columbia. It may also occur in eastern California.

NATIONS: CA?, US

STATES/PROVINCES: AB?, CA?, CO:S3S4, ID:S4, MT:S4, NV:S3?, OR:S3, UT?, WA, WY:S3S4

USFS ECOREGIONS: 341:C, 342B:CC, 342C:CC, 342D:CC, 342F:CC, 342G:CC, 342I:CC, M242A:CC, M242B:CC, M242C:CC, M261G:CC, M331A:CC, M331B:CC, M331D:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier, Grand Teton, Rockefeller); USFS (Bighorn, Medicine Bow, Shoshone)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2086.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Bramble-Brodahl 1978, CONHP unpubl. data 2003, Despain 1973a, Driscoll et al. 1984, Francis 1983, Hess 1981, Hess and Wasser 1982, Hironaka et al. 1983, Hurd 1961, Jensen et al. 1988a, Johnston 1987, Jones and Ogle 2000, Kagan et al. 2000, Komarkova 1986, Lewis 1971, Lewis 1975a, MTNHP 2002b, Mooney 1985, Mueggler and Stewart 1980, NVNHP 2003, Sabinske 1978, Smith 1966, Strong 1980, Terwilliger and Smith 1978, Tiedemann et al. 1987, Tweit and Houston 1980, Western Ecology Working Group n.d.

V.A.7.N.g. Medium-tall temperate or subpolar grassland with a sparse cold-deciduous shrub layer

Dasiphora fruticosa ssp. *floribunda* Shrub Herbaceous Alliance

Dasiphora fruticosa ssp. *floribunda* / *Artemisia michauxiana* Shrub Herbaceous Vegetation [Provisional]

SHRUBBY-CINQUEFOIL / MICHAUX'S WORMWOOD SHRUB HERBACEOUS VEGETATION

IDENTIFIER: C EGL005833

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland with a sparse shrub layer (V.A.7.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland with a sparse shrub layer (V.A.7.N.)
Formation	Medium-tall temperate or subpolar grassland with a sparse cold-deciduous shrub layer (V.A.7.N.g.)
Alliance	<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i> Shrub Herbaceous Alliance (A.1534)
Alliance (English name)	Shrubby-cinquefoil Shrub Herbaceous Alliance
Association	<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i> / <i>Artemisia michauxiana</i> Shrub Herbaceous Vegetation [Provisional]
Association (English name)	Shrubby-cinquefoil / Michaux's Wormwood Shrub Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine Fell-Field (CES306.811)

ELEMENT CONCEPT

GLOBAL SUMMARY: This fell-field association is found throughout the uppermost subalpine and alpine of Glacier National Park in Montana and is much less well-documented in Waterton Lakes National Park, Alberta. This patterned to heterogeneous vegetation type is characteristic of fell-fields, large expanses of steeply sloped (to 70%), unstable colluvium. The defining rocky surface is comprised of coarse-textured debris, talus, or small-sized scree; regardless of fragment size, the amount of exposed rock cover is between 80% and 95%, usually comprised of green or red argillite, with other rock types (quartzite, arenite) having a minor representation. The sampled elevation range is broad, from the high subalpine at 1940 m (6365 feet) to mid-alpine at 2620 m (8560 feet). Though steeply sloping, well-drained, and with their predominantly south- to southwest-facing slopes exposed to prevailing drying winds, the soil of these sites holds considerable amounts of moisture, even following extensive precipitation-free periods. The physiognomy of this type is not so much that of an alpine vegetated slope but of sparsely distributed shrubs on a rocky substrate. *Dasiphora fruticosa* ssp. *floribunda* is definitely a subshrub in this environment and its cover is mostly in the range of 3 to 10% with extremes approaching 25%. The graminoid component is very sparse, the aggregate cover seldom exceeding 1-3%, with only *Calamagrostis purpurascens* and *Poa secunda* exceeding 50% constancy. Forb cover is also minimal, usually in the 1-10% range, and only *Artemisia michauxiana* and *Potentilla glandulosa* are considered characteristic species in this local description of the type, though both species have much wider ecological amplitudes than just the alpine zone, and neither exhibits 100% constancy. Occurring with low cover are groups of alpine generalist species including *Potentilla diversifolia*, *Solidago multiradiata*, *Minuartia obtusiloba* (= *Arenaria obtusiloba*), *Besseyia wyomingensis*, and *Oxytropis campestris*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This patterned to heterogeneous vegetation type is characteristic of fell-fields, large expanses of steeply sloped (to 70%), unstable colluvium. The defining rocky surface is comprised of coarse-textured debris, talus, or small-sized scree; regardless of fragment size, the amount of exposed rock cover is between 80% and 95%, usually comprised of green or red argillite, with other rock types (quartzite, arenite) having a minor representation. The predominantly vertically elongate shape of vegetation patches is the result of slope movement, with this shape offering the least amount of exposure from debris striking from upslope. The sampled elevation range is broad, from the high subalpine at 1940 m (6365 feet) to mid-alpine at 2620 m (8560 feet). Though steeply sloping, well-drained, and with their predominantly south- to southwest-facing slopes exposed to prevailing drying winds, the soil of these sites holds considerable amounts of moisture, even following extensive precipitation-free periods. Overlapping shale slabs covering the surface contribute to an unknown degree to retard surface evaporation.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The physiognomy of this type is not so much that of an alpine vegetated slope but of sparsely distributed shrubs on a rocky substrate. *Dasiphora fruticosa* ssp. *floribunda* is definitely a subshrub in this environment, and its cover is mostly in the range of 3 to 10% with extremes approaching 25%. The graminoid component is very sparse, the aggregate cover seldom exceeding 1-3%, with only *Calamagrostis purpurascens* and *Poa secunda* exceeding 50% constancy. Forb cover is also minimal, usually in the 1-10% range, and only *Artemisia michauxiana* and *Potentilla glandulosa* are considered characteristic species in this local description of the type, though both species have much wider ecological amplitudes than just the alpine zone, and neither exhibits 100% constancy. Occurring with low cover are groups of alpine generalist species including *Potentilla diversifolia*, *Solidago multiradiata*, *Minuartia obtusiloba* (= *Arenaria obtusiloba*), *Besseyia wyomingensis*, and *Oxytropis campestris*. The lower elevation affinity of this type is denoted based on the constancy and abundance of a number of prairie-associated forbs including *Bupleurum americanum*, *Campanula rotundifolia*, *Phacelia sericea*, *Galium boreale*, *Achillea millefolium*, *Cerastium arvense*, *Eriogonum ovalifolium*, and *Anemone multifida*. Considerable floristic variability is encountered in this type and may be attributable to frequency of disturbance via erosion and soil movement.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i> , <i>Penstemon ellipticus</i>
Herb (field)	Forb	<i>Achillea millefolium</i> , <i>Artemisia michauxiana</i> , <i>Cerastium arvense</i> , <i>Eriogonum ovalifolium</i> , <i>Galium boreale</i> , <i>Potentilla diversifolia</i>
Herb (field)	Graminoid	<i>Calamagrostis purpurascens</i> , <i>Poa secunda</i>

Global

Stratum

Lifeform

Species

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Dasiphora fruticosa* ssp. *floribunda*, *Potentilla diversifolia*, *Potentilla glandulosa*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4 (28-Jan-2004).

CLASSIFICATION

STATUS: Provisional

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: The plots representing this type from Glacier National Park are thought to reflect the highest elevations of the type, and for a more complete comprehension of the type, subalpine and montane environments would need to be sampled. Damm (2001) recognized this type as the *Artemisio michauxiana* - *Potentilletum fruticosae* Association; however, not all the plots Damm attributed to this type were so assigned. Other types to which plots were assigned include *Dasiphora fruticosa* ssp. *floribunda* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001502) and *Festuca idahoensis* - (*Festuca campestris*) / *Potentilla diversifolia* Herbaceous Vegetation (CEGL001623). Others of Damm's associations, including *Myosotido alpestris* - *Caricetum albonigrae*, contained plots ultimately assigned to this community.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Saxifraga bronchialis* Scree Slope Sparse Vegetation (CEGL005902)

GLOBAL RELATED CONCEPTS:

- *Artemisio michauxiana* - *Potentilletum fruticosae* Association (Damm 2001) I
- *Myosotido alpestris* - *Caricetum albonigrae* Association (Damm 2001) I

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This fell-field association is found throughout the uppermost subalpine and alpine of Glacier National Park and is much less well-documented in Waterton Lakes National Park.

GLOBAL RANGE:

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S3

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2027, GLAC.2028, GLAC.258, GLAC.325, GLAC.123, GLAC.126, GLAC.246, CD148, CD161, CD141, CD155, CD304, CD273, CD111, CD494, CD244, CD249, CD218, CD460, CD722, CD466, CD308, CD378, CD390, CD375, CD389, CD391, CD551, WATE.4061, WATE.4074.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Damm 2001, Western Ecology Working Group n.d.

***Dasiphora fruticosa* ssp. *floribunda* / *Festuca campestris* Shrub Herbaceous Vegetation**
SHRUBBY-CINQUEFOIL / PRAIRIE FESCUE SHRUB HERBACEOUS VEGETATION**SHRUBBY-CINQUEFOIL / PRAIRIE FESCUE SHRUB PRAIRIE****IDENTIFIER: C EGL001503****NVC Classification**

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland with a sparse shrub layer (V.A.7.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland with a sparse shrub layer (V.A.7.N.)
Formation	Medium-tall temperate or subpolar grassland with a sparse cold-deciduous shrub layer (V.A.7.N.g.)
Alliance	<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i> Shrub Herbaceous Alliance (A.1534)
Alliance (English name)	Shrubby-cinquefoil Shrub Herbaceous Alliance
Association	<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i> / <i>Festuca campestris</i> Shrub Herbaceous Vegetation
Association (English name)	Shrubby-cinquefoil / Prairie Fescue Shrub Herbaceous Vegetation
Association (Common name)	Shrubby-cinquefoil / Prairie Fescue Shrub Prairie

ECOLOGICAL SYSTEM(S): Northwestern Great Plains Mixedgrass Prairie (CES303.674)
Northwestern Great Plains Shrubland (CES303.662)

ELEMENT CONCEPT

GLOBAL SUMMARY: This shrub herbaceous type is found in northwestern Montana and southern Alberta. It is primarily east of the Continental Divide, and north of the 46th parallel. It usually occurs on gently sloping or rolling topography to somewhat steep slopes (1-45%) at elevations between 1340 and 2015 m (4400-6600 feet). Stands tend to occur on south-facing low and midslopes but can occur on all aspects, and on basin floors. Soil textures are sandy loam, loam to silty clay loam. Soils are moderately deep, moderately to well-drained with 10- to 18 inch rooting depth, and derived from glacial-fluvial deposits of siltstone, limestone or sandstone parent materials. Surface rock can be abundant, but little bare ground is exposed. Vegetation and litter generally exceed 98% cover. It is considered a moderately mesic Rocky Mountain foothill steppe. This association is a high-diversity, foothill, montane to subalpine, mesic dwarf-shrub steppe dominated by *Dasiphora fruticosa* ssp. *floribunda* and *Festuca campestris*. *Dasiphora fruticosa* ssp. *floribunda* (= *Potentilla fruticosa*) is the diagnostic shrub species, and may not be readily visible because of the tall growth of the *Festuca campestris*. However, not only is *Dasiphora* present, but it can have canopy cover between 5-30%. In general, higher elevation stands have less overall vegetative cover. Other shrubs that may be present include *Rosa woodsii*, *Arctostaphylos uva-ursi*, *Artemisia frigida*, *Amelanchier alnifolia*, *Mahonia repens*, and *Juniperus horizontalis*. Herbaceous cover ranges from 40-100% with very high species diversity. Stands at lower elevations have 90-100% herbaceous cover, while higher elevation areas have 40-70% total herbaceous cover. *Festuca campestris* is the highest of all herbaceous species at 30% average cover. Other high-constancy species include *Pseudoroegneria spicata* (= *Agropyron spicatum*), *Bouteloua gracilis*, *Gaillardia aristata*, *Lupinus sericeus*, *Fragaria virginiana*, *Festuca idahoensis*, *Penstemon confertus*, *Galium boreale*, *Potentilla gracilis*, *Anemone multifida*, *Achillea millefolium*, and *Cerastium arvense*. Presence of *Danthonia intermedia* may be an indicator for more mesic sites with higher productivity.

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association occurs on gentle to somewhat steep slopes (1-45%) from 1360 to 2010 m (4400-6600 feet) in elevation. These types tend to be found on south-facing low and midslopes but can occur on all aspects and are sometimes found within the basin floor. Soil texture of most plots was characterized as a sandy loam or loam, but certain soils may occur as sandy or silty clay loams. Waterton Lakes National Park classified soils within this association mostly as Orthic humic Chernozems, but soils within one plot were classified as Orthic humic Regosols. All soils are moderately well- to well-drained and mostly derived from sedimentary sand and siltstones or glacial-fluvial deposits. Argillite and limestone rock and gravel are common in the soil profile. Litter may dominate the ground surface, ranging between 6-45%. Small rock, bare soil, and moss are consistently common in most plots.

GLOBAL ENVIRONMENT: It usually occurs on gently sloping or rolling topography to somewhat steep slopes (1-45%) at elevations between 1360-2010 m (4400-6600 feet). Stands tend to occur on south-facing low and midslopes but can occur on all aspects, and on basin floors. Soil textures are sandy loam, loam or silty clay loam. Soils are moderately deep, moderately to well-drained with 10- to 18-inch rooting depth, and are derived from glacial-fluvial deposits of siltstone, limestone or sandstone parent materials. Surface rock can be abundant, but little bare ground is exposed. Argillite and limestone rock and gravel are common in the soil profile. Litter may dominate the ground surface, ranging between 6-45%. Small rock, bare soil, and moss are consistently common in most occurrences.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This association is a high-diversity, montane to subalpine, mesic dwarf-shrub steppe dominated by *Dasiphora fruticosa* ssp. *floribunda* in the shrub layer and *Festuca campestris* in the herbaceous layer. Overall shrub cover ranges from 5-25% with *Dasiphora fruticosa* ssp. *floribunda* comprising 11% average cover at heights of less than 0.5 m. In general, the higher elevation plots tended to have less overall vegetative cover, including shrubs. *Rosa woodsii* is common in about half the sampled areas with an average cover of 2%. *Amelanchier alnifolia*, *Mahonia repens*, and *Juniperus horizontalis* are uncommon within this association but may have moderate cover in the places where they occur. Herbaceous cover ranges from 40-100% with very high species diversity. Half the surveyed areas at lower elevations have 90-100% herbaceous cover, while the remaining half of the higher elevation areas have 40-70% herbaceous cover. Average cover of *Festuca campestris* is the highest of all herbaceous species at 30%. Other high-constancy herbaceous species with 2-4% cover include *Lupinus sericeus*, *Fragaria virginiana*, *Festuca idahoensis*, *Penstemon confertus*, *Galium boreale*, and *Potentilla gracilis*. *Anemone multifida*, *Achillea millefolium*, and *Cerastium arvense* have low cover but are also high-constancy forbs within this association. Finally, *Koeleria macrantha*, *Hedysarum sulphurescens*, *Agoseris glauca*, *Pulsatilla patens* ssp. *multifida*, *Danthonia parryi* and/or *Danthonia intermedia*, and the exotic grass *Phleum pratense* are only relatively common but can have conspicuous cover in the places where they occur. A number of additional herbaceous species contributing minimal cover are present within this association.

GLOBAL VEGETATION: This association is a high-diversity, foothill, montane to subalpine, mesic dwarf-shrub steppe dominated by *Dasiphora fruticosa* ssp. *floribunda* and *Festuca campestris*. *Dasiphora fruticosa* ssp. *floribunda* (= *Potentilla fruticosa*) is the diagnostic shrub species, and may not be readily visible because of the tall growth of the *Festuca campestris*. However, not only is *Dasiphora* present, but it can have canopy cover between 5-30%. In general, higher elevation stands have less overall vegetative cover. Other shrubs that may be present include *Rosa woodsii*, *Arctostaphylos uva-ursi*, *Artemisia frigida*, *Amelanchier alnifolia*, *Mahonia repens*, and *Juniperus horizontalis*. Herbaceous cover ranges from 40-100% with very high species diversity. Stands at lower elevations have 90-100% herbaceous cover, while higher elevation areas have 40-70% total herbaceous cover. *Festuca campestris* is the highest of all herbaceous species at 30% average cover. Other high-constancy (>20%) herbaceous species include *Pseudoroegneria spicata* (= *Agropyron spicatum*), *Bouteloua gracilis*, *Gaillardia aristata*, *Lupinus sericeus*, *Fragaria virginiana*, *Festuca idahoensis*, *Penstemon confertus*, *Galium boreale*, *Potentilla gracilis*, *Anemone multifida*, *Achillea millefolium*, and *Cerastium arvense*. Herbaceous species with lower constancy include *Koeleria macrantha*, *Hedysarum sulphurescens*, *Agoseris glauca*, *Pulsatilla patens* ssp. *multifida*, *Danthonia parryi* and/or *Danthonia intermedia*, and the exotic grass *Phleum pratense*. Presence of *Danthonia intermedia* may be an indicator of more mesic sites with higher productivity.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i> , <i>Rosa woodsii</i>
Herb (field)	Forb	<i>Fragaria virginiana</i> , <i>Galium boreale</i> , <i>Lupinus sericeus</i> , <i>Penstemon confertus</i> , <i>Potentilla gracilis</i>
Herb (field)	Graminoid	<i>Festuca campestris</i> , <i>Festuca idahoensis</i>
Nonvascular	Moss	<i>Tortula ruralis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i> , <i>Rosa woodsii</i>
Herb (field)	Graminoid	<i>Festuca campestris</i> , <i>Festuca idahoensis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Achillea millefolium*, *Anemone multifida*, *Cerastium arvense*, *Dasiphora fruticosa* ssp. *floribunda*, *Festuca campestris*, *Festuca idahoensis*, *Fragaria virginiana*, *Galium boreale*, *Lupinus sericeus*, *Penstemon confertus*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Arabis glabra*, *Bromus inermis*, *Calochortus apiculatus*, *Hedysarum sulphurescens*, *Hypericum perforatum*, *Penstemon albertinus*, *Phleum pratense*, *Poa pratensis*, *Taraxacum officinale*, *Tragopogon dubius*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This association has been categorized as shrub herbaceous vegetation on a national basis; however, a strong argument could be made for IPP occurrences to be considered dwarf-shrublands because the dominant shrub *Dasiphora fruticosa ssp. floribunda* is consistently less than 0.5 m in height. This association is distinguished from *Dasiphora fruticosa ssp. floribunda* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001502) by the abundance (or in some cases only modest, <5%, cover) of *Festuca campestris*, which is considered to indicate relatively more mesic conditions. The lack of *Festuca campestris* in habitats ostensibly conducive to it could indicate past or ongoing disturbance.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Dasiphora fruticosa ssp. floribunda* / *Deschampsia caespitosa* Shrubland (CEGL001107)
- *Dasiphora fruticosa ssp. floribunda* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001502)

GLOBAL RELATED CONCEPTS:

- *Potentilla fruticosa* / *Festuca scabrella* habitat type (Mueggler and Stewart 1980) =
- *Potentilla fruticosa* / *Festuca scabrella* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:V.B.2.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is relatively common on the east side of the Continental Divide in Glacier and Waterton Lakes national parks. It is present at moderate elevations on open low slopes and midslopes with rocky sandy loam to loam soil. This type is documented in Glacier National Park in the Two Medicine subdistrict along the Firebrand Pass Trail, along Kupunkamint ridge, and near the Cut Bank Ranger Station, in the St. Mary subdistrict in the Red Eagle lookout meadow, near the Rising Sun boat dock, and above St. Mary Lake near Dead Horse Point, and in the Belly River subdistrict near Slide Lake. Specific locations of the association in Waterton Lakes National Park are unknown.

GLOBAL RANGE: This association is known from western Montana, southwestern Alberta, and Saskatchewan.

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S3, SK

USFS ECOREGIONS: 331D:CC, M332C:CC, M332D:CC, M333C:??

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: CD292, CD242, CD37, CD40, CD113, CD293, CD130, CD215, CD84, CD243, CD72, GLAC.11, GLAC.115, GLAC.206, GLAC.230, WATE.4029, WATE.4039, WATE.5005, WATE.5068, GRAS-00-007, GRAS-00-030, GRAS-01-027, GRAS-99-034.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, MTNHP 2002b, Mueggler and Stewart 1980, Western Ecology Working Group n.d.

***Dasiphora fruticosa ssp. floribunda* / *Festuca idahoensis* Shrub Herbaceous Vegetation**
SHRUBBY-CINQUEFOIL / IDAHO FESCUE SHRUB HERBACEOUS VEGETATION
SHRUBBY-CINQUEFOIL / IDAHO FESCUE SHRUB PRAIRIE

IDENTIFIER: CEGL001502

NVC Classification

Physiognomic Class Herbaceous Vegetation (V)
Physiognomic Subclass Perennial graminoid vegetation (V.A.)

Physiognomic Group	Temperate or subpolar grassland with a sparse shrub layer (V.A.7.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland with a sparse shrub layer (V.A.7.N.)
Formation	Medium-tall temperate or subpolar grassland with a sparse cold-deciduous shrub layer (V.A.7.N.g.)
Alliance	<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i> Shrub Herbaceous Alliance (A.1534)
Alliance (English name)	Shrubby-cinquefoil Shrub Herbaceous Alliance
Association	<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i> / <i>Festuca idahoensis</i> Shrub Herbaceous Vegetation
Association (English name)	Shrubby-cinquefoil / Idaho Fescue Shrub Herbaceous Vegetation
Association (Common name)	Shrubby-cinquefoil / Idaho Fescue Shrub Prairie

ECOLOGICAL SYSTEM(S): Northwestern Great Plains Mixedgrass Prairie (CES303.674)
Northwestern Great Plains Shrubland (CES303.662)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association occurs infrequently in the mountains of southwestern Montana, northern Wyoming and southern Idaho. Elevation ranges from 1920-2600 m. Stands have been described from relatively mesic, gentle upland slopes with moderately deep soils derived from granitic parent materials in Montana, and on gently sloping to undulating alluvial benches along drainages in the mesic transition zone between riparian and dry upland areas in Wyoming and Idaho. However, these soils are deeper and derived from sedimentary rock such as sandstone, siltstone, and shale. This association has a dense and diverse herbaceous layer with a very sparse to moderately dense short-shrub layer (3-45% cover). The shrub layer has 3-25% canopy cover of *Dasiphora fruticosa* ssp. *floribunda* (= *Pentaphylloides floribunda*), which is a diagnostic species, and may have up to 20% cover of *Artemisia cana* in the alluvial bench stands. The herbaceous layer is dominated by medium-tall perennial graminoids with perennial forbs. The dominant/diagnostic graminoid species is *Festuca idahoensis*. *Danthonia intermedia* and *Carex obtusata* or several other *Carex* spp. often codominate. Forb species are diverse, with *Achillea millefolium*, *Geum triflorum*, *Agoseris glauca*, *Arenaria congesta*, *Besseyia wyomingensis*, *Campanula rotundifolia*, *Fragaria virginiana*, and *Potentilla gracilis* being the most consistent.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is located at mid elevations from 1460 to 1770 m (4800-5800 feet) on exposed rocky ridges and bedrock outcrops on all midslope aspects. Slopes are steep to moderately steep. Soil texture is a well-drained, sandy loam derived from sedimentary rocks, particularly argillite and limestone. There tends to be little soil development over bedrock. Ground cover is variable with litter covering 20-45% of the ground surface, and bedrock, large rocks, and small rocks covering 24-60%. Moss and lichen cover can be 10-15%.

GLOBAL ENVIRONMENT: This association occurs infrequently in the mountains of southwestern Montana, northern Wyoming and southern Idaho. Elevation ranges from 1920-2600 m. Stands have been described from relatively mesic, gentle upland slopes with moderately deep soils derived from granitic parent materials in Montana, and on gently sloping to undulating alluvial benches along drainages in the mesic transition zone between riparian and dry upland areas in Wyoming and Idaho. However, these soils are deeper and derived from sedimentary rock such as sandstone, siltstone, and shale.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This association is highly diverse, montane to subalpine dwarf-shrub steppe that occurs on subxeric, open, rocky ridges and outcrops. Shrub cover ranges from 5-20% and is dominated by *Dasiphora fruticosa* ssp. *floribunda* that averages 5-12% cover and is less than 0.5 m in height. *Amelanchier alnifolia* and *Penstemon fruticosus* may also be present with moderate cover; the severe hedging of *Amelanchier alnifolia* is omnipresent, thus rendering it primarily a short shrub, or even dwarf-shrub. Herbaceous cover is very high at 50-80% and high in species diversity. *Festuca idahoensis* consistently is the dominant graminoid with an average cover of 22%. *Pseudoroegneria spicata*, *Heuchera cylindrica*, *Agrostis scabra*, and *Carex geyeri* are also common with individual average covers from 3-11%. Other high-constancy herbaceous species present in this association include *Achillea millefolium*, *Penstemon confertus*, *Claytonia parviflora* ssp. *parviflora*, *Sedum lanceolatum*, *Galium boreale*, *Fragaria virginiana*, *Dodecatheon pulchellum*, *Castilleja miniata*, *Antennaria microphylla*, and *Allium cernuum*. *Selaginella densa* var. *scopulorum*, *Festuca brachyphylla*, *Trisetum spicatum*, *Carex rupestris*, *Danthonia intermedia*, and *Potentilla glandulosa* may be present with conspicuous cover. A few *Picea engelmannii* and *Pseudotsuga menziesii* seedlings are also scattered in the plot with very low cover.

GLOBAL VEGETATION: This association has a dense and diverse herbaceous layer with a very sparse to moderately dense short-shrub layer (3-45% cover). The shrub layer has 3-25% canopy cover of *Dasiphora fruticosa* ssp. *floribunda* (= *Pentaphylloides floribunda*) which is a diagnostic species, and may have up to 20% cover of *Artemisia cana* in the alluvial bench stands. Other shrubs present include *Amelanchier alnifolia* and *Penstemon fruticosus*. The herbaceous layer is dominated by medium-tall perennial graminoids with perennial forbs. The dominant/diagnostic graminoid species is *Festuca idahoensis*. *Danthonia intermedia*, *Pseudoroegneria spicata*, *Heuchera cylindrica*, *Agrostis scabra*, *Carex geyeri*, and *Carex obtusata* or several other *Carex* spp. often

codominate. Forb species are diverse, with *Achillea millefolium*, *Geum triflorum*, *Agoseris glauca*, *Arenaria congesta*, *Besseyia wyomingensis*, *Campanula rotundifolia*, *Fragaria virginiana*, and *Potentilla gracilis* being the most consistent.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i>
Herb (field)	Forb	<i>Heuchera cylindrica</i>
Herb (field)	Graminoid	<i>Agrostis scabra</i> , <i>Carex geyeri</i> , <i>Festuca idahoensis</i> , <i>Pseudoroegneria spicata</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i>
Herb (field)	Graminoid	<i>Festuca idahoensis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Achillea millefolium*, *Agrostis scabra*, *Dasiphora fruticosa* ssp. *floribunda*, *Festuca idahoensis*, *Heuchera cylindrica*, *Penstemon confertus*, *Pseudoroegneria spicata*

GLOBAL: *Dasiphora fruticosa* ssp. *floribunda*, *Festuca idahoensis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Calochortus apiculatus*, *Penstemon lyallii*

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (30-Jan-2007). This association occurs infrequently and is known only from scattered locations in the mountains of southwestern Montana, northern Wyoming and southern Idaho. There are likely to be over 100 occurrences rangewide. Stands are restricted to relatively mesic, gentle upland slopes and alluvial benches along drainages with moderate to deep soils. The vegetation is easily accessible by livestock. Improper grazing will degrade these communities causing a shift to less palatable grasses and more shrubs, and may introduce non-native plant species.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This association has been categorized as shrub herbaceous vegetation on a national basis, however, a strong argument could be made for IPP occurrences to be considered dwarf-shrublands because the dominant shrub, *Dasiphora fruticosa* ssp. *floribunda*, is consistently less than 0.5 m in height. This association is distinguished from *Dasiphora fruticosa* ssp. *floribunda* / *Festuca campestris* Shrub Herbaceous Vegetation (CEGL001503) by the abundance (or in some cases only modest, <5%, cover) of *Festuca campestris*, which is considered to indicate relatively more mesic conditions. The lack of *Festuca campestris* in habitats ostensibly conducive to it could indicate past or ongoing disturbance.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Dasiphora fruticosa* ssp. *floribunda* / *Deschampsia caespitosa* Shrubland (CEGL001107)
- *Dasiphora fruticosa* ssp. *floribunda* / *Festuca campestris* Shrub Herbaceous Vegetation (CEGL001503)
- *Dasiphora fruticosa* ssp. *floribunda* / *Schizachyrium scoparium* Shrub Herbaceous Vegetation (CEGL002198)

GLOBAL RELATED CONCEPTS:

- *Potentilla fruticosa* / *Festuca idahoensis* Community Type (Youngblood et al. 1985a) =
- *Potentilla fruticosa* / *Festuca idahoensis* habitat type (Mueggler and Stewart 1980) =
- *Potentilla fruticosa*/*Festuca idahoensis* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:V.B.2.c. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon on the east side of Glacier National Park, limited to rocky ridges and bedrock outcrops along midslopes at various locations. This association is documented in

the Goat Haunt subdistrict near the Pass Creek cabin, in the Two Medicine subdistrict along the Dawson Pass Trail below Rising Wolf Mountain, and on the Blackfeet Reservation off the Cut Bank Road within the Lake Creek drainage.

GLOBAL RANGE: This association occurs in the mountains of southwestern Montana, northern Wyoming and southern Idaho.

NATIONS: US

STATES/PROVINCES: ID:S1, MT:S2S3, WY:S4

USFS ECOREGIONS: 331D:CC, 331G:CC, M331A:CC, M331B:C?, M331D:CC, M332D:CC, M332E:CC, M332F:CC

FEDERAL LANDS: BIA (Blackfeet); NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: CD135, CD114, CD701, CD741, CD715, CD33, CD45, CD44, CD468, CD89, GLAC.102, GLAC.173, GLAC.302.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz, mod. G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, IDCDC 2005, MTNHP 2002b, Mattson 1984, Mueggler and Stewart 1980, Tweit and Houston 1980, Western Ecology Working Group n.d., Youngblood et al. 1985a

V.A.8.N.c. Short temperate or subpolar alpine grassland with a sparse needle-leaved or microphyllous evergreen dwarf-shrub layer

***Dryas octopetala* Dwarf-shrub Herbaceous Alliance**

***Dryas octopetala* - *Carex rupestris* Dwarf-shrub Herbaceous Vegetation**

EIGHT-PETAL MOUNTAIN-AVENS - CURLY SEDGE DWARF-SHRUB HERBACEOUS VEGETATION

IDENTIFIER: CEGLO01892

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland with a sparse dwarf-shrub layer (V.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland with a sparse dwarf-shrub layer (V.A.8.N.)
Formation	Short temperate or subpolar alpine grassland with a sparse needle-leaved or microphyllous evergreen dwarf-shrub layer (V.A.8.N.c.)
Alliance	<i>Dryas octopetala</i> Dwarf-shrub Herbaceous Alliance (A.1577)
Alliance (English name)	Eight-petal Mountain-avens Dwarf-shrub Herbaceous Alliance
Association	<i>Dryas octopetala</i> - <i>Carex rupestris</i> Dwarf-shrub Herbaceous Vegetation
Association (English name)	Eight-petal Mountain-avens - Curly Sedge Dwarf-shrub Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine Turf (CES306.816)

ELEMENT CONCEPT

GLOBAL SUMMARY: This alpine fellfield association is found throughout Colorado's Rocky Mountains and in western and central Montana north into Alberta. This vegetation type represents the drier, mostly subxeric to submesic occurrences of *Dryas octopetala*-dominated dwarf-shrublands. It occurs predominantly in alpine environments (well above treeline); actual elevations vary from 3370 to 3900 m in the Colorado alpine to between 1700 and 2400 m in northwestern Montana. Typical terrain is moderately to steeply sloping, and all aspects are represented. The determining environmental parameter appears to be wind-scouring with sites blown snow-free in winter. Soils are very poorly developed and well- to rapidly drained. The association occurs on a wide variety of parent materials, though typically on residual and colluvial landforms. Where not protected by a dwarf-shrub mat, ground surfaces are comprised of 5 to 60% exposed gravel, cobble and, to a much lesser degree, soil; litter can only accumulate immediately under the protection of the dwarf-shrub cover.

A mat of the dwarf-shrub *Dryas octopetala* dominates the visual aspect, with variable cover ranging from 10 to 80%. Usually mats occur in relatively evenly spaced windrows oriented perpendicular to the prevailing wind or along the edges of stepped terraces. Other dwarf-shrubs include *Salix arctica*, *Dasiphora fruticosa ssp. floribunda* (= *Pentaphylloides floribunda*, = *Potentilla fruticosa*), *Arctostaphylos uva-ursi*, *Juniperus communis*, and *Salix reticulata*. Of the herbaceous component, graminoids generally have greater cover than forbs, a condition which is presumed to indicate the relatively xeric nature of the type. *Carex rupestris* has high constancy and occasionally is the dominant graminoid, but in Glacier National Park stands, there is no one dominant graminoid, only a variable suite of xeric-adapted species, including *Carex nardina*, *Calamagrostis purpurascens*, *Calamagrostis koelerioides*, *Festuca brachyphylla*, *Poa alpina*, and *Trisetum spicatum*. Typically the forb component does not exceed 10% cover, and that of individual forbs does not exceed 5%; those with highest constancy include *Minuartia obtusiloba* (= *Arenaria obtusiloba*), *Myosotis asiatica*, *Geum rossii*, *Artemisia scopulorum*, *Saxifraga bronchialis*, *Silene acaulis*, *Oxytropis campestris*, *Rhodiola rosea* (= *Sedum roseum*), *Solidago multiradiata*, *Potentilla diversifolia*, and *Smelowskia calycina*. Cover of mosses and lichens is very low.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This vegetation type represents the drier, mostly subxeric to submesic, occurrences of *Dryas octopetala*-dominated dwarf-shrublands. It occurs predominantly in alpine environments (well above treeline) mostly between 2000 and 2400 m (6560-7870 feet) but can be found as low as 1700 m (5575 feet) east of the Continental Divide on exposed, wind-swept ridges. Typical terrain is moderately to steeply sloping and all aspects are represented, though southerly exposures predominate; the determining environmental parameter is hypothesized to be wind-scouring with sites blown snow-free in winter. Soils are very poorly developed and well- to rapidly drained (Regosols, Inceptisols). It occurs on residual and colluvial landforms composed predominantly of calcareous sedimentary rock (limestone) and to a lesser degree non-calcareous sedimentary lithologies (mostly argillite and mudstone). Where not protected by a dwarf-shrub mat, ground surfaces are comprised of 5 to 60% exposed cobble and to a much lesser degree soil; litter can only accumulate immediately under the protection of the dwarf-shrub cover.

GLOBAL ENVIRONMENT: This alpine fellfield vegetation type represents the drier, mostly subxeric to submesic occurrences of *Dryas octopetala*-dominated dwarf-shrublands. It occurs predominantly in alpine environments (well above treeline); actual elevations vary from 3370 to 3900 m in the Colorado alpine to between 1700 and 2400 m in northwestern Montana. Typical terrain is moderately to steeply sloping, and all aspects are represented, though southerly exposures predominate in Montana, while northerly exposures are common in northern Colorado. Regardless of aspect, the determining environmental parameter appears to be wind-scouring with sites blown snow-free in winter. Soils are very poorly developed and well- to rapidly drained (Regosols, Inceptisols). The association occurs on a wide variety of parent materials, though typically on residual and colluvial landforms. Parent materials include calcareous sedimentary rock (limestone predominate in Montana) (Cooper et al. 1997) and noncalcareous sedimentary lithologies (mostly argillite and mudstone), as well as igneous and metamorphic rock (granite, gneiss) (Hess and Wasser 1982). Where not protected by a dwarf-shrub mat, ground surfaces are comprised of 5 to 60% exposed gravel, cobble and, to a much lesser degree, soil; litter can only accumulate immediately under the protection of the dwarf-shrub cover.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: A *Dryas octopetala* mat of variable cover ranging from 10 to 80% with a modal cover of about 50% dominates the visual aspect. Usually mats occur in relatively evenly spaced windrows oriented perpendicular to the prevailing wind or along the edges of stepped terraces. Other dwarf-shrubs include *Dasiphora fruticosa ssp. floribunda* (= *Pentaphylloides floribunda*, = *Potentilla fruticosa*), *Arctostaphylos uva-ursi*, *Juniperus communis*, *Salix arctica*, and *Salix reticulata*; the last two named dwarf-shrub occur in only trace amounts, but the others sometimes have as much as 10% cover. Of the herbaceous component, graminoids generally have greater cover than forbs, a condition which is presumed to indicate the relatively xeric nature of the type. *Carex rupestris* has greater than 50% constancy and occasionally is the dominant graminoid, but more generally, there is no one dominant graminoid, only a variable suite of xeric-adapted species, including *Carex nardina*, *Calamagrostis purpurascens*, *Calamagrostis koelerioides*, *Festuca brachyphylla*, *Poa alpina*, and *Trisetum spicatum*. Typically the forb component does not exceed 10% cover and that of individual forbs does not exceed 5%; those with highest constancy include *Minuartia obtusiloba* (= *Arenaria obtusiloba*), *Myosotis asiatica*, *Saxifraga bronchialis*, *Silene acaulis*, *Oxytropis campestris*, *Rhodiola rosea* (= *Sedum roseum*), *Solidago multiradiata*, *Potentilla diversifolia*, and *Smelowskia calycina*.

GLOBAL VEGETATION: A mat of the dwarf-shrub *Dryas octopetala* dominates the visual aspect, with variable cover ranging from 10 to 80%. Usually mats occur in relatively evenly spaced windrows oriented perpendicular to the prevailing wind or along the edges of stepped terraces. Other dwarf-shrubs include *Salix arctica*, *Dasiphora fruticosa ssp. floribunda* (= *Pentaphylloides floribunda*; = *Potentilla fruticosa*), *Arctostaphylos uva-ursi*, *Juniperus communis*, and *Salix reticulata*; any of these can occasionally have as much as 10% cover. Of the herbaceous component, graminoids generally have greater cover than forbs, a condition which is presumed to indicate the relatively xeric nature of the type. *Carex rupestris* has high constancy and is often the dominant graminoid, but in many stands there is no one dominant graminoid, only a variable suite of xeric-adapted species, including *Carex nardina*, *Calamagrostis purpurascens*, *Calamagrostis koelerioides*, *Festuca brachyphylla*, *Poa alpina*, and *Trisetum spicatum*. Typically the forb component does not exceed 15% cover, and that of individual forbs does not exceed 5%; those with highest constancy include

Minuartia obtusiloba (= *Arenaria obtusiloba*), *Myosotis asiatica*, *Geum rossii*, *Artemisia scopulorum*, *Saxifraga bronchialis*, *Silene acaulis*, *Oxytropis campestris*, *Rhodiola rosea* (= *Sedum roseum*), *Solidago multiradiata*, *Potentilla diversifolia*, and *Smelowskia calycina*. Cover of mosses and lichens is very low.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Arctostaphylos uva-ursi</i> , <i>Dasiphora fruticosa</i> ssp. <i>floribunda</i> , <i>Dryas octopetala</i> , <i>Juniperus communis</i>
Herb (field)	Forb	<i>Minuartia obtusiloba</i> , <i>Oxytropis campestris</i> , <i>Potentilla diversifolia</i> , <i>Solidago multiradiata</i>
Herb (field)	Graminoid	<i>Calamagrostis purpurascens</i> , <i>Carex nardina</i> , <i>Carex rupestris</i> , <i>Festuca brachyphylla</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Dryas octopetala</i>
Herb (field)	Graminoid	<i>Carex rupestris</i> , <i>Festuca brachyphylla</i> , <i>Poa alpina</i> , <i>Trisetum spicatum</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Calamagrostis koelerioides*, *Carex nardina*, *Carex rupestris*, *Dryas octopetala*, *Minuartia obtusiloba*, *Silene acaulis*

GLOBAL: *Arenaria fendleri*, *Carex rupestris*, *Minuartia obtusiloba*, *Trifolium nanum*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This vegetation type has been recognized elsewhere in Montana; we have had to broaden the type's concept by including a greater range of graminoids to fit the IPP plots. Damm (2001) recognized a *Salici nivalis* - *Dryadetum octopetalae* Association, many of the plots of which were allocated to this plant association. However, those with appreciable amounts of *Salix nivalis* and/or *Carex scirpoidea* were grouped with *Dryas octopetala* - *Polygonum viviparum* Dwarf-shrub Herbaceous Vegetation (CEGL001894).

GLOBAL COMMENTS: *Dryas octopetala*-dominated communities and fellfields have been described from a number of studies in both Canada and the U.S. A systematic crosswalk of these types is needed to more clearly define what associations occur in the Canadian and U.S. Rocky Mountains. See Achuff et al. (2002a) for a review of some of the Canadian literature reporting *Dryas* communities.

GLOBAL SIMILAR ASSOCIATIONS:

- *Dryas integrifolia* - *Carex* spp. Dwarf-shrub Herbaceous Vegetation (CEGL001890)
- *Dryas octopetala* - *Carex* spp. Dwarf-shrub Herbaceous Vegetation (CEGL001893)
- *Dryas octopetala* - *Polygonum viviparum* Dwarf-shrub Herbaceous Vegetation (CEGL001894)

GLOBAL RELATED CONCEPTS:

- *Dryas octopetala* - *Carex rupestris* ssp. *drummondiana* Habitat Type/Association (Komarkova 1986) =
- *Dryas octopetala* / *Arenaria obtusiloba* Habitat Type (Hess 1981) =
- *Dryas octopetala* / *Carex rupestris* Community Type (Cooper et al. 1997) =
- *Dryas octopetala* / *Carex rupestris* Habitat Type (Wasser and Hess 1982) =
- *Dryas octopetala* / *Carex rupestris* Habitat Type (Hess and Wasser 1982) =
- *Dryas octopetala* / *Carex rupestris* Herbaceous Vegetation (Cooper et al. 1999) =
- *Dryas octopetala* / *Carex rupestris* Plant Association (Johnston 1987) =

- *Dryas octopetala*-*Carex rupestris* (Bourgeron and Engelking 1994) =
- *Dryas octopetala* (Welden 1981) =
- *Dryas* Shrub Mat Community (Eddleman 1967) B
- *Dryasetum octopetalae* Association (Kiener 1939) (Willard 1963) =
- *Dryasetum octopetalae*, the northslope Association (Kiener 1967) =
- *Salici nivalis* - *Dryadetum octopetalae* Association (Damm 2001) I
- Association *Eritricho aretioidis* - *Dryasetum octopetalae* (Kiener 1939 corr. Komarkova 1976) (Komarkova 1979) =
- DRISCOLL FORMATION CODE:V.C.6.b. (Driscoll et al. 1984) B
- H01: *Dryas octopetala* Vegetation Type (Achuff et al. 2002a) I
- Station #5 (Holway 1962a) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This vegetation type has been extensively sampled in the alpine of both Glacier National Park and Waterton Lakes National Park.

GLOBAL RANGE: This alpine fell-field association is found throughout Colorado's Rocky Mountains, and in western and central Montana north into Alberta. It is likely to occur elsewhere in the alpine of western North America.

NATIONS: CA, US

STATES/PROVINCES: AB, CO:S4, ID?, MT:S3

USFS ECOREGIONS: M331A:C?, M331I:CC, M332A:C?, M332C:C?, M332D:CC, M332E:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier, Rocky Mountain); PC (Waterton Lakes); USFS (Arapaho-Roosevelt, Beaverhead, Gunnison, White River NF)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: CD469, CD29, CD30, CD28, CD108, CD115, CD10, CD3, CD8, CD9, CD763, CD726, CD363, CD801, CD176, CD187, CD186, CD364, CD91, CD727, CD53, CD54, CD46, CD47, CD48, CD43, CD742, CD373, CD377, CD56, CD367, CD153, CD157, CD27, CD156, CD94, CD95, CD74, CD75, CD92, GLAC.154, WATE.4035, WATE.4069, WATE.4072, WATE.4084, WATE.4085, WATE.4094, WATE.4122, WATE.4126, WATE.5004, WATE.5090, WATE.5098.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper, mod. M.S. Reid and K.A. Schulz

REFERENCES: Achuff et al. 2002a, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Cooper and Lesica 1992, Cooper et al. 1997, Cooper et al. 1999, Cox 1933, Damm 2001, Driscoll et al. 1984, Eddleman 1967, Fritz 1981, Hess 1981, Hess and Wasser 1982, Holway 1960, Holway 1962a, Holway and Ward 1963, Johnston 1987, Kiener 1967, Komarkova 1979, Komarkova 1986, MTNHP 2002b, Wasser and Hess 1982, Welden 1981, Western Ecology Working Group n.d., Willard 1963, Willard 1979

Dryas octopetala - *Polygonum viviparum* Dwarf-shrub Herbaceous Vegetation EIGHT-PETAL MOUNTAIN-AVENS - SERPENT-GRASS DWARF-SHRUB HERBACEOUS VEGETATION

IDENTIFIER: CEGL001894

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland with a sparse dwarf-shrub layer (V.A.8.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland with a sparse dwarf-shrub layer (V.A.8.N.)
Formation	Short temperate or subpolar alpine grassland with a sparse needle-leaved or microphyllous evergreen dwarf-shrub layer (V.A.8.N.c)
Alliance	<i>Dryas octopetala</i> Dwarf-shrub Herbaceous Alliance (A.1577)
Alliance (English name)	Eight-petal Mountain-avens Dwarf-shrub Herbaceous Alliance
Association	<i>Dryas octopetala</i> - <i>Polygonum viviparum</i> Dwarf-shrub Herbaceous Vegetation
Association (English name)	Eight-petal Mountain-avens - Serpent-grass Dwarf-shrub Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine Dwarf-Shrubland (CES306.810)**ELEMENT CONCEPT**

GLOBAL SUMMARY: This association is a minor type that has been substantiated from throughout the alpine of southwestern, northwestern and central Montana, and is likely to occur as far north as Canada's Jasper National Park and south to Colorado's Front Range. This is an alpine, fell-field association, ranging in elevation from 2070 to over 3000 m (6790-9840 feet). It is found on gentle to steep slopes with all but southerly aspects. Parent materials include a wide range of sedimentary rock with limestone and siltstone (argillite) predominating. Soils are typically sandy clay derived from limestone (or other calcareous substrate) and quartzite. Gravel content of soil ranges from 5-30%. Soil moisture content during the growing season is high. Disturbance from solifluction, slumps, and earthflows is common. This *Dryas octopetala* type is more mesic than others currently described, which is attributable to exposures with less solar insolation, placements in the landscape receiving less wind and greater snow deposition and duration. A dwarf-shrub layer dominates the vegetation cover of this community. *Dryas octopetala* forms mats that range from 30-80% in cover. Dwarf *Salix* spp. can be common to codominant, including *Salix reticulata*, *Salix arctica*, or *Salix nivalis*. The herbaceous layer is sparse (<20% cover) and is dominated by the forbs *Polygonum viviparum*, *Polygonum bistortoides*, *Zigadenus elegans*, and *Oxytropis borealis* var. *viscida* (= *Oxytropis viscida*). Forb diversity in the Glacier National Park occurrences is high, with over 100 species represented in 30 plots, and its cover generally exceeds that of the graminoids. Graminoid cover is low (<10%) and mostly composed of *Carex elynoides*, *Carex rupestris*, *Carex albonigra*, *Kobresia simpliciuscula*, *Kobresia myosuroides*, and *Festuca brachyphylla*. Moss and lichen cover is high on some plots (>50%). Diagnostic of this alpine association is a dwarf-shrub layer dominated by *Dryas octopetala* with *Polygonum viviparum* dominant in the herbaceous layer.

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This type occurs exclusively within alpine environments, usually well above treeline, with a documented elevation range of 2070 to 2640 m (6790-8660 feet). It occurs on moderate to steep slopes representing all aspects but is more prevalent on other-than-south-facing exposures. The more mesic conditions found in this type (as opposed to *Dryas octopetala* - *Carex rupestris* Dwarf-shrub Herbaceous Vegetation (CEGL001892)) may be attributable to exposures with less solar insolation, placements in the landscape receiving less wind and greater snow deposition and duration. Parent materials include a wide range of sedimentary rock with limestone and siltstone (argillite) predominating. The amount of exposed rock and soil is inversely proportional to dwarf-shrub cover, ranges between 15 and 85% and is generally less than 35% (soil is only about 5% of exposed substrate). Litter is retained only immediately below the dwarf-shrub canopy.

GLOBAL ENVIRONMENT: This is an alpine, fell-field association, ranging in elevation from 2070 to over 3000 m (6790-9840 feet). It is found on gentle to steep slopes with all but southerly aspects. Parent materials include a wide range of sedimentary rock with limestone and siltstone (argillite) predominating. Soils are typically sandy clay derived from limestone (or other calcareous substrate) and quartzite. Gravel content of soil ranges from 5-30%. Soil moisture content during the growing season is high. Disturbance from solifluction, slumps, and earthflows is common. This *Dryas octopetala* type is more mesic than others currently described, which is attributable to exposures with less solar insolation, placements in the landscape receiving less wind and greater snow deposition and duration (Cooper et al. 1997). Organic matter and nitrogen content were the highest in this association than any other non-wetland community in the alpine of southwestern Montana (Cooper et al. 1997).

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Of the several alpine dwarf-shrub types characterized by the dominance of *Dryas octopetala*, this type is characteristically the most mesic, averaging about 20% higher vascular plant cover than *Dryas octopetala* - *Carex rupestris* Dwarf-shrub Herbaceous Vegetation (CEGL001892). This type occurs in small patches with mats of *Dryas octopetala*, *Salix nivalis*, and *Salix arctica* providing the dominant aspect. The only other dwarf-shrub of note is *Dasiphora floribunda*, though its cover seldom exceeds 5%. Graminoid canopy cover is low, seldom exceeding 10% in the aggregate; species characteristically present are *Carex scirpoidea*, *Carex rupestris*, *Carex albonigra*, *Carex phaeocephala*, *Festuca brachyphylla*, *Luzula spicata*, *Trisetum spicatum*, and *Poa alpina*. Relatively high coverages (to >25%) of *Kobresia simpliciuscula* and *Kobresia myosuroides* typify those stands, judged to represent the most mesic sites within this type; these sites also have a greater-than-modal cover of forbs. The forb component is highly diverse with over 100 species represented in slightly more than 30 plots, and its cover generally exceeds that of the graminoids. Forbs most consistently present include *Polygonum bistortoides*, *Polygonum viviparum*, *Minuartia obtusiloba*, *Silene acaulis*, *Hedysarum sulphurescens*, *Besseyia wyomingensis*, *Potentilla diversifolia*, *Oxytropis campestris*, *Smelowskia calycina*, *Solidago multiradiata*, *Zigadenus elegans*, *Selaginella densa* var. *scopulorum* (= *Selaginella scopulorum*), and *Selaginella densa* var. *standleyi* (= *Selaginella standleyi*). Damm (2001) has documented a great diversity of lichens and bryophytes for this vegetation type.

GLOBAL VEGETATION: A dwarf-shrub layer dominates the vegetation cover of this community. *Dryas octopetala* forms mats that range from 30-80% in cover. Dwarf *Salix* spp. can be common to codominant, including *Salix reticulata*, *Salix arctica* or *Salix nivalis*. The herbaceous layer is sparse (<20% cover) and is dominated by the forbs *Polygonum viviparum*, *Polygonum bistortoides*,

Zigadenus elegans, and *Oxytropis borealis* var. *viscida* (= *Oxytropis viscida*). Other common species include *Minuartia obtusiloba*, *Silene acaulis*, *Hedysarum sulphurescens*, *Besseyia wyomingensis*, *Lloydia serotina*, *Potentilla diversifolia*, *Oxytropis campestris*, *Smelowskia calycina*, *Solidago multiradiata*, *Selaginella densa* var. *scopulorum* (= *Selaginella scopulorum*), and *Selaginella densa* var. *standleyi* (= *Selaginella standleyi*). Forb diversity in the Glacier National Park occurrences is high, with over 100 species represented in 30 plots, and its cover generally exceeds that of the graminoids. Graminoid cover is low (<10%) and mostly composed of *Carex elynoides*, *Carex rupestris*, *Carex albonigra*, *Kobresia simpliciuscula*, *Kobresia myosuroides*, and *Festuca brachyphylla*. Moss and lichen cover is high on some plots (>50%). Diagnostic of this alpine association is a dwarf-shrub layer dominated by *Dryas octopetala* with *Polygonum viviparum* dominant in the herbaceous layer.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i> , <i>Dryas octopetala</i> , <i>Salix arctica</i> , <i>Salix nivalis</i>
Herb (field)	Forb	<i>Hedysarum sulphurescens</i> , <i>Minuartia obtusiloba</i> , <i>Oxytropis campestris</i> , <i>Polygonum bistortoides</i> , <i>Polygonum viviparum</i> , <i>Smelowskia calycina</i> , <i>Zigadenus elegans</i>
Herb (field)	Graminoid	<i>Carex albonigra</i> , <i>Carex scirpoidea</i> , <i>Festuca brachyphylla</i> , <i>Kobresia myosuroides</i> , <i>Kobresia simpliciuscula</i> , <i>Luzula spicata</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Dryas octopetala</i> , <i>Salix arctica</i> , <i>Salix nivalis</i> , <i>Salix reticulata</i>
Herb (field)	Forb	<i>Oxytropis campestris</i> , <i>Polygonum bistortoides</i> , <i>Polygonum viviparum</i>
Herb (field)	Graminoid	<i>Carex elynoides</i> , <i>Carex rupestris</i> , <i>Festuca brachyphylla</i> , <i>Kobresia myosuroides</i> , <i>Kobresia simpliciuscula</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex scirpoidea*, *Dryas octopetala*, *Polygonum bistortoides*, *Polygonum viviparum*, *Salix arctica*, *Salix nivalis*

GLOBAL: *Dryas octopetala*, *Polygonum bistortoides*, *Salix nivalis*, *Zigadenus elegans*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3? (14-Nov-1997). This association has been formally named based on only three sample plots from southwestern Montana ranges (Tendoy, Anaconda-Pintlar, Madison) which lie wholly within the Beaverhead Mountains Section. However, it appears this, or a compositionally quite similar association, occurs in Glacier National Park, Big Snowy Mountains (central Montana) and the Flint Creek Range (immediately north of Anaconda-Pintlar Range) of Montana. The habitats of these sites, notably moist sites on calcareous substrates, match closely those described for southwestern Montana. The Canadian literature also describes similar vegetation types occurring in similar environments. In Colorado, moist *Dryas octopetala*-dominated fell-fields with *Polygonum viviparum* have been described, but dwarf *Salix* spp. were not a component. A formal crosswalking has not been conducted amongst these various representations of what could be one association, but citations are sufficient to reduce its suspected rarity to a G3 rank. An additional factor is that potential threats to this association, grazing by sheep and roading, are minor. Concern could stem from off-road vehicle use (ATVs for example) as these sites are generally fragile, especially when their moisture status is high.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: The plots representing this type were extracted from five of Damm's (2001) associations, *Salici nivalis* - *Dryadetum octopetalae*, *Myosotido alpestris* - *Caricetum albonigrae*, *Tofieldio pusillae* - *Kobresietum simpliciusculae*, *Euphrasio arcticae* - *Kobresietum myosuroides*, and *Zigadeno elegantis* - *Caricetum scirpoideae*. We have applied the name for a southwestern Montana alpine type (Cooper et al. 1997), similar in environment and

composition, to the vegetation type described herein; there are doubtless some fine distinctions that can be drawn between the vegetation of the two areas, but at this juncture, lacking an extensive regional analysis, one type will suffice for both conditions.

GLOBAL COMMENTS: The Canadian literature describes similar vegetation types occurring in similar environments and in Montana. Also, in Colorado, moist *Dryas octopetala*-dominated fell-fields with *Polygonum viviparum* have been described, but dwarf *Salix* spp. were not a component. Crosswalking needs to be conducted among these various representations of what could be one association. See Cooper et al. (1999) for discussion and references. Additional inventory for communities that could represent this association should be conducted in the alpine of mountains of Colorado, Wyoming, and the Canadian provinces of Alberta and British Columbia.

GLOBAL SIMILAR ASSOCIATIONS:

- *Dryas octopetala* - *Carex rupestris* Dwarf-shrub Herbaceous Vegetation (CEGL001892)
- *Dryas octopetala* - *Carex* spp. Dwarf-shrub Herbaceous Vegetation (CEGL001893)
- *Dryas octopetala* Dwarf-shrub Herbaceous Vegetation (CEGL001891)
- *Salix arctica* - (*Salix petrophila*, *Salix nivalis*) / *Polygonum bistortoides* Dwarf-shrubland (CEGL001431)

GLOBAL RELATED CONCEPTS:

- *Dryas octopetala*-*Polygonum viviparum* (Bourgeron and Engelking 1994) =
- *Dryas octopetala*/*Polygonum viviparum* Community Type (Cooper et al. 1997) =
- DRISCOLL FORMATION CODE:V.C.6.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This type is found throughout the alpine zone of both Glacier National Park and Waterton Lakes National Park, though it is much more prolifically documented from the former park.

GLOBAL RANGE: This association has been substantiated from throughout the alpine of southwestern Montana (Beaverhead Mountains Section) with occurrences in Glacier National Park and the Big Snowy Mountains of central Montana. The association is likely to occur as far north as Canada's Jasper National Park and south to Colorado's Front Range. Additional inventory will probably find additional occurrences in the Rocky Mountain Front Range of Montana.

NATIONS: CA, US

STATES/PROVINCES: AB:S1S2, BC?, CO?, MT:S2, WY?

USFS ECOREGIONS: M331A:CC, M332B:C?, M332C:CC, M332D:CC, M332E:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Jasper?, Waterton Lakes); USFS (Beaverhead, Lewis and Clark)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: CD323, CD408, CD411, CD740, CD321, CD320, CD147, CD412, CD392, CD393, CD309, CD310, CD312, CD311, CD313, CD57, CD68, CD65, CD65, CD59, CD66, CD278, CD441, CD167, CD366, CD322, CD368, CD90, CD159, CD73, GLAC.232, WATE.4070, WATE.4078, WATE.4079, WATE.5125.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper, mod. M.S. Reid

REFERENCES: Bamberg and Major 1968, Bourgeron and Engelking 1994, Cooper and Lesica 1992, Cooper et al. 1997, Cooper et al. 1999, Driscoll et al. 1984, MTNHP 2002b, Nesser et al. 1997, Western Ecology Working Group n.d.

V.B.2.N.a. Tall temperate or subpolar perennial forb vegetation

***Valeriana sitchensis* Herbaceous Alliance**

***Valeriana sitchensis* - *Veratrum viride* Herbaceous Vegetation**

SITKA VALERIAN - AMERICAN FALSE HELLEBORE HERBACEOUS VEGETATION

IDENTIFIER: CEGLO01998

NVC Classification

Physiognomic Class Herbaceous Vegetation (V)
Physiognomic Subclass Perennial forb vegetation (V.B.)

Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Tall temperate or subpolar perennial forb vegetation (V.B.2.N.a.)
Alliance	<i>Valeriana sitchensis</i> Herbaceous Alliance (A.1611)
Alliance (English name)	Sitka Valerian Herbaceous Alliance
Association	<i>Valeriana sitchensis</i> - <i>Veratrum viride</i> Herbaceous Vegetation
Association (English name)	Sitka Valerian - American False Hellebore Herbaceous Vegetation
ECOLOGICAL SYSTEM(S):	North Pacific Maritime Mesic Subalpine Parkland (CES204.837) Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is a lush subalpine meadow association of the northern Cascades (Washington) and northern Rockies (Montana and Alberta). It is a small-patch type best described as a forb meadow associated with mesic sites of the upper subalpine to lower alpine zones; the observed elevation range in the Cascades was 1738 to 2150 m (5700-7050 feet), while in the northern Rocky Mountains it has been documented from 1555 to 2270 m (5100-7445 feet). In the Cascades it occurs on southerly exposures of moderate to steep, well-drained slopes. In the northern Rockies it occupies a wider variety of environments, including steep northeast slopes and glacio-fluvial flats and swales that lose their snow cover relatively late in the season. Substrates in the Rockies range from glacial till and drift to scree slopes, almost all of which are composed of noncalcareous sedimentary rock. These are lush, tall-forb communities, often highly diverse. The Cascadian and Rocky Mountain expressions of this type are dominated by *Valeriana sitchensis* and usually *Veratrum viride*, but the Cascadian has *Lupinus latifolius* and *Carex spectabilis* as major associates, and the Rocky Mountain examples have quite a different suite of associated forbs, none of which attain more than a modest cover. The most constant forbs of the northern Rockies are *Angelica arguta*, *Heracleum maximum*, *Hypericum scouleri* (= *Hypericum formosum*), *Chamerion angustifolium* (= *Epilobium angustifolium*), *Erigeron peregrinus*, *Erythronium grandiflorum*, and *Senecio triangularis*. In the Cascades, *Heracleum maximum*, *Erythronium* spp., and *Chamerion angustifolium* are also common, along with *Mitella breweri*, *Polygonum bistortoides*, and *Pulsatilla occidentalis* (= *Anemone occidentalis*). A number of forbs with less demanding moisture requirements, such as *Thalictrum occidentale* and *Potentilla diversifolia*, also regularly occur. Graminoids are a minor component of these sites with *Poa alpina*, *Phleum alpinum*, *Juncus drummondii*, *Luzula parviflora*, and *Carex microptera* having the greatest constancy but only infrequently exceed a few percent cover.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: In spite of this type's assignment to a temporarily flooded herbaceous alliance few of the supporting stands within IPP are actually flooded, though they may have surface water ponding (in micro-depressions) for a few days during spring melt-off, and soils may remain saturated well into the growing season. This type occurs as small patches in the highest portions of the subalpine and may extend to the lowest portion of the alpine; its observed elevation range was from 1925 to 2270 m (6315-7445 feet). It is found on gently rolling to steeply inclined topography but moderate to steep slopes (15-75% with warm exposures (160-240°) are by far most prevalent). These sites are almost always associated with lower slope, toeslope and receiving positions, from which it may be inferred that they are subirrigated, which would account for the mostly lush vegetation comprised of mesic to hygic species. Sites also accumulate greater than average snowload from colluvial processes. The ground surface in more than half the cases has a very high percentage (>70%) of exposed, colluvially derived, fine and coarse rock of limestone and argillite; in the relatively few cases where exposed rock and soil are highly reduced, litter cover is virtually continuous, and moss and lichens are a minor component, seldom exceeding 15% cover.

GLOBAL ENVIRONMENT: This association has been described from the Cascades and Mount Rainier of Washington, Garibaldi Park in British Columbia's Cascades, and Glacier-Waterton International Peace Park of the northern or Canadian Rocky Mountains. It is a small-patch type best described as a forb meadow associated with mesic sites of the upper subalpine to lower alpine zones; the observed elevation range in the Cascades was 1738 to 2150 m (5700-7050 feet), while in the northern Rocky Mountains it has been documented from 1555 to 2270 m (5100-7445 feet). In the Cascades it occurs on southerly exposures of moderate to steep, well-drained slopes. Franklin and Dyrness (1973) report these as being fresh slopes, frequently subject to recurring avalanches. In the northern Rockies it occupies a wider variety of environments, including steep northeast slopes and glacio-fluvial flats and swales that lose their snow cover relatively late in the season (sites of Cascades may be snow-free relatively early, in late May-early June). Substrates in the Rockies range from glacial till and drift to scree slopes, almost all of which are composed of noncalcareous sedimentary rock.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Despite the abundance of surface rock and warm exposures, herbaceous cover on these sites can be quite high, in excess of 90%, but highly variable is a more apt description; this variability is thought to be due to periodic disturbance (colluvial processes). Dwarf-shrubs are never more than a trace component; those recorded include *Salix arctica*, *Salix vestita*, and *Vaccinium scoparium*. A number of graminoids, including *Carex haydeniana*,

Poa cusickii, *Poa alpina*, *Phleum alpinum*, and *Trisetum spicatum*, exhibit high constancy but seldom exceed 5% cover; also present in trace amounts are chionophilous graminoids, including *Juncus drummondii*, *Juncus parryi*, and *Luzula glabrata*. The forb layer is often species-rich exhibiting a shifting composition that does not necessarily appear to be responding to particular environmental variables. Though named for *Valeriana sitchensis* and *Veratrum viride*, both of these forbs, as well as a number of others, can exhibit dominance (with individual cover usually exceeding 10%), and most of which are also highly constant; these include *Arnica X diversifolia*, *Hypericum scouleri* (= *Hypericum formosum*), *Symphotrichum foliaceum* (= *Aster foliaceus*), *Epilobium anagallidifolium* (= *Epilobium alpinum*), *Fragaria virginiana*, and *Erigeron peregrinus*. Indicative of para-snowbed conditions is the high constancy of *Sibbaldia procumbens* and *Ranunculus eschscholtzii* and of hygric conditions *Veronica wormskjoldii* and *Packera streptanthifolia* (= *Senecio cymbalarioides*).

GLOBAL VEGETATION: These are lush, tall-forb communities, often highly diverse. The Cascadian and Rocky Mountain expressions of this type are dominated by *Valeriana sitchensis* and usually *Veratrum viride*, but the Cascadian has *Lupinus latifolius* and *Carex spectabilis* as major associates, and the Rocky Mountain examples have quite a different suite of associated forbs, none of which attain more than modest cover. The most constant forbs of the northern Rockies that testify to the relative mesophytic character of these sites are *Angelica arguta*, *Heracleum maximum*, *Hypericum scouleri* (= *Hypericum formosum*), *Chamerion angustifolium* (= *Epilobium angustifolium*), *Erigeron peregrinus*, *Erythronium grandiflorum*, and *Senecio triangularis*. In the Cascades, *Heracleum maximum*, *Erythronium* spp., and *Chamerion angustifolium* are also common, along with *Mitella breweri*, *Polygonum bistortoides*, and *Pulsatilla occidentalis* (= *Anemone occidentalis*). In general the forenamed forbs seldom exceed 5% cover. A number of forbs with less demanding moisture requirements, such as *Thalictrum occidentale* and *Potentilla diversifolia*, also regularly occur. Graminoids are a minor component of these sites with *Poa alpina*, *Phleum alpinum*, *Juncus drummondii*, *Luzula parviflora*, and *Carex microptera* having the greatest constancy but only infrequently exceed a few percent cover.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Arnica x diversifolia</i> , <i>Fragaria virginiana</i> , <i>Hypericum scouleri</i> , <i>Symphotrichum foliaceum</i> , <i>Valeriana sitchensis</i> , <i>Veratrum viride</i>
Herb (field)	Graminoid	<i>Carex haydeniana</i> , <i>Trisetum spicatum</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Heracleum maximum</i> , <i>Valeriana sitchensis</i> , <i>Veratrum viride</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Erigeron peregrinus*, *Symphotrichum foliaceum*, *Valeriana sitchensis*

GLOBAL: *Veratrum viride*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This is a vegetation type previously recognized from coastal Northwest ranges and substantiated for IPP by reclassifying a number of C. Damm plots (occurring in *Aquilegio flavescens* - *Senecietum megacephali*, *Phacelia hastata* - *Penstemon ellipticus* basal community, and *Leprario caesioalbae* - *Salicetum arcticae*) and renaming one of his community types (*Fragaria virginiana* - *Carex haydeniana*), the plots of which almost wholly fit comfortably in this type. This type merges gradationally with *Heracleum maximum* Herbaceous Vegetation (CEGL005857), which typifies montane to mid-subalpine sites, usually those of collecting positions, snow glades with deeper soils (eolian deposits frequently) and mostly lacking a contribution by colluvium.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Valeriana sitchensis* - *Carex spectabilis* Herbaceous Vegetation (CEGL001996)
- *Valeriana sitchensis* - *Ligusticum grayi* Herbaceous Vegetation (CEGL001997)

GLOBAL RELATED CONCEPTS:

- *Aquilegio flavescens* - *Senecietum megacephali* Association (Damm 2001) I
- *Fragaria virginiana* - *Carex haydeniana* lush subalpine meadow community (Damm 2001) F
- *Leprario caesioalbae* - *Salicetum arcticae* Association (Damm 2001) I
- *Lupinus latifolius* Community (Douglas and Bliss 1977) F
- *Phacelia hastata* - *Penstemon ellipticus* basal community (Damm 2001) I
- *Valeriana sitchensis*-*Veratrum viride* (Bourgeron and Engelking 1994) =
- *Veratrum viride*/*Valeriana sitchensis* Association (Hamann 1972) =
- *Veratrum viride*/*Valeriana sitchensis* Association (Franklin and Dyrness 1973) =
- DRISCOLL FORMATION CODE:V.D.2.a. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This type has been well-documented from Glacier National Park and to a lesser degree from Waterton Lakes National Park, though there is no reason to expect it to be any less prevalent in the latter park.

GLOBAL RANGE: This association has been described from the Cascades and Mount Rainier of Washington, Garibaldi Park in British Columbia's Cascades and Glacier-Waterton International Peace Park of the northern and Canadian Rocky Mountains.

NATIONS: CA, US

STATES/PROVINCES: AB, BC, MT, OR, WA:S4

USFS ECOREGIONS: M242A:CC, M242B:CC, M242C:C?, M333B:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier, Mount Rainier); PC (Waterton Lakes); USFS (Mount Hood)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.106, GLAC.109, GLAC.110, GLAC.113, GLAC.149, GLAC.2020, GLAC.250, GLAC.287, GLAC.331, GLAC.2019, GLAC.2026; CD176, CD181, CD182, CD397, CD400, CD401, CD402, CD586, CD214, CD576, CD439, CD570, CD545, CD568, CD700, CD405, WATE.4114.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Bourgeron and Engelking 1994, Damm 2001, Douglas and Bliss 1977, Driscoll et al. 1984, Franklin and Dyrness 1973, Hamann 1972, WNHP unpubl. data, Western Ecology Working Group n.d.

***Xerophyllum tenax* Herbaceous Alliance**

***Xerophyllum tenax* Herbaceous Vegetation**

BEAR-GRASS HERBACEOUS VEGETATION

IDENTIFIER: CEGL005859

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial forb vegetation (V.B.)
Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Tall temperate or subpolar perennial forb vegetation (V.B.2.N.a.)
Alliance	<i>Xerophyllum tenax</i> Herbaceous Alliance (A.1600)
Alliance (English name)	Bear-grass Herbaceous Alliance
Association	<i>Xerophyllum tenax</i> Herbaceous Vegetation
Association (English name)	Bear-grass Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Mesic Meadow (CES306.829)

ELEMENT CONCEPT

GLOBAL SUMMARY: This herbaceous vegetation type occurs from upper montane to alpine environments in northwestern Montana and southern Alberta. It ranges in elevation from 1790 to 2222m (5870-7290 feet). It is virtually always associated with moderate to steep slopes with warm exposures (predominantly southeast- to west-facing aspects). Often stands are associated with the upper slopes of ridgeline and slope shoulders, positions among the earliest to lose snow at a given altitude. Parent material is quite variable, ranging from glacial drift to colluvium derived from calcareous and noncalcareous rock types. Soils are often quite well-drained with a significant rock component of 50% or more. The ground surface is usually 90% or more litter with the remainder composed of basal vegetation and a trace of bryophytes and exposed rock. This association presents a distinctive aspect with what can initially appear to be a monoculture of *Xerophyllum tenax* (greater than 70% average cover) of tall, dense tussocks rising to 0.3 m (1 foot) and when in flower the stalk projects delicate, clustered white blooms more than 1 m (3.3 feet) above the tussocks. Over 90 vascular species occur within this association; about 20% of these are shrubs which never comprise more than 10% cover in the aggregate and of which only *Vaccinium membranaceum* attains greater than 50% constancy. Tree species, mostly *Abies lasiocarpa* in the tall-shrub layer, may occur sparsely scattered. The only graminoid of consequence is *Carex geyeri*, though its cover seldom exceeds 5%. Though diverse, the herbaceous component has only six species (exclusive of *Xerophyllum tenax*) with more than 50% constancy, including *Erigeron peregrinus*, *Valeriana sitchensis*, *Veratrum viride*, *Erythronium grandiflorum*, *Thalictrum occidentale*, and *Chamerion angustifolium* (= *Epilobium angustifolium*). Generally this forb component does not, individually or in the aggregate, exhibit more than 10% cover, and should the first three named forbs exceed this cover, then another association is possibly indicated. This association often occurs in areas that have experienced fire in the past; though evidence is often old, the burns appear to have been intense and occurred in primarily closed forest conditions.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This vegetation type occurs from upper montane to alpine environments, ranging in elevation from 1790 to 2222 m (5870-7290 feet). It is virtually always associated with moderate to steep slopes with warm exposures (predominantly southeast- to west-facing aspects). Often stands are associated with the upper slopes of ridgeline and slope shoulders, positions among the earliest to lose snow at a given altitude. Parent material is quite variable, ranging from glacial drift to colluvium derived from calcareous and non-calcareous rock types. Soils are often quite well-drained with a significant rock component of 50% or more. The ground surface is usually 90% or more litter with the remainder composed of basal vegetation and a trace of bryophytes and exposed rock.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This herbaceous association presents a distinctive aspect with what can initially appear to be a monoculture of *Xerophyllum tenax* (greater than 70% average cover) of tall, dense tussocks rising to 0.3 m (1 foot) and when in flower the stalk projects delicate, clustered white blooms more than 1 m (3.3 feet) above the tussocks. Over 90 vascular species occur within this association; about 20% of these are shrubs which never comprise more than 10% cover in the aggregate and of which only *Vaccinium membranaceum* contributes much cover or attains greater than 50% constancy. Tree species, mostly *Abies lasiocarpa* in the tall-shrub layer, may occur sparsely scattered. The only graminoid of consequence is *Carex geyeri*, though its cover seldom exceeds 5%. Though diverse, the herbaceous component has only six species (exclusive of *Xerophyllum tenax*) with more than 50% constancy, including *Erigeron peregrinus*, *Valeriana sitchensis*, *Veratrum viride*, *Erythronium grandiflorum*, *Thalictrum occidentale*, and *Chamerion angustifolium* (= *Epilobium angustifolium*). Generally this forb component does not, individually or in the aggregate, exhibit more than 10% cover, and should the first three named forbs exceed this cover, then another association is possibly indicated.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Needle-leaved tree	<i>Abies lasiocarpa</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Vaccinium membranaceum</i>
Herb (field)	Dwarf-shrub	<i>Vaccinium scoparium</i>
Herb (field)	Forb	<i>Thalictrum occidentale</i> , <i>Valeriana sitchensis</i> , <i>Xerophyllum tenax</i>
Herb (field)	Graminoid	<i>Carex geyeri</i> , <i>Elymus glaucus</i> , <i>Luzula glabrata</i> var. <i>hitchcockii</i>

Global

Stratum

Lifeform

Species

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Xerophyllum tenax*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: GNR (1-Jun-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: A number of forb-dominated stands having *Xerophyllum tenax* dominant are not classified as belonging to this association because of the abundance (greater than 10-20% cover) of forbs indicating mesic to hygric conditions; these forbs include, but are not limited to, *Valeriana sitchensis*, *Erigeron peregrinus*, *Senecio triangularis*, *Veratrum viride*, and *Mitella breweri*. C. Damm (2001) included in the *Xerophylletum tenacis* Association plots having *Vaccinium membranaceum* and other *Vaccinium* species with greater than 10% cover; these plots were attributed to the appropriate shrub-characterized type.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Amelanchier alnifolia* / *Xerophyllum tenax* Herbaceous Vegetation (CEGL001066)--relationship between these is unclear, but they could be very similar.

GLOBAL RELATED CONCEPTS:

- *Xerophylletum tenacis* Association (Damm 2001) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: All stands were sampled in Glacier National Park, occurring across the breadth of the park; this type has been visually confirmed from Waterton Lakes National Park.

GLOBAL RANGE:

NATIONS: CA, US

STATES/PROVINCES: AB, MT

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.147, GLAC.2030, GLAC.286, GLAC.326, GLAC.2632, CD770, CD607, CD259, CD620, CD784, CD608, CD183.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Damm 2001, Western Ecology Working Group n.d.

V.B.2.N.b. Low temperate or subpolar perennial forb vegetation

Arenaria capillaris* Herbaceous Alliance**Arenaria capillaris* / *Polytrichum piliferum* Herbaceous Vegetation
SLENDER MOUNTAIN SANDWORT / HAIRMOSS HERBACEOUS VEGETATION****IDENTIFIER: C EGL005855****NVC Classification**

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial forb vegetation (V.B.)
Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Low temperate or subpolar perennial forb vegetation (V.B.2.N.b.)
Alliance	<i>Arenaria capillaris</i> Herbaceous Alliance (A.2630)
Alliance (English name)	Slender Mountain Sandwort Herbaceous Alliance
Association	<i>Arenaria capillaris</i> / <i>Polytrichum piliferum</i> Herbaceous Vegetation
Association (English name)	Slender Mountain Sandwort / Hairmoss Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine Fell-Field (CES306.811)**ELEMENT CONCEPT**

GLOBAL SUMMARY: This vegetation type has been described only from the alpine and upper subalpine of Glacier National Park in Montana, east of the Continental Divide. This community occurs across a range of topographic positions, which apparently have in common an extended period of snow cover. Slopes are predominantly gentle to moderately steep (7-45%) with easterly to northerly exposures, which would be lee slopes in the presence of prevailing southwesterly wind. Snow drifts occur in the lee of raised relief features and depressions; drifts provide abundant early growing-season moisture, but sites may desiccate markedly in late summer. The observed elevation range is 2090 to 2390 m (6855-7840 feet). Parent materials include argillite, quartzite, arenites and limestone and can constitute up to 40% surface rock, most of which is stable though imparting a distinct fell-field aspect to these sites; frost churning is obviously occurring in the rockier frost rubble sites. Frost action is also manifested as cracks and soil creep in the open mineral soil. Total vascular cover varies considerably, from 25% to 80%, most of it being low-growing forbs, among which *Arenaria capillaris* consistently has the greatest cover and is indicative of persisting snow cover. Another chionophilous forb, *Sibbaldia procumbens*, exhibits less cover and is inconsistently present. Other forbs with moderate to high constancy include *Eriogonum flavum*, *Arnica rydbergii*, *Antennaria umbrinella*, *Silene parryi*, *Pedicularis contorta*, *Potentilla diversifolia*, *Polygonum bistortoides*, *Solidago multiradiata*, *Selaginella densa* var. *scopulorum* (= *Selaginella scopulorum*), and *Agoseris glauca*. The graminoid component is relatively unimportant, with *Carex phaeocephala*, *Luzula spicata*, and *Poa cusickii* being consistently present (more than 60%). Bryophytes, among which *Polytrichum piliferum* is highly constant and highly variable in cover, and lichens comprise a component highly variable in cover, from being unrepresented to a combined cover of 75%.

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This community occurs across a range of topographic positions, which apparently have in common an extended period of snow cover. Slopes are predominantly gentle to moderately steep (7-45%) with easterly to northerly exposures, which would be lee slopes in the presence of prevailing southwesterly wind. Snow drifts occur in the lee of raised relief features and depressions; drifts provide abundant early growing-season moisture, but sites may desiccate markedly in late summer. The observed elevation range is 2090 to 2390 m (6855-7840 feet). Parent materials include argillite, quartzite, arenites and limestone and can constitute up to 40% surface rock, most of which is stable though imparting a distinct fell-field aspect to these sites; frost churning is obviously occurring in the rockier frost rubble sites. Frost action is also manifested as cracks and soil creep in the open mineral soil.

GLOBAL ENVIRONMENT:**VEGETATION DESCRIPTION**

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Total vascular cover varies considerably, from 25% to 80%, most of it being low-growing forbs, among which *Arenaria capillaris* consistently has the greatest cover and is indicative of persisting snow cover; another chionophilous forb, *Sibbaldia procumbens*, exhibits less cover and is inconsistently present. Other forbs with moderate to high constancy include *Eriogonum flavum*, *Arnica rydbergii*, *Antennaria umbrinella*, *Silene parryi*, *Pedicularis contorta*, *Potentilla diversifolia*, *Polygonum bistortoides*, *Solidago multiradiata*, *Selaginella densa* var. *scopulorum* (= *Selaginella scopulorum*), and *Agoseris glauca*. The graminoid component is relatively unimportant, with *Carex phaeocephala*, *Luzula spicata*, and *Poa cusickii* being consistently present (more than 60%). Bryophytes, among which *Polytrichum*

piliferum is highly constant and highly variable in cover, and lichens comprise a component highly variable in cover, from being unrepresented to a combined cover of 75%.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Antennaria umbrinella</i> , <i>Arenaria capillaris</i> , <i>Arnica rydbergii</i> , <i>Eriogonum flavum</i> , <i>Potentilla diversifolia</i> , <i>Selaginella densa</i> var. <i>scopulorum</i> , <i>Silene parryi</i>
Nonvascular	Moss	<i>Polytrichum piliferum</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Arenaria capillaris*, *Arnica rydbergii*, *Eriogonum flavum*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2G3 (12-Jan-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This vegetation type was first described by C. Damm (2001) as *Polytrichum - Arenaria capillaris* late melting meadow community; it has been renamed (simply switching order of species in accordance with the NVC) and redefined by splitting out those plots having appreciable amounts of *Juncus parryi*, *Juncus drummondii*, *Festuca idahoensis*, or *Sibbaldia procumbens*. This type should be compared to *Phlox diffusa* ssp. *longistylis - Arenaria capillaris* Herbaceous Vegetation (CEGL001978) of Washington State where it is a G3? community.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

- *Polytricho piliferi - Arenarietum capillaris* Association (Damm 2001) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This vegetation type has been described only from Glacier National Park, east of the Continental Divide; it is assumed that it could occur in Waterton Lakes National Park given that there is abundant alpine/subalpine terrain with varied topographic configurations.

GLOBAL RANGE:

NATIONS: CA?, US

STATES/PROVINCES: AB?, MT:S2S3

USFS ECOREGIONS: M332C:CC, M333C:PP

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes?)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: CD297, CD508, CD295, CD272, CD267, CD637, CD358, CD64.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Damm 2001, Western Ecology Working Group n.d.

***Chamerion angustifolium* Herbaceous Alliance**

***Chamerion angustifolium* Rocky Mountain Herbaceous Vegetation [Provisional]
FIREWEED ROCKY MOUNTAIN HERBACEOUS VEGETATION**

ROCKY MOUNTAIN FIREWEED MEADOW

IDENTIFIER: CEGL005856

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial forb vegetation (V.B.)
Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Low temperate or subpolar perennial forb vegetation (V.B.2.N.b.)
Alliance	<i>Chamerion angustifolium</i> Herbaceous Alliance (A.3535)
Alliance (English name)	Fireweed Herbaceous Alliance
Association	<i>Chamerion angustifolium</i> Rocky Mountain Herbaceous Vegetation [Provisional]
Association (English name)	Fireweed Rocky Mountain Herbaceous Vegetation
Association (Common name)	Rocky Mountain Fireweed Meadow

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Mesic Meadow (CES306.829)
Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)
Rocky Mountain Lodgepole Pine Forest (CES306.820)
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)

ELEMENT CONCEPT

GLOBAL SUMMARY: This tentative, early successional association is known from one stand in Glacier National Park, Montana, east of the Continental Divide. The stand occurs on a gentle mountain valley of glacial-fluvial deposits, with an elevation of 1837 m (6023 feet). The soil is moderately well-drained clay loam with a large amount of silt and clay. The ground surface is mostly covered with litter and duff. This lush herbaceous community (80% total cover) consists of a high diversity of forbs and a few graminoids. There are a few short shrubs, *Ribes inerme*, *Salix farriarum*, and *Dasiphora fruticosa ssp. floribunda*, found within this stand, with a combined cover of less than 5%. The herbaceous layer is dominated by *Chamerion angustifolium*, which has an average cover of 50%. *Fragaria virginiana* is the second most abundant forb with 30% average cover. Other common forbs include *Achillea millefolium*, *Geum macrophyllum*, *Potentilla gracilis*, *Thalictrum occidentale*, and *Senecio integerrimus*. Graminoids present include *Elymus trachycaulus*, *Juncus balticus*, and *Carex preslii*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Only one stand of this herbaceous association was sampled in the park. The stand occurs on a gentle mountain valley of glacial-fluvial deposits, with an elevation of 1837 m (6023 feet). The soil is moderately well-drained clay loam with a large amount of silt and clay. The ground surface is mostly covered with litter and duff.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This lush herbaceous association (80% total cover) consists of a high diversity of forbs and a few graminoids. There are a few short shrubs, *Ribes inerme*, *Salix farriarum*, and *Dasiphora fruticosa ssp. floribunda*, found within this stand, with a combined cover of less than 5%. The herbaceous layer is dominated by *Chamerion angustifolium*, which has an average cover of 50%. *Fragaria virginiana* is the second most abundant forb with 30% average cover. Other common forbs include *Achillea millefolium*, *Geum macrophyllum*, *Potentilla gracilis*, *Thalictrum occidentale*, and *Senecio integerrimus*. Graminoids present include *Elymus trachycaulus*, *Juncus balticus*, and *Carex preslii*.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

Stratum

Herb (field)

Lifeform

Forb

Species

Chamerion angustifolium, *Fragaria virginiana*

Global

Stratum

Lifeform

Species

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Chamerion angustifolium*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4G5 (15-Apr-2004).

CLASSIFICATION

STATUS: Provisional

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This tentatively identified, early successional community type is highly likely to be widespread in the northern Rockies. The dominant forb *Chamerion angustifolium* can be abundant in a number of post-disturbance locations, especially post-fire stands. It rapidly succeeds to other vegetation types, hence has not been previously recognized in the vegetation literature as anything other than an ephemeral community.

GLOBAL SIMILAR ASSOCIATIONS:

- *Chamerion angustifolium* Herbaceous Vegetation (CEGL002558)

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from one stand in Glacier National Park east of the Continental Divide, along Otatso Creek near Slide Lake.

GLOBAL RANGE:

NATIONS: CA, US

STATES/PROVINCES: AB, ID?, MT, WA?, WY?

USFS ECOREGIONS: M332C:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.243.

LOCAL DESCRIPTION AUTHORS: J. Miller

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Western Ecology Working Group n.d.

V.B.2.N.d. Temporarily flooded temperate perennial forb vegetation

Argentina anserina Herbaceous Alliance [Provisional]**Argentina anserina Herbaceous Vegetation [Provisional]
SILVERWEED HERBACEOUS VEGETATION****IDENTIFIER: C EGL005825****NVC Classification**

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial forb vegetation (V.B.)
Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Temporarily flooded temperate perennial forb vegetation (V.B.2.N.d.)
Alliance	<i>Argentina anserina</i> Herbaceous Alliance [Provisional] (A.2642)
Alliance (English name)	Silverweed Herbaceous Alliance
Association	<i>Argentina anserina</i> Herbaceous Vegetation [Provisional]
Association (English name)	Silverweed Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Western Great Plains Closed Depression Wetland (CES303.666)**ELEMENT CONCEPT**

GLOBAL SUMMARY: This is a very tentatively classified forb community documented in Waterton Lakes National Park, Alberta. This association is known from the edge of isolated wetlands and mudflats. It occurs primarily on disturbed ground and was sampled at the edge of a poorly drained livestock pasture at 1290 m (4200 feet) elevation. Slopes are gentle. Ground cover is generally 99% bare ground. This association is dominated by forbs, with 10-30% total herbaceous cover. Dominant forb species are *Argentina anserina* (25%), *Veronica peregrina* (<1%), *Potentilla rivalis* (1%), *Monolepis nuttalliana* (<1%), and *Oxytropis deflexa* (<1%). Graminoids present include *Panicum capillare* (<1%), *Juncus bufonius* (<1%), and *Poa secunda* (<1%).

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is known from the edge of isolated wetlands and mudflats. It occurs primarily on disturbed ground and was sampled at the edge of a poorly drained livestock pasture at 1290 m (4200 feet) elevation. Slopes are gentle. Ground cover is generally 99% bare ground.

GLOBAL ENVIRONMENT:**VEGETATION DESCRIPTION**

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This association is dominated by forbs, with 10-30% total herbaceous cover. Dominant forb species are *Argentina anserina* (25% cover), *Veronica peregrina* (<1% cover), *Potentilla rivalis* (1%), *Monolepis nuttalliana* (<1%), and *Oxytropis deflexa* (<1%). Graminoids present include *Panicum capillare* (<1%), *Juncus bufonius* (<1%), and *Poa secunda* (<1%).

GLOBAL VEGETATION:**MOST ABUNDANT SPECIES****WATERTON-GLACIER INTERNATIONAL PEACE PARK**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Argentina anserina</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES**WATERTON-GLACIER INTERNATIONAL PEACE PARK:** *Argentina anserina***GLOBAL:****OTHER NOTEWORTHY SPECIES****WATERTON-GLACIER INTERNATIONAL PEACE PARK:** *Monolepis nuttalliana*, *Veronica peregrina***GLOBAL:**

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: GNA (invasive) (19-Apr-2004).

CLASSIFICATION

STATUS: Provisional

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This is a spatially small-patch, weedy association that may be very short-lived.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is documented from Waterton Lakes National Park.

GLOBAL RANGE: This association is documented from Waterton Lakes National Park, Alberta. It is reported by ecologists to be a relatively common, but very patchily distributed, vegetation type throughout Montana, although it remains undocumented by any quantitative samples other than those from Waterton Lakes National Park.

NATIONS: CA, US

STATES/PROVINCES: AB, MT

USFS ECOREGIONS: 331D:PP, M333B:PP, M333C:PP

FEDERAL LANDS: PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.9050.

LOCAL DESCRIPTION AUTHORS: G. Kittel

GLOBAL DESCRIPTION AUTHORS: S.V. Cooper

REFERENCES: Western Ecology Working Group n.d.

***Heracleum maximum* Temporarily Flooded Herbaceous Alliance**

***Heracleum maximum* Herbaceous Vegetation**

COW-PARSNIP HERBACEOUS VEGETATION

IDENTIFIER: C EGL005857

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial forb vegetation (V.B.)
Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Temporarily flooded temperate perennial forb vegetation (V.B.2.N.d.)
Alliance	<i>Heracleum maximum</i> Temporarily Flooded Herbaceous Alliance (A.1661)
Alliance (English name)	Cow-parsnip Temporarily Flooded Herbaceous Alliance
Association	<i>Heracleum maximum</i> Herbaceous Vegetation
Association (English name)	Cow-parsnip Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is a lush forb meadow type of the northern Rockies, in northwestern Montana and southern Alberta. Stands of this herbaceous vegetation are found on moderately sloped to flat benches, valley floors, and colluvial slopes, predominately on glacial deposits, with southeast aspects between 1671 to 1700 m (5480-5574 feet) elevation. Soils are moderately drained to well-drained silt or clay loams, and the ground surface is mostly litter and duff. This lush herbaceous association consists of a wide diversity of graminoids and forbs. Occasionally a few scattered shrubs are present with up to 10% combined cover, including *Spiraea betulifolia*, *Amelanchier alnifolia*, *Dasiphora fruticosa ssp. floribunda*, and *Symphoricarpos occidentalis*. There is a wide variety of tall forbs including *Heracleum maximum*, which, while not present nor dominant in all stands, is the indicator species for this wet association. Forbs consistently present are *Osmorhiza occidentalis*, *Thalictrum occidentale*, *Potentilla gracilis*, *Fragaria virginiana*, *Achillea millefolium*, and *Valeriana sitchensis* with 2-20% cover. Graminoids present consist of *Bromus carinatus*, *Carex hoodii*, and *Carex geeyeri*.

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Stands of this herbaceous vegetation are found on moderately sloped to flat benches, valley floors, and colluvial slopes, predominately on glacial deposits, with southeast aspects between 1671 to 1700 m (5480-5574 feet) elevation. Soils are moderately drained to well-drained silt or clay loams, and the ground surface is mostly litter and duff.

GLOBAL ENVIRONMENT:**VEGETATION DESCRIPTION**

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This lush herbaceous association is 0.5 m or less in height and consists of a wide diversity of graminoids and forbs. Occasionally a few scattered shrubs are present with up to 10% combined cover, including *Spiraea betulifolia*, *Amelanchier alnifolia*, *Dasiphora fruticosa ssp. floribunda*, and *Symphoricarpos occidentalis*. There is a wide variety of tall forbs including *Heracleum maximum*, which, while not present nor dominant in all stands, is the indicator species for this wet association. Forbs consistently present are *Osmorhiza occidentalis*, *Thalictrum occidentale*, *Potentilla gracilis*, *Fragaria virginiana*, *Achillea millefolium*, and *Valeriana sitchensis* with 2-20% cover. Graminoids present consist of *Bromus carinatus*, *Carex hoodii*, and *Carex geeyeri*.

GLOBAL VEGETATION:**MOST ABUNDANT SPECIES****WATERTON-GLACIER INTERNATIONAL PEACE PARK**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Fragaria virginiana</i> , <i>Heracleum maximum</i> , <i>Osmorhiza occidentalis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Osmorhiza occidentalis*

GLOBAL:**OTHER NOTEWORTHY SPECIES**

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Rumex acetosella*, *Taraxacum officinale*

GLOBAL:**CONSERVATION STATUS RANK**

GLOBAL RANK & REASONS: G3G4 (12-Jan-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This association is named for the indicator species *Heracleum maximum*. Not all of the IPP plots had this species present, however, the species composition of these stands is very

similar to stands with *Heracleum maximum* found in the park and to those in the literature. Thus, all stands were placed in the same association.

GLOBAL COMMENTS: This type from Glacier National Park is very similar to the other *Heracleum maximum* associations in the NVC. Further comparison of stand tables and environmental settings is needed, but without additional inventory and compositional data, it will be difficult to determine if these represent variations of one association, or are best kept as distinct types.

GLOBAL SIMILAR ASSOCIATIONS:

- *Heracleum maximum* - *Rudbeckia occidentalis* Herbaceous Vegetation (CEGL001940)
- *Saussurea americana* - *Heracleum maximum* Herbaceous Vegetation (CEGL001945)

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: The association is known from five locations in IPP. Four in Glacier National Park, all east of the Continental Divide. Three stands are in the vicinity of Poia Lake and one near Two Medicine Lake. One stand is known from Waterton Lakes National Park.

GLOBAL RANGE:

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S3S4

USFS ECOREGIONS: M332C:CC, M333C:PP

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.20, GLAC.2619, GLAC.2620, GLAC.2622, WATE.5114.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Western Ecology Working Group n.d.

***Senecio triangularis* Temporarily Flooded Herbaceous Alliance**

***Senecio triangularis* Herbaceous Vegetation**

ARROWLEAF RAGWORT HERBACEOUS VEGETATION

IDENTIFIER: CEGL001987

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial forb vegetation (V.B.)
Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Temporarily flooded temperate perennial forb vegetation (V.B.2.N.d.)
Alliance	<i>Senecio triangularis</i> Temporarily Flooded Herbaceous Alliance (A.1667)
Alliance (English name)	Arrowleaf Ragwort Temporarily Flooded Herbaceous Alliance
Association	<i>Senecio triangularis</i> Herbaceous Vegetation
Association (English name)	Arrowleaf Ragwort Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association has large gaps in its documented range, occurring in the alpine/subalpine of Colorado and reported again in the mountains of Montana, eastern Oregon and northward into Alberta. This broadly distributed wetland type occurs in small and often linear patches. In Montana and Oregon this type has been well-documented as a riparian stringer of high-gradient, ephemeral, first- or second-order streams; water tables are at the surface throughout the summer. This type also occurs as a species-

rich herb meadow on fluvial, residual and colluvial landforms, many of which are subject to snow avalanches. Its documented elevation range in Montana-Alberta is from 1225 to 2181 m (4020-7150 feet). All substrates are apparently relatively medium- to coarse-textured and well-drained. However, all these seemingly disparate environments are subirrigated, with oxygenated water through most of the growing season. The vegetation is characterized by a dense herbaceous layer dominated by *Senecio triangularis*. Graminoids are a minor component, with *Poa alpina*, *Phleum alpinum*, *Juncus drummondii*, *Trisetum spicatum*, *Elymus glaucus*, *Glyceria striata* (= *Glyceria elata*), and *Carex disperma* the reported species. Shrubs are virtually absent; only *Ribes* spp. associated with wetlands are present in trace amounts. The diagnostic forb *Senecio triangularis* is 100% constant and almost always the dominant, the only recorded exceptions being *Chamerion* spp. (= *Epilobium* spp.) which may increase markedly following disturbance. Other moderate- to high-constancy forbs indicative of wet-site conditions include *Trollius laxus*, *Parnassia fimbriata*, *Mimulus lewisii*, *Veratrum viride*, *Equisetum arvense*, *Thalictrum occidentale*, *Geum macrophyllum*, *Arnica cordifolia*, and *Ranunculus* spp. Species more associated with the diverse forb meadow condition include *Allium schoenoprasum*, *Arnica mollis*, *Angelica arguta*, *Castilleja rhexiifolia*, *Castilleja miniata*, *Chamerion angustifolium* (= *Epilobium angustifolium*), *Erigeron peregrinus*, *Epilobium* spp. (including *Epilobium ciliatum*, *Epilobium anagallidifolium* (= *Epilobium alpinum*)), and *Valeriana sitchensis*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This type occurs primarily as small, predominantly linear patches (often not much wider than a meter) flanking high-gradient, first- and second-order streams of subalpine to alpine environments, its documented elevation being from 1665 to 2350 m (5460-7710 feet); this upper elevation datum extends the type's known range by 400 m (1300 feet). It has also been noted in upper and midslope positions where ostensibly it is abundantly subirrigated. It occurs on permanently saturated soils that are temporarily flooded in spring and immediately following major summer precipitation. With abundant moisture being the primary driving variable, factors such as slope and insolation have little influence on the species composition. Snowloads can be appreciable creating a shortened growing season. Substrates are primarily coarse-textured alluvium derived from a variety of sedimentary rock types, both calcareous and not. Generally soils are not exposed; rather, it is the highly variable rock content (from 0 to 85%) that shares surface exposure with commensurately variable litter and bryophyte cover. Bryophyte cover is generally at least 45% and in more than one-third of the cases exceeds 80%. Lichens are mostly absent or low in cover, not exceeding 5%.

GLOBAL ENVIRONMENT: This is a broadly distributed wetland type that occurs in small and often linear patches. In Montana this type has been well-documented as a riparian stringer (Hansen et al. 1995) of high-gradient, ephemeral, first- or second-order streams; water tables are at the surface throughout the summer. This type also occurs as a species-rich herb meadow on fluvial, residual and colluvial landforms, many of which are subject to snow avalanches. Its documented elevation range in Montana-Alberta is from 1225 to 2181 m (4020-7150 feet) (Hansen et al. 1995). In Oregon it occupies similar habitats, occurring on alluvial bars and streambanks (Crowe and Clausnitzer 1997). It also occupies midslope to toeslope positions of talus and scree slopes, as well as glacio-fluvial deposits that receive late-melting runoff (subsurface). All substrates are apparently relatively medium- to coarse-textured and well-drained. However, the unifying factor of all these seemingly disparate environments is that sites are subirrigated, ostensibly with oxygenated water through most of the growing season.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This type is characterized as among the lushest in the IPP with vascular plant cover often approaching 100%, but where rock outcrops occur cover can be as low as 15%. If shrubs occur, they are incidental. The structurally dominant forbs *Senecio triangularis* and *Mimulus lewisii* provide the aspect of a tall, lush and productive herbaceous community. Other forbs often abundantly represented on the higher-elevation sites within the type include *Symphotrichum foliaceum* (= *Aster foliaceus*), *Epilobium anagallidifolium* (= *Epilobium alpinum*), *Arnica mollis*, *Arnica X diversifolia*, *Arnica longifolia*, *Mimulus tilingii*, *Saxifraga lyallii*, *Parnassia fimbriata*, and *Oxyria digyna*; on lower-elevation sites a not wholly unique suite of forbs is common, including *Arnica latifolia*, *Valeriana sitchensis*, *Veratrum viride*, *Erigeron peregrinus*, *Heracleum maximum*, *Mitella breweri*, and *Geum macrophyllum*. The most common graminoids include *Juncus mertensianus*, *Juncus drummondii*, *Carex spectabilis*, and *Vahlodea atropurpurea*; their individual or combined cover seldom exceeds 5%. Moss cover often exceeds 50%, and in some stands it is more than 80%; greater moss cover is associated with the higher elevation sites (upper subalpine and alpine, >2000 m).

GLOBAL VEGETATION: This association is characterized by a dense herbaceous layer dominated by *Senecio triangularis*. In Montana, shrubs are virtually absent, only *Ribes* spp. associated with wetlands are present in trace amounts. Graminoid are also a minor presence, with *Poa alpina*, *Phleum alpinum*, *Juncus drummondii*, *Trisetum spicatum*, and *Elymus glaucus* being at least 40% constant but seldom exhibiting more than 2-3% cover (Hansen et al. 1995) In Oregon, Crowe and Clausnitzer (1997) report that *Glyceria striata* (= *Glyceria elata*) and *Carex disperma* occur in most stands. The diagnostic forb *Senecio triangularis* is 100% constant and almost always the dominant, the only recorded exceptions being *Chamerion* spp. (= *Epilobium* spp.) which may increase markedly following disturbance. Other moderate- to high-constancy forbs indicative of wet-site conditions include *Trollius laxus*, *Parnassia fimbriata*, *Mimulus lewisii*, *Veratrum viride*, *Mertensia* spp., and *Equisetum arvense*. In Oregon common forbs include

Thalictrum occidentale, *Geum macrophyllum*, *Canadanthus modestus* (= *Aster modestus*), *Arnica cordifolia*, and *Ranunculus* spp. Species more associated with the diverse forb meadow condition include *Allium schoenoprasum*, *Arnica mollis*, *Angelica arguta*, *Castilleja rhexiifolia*, *Castilleja miniata*, *Chamerion angustifolium* (= *Epilobium angustifolium*), *Erigeron peregrinus*, *Epilobium* spp. (including *Epilobium ciliatum*, *Epilobium anagallidifolium* (= *Epilobium alpinum*)), and *Valeriana sitchensis*. In Wyoming, *Agrostis exarata* is constant, and *Mimulus guttatus* or *Mimulus lewisii*, *Platanthera dilatata* (= *Habenaria dilatata*), *Epilobium anagallidifolium*, and *Mitella pentandra* are common and sometimes abundant (Mattson 1984).

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Epilobium anagallidifolium</i> , <i>Erigeron peregrinus</i> , <i>Mimulus lewisii</i> , <i>Oxyria digyna</i> , <i>Saxifraga lyallii</i> , <i>Senecio triangularis</i> , <i>Valeriana sitchensis</i> , <i>Veratrum viride</i>
Herb (field)	Graminoid	<i>Juncus mertensianus</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Senecio triangularis</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Mimulus lewisii*, *Mimulus tilingii*, *Senecio triangularis*

GLOBAL: *Senecio triangularis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5? (3-May-2000).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: All but one of Damm's (2001) plots from *Senecio triangularis* - *Mimuletum lewisii* and *Saxifragetum lyallii* associations were incorporated into this vegetation type (one exception attributed to *Carex nigricans* association) despite the fact that they represented only the highest elevation examples of the type; they have in common saturated mineral soils with herbs being dominant. There is a gradual cline in species composition from subalpine to alpine environments as represented in this dataset. The comparably wet and lush *Trollius laxus* - *Parnassia fimbriata* Herbaceous Vegetation (CEGL005858) (*Trollio* - *Parnassietum fimbriatae* Association of Damm 2001) differs by exhibiting a different suite of dominant obligate wetland forbs and occurring on soils high in organics to exclusively organic (peatlands).

GLOBAL COMMENTS: Damm (2001) has recognized two subassociations of this association in Glacier National Park and has identified several other wet subalpine/alpine communities that differ only in lacking the tall forb layer or having it poorly represented. *Senecio triangularis* - *Mimulus guttatus* Herbaceous Vegetation (CEGL001988) derived from Mattson (1984) (for only Yellowstone National Park) should be archived as it matches quite closely the environmental and vegetation parameters of this more broadly described type. *Senecio triangularis* - *Veratrum californicum* Herbaceous Vegetation (CEGL001989) should be crosswalked as well; the dominance of tall hygric- to subhydryc-associated forbs places it very close to *Senecio triangularis* Herbaceous Vegetation (CEGL001987). It will be understood that because it is a wide-ranging type, there will be regional floristic differences in its composition, but ecologically it is one unit.

GLOBAL SIMILAR ASSOCIATIONS:

- *Calamagrostis canadensis* - *Senecio triangularis* Herbaceous Vegetation (CEGL001561)
- *Cardamine cordifolia* - *Mertensia ciliata* - *Senecio triangularis* Herbaceous Vegetation (CEGL002662)
- *Senecio triangularis* - *Mimulus guttatus* Herbaceous Vegetation (CEGL001988)
- *Senecio triangularis* - *Veratrum californicum* Herbaceous Vegetation (CEGL001989)

GLOBAL RELATED CONCEPTS:

- *Erigeron peregrinus* - *Valeriana sitchensis* Vegetation Type (Achuff et al. 1993) I
- *Erigeron peregrinus* - *Valeriana sitchensis* Vegetation Type (Achuff and Dudynsky 1984b) I

- *Erigeron peregrinus* - *Valeriana sitchensis* Vegetation Type (Achuff and Dudynsky 1984a) I
- *Erigeron peregrinus* - *Valeriana sitchensis* Vegetation Type (Achuff and Corns 1982) I
- *Lupinus polyphyllus* - *Senecio triangularis* Community Type (Manning and Padgett 1995) ?
- *Saxifraga odontoloma* - *Senecio triangularis* Association (Diaz and Mellen 1996) ?
- *Saxifragetum lyallii* Association (Damm 2001) F
- *Senecio triangularis* - Mixed Subalpine Forb Association (Crowe et al. 2004) F
- *Senecio triangularis* - *Agrostis exarata* Habitat Type (Mattson 1984) F
- *Senecio triangularis* - *Aster modestus* community (Diaz and Mellen 1996) =
- *Senecio triangularis* - *Erigeron peregrinus* Vegetation Type (Achuff et al. 2002a) =
- *Senecio triangularis* - *Mimuletum lewisii* Association (Damm 2001) =
- *Senecio triangularis* Association (Christy 2004) =
- *Senecio triangularis* (Crowe and Clausnitzer 1997) =
- *Senecio triangularis* (Kovalchik 1987) =
- *Senecio triangularis* (Bourgeron and Engelking 1994) =
- *Senecio triangularis* Association (Crowe et al. 2004) F
- *Senecio triangularis* Community Type (Hansen et al. 1995) =
- *Trollio* - *Parnassietum fimbriatae* Association (Damm 2001) I
- DRISCOLL FORMATION CODE:V.D.2.a. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This is a broadly distributed small-patch type occurring throughout the subalpine and alpine zones in both Glacier National Park and Waterton Lakes National Park.

GLOBAL RANGE: This association is reported from the mountains of Montana, eastern Oregon and northward into Alberta and British Columbia, Canada.

NATIONS: CA, US

STATES/PROVINCES: AB, AK?, CA?, ID, MT:S3?, OR:S5, WA:S4, WY

USFS ECOREGIONS: M331A:CC, M331D:CC, M331I:CC, M332B:CC, M332C:CC, M332D:CC, M332E:C?, M333B:CC, M333C:CC, M333D:CC

FEDERAL LANDS: NPS (Glacier, Yellowstone); PC (Waterton Lakes); USFS (Deschutes, Fremont, Ochoco, Wallowa-Whitman, Willamette, Winema)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.104, GLAC.111, GLAC.184, GLAC.209, GLAC.248, GLAC.332, WATE.4103, WATE.4120, WATE.4129, WATE.5063, WATE.5107, CD353, CD350, CD589, CD560, CD562, CD559, CD603, CD501, CD737, CD623, CD644, CD616, CD630, CD318, CD646, CD738, CD265, CD512, CD202, CD597, CD626, CD739.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: K.A. Schulz

REFERENCES: Achuff and Corns 1982, Achuff and Dudynsky 1984a, Achuff and Dudynsky 1984b, Achuff et al. 1993, Achuff et al. 1997, Achuff et al. 2002a, Bourgeron and Engelking 1994, Christy 2004, Crowe and Clausnitzer 1997, Crowe et al. 2004, Damm 2001, Diaz and Mellen 1996, Driscoll et al. 1984, Hansen et al. 1991, Hansen et al. 1995, Hemstrom et al. 1987, Hickman 1976, IDCDC 2005, Johnston 1987, Kagan et al. 2000, Kovalchik 1987, MTNHP 2002b, Manning and Padgett 1991, Manning and Padgett 1995, Mattson 1984, Murray 2000, Western Ecology Working Group n.d.

V.B.2.N.e. Semipermanently flooded temperate perennial forb vegetation

Equisetum fluviatile Semipermanently Flooded Herbaceous Alliance

Equisetum fluviatile Herbaceous Vegetation

WATER HORSETAIL HERBACEOUS VEGETATION

WATER HORSETAIL MARSH

IDENTIFIER: C EGL002746**NVC Classification**

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial forb vegetation (V.B.)
Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Semipermanently flooded temperate perennial forb vegetation (V.B.2.N.e.)
Alliance	<i>Equisetum fluviatile</i> Semipermanently Flooded Herbaceous Alliance (A.1678)
Alliance (English name)	Water Horsetail Semipermanently Flooded Herbaceous Alliance
Association	<i>Equisetum fluviatile</i> Herbaceous Vegetation
Association (English name)	Water Horsetail Herbaceous Vegetation
Association (Common name)	Water Horsetail Marsh

ECOLOGICAL SYSTEM(S):	Boreal Wet Meadow (CES103.873)
	Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
	Temperate Pacific Freshwater Emergent Marsh (CES200.877)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is an emergent wetland community occurring on seasonally to permanently flooded edges of lakes and ponds, along tidally influenced plains of larger rivers, calm backwater areas of rivers and streams, and in watered abandoned channels. It is presently documented from scattered locations of the Pacific Northwest, from coastal Washington to the interior regions of western Montana and north into the Boreal Plains of Alberta. It occurs from sea level to 1340 m (0-4390 feet) in elevation. Water depths range from below the soil surface to 0.5 m (1.5 feet) deep. Soils are fine-textured silts, clays and muck. Mineral soils often have layers of organic accumulation. Along the Columbia River Gorge, stands occur on river and slough channels on sand and silt and are flooded by freshwater during most high tides. Inland, stands occur in shallow water and wet ground at the edges of slow-moving meander curves in rivers and on the margins of lakes and ponds, stock ponds and reservoirs. Stands are characterized by emergent *Equisetum fluviatile* with 30-100% cover but tend to be species-poor. Other species present can include *Glyceria grandis*, *Alopecurus aequalis*, *Carex* spp., *Eleocharis palustris*, *Typha* spp., and *Scirpus* and/or *Schoenoplectus* spp. Stands at lower elevations (Columbia River Surge Plain) had higher species diversity (n=18 for all sampled stands combined) than those at higher elevations (n=3 eastern Washington and Montana).

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: Three stands of the *Equisetum fluviatile* association were sampled in Glacier National Park. This type is located at elevations between 1093 and 1340 m (3585-4390 feet) in flat, depressional wetland complexes. The association occurs in permanently flooded swales or at the edges of open water with standing water that covers 20-80% of the plot to a depth of about 10 cm. The soil is either muck or a very poorly drained, silty clay loam with organic material intermixed. The wetland is underlain by glacial, lacustrine, and fluvial deposits.

GLOBAL ENVIRONMENT: This is an emergent wetland community occurring on seasonally to permanently flooded edges of lakes and ponds, along tidally influenced plains of larger rivers, calm backwater areas of rivers and streams, and in watered abandoned channels. It occurs from sea level to 1340 m (0-4390 feet) in elevation. Water depths range from below the soil surface to 0.5 m (1.5 feet) deep. Soils are fine-textured silts, clays and muck. Mineral soils often have layers of organic accumulation. Along the Columbia River Gorge, stands occur on river and slough channels on sand and silt and are flooded by freshwater during most high tides. Inland, stands occur at the edges of slow-moving meander curves in rivers and in shallow water and wet ground on the margins of lakes and ponds, stock ponds and reservoirs.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: *Equisetum fluviatile* is consistently present within this association and clearly dominates the vegetation with 30-65% cover. Although overall herbaceous cover can reach 80%, this association typically has very low species diversity. *Carex vesicaria* and *Carex utriculata* are often present in this type with 1-10% cover. One stand also has 20% cover of *Sparganium angustifolium* and 10% cover of *Glyceria borealis*. Other species that may be present with low cover include *Alisma plantago-aquatica*, *Eleocharis palustris*, *Mentha arvensis*, and *Comarum palustre* (= *Potentilla palustris*). The herbaceous layer averages less than 0.5 m tall. About 10 cm of water floods most of the stand, precluding the growth of nonvascular species or the accumulation of litter.

GLOBAL VEGETATION: Stands are characterized by *Equisetum fluviatile* with 30-100% cover. Stands tend to be species-poor. Other species present can include *Glyceria grandis*, *Alopecurus aequalis*, *Carex* spp., *Eleocharis palustris*, *Typha* spp., and *Scirpus* and/or *Schoenoplectus* spp. Stands at lower elevations (Columbia River Surge Plain) had higher species diversity (n=18 for all

sampled stands combined) than those at higher elevations (n=3 eastern Washington and Montana). In Alberta, it often forms open monotypic stands in the deepest zone of emergent vegetation, developing a denser cover moving in shore. Typically there then follows a transition zone of mixed *Equisetum fluviatile* and *Carex* spp. that leads to a zone of shoreline sedges, usually *Carex aquatilis*, *Carex rostrata*, and/or *Carex utriculata*.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Carex utriculata</i> , <i>Carex vesicaria</i>
Herb (field)	Aquatic herb (floating & submergent)	<i>Sparganium angustifolium</i>
Herb (field)	Fern or fern ally	<i>Equisetum fluviatile</i>

HERB (FIELD) GLYCERIA BOREALIS

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Fern or fern ally	<i>Equisetum fluviatile</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Carex utriculata*, *Carex vesicaria*, *Equisetum fluviatile*

GLOBAL: *Equisetum fluviatile*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G4 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 1 - Strong

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS: This type can also occur as reed swamp communities. Stands described from Montana, Alberta and eastern Washington have no *Eleocharis* present. Only the tidal freshwater locations in western Washington list *Eleocharis palustris*. Stands in Idaho and Oregon need to be evaluated.

GLOBAL SIMILAR ASSOCIATIONS:

- *Equisetum fluviatile* - (*Eleocharis palustris*) Herbaceous Vegetation (CEGL005258)
- *Equisetum hyemale* Herbaceous Vegetation (CEGL002760)

GLOBAL RELATED CONCEPTS:

- *Equisetum fluviatile* - *Carex utriculata* Wm02 (MacKenzie and Moran 2004) =
- *Equisetum fluviatile* (Bourgeron and Engelking 1994) =
- *Equisetum fluviatile* Association (Kovalchik 1993) =
- *Equisetum fluviatile* Community Type (Kunze 1994) =
- *Equisetum fluviatile* Emergent Wetland (Willoughby et al. 2004) =
- *Equisetum fluviatile* Habitat Type (Hansen et al. 1995) =
- DRISCOLL FORMATION CODE:V.D.2.a. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is uncommon on both the east and west sides of Glacier National Park, occurring in semipermanently or permanently flooded wetland complexes. This association was specifically sampled in the Goat Haunt subdistrict near Kootenai Lakes and in the North Fork subdistrict at two locations off of the Inside North Fork Road near Sullivan Meadow and Anaconda Creek.

GLOBAL RANGE: This emergent wetland herbaceous vegetation is known from the Columbia River tidal surge plain in western Washington, and non-tidal locations in eastern Washington, as well as in Oregon, Idaho, Montana and possibly British Columbia.

NATIONS: CA, US

STATES/PROVINCES: AB:S4, BC, ID:S3, MT:S4, OR:S3, WA:S3?

USFS ECOREGIONS: 242A:CC, M332C:CC

FEDERAL LANDS: NPS (Glacier)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES: Three plots were sampled in Glacier National Park. Further inventory is necessary for developing a more complete description of the range of variation in vegetation composition and environmental conditions of this association.

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.114, AAGL.D253, AAGL.D58.

LOCAL DESCRIPTION AUTHORS: C. Murphy, mod. J. Asebrook

GLOBAL DESCRIPTION AUTHORS: G. Kittel, mod. L. Allen

REFERENCES: Bourgeron and Engelking 1994, Bursik and Moseley 1995, Driscoll et al. 1984, Hansen et al. 1991, Hansen et al. 1995, IDCDC 2005, Kagan et al. 2000, Kovalchik 1993, Kunze 1994, MTNHP 2002b, MacKenzie and Moran 2004, Titus et al. 1996, WNHP unpubl. data, Western Ecology Working Group n.d., Willoughby et al. 2004

V.B.2.N.f. Saturated temperate perennial forb vegetation

Trollius laxus Saturated Herbaceous Alliance

Trollius laxus - *Parnassia fimbriata* Herbaceous Vegetation

AMERICAN GLOBEFLOWER - FRINGED GRASS-OF-PARNASSUS HERBACEOUS VEGETATION

IDENTIFIER: C EGL005858

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial forb vegetation (V.B.)
Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Saturated temperate perennial forb vegetation (V.B.2.N.f.)
Alliance	<i>Trollius laxus</i> Saturated Herbaceous Alliance (A.2631)
Alliance (English name)	American Globeflower Saturated Herbaceous Alliance
Association	<i>Trollius laxus</i> - <i>Parnassia fimbriata</i> Herbaceous Vegetation
Association (English name)	American Globeflower - Fringed Grass-of-Parnassus Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)

ELEMENT CONCEPT

GLOBAL SUMMARY: This community has been documented from throughout the subalpine and alpine of Glacier National Park, Montana. This is a palustrine wetland type occurring at upper subalpine to lower alpine environments, from 1960 to 2320 m (6430-7610 feet). It is found as a mostly linear, small-patch type bordering first- and second-order streams and associated with seeps and subirrigated positions. Often associated with glacial cirque basins, most of the sites are very low-gradient terraces and benchlands, collecting positions, often with a concave surface. High moisture status is the primary driving variable overwhelming any differences in slope, exposure or parent material. Sites are developed on limestones, argillites and diorite. The upper soil horizons are black, very high in organic content and, if sufficiently deep, qualify the sites as peatlands; bank overflow and slopewash are responsible for a considerable amount of silt accumulating in the peat mat. The vascular layer is both lush (exceeding 80% cover in 90% of plots) and diverse. This community is characterized by an assemblage of low-growing forbs; however, *Senecio triangularis* is consistently present, with cover not much exceeding 5%. Characteristic low-stature forbs include *Trollius laxus*, *Triantha glutinosa* (= *Tofieldia glutinosa*), *Parnassia fimbriata*, *Hypericum scouleri* (= *Hypericum formosum*), *Veronica wormskjoldii*, and *Packera streptanthifolia* (= *Senecio cymbalarioides*), any one of which may express dominance. *Allium schoenoprasum*, *Arnica X diversifolia*, *Arnica mollis*, and *Symphotrichum foliaceum* (= *Aster foliaceus*) are also consistently present. *Carex podocarpa* is the only high-constancy graminoid also having appreciable cover (often in excess of 10%); *Carex nigricans*, *Juncus drummondii*, and *Poa alpina* are present in 50% or more of the plots. *Carex lenticularis* is exclusive to plots with well-developed, though not necessarily deep, peaty soils. Moss cover is in excess of 40% and mostly greater than 80% with *Philonotis fontana*, *Bryum* spp., *Brachythecium* spp., and *Campylopusium stellatum* comprising the majority of cover. Lichens, if present, occur only in trace amounts.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This is a palustrine wetland type occurring at upper subalpine to lower alpine environments, from 1960 to 2320 m (6 430-7610 feet). It is found as a mostly linear, small-patch type bordering first- and second-order streams and associated with seeps and subirrigated positions. Often associated with glacial cirque basins, most of the sites are very low-gradient terraces and benchlands, collecting positions, often with a concave surface. High moisture status is the primary driving variable overwhelming any differences in slope (which ranges from 1 to 100%), exposure or parent material. Sites are developed on limestones, argillites and diorite. The upper soil horizons are black, very high in organic content and, if sufficiently deep, qualify the sites as peatlands; bank overflow and slope wash are responsible for a considerable amount of silt accumulating in the peat mat.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The vascular layer is both lush (exceeding 80% cover in 90% of plots) and diverse. Relative to the *Senecio triangularis*-dominated community, this community is characterized by an assemblage of low-growing forbs; however, *Senecio triangularis* is consistently present, with cover not much exceeding 5%. Characteristic low-stature forbs include *Trollius laxus*, *Triantha glutinosa* (= *Tofieldia glutinosa*), *Parnassia fimbriata*, *Hypericum scouleri* (= *Hypericum formosum*), *Veronica wormskjoldii*, and *Packera streptanthifolia* (= *Senecio cymbalarioides*), any one of which may express dominance. *Allium schoenoprasum*, *Arnica X diversifolia*, *Arnica mollis*, and *Symphyotrichum foliaceum* (= *Aster foliaceus*) are also consistently present but not so indicative of hygric conditions as the forenamed forbs. *Carex podocarpa* is the only high-constancy graminoid also having appreciable cover (often in excess of 10%); *Carex nigricans*, *Juncus drummondii*, and *Poa alpina* are present in 50% or more of the plots. *Carex lenticularis* is exclusive to plots with well-developed, though not necessarily deep, peaty soils. Moss cover is in excess of 40% and mostly greater than 80% with *Philonotis fontana*, *Bryum* spp., *Brachythecium* spp., and *Campylium stellatum* comprising the majority of cover. Lichens, if present, occur only in trace amounts.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Arnica x diversifolia</i> , <i>Packera streptanthifolia</i> , <i>Parnassia fimbriata</i> , <i>Symphyotrichum foliaceum</i> , <i>Triantha glutinosa</i> , <i>Trollius laxus</i>
Herb (field)	Graminoid	<i>Carex lenticularis</i> , <i>Carex nigricans</i> , <i>Carex podocarpa</i> , <i>Poa alpina</i>
Nonvascular	Moss	<i>Campylium stellatum</i> , <i>Philonotis fontana</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Parnassia fimbriata*, *Triantha glutinosa*, *Trollius laxus*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3? (12-Jan-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: Damm (2001) described a *Trollio - Parnassietum fimbriatae* Association based on all the plots used to describe what we have termed *Trollius laxus - Parnassia fimbriata* Herbaceous Vegetation (CEGL005858) and other plots as well that we have reallocated to *Carex nigricans - Sibbaldia procumbens* Herbaceous Vegetation (CEGL005824) based on at least a 10% cover of *Carex nigricans* and *Carex scirpoidea - Zigadenus elegans* Herbaceous

Vegetation (CEGL005866) based on the relatively high cover of *Carex scirpoidea* and the low cover of the characteristic forbs *Trollius laxus*, *Triantha glutinosa* (= *Tofieldia glutinosa*), and *Parnassia fimbriata*. The plots of one association, *Tofieldio glutinosae - Caricetum lenticularis*, which Damm (2001) cites as having strong affinities to both this type and the *Carex nigricans* association has had its plots in fact allocated between these two types. There were simply no consistent distinguishing features for *T. glutinosae - C. lenticularis*, abiotic or compositionally that set it apart; in fact it shared the same bryophyte composition, dominated by *Philonotis fontana*. *Trollius laxus - Parnassia fimbriata* Herbaceous Vegetation (CEGL005858) differs from the *Senecio triangularis* type structurally by its shorter status and lack of *Mimulus* spp. codominance; environmental parameters distinguishing these two communities have not been fully elucidated, but the type in question definitely has soils higher in organic content to the extent that some plots are developed on peat and lack a mineral horizon altogether.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

- *Tofieldio glutinosae - Caricetum lenticularis* Association (Damm 2001) I
- *Trollio - Parnassietum fimbriatae* Association (Damm 2001) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This community has been documented from throughout the subalpine and alpine of Glacier National Park and is fully expected to occur in Waterton Lakes National Park as there is no shortage of appropriate habitat, however, it has not been confirmed for the Canadian park.

GLOBAL RANGE:

NATIONS: CA, US

STATES/PROVINCES: AB, MT

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes?)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: CD410, CD629, CD422, CD547, CD546, CD732, CD421, CD398, CD424, CD352, CD351, CD575, CD518, CD564, CD426, CD428.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Damm 2001, Western Ecology Working Group n.d.

V.C.2.N.a. Permanently flooded temperate or subpolar hydromorphic-rooted vegetation

***Myriophyllum sibiricum* Permanently Flooded Herbaceous Alliance**

***Myriophyllum sibiricum* Herbaceous Vegetation**

SIBERIAN WATER-MILFOIL HERBACEOUS VEGETATION

IDENTIFIER: CEGL002000

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Hydromorphic-rooted vegetation (V.C.)
Physiognomic Group	Temperate or subpolar hydromorphic-rooted vegetation (V.C.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar hydromorphic-rooted vegetation (V.C.2.N.)
Formation	Permanently flooded temperate or subpolar hydromorphic-rooted vegetation (V.C.2.N.a.)
Alliance	<i>Myriophyllum sibiricum</i> Permanently Flooded Herbaceous Alliance (A.1761)
Alliance (English name)	Siberian Water-milfoil Permanently Flooded Herbaceous Alliance
Association	<i>Myriophyllum sibiricum</i> Herbaceous Vegetation

Association (English name) Siberian Water-milfoil Herbaceous Vegetation

ECOLOGICAL SYSTEM(S): North American Arid West Emergent Marsh (CES300.729)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association has been described from Colorado mountain lakes and ponds, and from the low-elevation Rocky Mountain Front of Alberta in Waterton Lakes National Park. In Colorado it occurs at roughly 2539 m (8300 feet) elevation, while in Alberta it was found from 1280 to 1290 m (4200-4230 feet). This association occurs in small ponds supporting submerged aquatic vegetation, typically less than 200 m². Depths for most ponds are estimated to be from 1-2 m in the deepest portion. The total cover value for *Myriophyllum sibiricum* may be as little as 5%, but more typically it falls in the 40-80% range. Water can be quite saline and the plants heavily encrusted with lime salts. Ponds typically have concentric rings, or zones of vegetation, *Myriophyllum sibiricum* occupying the deepest portion of relatively shallow ponds. Concentric zones include bands of *Schoenoplectus tabernaemontani* (= *Scirpus validus*), *Carex* spp., and *Salix* spp.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This association is known from ponds within a narrow elevation range, 1280 to 1290 m (4200-4230 feet) in Waterton Lakes National Park. These sites are permanently flooded or semipermanently flooded kettle ponds in rolling terrain or depressions in flatter, wide, valley bottom floodplains. These ponds are situated on glacial deposits, typically on moraines (i.e., kettles), but also on fluvial or lacustrine deposits. The water depth within this association varies from 10 to 60 cm, but most stands are flooded to at least 30 cm. Water levels can fluctuate depending on the site and disturbances, such as road construction altering drainage patterns. The substrate is usually a loose, 10- to 15-cm deep clay and silt veneer over a firmer gravel and cobble pond bottom.

GLOBAL ENVIRONMENT: Ponds supporting *Myriophyllum sibiricum* tend to be smaller and shallower (maximum depth of 2 m), than lakes supporting *Stuckenia filiformis*, for example. Generally these are small ponds supporting submerged aquatic vegetation, typically less than 200 m². In Colorado the association occurs at roughly 2539 m (8300 feet) elevation, while in Alberta it was found from 1280 to 1290 m (4200-4230 feet). These sites in Alberta are permanently flooded or semipermanently flooded kettle ponds in rolling terrain or depressions in flatter, wide, valley bottom floodplains. These ponds are situated on glacial deposits, typically on moraines (i.e., kettles), but also on fluvial or lacustrine deposits. The water depth within this association varies from 10 to 60 cm, but most stands are flooded to at least 30 cm. Depths for most ponds are estimated to be from 1-2 m in the deepest portion (Johnson 1941). Hence this type is most typically found in stock ponds and shallow ends of deeper, stagnant pools. Water levels can fluctuate depending on the site and disturbances, such as road construction altering drainage patterns. The substrate is usually a loose, 10- to 15-cm deep clay and silt veneer over a firmer gravel and cobble pond bottom.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: *Myriophyllum sibiricum* usually dominates this aquatic association, having an average cover of 60% and 100% constancy. Overall, the association has low species diversity. *Potamogeton richardsonii*, present in half of the stands with an average cover of 15%, and occasionally *Stuckenia pectinata* (= *Potamogeton pectinatus*) are the only other vascular plant species present. Total herbaceous cover is over 75% in the majority of stands, but can be very low in stands with high cover of algae (e.g., *Chara* species). Nonvascular species have more than trace cover in half of the stands. *Chara* algae are present in 75% of the stands and even occasionally dominates with high cover. Its average cover is 35%. Other nonvasculars (e.g., *Dichelyma uncinatum* and *Volvox* species) are occasionally present, but with no more than 1% cover.

GLOBAL VEGETATION: The foliar cover value for *Myriophyllum sibiricum* may be as little as 5%, but more typically it falls in the 40-80% range. Overall, the association has low species diversity. *Potamogeton richardsonii* was present in half of the stands sampled in Waterton, with an average cover of 15%. *Stuckenia pectinata* (= *Potamogeton pectinatus*) or *Stuckenia filiformis* (= *Potamogeton filiformis*) are the only other vascular plant species reported. Nonvascular species have more than trace cover in many stands. *Chara* algae occasionally dominate with high cover; average cover is 35%. Other nonvasculars (e.g., *Dichelyma uncinatum* and *Volvox* species) are occasionally present, but with no more than 1% cover. The shoreline vegetation consists of emergent wetland species, particularly *Carex utriculata*, *Eleocharis palustris*, *Glyceria grandis*, *Cirsium scariosum* (= *Cirsium tioganum*), *Mentha arvensis*, occasionally *Schoenoplectus tabernaemontani* (= *Scirpus validus*), and the exotics *Phalaris arundinacea* and *Cirsium arvense*. The shoreline emergent wetland stands are dense (approximately 90-100% cover) and often provide cover of approximately 25% for the entire pond. Litter for each pond typically approaches approximately 20-25% and is associated with the dense shoreline growth from shallow water to 0.5 m deep.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Submerged aquatic	Aquatic herb (floating & submergent)	<i>Myriophyllum sibiricum</i> , <i>Potamogeton richardsonii</i>

Global

Stratum

Submerged aquatic

Lifeform

Aquatic herb (floating & submergent)

Species

Myriophyllum sibiricum, *Potamogeton richardsonii*, *Stuckenia filiformis*, *Stuckenia pectinata*

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL: *Myriophyllum sibiricum*, *Stuckenia filiformis*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: GUQ (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS:

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Stuckenia pectinata* - *Myriophyllum (sibiricum, spicatum)* Herbaceous Vegetation (CEGL002003)

GLOBAL RELATED CONCEPTS:

- *Myriophyllum exalbescens* (Bourgeron and Engelking 1994) =
- DRISCOLL FORMATION CODE:V.E.1.b. (Driscoll et al. 1984) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is known from a limited range within Waterton Lakes National Park. It is found in low-elevation kettle ponds and flooded depressions in and near the bison paddock in the north-central portion of the park, as well as in a nearby wetland within the Waterton River valley.

GLOBAL RANGE: This association has been described from Colorado mountain lakes and ponds, and from the Rocky Mountain Front in Alberta. It is likely to be more widespread than reported.

NATIONS: CA, US

STATES/PROVINCES: AB, CO:SU, WY?

USFS ECOREGIONS: M331E:C?, M331H:C?, M331I:C?

FEDERAL LANDS: NPS (Florissant Fossil Beds); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES: If other stands exist within the IPP, further inventory of kettle ponds and flooded depressions will provide data for better characterizing the vegetation and environmental conditions of this association.

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.9048, WATE.9049, WATE.9051, WATE.9053.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: G. Kittel, mod. Western Ecology Group

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Driscoll et al. 1984, Johnson 1936, Johnson 1939, Johnson 1941, Western Ecology Working Group n.d.

***Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance**

***Nuphar lutea* ssp. *polysepala* Herbaceous Vegetation YELLOW POND-LILY HERBACEOUS VEGETATION**

IDENTIFIER: C EGL002001

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Hydromorphic-rooted vegetation (V.C.)
Physiognomic Group	Temperate or subpolar hydromorphic-rooted vegetation (V.C.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar hydromorphic-rooted vegetation (V.C.2.N.)
Formation	Permanently flooded temperate or subpolar hydromorphic-rooted vegetation (V.C.2.N.a.)
Alliance	<i>Nymphaea odorata</i> - <i>Nuphar</i> spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
Alliance (English name)	White Water-lily - Yellow Pond-lily species Permanently Flooded Temperate Herbaceous Alliance
Association	<i>Nuphar lutea</i> ssp. <i>polysepala</i> Herbaceous Vegetation
Association (English name)	Yellow Pond-lily Herbaceous Vegetation

ECOLOGICAL SYSTEM(S):	North American Arid West Emergent Marsh (CES300.729)
	Northern Columbia Plateau Basalt Pothole Ponds (CES304.058)
	Temperate Pacific Freshwater Aquatic Bed (CES200.876)

ELEMENT CONCEPT

GLOBAL SUMMARY: This association is composed of floating aquatic vegetation. It occurs on permanently flooded ponds, lakes, deeper beaver ponds, and glacial kettle lakes, from sea level to 2410 m (7900 feet) in elevation. Soils are usually organic Histosols, on anoxic muck or peat. Water depths range from 40 to 200 cm (1.25-6.5 feet). Stands have been observed where water levels fluctuate seasonally, leaving *Nuphar* high and dry on exposed mudflats, especially in drought years. Stands can completely fill smaller ponds, or occurrences may be only as large as the water depth allows, and are part of a larger mosaic of other freshwater emergent marsh communities. *Nuphar lutea* ssp. *polysepala* (= *Nuphar luteum*; = *Nuphar polysepala*; = *Nuphar polysepalum*) is often the only species present. Cover is continuous, intermittent, or open. Other aquatic and emergent herbs present may include *Menyanthes* spp., *Potamogeton* spp., *Glyceria* spp., *Eleocharis* spp., *Carex* spp., *Equisetum* spp., *Typha* spp., and *Lemna* spp. Many of these associates are in shallower, adjacent water.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Lacustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: At the one plot sampled, *Nuphar lutea* formed a stand in deep water of a permanent pond. The pond was part of a wetland complex in the bottom of a wide stream valley at 1265 m (4147 feet) elevation. The substrate was organic muck.

GLOBAL ENVIRONMENT: This association is composed of floating aquatic vegetation. It occurs on permanently flooded ponds, lakes, deeper beaver ponds, and glacial kettle lakes, from sea level to 3140 m (10,300 feet) elevation. Soils are usually organic Histosols, on anoxic muck or peat. Water is 40 to 200 cm (1.25-6.5 feet) deep, although stands have been observed where water levels fluctuate seasonally, leaving *Nuphar* high and dry on exposed mudflats, especially in drought years. Stands can completely fill smaller ponds, or stands may be only as large as the water depth allows and are part of a larger mosaic of other freshwater emergent marsh communities.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: One plot dominated by *Nuphar lutea* was sampled on Glacier National Park. *Nuphar lutea* had 50% cover in a pond and was the only species recorded. Other aquatic species that might have been present were not sampled. The stand occurred in water deeper than the shoreline zone that was dominated by *Carex aquatilis*, *Juncus mertensianus*, and mesic forbs.

GLOBAL VEGETATION: This aquatic association is characterized by the dominance of *Nuphar lutea* ssp. *polysepala* (= *Nuphar luteum*; = *Nuphar polysepala*; = *Nuphar polysepalum*), which is the often the only species present. Cover is continuous, intermittent, or open. Other aquatic and emergent herbs present may include *Menyanthes* spp., *Potamogeton* spp., *Glyceria* spp., *Eleocharis* spp., *Carex* spp., *Equisetum* spp., *Typha* spp., and *Lemna* spp. Many of these associates are in shallower, adjacent water.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

Stratum

Floating aquatic

Lifeform

Aquatic herb (floating & submergent) *Nuphar lutea* ssp. *polysepala*

Species

Global

Stratum

Floating aquatic

Lifeform

Aquatic herb (floating & submergent) *Nuphar lutea* ssp. *polysepala*

Species

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Nuphar lutea* ssp. *polysepala*

GLOBAL: *Nuphar lutea* ssp. *polysepala*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G5 (1-Feb-1996).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This association is unlikely to be confused with any others in the IPP. However, only one plot from the IPP is known, and if other stands exist, variations in species composition might be observed.

GLOBAL COMMENTS: Dorn (1984) states that *Nuphar lutea* ssp. *variegata* (= *Nuphar variegatum*) occurs in northwestern Montana, while *Nuphar lutea* ssp. *polysepala* (= *Nuphar polysepala*) occurs in the west and south-central parts of the state. Specimens from Glacier National Park were not identified to subspecies. As both subspecies occurs in Montana, Glacier NP stands may represent the transition between western *Nuphar lutea* ssp. *polysepala* and the northerly *Nuphar lutea* ssp. *variegata*.

GLOBAL SIMILAR ASSOCIATIONS:

- *Nuphar lutea* ssp. *advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386)

GLOBAL RELATED CONCEPTS:

- *Nuphar lutea* ssp. *polysepala* Association (Christy 2004) =
- *Nuphar lutea* ssp. *polysepala* Association (Crowe et al. 2004) =
- *Nuphar lutea* ssp. *polysepala* (Bourgeron and Engelking 1994) =
- *Nuphar polysepala* Association (Kovalchik 1993) =
- *Nuphar polysepalum* Community Type (Kunze 1994) =
- DRISCOLL FORMATION CODE:V.E.1.b. (Driscoll et al. 1984) B
- Pond Lily Herbaceous Vegetation (*Nuphar lutea* ssp. *polysepala*) (Christy et al. 1998) =
- Yellow pond-lily series (Sawyer and Keeler-Wolf 1995) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This association is known from only one low-elevation pond located adjacent to Howe Lake, in the Lake McDonald basin of Glacier National Park.

GLOBAL RANGE: This association occurs throughout northern California, from the Central Valley into the Sierra-Nevada, in Oregon, on the western Olympic Peninsula and the northern lowlands of the Puget Trough of Washington, throughout eastern Washington, north into British Columbia, and in the mountains of northwestern Montana, Idaho, northwestern Wyoming, and northern Colorado.

NATIONS: CA, US

STATES/PROVINCES: BC:S5, CA, CO:S3, ID:S4, MT, OR:S5, WA:S4S5

USFS ECOREGIONS: 242A:CC, M331A:CC, M331D:CC, M331H:CC, M331I:CC, M332C:CC, M332E:CC, M333A:CC, M333B:CC, M333D:CC

FEDERAL LANDS: NPS (Crater Lake, Glacier, Rocky Mountain); USFS (Oregon Dunes, Siuslaw, Wallowa-Whitman)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES: Only one plot from the IPP has been sampled. If other stands exist in the IPP, further sampling should occur to better characterize the variations in species composition and environmental conditions for this association.

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.2073.

LOCAL DESCRIPTION AUTHORS: C. Murphy

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group, mod. K.A. Schulz

REFERENCES: Boggs 2000, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Christy 2004, Christy et al. 1998, Crowe et al. 2004, Dorn 1984, Driscoll et al. 1984, Egler 1934, Hansen 1942, IDCDC 2005, Jankovsky-Jones et al. 1999, Jankovsky-Jones et al. 2001, Kagan et al. 2000, Kovalchik 1993, Kovalchik 2001, Kunze 1994, Marr et al. 1980, Murray 2000, Peck 1919, Ramaley and Robbins 1909, Rodwell 1995, Sawyer and Keeler-Wolf 1995, Seyer 1979, Seyer 1981, Shephard 1995, Titus and Christy 1996a, Titus and Christy 1999, Viereck et al. 1992, WNHP unpubl. data, Western Ecology Working Group n.d., Youngblood et al. 1985a

***Stuckenia pectinata* Permanently Flooded Herbaceous Alliance**

***Stuckenia pectinata* - *Myriophyllum (sibiricum, spicatum)* Herbaceous Vegetation SAGO PONDWEED - (SIBERIAN WATER-MILFOIL, EURASIAN WATER-MILFOIL) HERBACEOUS VEGETATION**

SAGO PONDWEED - WATER-MILFOIL SUBMERGED WETLAND

IDENTIFIER: CEG002003

NVC Classification

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Hydromorphic-rooted vegetation (V.C.)
Physiognomic Group	Temperate or subpolar hydromorphic-rooted vegetation (V.C.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar hydromorphic-rooted vegetation (V.C.2.N.)
Formation	Permanently flooded temperate or subpolar hydromorphic-rooted vegetation (V.C.2.N.a.)
Alliance	<i>Stuckenia pectinata</i> Permanently Flooded Herbaceous Alliance (A.1764)
Alliance (English name)	Sago Pondweed Permanently Flooded Herbaceous Alliance
Association	<i>Stuckenia pectinata</i> - <i>Myriophyllum (sibiricum, spicatum)</i> Herbaceous Vegetation
Association (English name)	Sago Pondweed - (Siberian Water-milfoil, Eurasian Water-milfoil) Herbaceous Vegetation
Association (Common name)	Sago Pondweed - Water-milfoil Submerged Wetland

ECOLOGICAL SYSTEM(S): Western Great Plains Open Freshwater Depression Wetland (CES303.675)

ELEMENT CONCEPT

GLOBAL SUMMARY: This sago pondweed - water-milfoil pond community is found in glacial ponds in the northwestern Great Plains of the United States and Canada. These ponds occur at elevations ranging from 1250 to 1525 m (4100-5000 feet). Stands occur in the permanently inundated, deep water zone of glacial ponds in gently rolling, glacial terrain. Water is usually 15-100 cm deep. The type can occur in fresh to brackish water, but is characteristic of mildly brackish water. Underlying parent material is mixed sedimentary (partly calcareous) glacial till or lacustrine deposits. Pond bottoms are composed of clayey mud or mud mixed with gravel and stones. The vegetation is characteristically poor in species, and canopy cover is low to moderate, being occasionally up to 70%. Submerged aquatic macrophytes dominate the vegetation. *Stuckenia pectinata* (= *Potamogeton pectinatus*) is present in all stands sampled; *Myriophyllum spicatum* or *Myriophyllum sibiricum* can be locally dominant and was present in most stands. *Ranunculus aquatilis*, *Utricularia macrorhiza* (= *Utricularia vulgaris*), *Sagittaria cuneata*, and *Potamogeton richardsonii* are occasionally present. *Chara* sp., a calciphile macroalga, is often present.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: *Stuckenia pectinata* (= *Potamogeton pectinatus*) associations are located along flat lakeshores at elevations near 1270 m (4160 feet) within the basin floor. Soils are hydric and derived from lacustrine and fluvial deposits. They consist of unconsolidated clay that is very poorly drained due to permanent flooding. As this association occurs at the edges of shallow lakes, water measuring 20-30 cm deep covers most of the ground surface.

GLOBAL ENVIRONMENT: This community occurs in the permanently inundated, "deep water" zone of glacial ponds or small lakes of the western Great Plains in gently rolling, glacial terrain. Water is usually 15-100 cm deep. The type can occur in fresh to brackish water (270-44,000 ohms/cm), but is characteristic of mildly brackish water (median of 2500 ohms/cm) (Lesica 1989). These ponds occur at elevations ranging from 1250 to 1500 m (4100-5000 feet). Underlying parent material is mixed sedimentary (partly calcareous) glacial till or lacustrine deposits. Pond bottoms are composed of clayey mud or mud mixed with gravel and stones.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This association is a lowland, herbaceous aquatic community that occurs along permanently flooded lakeshores. Overall herbaceous cover is 70% and measures less than 0.5 m in height. The vegetation is dominated almost exclusively by *Stuckenia pectinata* (= *Potamogeton pectinatus*) that ranges in cover from 45-50%. Other high-constancy, conspicuous forbs include *Potamogeton richardsonii* and *Sagittaria cuneata*; each has an average cover of 8%. *Myriophyllum sibiricum* and nonvascular plants *Chara* sp. and *Volvox* sp. are also consistently present with low cover.

GLOBAL VEGETATION: This community is characteristically poor in species. Canopy cover is low to moderate, generally <50%, but up to 70% in some stands. Submerged aquatic macrophytes dominate the vegetation. *Stuckenia pectinata* (= *Potamogeton pectinatus*) was present in all stands sampled and is typically the predominant vascular species; *Myriophyllum spicatum* or *Myriophyllum sibiricum* can be locally dominant and are present in most stands. *Ranunculus aquatilis*, *Utricularia macrorhiza* (= *Utricularia vulgaris*), *Sagittaria cuneata*, and *Potamogeton richardsonii* are occasionally present. *Chara* sp., a calciphile macroalga, is often present (Lesica 1989, 1994, P. Lesica pers. obs.), as well as species of *Volvox*, another macroalga.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Submerged aquatic	Aquatic herb (floating & submergent)	<i>Potamogeton richardsonii</i> , <i>Sagittaria cuneata</i> , <i>Stuckenia pectinata</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Submerged aquatic	Aquatic herb (floating & submergent)	<i>Potamogeton richardsonii</i> , <i>Stuckenia pectinata</i>

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Myriophyllum sibiricum*, *Potamogeton richardsonii*, *Stuckenia pectinata*

GLOBAL: *Myriophyllum sibiricum*, *Stuckenia pectinata*

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3G4 (14-Nov-1997). More than 18 occurrences of this community type have been documented in Montana, ranging from the glacial potholes of the Ovando Valley (west-central portion) to those of Missouri Coteau Subsection (northernmost Montana) and including the area most intensively sampled, the prairie potholes of the Blackfeet Indian Reservation (just east of the Continental Divide) (Lesica 1989); related or identical communities (supporting same dominant species) have been documented from Saskatchewan, North Dakota, and California. This is a common aquatic type of open-water portions of prairie ponds (sloughs in Canadian parlance) with slightly brackish to saline water and a variety of bottom conditions. This habitat is not unique and the dominant (indicator) species for the community type are broadly distributed, so this type can be expected to occur from at least Manitoba and Minnesota westward and south to California. This association was initially rated as rare because investigators had not previously differentiated aquatic assemblages at the community type level.

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: Owing to very limited sampling, the characterization of this community, even for the circumscribed area of the IPP, is considered provisional.

GLOBAL COMMENTS: This type should be reviewed throughout the Great Plains prairie potholes region. There is disagreement over the taxonomy of *Myriophyllum*. Some authorities consider the native North American plants to be *Myriophyllum spicatum* var. *exalbescens*, while others consider them to be a distinct species, *Myriophyllum exalbescens*. Synonymous communities may have

Myriophyllum exalbescens rather than *Myriophyllum spicatum* in the name. The taxonomic authority followed herein (Kartesz 1999) recognizes *Myriophyllum exalbescens* as *Myriophyllum sibiricum*, hence the inclusion of both *Myriophyllum spicatum* and *Myriophyllum sibiricum* as indicators for this association.

Stewart and Kantrud (1972) report that both *Myriophyllum exalbescens* and *Stuckenia pectinata* (= *Potamogeton pectinatus*) are common in slightly or moderately brackish water of potholes in North Dakota. They describe the open-water community of moderately brackish ponds as dominated by *Zannichellia palustris* and *Stuckenia pectinata* with *Myriophyllum spicatum* a secondary species (Stewart and Kantrud 1971). Lesica (1989, 1992) considered communities dominated by *Zannichellia palustris* distinct from those dominated by *Stuckenia pectinata*. Walker and Coupland (1970) report that lightly saline aquatic communities of southern Saskatchewan are dominated by a number of species including *Myriophyllum spicatum*; *Stuckenia pectinata* is of secondary importance. In Saskatchewan as in North Dakota *Myriophyllum spicatum* is dominant while *Stuckenia pectinata* is less abundant, opposite to what was found in Montana. *Myriophyllum spicatum* and *Stuckenia pectinata* are among the characteristic plants of ponds in southern California (Ferren et al. 1996). This community as described in Montana has lower species richness compared to those from other, more humid areas. Montana communities may be depauperate representations of a more widespread aquatic association of slightly to moderately saline water.

Similar communities are associated with glacial ponds in western Montana but were called the *Potamogeton pectinatus* or the *Myriophyllum spicatum* community types (Lesica 1994).

GLOBAL SIMILAR ASSOCIATIONS:

- *Myriophyllum sibiricum* Herbaceous Vegetation (CEGL002000)
- *Potamogeton richardsonii* - *Myriophyllum spicatum* Herbaceous Vegetation (CEGL002006)--occurs in the same area. It has appreciable cover of the broad-leaved macrophyte *Potamogeton richardsonii* and is most abundant in water with a lower ionic content (Lesica 1989).

GLOBAL RELATED CONCEPTS:

- *Potamogeton pectinatus*-*Myriophyllum spicatum* (Bourgeron and Engelking 1994) =
- *Potamogeton pectinatus* community type (Lesica 1994) F
- *Ruppia maritima* - *Potamogeton pectinatus* (Lesica 1989) ?
- DRISCOLL FORMATION CODE: V.E.1.b. (Driscoll et al. 1984) B
- Palustrine (Cowardin et al. 1979) B

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE:

GLOBAL RANGE: This sago pondweed - water-milfoil pond community is found in glacial ponds in the northwestern Great Plains of the United States and Canada, but may range more broadly. This community was recorded for 13 of 84 ponds sampled in Glacier County, Montana. Many hundreds of ponds exist in the same general area.

NATIONS: CA, US

STATES/PROVINCES: AB, CA?, MT:S1, ND:SU, ON?, SD:SU, SK:SU

USFS ECOREGIONS: 331D:CC, M332C:CC

FEDERAL LANDS: PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: WATE.9041, WATE.9046.

LOCAL DESCRIPTION AUTHORS: J. Asebrook

GLOBAL DESCRIPTION AUTHORS: P. Lesica, mod. Western Ecology Group

REFERENCES: Bourgeron and Engelking 1994, Cowardin et al. 1979, Driscoll et al. 1984, Ferren et al. 1996, Kartesz 1999, Lesica 1989, Lesica 1992, Lesica 1993, Lesica 1994, Lesica pers. comm., MTNHP 2002b, MTNHP unpubl. data, NDNHI n.d., Stewart and Kantrud 1971, Stewart and Kantrud 1972, Walker and Coupland 1970, Western Ecology Working Group n.d.

VII. SPARSE VEGETATION

VII.A.1.N.a. Cliffs with sparse vascular vegetation

Saxifraga (chrysantha, mertensiana) Sparsely Vegetated Alliance

Saxifraga mertensiana Cliff Crevice Sparse Vegetation

WOOD SAXIFRAGE CLIFF CREVICE SPARSE VEGETATION

IDENTIFIER: C EGL005903

NVC Classification

Physiognomic Class	Sparse Vegetation (VII)
Physiognomic Subclass	Consolidated rock sparse vegetation (VII.A.)
Physiognomic Group	Sparsely vegetated cliffs (VII.A.1.)
Physiognomic Subgroup	Natural/Semi-natural sparsely vegetated cliffs (VII.A.1.N.)
Formation	Cliffs with sparse vascular vegetation (VII.A.1.N.a.)
Alliance	<i>Saxifraga (chrysantha, mertensiana)</i> Sparsely Vegetated Alliance (A.1632)
Alliance (English name)	(Golden Saxifrage, Wood Saxifrage Sparsely Vegetated Alliance)
Association	<i>Saxifraga mertensiana</i> Cliff Crevice Sparse Vegetation
Association (English name)	Wood Saxifrage Cliff Crevice Sparse Vegetation

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine Bedrock and Scree (CES306.809)

ELEMENT CONCEPT

GLOBAL SUMMARY: This community has been described throughout the alpine zone of Glacier National Park, Montana; it is virtually certain to occur throughout alpine Waterton Lakes National Park, Alberta, because there is abundant habitat. This is a community of a common environment, large and moist crevices occurring in subalpine to more often alpine cliff faces and overhangs. These crevices vary in depth from a few decimeters to more than a meter and exhibit a unique, cool, moist and shaded microclimate. This type was documented from 1600 to 2400 m (5250-7870 feet) on primarily southwest- to west-facing exposures with very steep slopes, ranging from 55% to overhanging cliffs (angle >90 degrees). There is a gradient of decreasing vegetation from openings to deeper within crevices that corresponds to the attenuation of sunlight. At least in their inner reaches these protected sites are at least moist, and some tend to be wet at the time of snowmelt and for long periods thereafter, being supplied with percolating seepage. Plants grow within pockets of trapped fine-textured soil; extensive bryophyte cushions develop which in turn promote the formation of organic-rich soil. Parent materials include primarily red and green argillite and igneous diorite. Three species of *Saxifraga*, *Saxifraga mertensiana*, *Saxifraga cernua*, and *Saxifraga rivularis* (= *Saxifraga debilis*), are strongly associated with this unique habitat and define its extent. *Cryptogramma stelleri* and *Cerastium beerlingianum* are optimally represented in these sites; other forbs present and indicative of these hygric to hydric sites, including *Epilobium anagallidifolium* (= *Epilobium alpinum*), *Saxifraga occidentalis*, and *Deschampsia caespitosa*, are also found in other wet-site vegetation types. Bryophytes are an important component and, though generally attaining high cover in excess of 50%, also have as little as 5% cover; the main taxa, all of which are common in other types of wet sites, are *Philonotis fontana* var. *americana*, *Brachythecium* spp., and *Bryum* spp. Lichens are mostly found on rock surfaces, amounts ranging from nil to 50%.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This is a community of a common environment, large and moist crevices occurring in subalpine to more often alpine cliff faces and overhangs that have not hitherto been vegetationally described. These crevices vary in depth from a few decimeters to more than a meter and exhibit a unique, cool, moist and shaded microclimate. This type was documented from 1600 to 2400 m (5250-7870 feet) on primarily southwest- to west-facing exposures with very steep slopes, ranging from 55% to overhanging cliffs (angle >90 degrees). There is a gradient of decreasing vegetation from openings to deeper within crevices that corresponds to the attenuation of sunlight. At least in their inner reaches these protected sites are at least moist, and some tend to be wet at the time of snowmelt and for long periods thereafter, being supplied with percolating seepage. Plants grow within pockets of trapped fine-textured soil, trapped in the narrow portions of the crack; extensive bryophyte cushions develop which in turn promote the formation of organic-rich soil. Parent materials include primarily red and green argillite and igneous diorite.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Three species of *Saxifraga*, *Saxifraga mertensiana*, *Saxifraga cernua*, and *Saxifraga rivularis* (= *Saxifraga debilis*), are strongly associated with this unique habitat and define its extent. *Cryptogramma stelleri* and *Cerastium beeringianum* are optimally represented in these sites; other forbs present and indicative of these hygric to hydric sites, including *Epilobium anagallidifolium* (= *Epilobium alpinum*), *Saxifraga occidentalis*, and *Deschampsia caespitosa*, are also found in other wet-site vegetation types. Bryophytes are an important component and, though generally attaining high cover in excess of 50%, also have as little as 5% cover; the main taxa, all of which are common in other types of wet sites, are *Philonotis fontana* var. *americana*, *Brachythecium* spp., and *Bryum* spp. Lichens are mostly found on rock surfaces, amounts ranging from nil to 50%.

GLOBAL VEGETATION:**MOST ABUNDANT SPECIES****WATERTON-GLACIER INTERNATIONAL PEACE PARK**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Forb	<i>Cerastium beeringianum</i> , <i>Saxifraga cernua</i> , <i>Saxifraga mertensiana</i> , <i>Saxifraga rivularis</i>
Herb (field)	Graminoid	<i>Poa alpina</i> , <i>Poa secunda</i>
Herb (field)	Fern or fern ally	<i>Cryptogramma stelleri</i> , <i>Cystopteris fragilis</i>
Nonvascular	Moss	<i>Philonotis fontana</i> var. <i>americana</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Cryptogramma stelleri*, *Saxifraga cernua*, *Saxifraga mertensiana*, *Saxifraga rivularis*

GLOBAL:**OTHER NOTEWORTHY SPECIES****WATERTON-GLACIER INTERNATIONAL PEACE PARK:****GLOBAL:****CONSERVATION STATUS RANK**

GLOBAL RANK & REASONS: G2? (22-Jan-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: Choate's (1963) description of this environment for Logan Pass at Glacier National Park was apparently first in the literature, and a comparable environment has been described for Alberta's Front Range (Mortimer 1978), but Damm's (2001) work is clearly definitive and nominal for the type. This is not a rarity confined to IPP but rather has been described in other North American and European alpine zones.

GLOBAL COMMENTS:**GLOBAL SIMILAR ASSOCIATIONS:****GLOBAL RELATED CONCEPTS:**

- *Saxifragetum mertensianae* Association (Damm 2001) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This community has been described throughout the alpine zone of Glacier National Park, based on the work of Damm (2001); it is virtually certain to occur throughout alpine Waterton Lakes National Park because there is abundant habitat.

GLOBAL RANGE:

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S2

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes?)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: CD491, CD492, CD517, CD600, CD524, CD550, CD552.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Choate 1963, Damm 2001, Mortimer 1978, Western Ecology Working Group n.d.

VII.B.1.N.c. High mountain talus/scree

Aquilegia (caerulea, flavescens) Sparsely Vegetated Alliance

Aquilegia flavescens - *Senecio megacephalus* Sparse Vegetation YELLOW COLUMBINE - ROCKY RAGWORT SPARSE VEGETATION

IDENTIFIER: C EGL005899

NVC Classification

Physiognomic Class	Sparse Vegetation (VII)
Physiognomic Subclass	Boulder, gravel, cobble, or talus sparse vegetation (VII.B.)
Physiognomic Group	Sparsely vegetated talus/scree slopes (VII.B.1.)
Physiognomic Subgroup	Natural/Semi-natural sparsely vegetated talus/scree slopes (VII.B.1.N.)
Formation	High mountain talus/scree (VII.B.1.N.c.)
Alliance	<i>Aquilegia (caerulea, flavescens)</i> Sparsely Vegetated Alliance (A.1603)
Alliance (English name)	(Colorado Blue Columbine, Yellow Columbine) Sparsely Vegetated Alliance
Association	<i>Aquilegia flavescens</i> - <i>Senecio megacephalus</i> Sparse Vegetation
Association (English name)	Yellow Columbine - Rocky Ragwort Sparse Vegetation

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine Bedrock and Scree (CES306.809)

ELEMENT CONCEPT

GLOBAL SUMMARY: This community has been documented primarily from subalpine to alpine sites proximal to the Continental Divide in northwestern Montana (Glacier National Park), principally on its western side. This is a tall-forb community typical of steep (45 to 70%) scree slopes having predominantly west- through southeast-facing exposures (the most wind-impacted by prevailing southwesterlies) with northern exposures completely unrepresented. Snowbank formation at the heads of these slopes may persist into August, providing subirrigation to downslope vegetation via meltwater. Vegetation structure with tall mesophytic forbs dominant is testimony to a favorable moisture status. This community occurs mainly where the most extensive scree fields are concentrated, from the upper limits of continuous vegetation at 1890 m (6200 feet) to the rocky summit region above, the highest elevation sample recorded at 2210 m (7250 feet). Though occurring primarily on green argillite, it also occurs on red argillite, sandstone and limestone. Humus accumulation is restricted to vegetation clumps, and there is essentially no profile development due to ongoing soil action (creep and slides) and congeliturbation. Though rock cover is high (60-100%), it can act to promote mesic conditions by the overlapping of shale/argillite slabs to cover finer mineral soil, thus retarding evaporation. Litter cover is highly variable, mostly less than 5%, but occasionally as high as 30%. Structurally this is a very open (mostly less than 20% canopy cover, as high as 65%), tall-forb community with much visible rock and mineral soil surface. Overtopping the lower growing mats of the woody *Penstemon ellipticus* and highly constant *Phacelia hastata* are the considerably taller forbs *Senecio megacephalus*, *Aquilegia flavescens*, *Chamerion angustifolium* (= *Epilobium angustifolium*), and *Symphytotrichum foliaceum* (= *Aster foliaceus*). Other tall forbs less consistently present include *Cirsium hookerianum*, *Potentilla diversifolia*, *Achillea millefolium*, *Arnica X diversifolia*, and *Valeriana sitchensis*. Shorter forbs occurring in somewhat fewer than half the plots include *Epilobium anagallidifolium* (= *Epilobium alpinum*), *Sedum lanceolatum*, *Castilleja miniata*, and *Galium boreale*. *Elymus alaskanus* ssp. *latiglumis* (= *Agropyron latiglume*) is the only characteristic graminoid. Mosses and lichens usually comprise less than 1% canopy cover.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This is a tall-forb community typical of steep (45 to 70%) scree slopes having predominantly west- through southeast-facing exposures (the most wind-impacted by prevailing southwesterlies) with northern exposures completely unrepresented (this lack of northerly aspects may reflect difficulty of sampling these locations, as well as the fact that talus is less well-developed on this exposure). Snowbank formation at the heads of these slopes may persist into August, providing subirrigation to downslope vegetation via meltwater. Vegetation structure with tall mesophytic forbs dominant is testimony to a favorable moisture status. This community occurs mainly in the vicinity of the Continental Divide where the most extensive scree fields are concentrated, from the upper limits of continuous vegetation at 1890 m (6200 feet) to the rocky summit region above, the highest elevation sample recorded at 2210 m (7250 feet). Though occurring primarily on green argillite, it also occurs on red argillite, sandstone and limestone. What little humus accumulation occurs is restricted to vegetation clumps, and there is essentially no profile development due to ongoing soil action (creep and slides) and congeliturbation. Though rock cover is high (60-100%), it can act to promote mesic conditions by the overlapping of shale/argillite slabs to cover finer mineral soil, thus retarding evaporation. Litter cover is highly variable, mostly less than 5% but occasionally as high as 30%.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Structurally this is a very open (mostly less than 20% canopy cover, as high as 65%), tall-forb community with much visible rock and mineral soil surface. Overtopping the lower growing mats of the woody *Penstemon ellipticus* and highly constant *Phacelia hastata* are the considerably taller forbs *Senecio megacephalus*, *Aquilegia flavescens*, *Chamerion angustifolium* (= *Epilobium angustifolium*), and *Symphotrichum foliaceum* (= *Aster foliaceus*). Other tall forbs less consistently present include *Cirsium hookerianum*, *Potentilla diversifolia*, *Achillea millefolium*, *Arnica X diversifolia*, and *Valeriana sitchensis*. Shorter forbs occurring in somewhat fewer than half the plots include *Epilobium anagallidifolium* (= *Epilobium alpinum*), *Sedum lanceolatum*, *Castilleja miniata*, and *Galium boreale*. *Elymus alaskanus ssp. latiglumis* (= *Agropyron latiglume*) is the only characteristic graminoid. Mosses and lichens usually comprise less than 1% canopy cover.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Penstemon ellipticus</i>
Herb (field)	Forb	<i>Aquilegia flavescens</i> , <i>Phacelia hastata</i> , <i>Senecio megacephalus</i>
Herb (field)	Graminoid	<i>Elymus alaskanus ssp. latiglumis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Cirsium hookerianum*, *Elymus alaskanus ssp. latiglumis*, *Penstemon ellipticus*, *Phacelia hastata*, *Senecio megacephalus*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2G3 (21-Jan-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: Damm (2001) has described an *Aquilegia flavescens* - *Senecio megacephali* association from which this type is largely derived; only a few plots with abundant representation of mesic to hygric species were allocated to other herb-dominated types, principally *Valeriana sitchensis* - *Veratrum viride* Herbaceous Vegetation (CEGL001998). There were also a number of plots within Damm's *Phacelia hastata* - *Penstemon ellipticus* basal community that were more appropriately grouped with this association.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Phacelia hastata* - (*Penstemon ellipticus*) Sparse Vegetation (CEGL005901)

GLOBAL RELATED CONCEPTS:

- *Aquilegio flavescens* - *Senecietum megacephali* Association (Damm 2001) =
- *Phacelia hastata* - *Penstemon ellipticus* basal community (Damm 2001) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This community has been documented primarily from subalpine to alpine sites proximal to the Continental Divide, principally on its western side. It has not been documented from Waterton Lakes National Park, however, it is expected to be found when scree slopes are explored within this park.

GLOBAL RANGE:

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S2?

USFS ECOREGIONS:

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes?)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.103, GLAC.2031, CD384, CD385, CD419, CD386, CD169, CD170, CD721, CD716, CD718, CD420, CD418, CD416, CD172, CD429, CD403, CD179, CD178, CD171, CD720, CD417, CD617, CD553, CD326.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Damm 2001, Western Ecology Working Group n.d.

***Athyrium americanum* Sparsely Vegetated Alliance**

***Athyrium americanum* - *Cryptogramma acrostichoides* Sparse Vegetation**

AMERICAN ALPINE LADY FERN - AMERICAN ROCKBRAKE SPARSE VEGETATION

IDENTIFIER: CEGL005900

NVC Classification

Physiognomic Class	Sparse Vegetation (VII)
Physiognomic Subclass	Boulder, gravel, cobble, or talus sparse vegetation (VII.B.)
Physiognomic Group	Sparsely vegetated talus/scree slopes (VII.B.1.)
Physiognomic Subgroup	Natural/Semi-natural sparsely vegetated talus/scree slopes (VII.B.1.N.)
Formation	High mountain talus/scree (VII.B.1.N.c.)
Alliance	<i>Athyrium americanum</i> Sparsely Vegetated Alliance (A.1625)
Alliance (English name)	American Alpine Ladyfern Sparsely Vegetated Alliance
Association	<i>Athyrium americanum</i> - <i>Cryptogramma acrostichoides</i> Sparse Vegetation
Association (English name)	American Alpine Lady Fern - American Rockbrake Sparse Vegetation

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine Bedrock and Scree (CES306.809)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is a high-elevation forb-dominated association found in northwestern Montana, in Glacier National Park. This community, typifying the gaps of subalpine and alpine (inventoried elevations 2000 to 2200 m [6560-7215 feet]) boulderfields, is often obscured by the very size of the boulders, which are much larger than the rock component of other talus communities, ranging from a couple of decimeters to more than 5 meters. The interstices accumulate a fine soil substrate necessary for the establishment of vascular plants. It generally occurs on steep (greater than 55%) slopes with southerly exposures, though it can occur on footslopes with low to moderate slopes. European literature establishes that boulder slopes generate a unique microclimate by impeding and retaining cold air draining downslope within the boulder interstices, where the azonal vegetation typical of colder

climates is found. These microsite gaps are buffered from both drying winds and direct solar radiation, thus plants typical of mesic to hygric sites can predominate. The protection afforded by these sites also promotes late snowmelt making them similar to snowbed sites. Rock cover ranges upward from 75% and litter is generally less than 5%. Fine soil occurs in small pockets comprising less than 5% of the surface. Vascular plant diversity is low, and cover ranges between 5% and 25% across the slope, with many of the sites qualifying as sparse vegetation. The pockets of vegetation are dominated by *Athyrium americanum* and *Cryptogramma acrostichoides*, which together may comprise 75% or more cover in the patch. The only dwarf-shrub present, *Penstemon ellipticus*, is highly constant, linking these sites with other fellfield types. *Carex phaeocephala*, *Juncus parryi*, and *Epilobium anagallidifolium* (= *Epilobium alpinum*) are also highly constant and indicative of the late-persisting snow cover, as are the most abundant bryophytes *Polytrichum piliferum* and *Bryum* spp.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This community, typifying the gaps of subalpine and alpine (inventoried elevations 2000 to 2200 m [6560-7215 feet]) boulderfields, is often obscured by the very size of the boulders, which are much larger than the rock component of other talus communities, ranging from a couple of decimeters to more than 5 meters. The interstices accumulate a fine soil substrate necessary for the establishment of vascular plants. It generally occurs on steep (greater than 55%) slopes with southerly exposures, though it can occur on footslopes with low to moderate slopes. European literature establishes that boulder slopes generate a unique microclimate by impeding and retaining cold air draining downslope within the boulder interstices, where the azonal vegetation typical of colder climates is found. These microsite gaps are buffered from both drying winds and direct solar radiation, thus plants typical of mesic to hygric sites can predominate. The protection afforded by these sites also promotes late snowmelt making them similar to snowbed sites. Rock cover ranges upward from 75% and litter is generally less than 5%. Fine soil occurs in small pockets comprising less than 5% of the surface.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Vascular plant diversity is low and cover ranges between 5% and 25% across the slope, with many of the sites qualifying as sparse vegetation. The pockets of vegetation are dominated by *Athyrium americanum* and *Cryptogramma acrostichoides*, which together may comprise 75% or more cover in the patch. The only dwarf-shrub present, *Penstemon ellipticus*, is highly constant, linking these sites with other fellfield types. *Carex phaeocephala*, *Juncus parryi*, and *Epilobium anagallidifolium* (= *Epilobium alpinum*) are also highly constant and indicative of the late-persisting snow cover, as are the most abundant bryophytes *Polytrichum piliferum* and *Bryum* spp.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Penstemon ellipticus</i>
Herb (field)	Graminoid	<i>Carex phaeocephala</i> , <i>Juncus parryi</i>
Herb (field)	Fern or fern ally	<i>Athyrium americanum</i> , <i>Cryptogramma acrostichoides</i>
Nonvascular	Moss	<i>Polytrichum piliferum</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Athyrium americanum*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2G3 (21-Jan-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: Damm (2001) defined this type for Glacier National Park and remarked on its similarity to the *Ligustico filicini - Athyrium distentifolii* association of Komarkova (1976), which has gone unrecognized by the NVC. All of Damm's plots assigned to this type are a good fit.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

- *Cryptogrammo crispae - Athyrium distentifolii* Association (Damm 2001) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This is a high-elevation forb-dominated association found in the subalpine and alpine of Glacier National Park. It is to be expected to occur in Waterton Lakes National Park as well, once the boulderfield habitats are surveyed.

GLOBAL RANGE: This is a high-elevation forb-dominated association found in northwestern Montana, in Glacier National Park.

NATIONS: CA?, US

STATES/PROVINCES: AB?, MT:S2?

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes?)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: CD556, CD557, CD591, CD592, CD327, CD593, CD331, CD779, CD354.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Damm 2001, Komarkova 1976, Western Ecology Working Group n.d.

***Phacelia hastata* Sparsely Vegetated Alliance**

***Phacelia hastata* - (*Penstemon ellipticus*) Sparse Vegetation**

SILVERLEAF SCORPIONWEED - (ROCKY LEDGE PENSTEMON) SPARSE VEGETATION

IDENTIFIER: CEG005901

NVC Classification

Physiognomic Class	Sparse Vegetation (VII)
Physiognomic Subclass	Boulder, gravel, cobble, or talus sparse vegetation (VII.B.)
Physiognomic Group	Sparsely vegetated talus/scree slopes (VII.B.1.)
Physiognomic Subgroup	Natural/Semi-natural sparsely vegetated talus/scree slopes (VII.B.1.N.)
Formation	High mountain talus/scree (VII.B.1.N.c.)
Alliance	<i>Phacelia hastata</i> Sparsely Vegetated Alliance (A.2634)
Alliance (English name)	Silverleaf Scorpionweed Sparsely Vegetated Alliance
Association	<i>Phacelia hastata</i> - (<i>Penstemon ellipticus</i>) Sparse Vegetation
Association (English name)	Silverleaf Scorpionweed - (Rocky Ledge Penstemon) Sparse Vegetation

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine Bedrock and Scree (CES306.809)

ELEMENT CONCEPT

GLOBAL SUMMARY: This community is found in both Glacier and Waterton Lakes national parks (Montana and Alberta), distributed primarily in the extensive talus slopes that lie in close proximity to the Continental Divide. This subalpine to alpine community occurs from 1800 to 2420 m (5405-7940 feet) on steep to very steep (45 to 78%) talus slopes spanning a range of exposures from east to primarily southwest (facing prevailing winds). The upper portions of these scree areas may receive and retain considerable snow which contributes meltwater to downslope positions. These are active, unstable sites for the most part with loose

surface rocks of agillite, diorite and limestone and obvious areas of slope movement. Rock dominates the surface with more than 95% exposure being common and litter being the other component, never having more than 10% cover. Considerable amounts of fine soil accumulate below the scree cover and, due to this cover, is to some degree protected from evaporation resulting in sites being considerably more mesic than indicated by exposure and surface rock. Many of these sites, perhaps the most typical of scree slopes, are transitional between NVC vegetated and sparsely vegetated categories with vascular plant cover ranging between 1% and 25%. The subshrub *Penstemon ellipticus* may have the greatest cover, up to 25%, or occasionally be absent. *Elymus alaskanus* ssp. *latiglumis* (= *Agropyron latiglume*) is the only graminoid with even modest constancy and occurs with less than 5% cover. The forb component is diverse and heterogeneous with even the nominal species *Phacelia hastata* present in only 80% of the plots. Other forbs evidencing only a modest constancy include *Stellaria americana*, *Minuartia nuttallii* (= *Arenaria nuttallii*), *Arenaria capillaris*, and *Phacelia sericea*. The moss and lichen components are negligible due to the disruption of slope movement.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This subalpine to alpine community occurs from 1800 to 2420 m (5405-7940 feet) on steep to very steep (45 to 78%) talus slopes spanning a range of exposures from east to primarily southwest (facing prevailing winds). The upper portions of these scree areas may receive and retain considerable snow which contributes meltwater to downslope positions. These are active, unstable sites for the most part with loose surface rocks of agillite, diorite and limestone and obvious areas of slope movement. Rock dominates the surface with more than 95% exposure being common and litter being the other component, never having more than 10% cover. Considerable amounts of fine soil accumulate below the scree cover and, due to this cover, is to some degree protected from evaporation resulting in sites being considerably more mesic than indicated by exposure and surface rock.

GLOBAL ENVIRONMENT:

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Many of these sites, perhaps the most typical of scree slopes, are transitional between NVC vegetated and sparsely vegetated categories with vascular plant cover ranging between 1% and 25%. The subshrub *Penstemon ellipticus* may have the greatest cover, up to 25%, or occasionally be absent. *Elymus alaskanus* ssp. *latiglumis* (= *Agropyron latiglume*) is the only graminoid with even modest constancy and occurs with less than 5% cover. The forb component is diverse and heterogeneous with even the nominal species *Phacelia hastata* present in only 80% of the plots. Other forbs evidencing only a modest constancy include *Stellaria americana*, *Minuartia nuttallii* (= *Arenaria nuttallii*), *Arenaria capillaris*, and *Phacelia sericea*. The moss and lichen components are negligible due to the disruption of slope movement.

GLOBAL VEGETATION:

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Penstemon ellipticus</i>
Herb (field)	Forb	<i>Minuartia nuttallii</i> , <i>Phacelia hastata</i> , <i>Phacelia sericea</i> , <i>Stellaria americana</i>
Herb (field)	Graminoid	<i>Elymus alaskanus</i> ssp. <i>latiglumis</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Minuartia nuttallii*, *Penstemon ellipticus*, *Phacelia hastata*, *Phacelia sericea*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G2G3 (22-Jan-2004).

CLASSIFICATION**STATUS:** Standard**CLASSIFICATION CONFIDENCE:** 2 - Moderate

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This community was well documented by C. Damm (2001) as *Phacelia hastata* - *Penstemon ellipticus* basal community and the *Phacelio hastatae* - *Arnenarion nuttallii* Alliance, neither syntaxon had the nominal species 100% constant and both were floristically heterogeneous (and lacking a tall forb component characterizing *Aquilegia flavescens* - *Senecio megacephalus* Sparse Vegetation (CEGL005899)); nor did the two syntaxa seem to differ environmentally (both characterized by steep scree slopes), so they were combined into one vegetation type. The parentheses around *Penstemon ellipticus* indicate that it is inconsistently present but highly indicative when it does occur.

GLOBAL COMMENTS:**GLOBAL SIMILAR ASSOCIATIONS:**

- *Aquilegia flavescens* - *Senecio megacephalus* Sparse Vegetation (CEGL005899)--is distinguished by having a tall-forb component.

GLOBAL RELATED CONCEPTS:

- *Phacelia hastata* - *Penstemon ellipticus* basal community (Damm 2001) =
- *Phacelio hastatae* - *Arnenarion nuttallii* Alliance (Damm 2001) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This community is found in both Glacier and Waterton Lakes National Parks, distributed primarily in the extensive talus slopes that lie in close proximity to the Continental Divide.

GLOBAL RANGE:**NATIONS:** CA, US**STATES/PROVINCES:** AB, MT:S2?**USFS ECOREGIONS:** M332C:CC, M333C:CC**FEDERAL LANDS:** NPS (Glacier); PC (Waterton Lakes)**ELEMENT SOURCES****WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: CD332, CD554, CD555, CD602, CD638, CD775, CD780, CD783, CD618, CD276, CD82, CD305, CD771, CD495, CD643, CD261, CD465, CD281, CD365, CD71, CD388, CD83, CD793, CD797, CD648, CD200, GLAC.2027, WATE.5059.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper**GLOBAL DESCRIPTION AUTHORS:** Western Ecology Group**REFERENCES:** Damm 2001, Western Ecology Working Group n.d.***Saxifraga bronchialis* Sparsely Vegetated Alliance*****Saxifraga bronchialis* Scree Slope Sparse Vegetation****YELLOW-SPOT SAXIFRAGE SCREE SLOPE SPARSE VEGETATION****IDENTIFIER:** CEGL005902**NVC Classification**

Physiognomic Class	Sparse Vegetation (VII)
Physiognomic Subclass	Boulder, gravel, cobble, or talus sparse vegetation (VII.B.)
Physiognomic Group	Sparsely vegetated talus/scree slopes (VII.B.1.)
Physiognomic Subgroup	Natural/Semi-natural sparsely vegetated talus/scree slopes (VII.B.1.N.)
Formation	High mountain talus/scree (VII.B.1.N.c.)
Alliance	<i>Saxifraga bronchialis</i> Sparsely Vegetated Alliance (A.2635)
Alliance (English name)	Yellow-spot Saxifrage Sparsely Vegetated Alliance
Association	<i>Saxifraga bronchialis</i> Scree Slope Sparse Vegetation
Association (English name)	Yellow-spot Saxifrage Scree Slope Sparse Vegetation

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine Bedrock and Scree (CES306.809)**ELEMENT CONCEPT**

GLOBAL SUMMARY: This subalpine to alpine community has been found across the north-south extent of Glacier National Park, Montana, and also is found in Waterton Lakes National Park, Alberta. This small-patch scree community occurs predominantly on steep to very steep (36 to 70%) talus slopes of all aspects; however, less frequently it has been noted on fell-fields of level ridges, reflecting a highly variable degree of substrate stability. Unconsolidated, unvegetated and actively moving scree mantles the slope between the vertically elongated vegetation patches. Disturbance, mass wasting on the steep slopes and congeliturbation on level summits and ridgetops, is the primary driver of structural and floristic composition. This type has been noted between 1500 and 2380 m (4920-7810 feet), occurring on red and green argillites. Exposed rock is mostly greater than 75%, and the rest of the ground surface is comprised of litter (about 10% average cover) and moss/lichen (averaging about 15% cover); mineral soil is present in slightly greater than trace amounts. Soil development is minimal; what little organic and inorganic matter that accumulates does so under the protective mat of *Saxifraga bronchialis*. The indicator species for this community, *Saxifraga bronchialis*, has a highly variable cover, from trace amounts in exceedingly rocky expressions to approaching 20%. It consistently has the greatest cover of any vascular species, establishing in dense mats that act to block the movement of scree, which lodges upslope against the stout cushions. *Dasiphora fruticosa ssp. floribunda* is regularly present as a trace subshrub. Some forbs are broadly distributed (in trace amounts) across the type, including *Sedum lanceolatum*, *Achillea millefolium*, *Cerastium arvense*, *Poa secunda*, and *Eriogonum ovalifolium*. Other herbs appear to be elevationally stratified; those of lower elevations being *Woodsia scopulina*, *Penstemon albertinus*, *Selaginella wallacei*, *Pseudoroegneria spicata*, and *Artemisia michauxiana*, whereas at higher elevations (mostly above 2000 m) are found *Potentilla diversifolia*, *Poa alpina*, *Solidago multiradiata*, *Festuca brachyphylla*, *Penstemon ellipticus*, and *Sibbaldia procumbens*. Lichens and mosses generally comprise less than 10% combined cover, with no species particularly indicative of this environment.

ENVIRONMENTAL DESCRIPTION**USFWS WETLAND SYSTEM:**

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This small-patch scree community occurs predominantly on steep to very steep (36 to 70%) talus slopes of all aspects; however, less frequently it has been noted on fell-fields of level ridges, reflecting a highly variable degree of substrate stability. Unconsolidated, unvegetated and actively moving scree mantles the slope between the vertically elongated vegetation patches. Disturbance, mass wasting on the steep slopes and congeliturbation on level summits and ridgetops, is the primary driver of structural and floristic composition. This type has been noted between 1500 and 2380 m (4920-7810 feet), occurring on red and green argillites. Exposed rock is mostly greater than 75%, and the rest of the ground surface is comprised of litter (about 10% average cover) and moss/lichen (averaging about 15% cover); mineral soil is present in slightly greater than trace amounts. Soil development is minimal; what little organic and inorganic matter that accumulates does so under the protective mat of *Saxifraga bronchialis*.

GLOBAL ENVIRONMENT:**VEGETATION DESCRIPTION**

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: The indicator species for this community, *Saxifraga bronchialis*, has a highly variable cover, from trace amounts in exceedingly rocky expressions to approaching 20%. It consistently has the greatest cover of any vascular species, establishing in dense mats that act to block the movement of scree, which lodges upslope against the stout cushions. *Dasiphora fruticosa ssp. floribunda* is regularly present as a trace subshrub. Some forbs are broadly distributed (in trace amounts) across the type, including *Sedum lanceolatum*, *Achillea millefolium*, *Cerastium arvense*, *Poa secunda*, and *Eriogonum ovalifolium*. Other herbs appear to be elevationally stratified; those of lower elevations being *Woodsia scopulina*, *Penstemon albertinus*, *Selaginella wallacei*, *Pseudoroegneria spicata*, and *Artemisia michauxiana*, whereas at higher elevations (mostly above 2000 m) are found *Potentilla diversifolia*, *Poa alpina*, *Solidago multiradiata*, *Festuca brachyphylla*, *Penstemon ellipticus*, and *Sibbaldia procumbens*. Lichens and mosses generally comprise less than 10% combined cover, with no species particularly indicative of this environment.

GLOBAL VEGETATION:**MOST ABUNDANT SPECIES****WATERTON-GLACIER INTERNATIONAL PEACE PARK**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Dwarf-shrub	<i>Dasiphora fruticosa ssp. floribunda</i>
Herb (field)	Forb	<i>Achillea millefolium</i> , <i>Saxifraga bronchialis</i> , <i>Sedum lanceolatum</i>
Herb (field)	Graminoid	<i>Poa secunda</i> , <i>Pseudoroegneria spicata</i>
Herb (field)	Fern or fern ally	<i>Selaginella wallacei</i> , <i>Woodsia scopulina</i>

Global

Stratum

Lifeform

Species

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: G3? (22-Jan-2004).

CLASSIFICATION

STATUS: Standard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This type was first described by C. Damm (2001) for Glacier National Park; he described the *Saxifraga bronchialis* scree slope community as being compositionally close to *Artemisia - Potentilletum* (of scree) and to fell-field communities of the *Arenario - Fetucetalia* Order, which are found in the vicinity of this talus slope community on more stable substrates. Four plots were identified in his substantiating dataset that appear to belong to other vegetation types as they had both relatively high cover (>25%) and indicator species from other communities that exhibited considerable cover (e.g., *Festuca idahoensis* and *Penstemon ellipticus* having more than 10% cover).

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

- *Dasiphora fruticosa* ssp. *floribunda* / *Artemisia michauxiana* Shrub Herbaceous Vegetation [Provisional] (CEGL005833)

GLOBAL RELATED CONCEPTS:

- *Saxifraga bronchialis* scree slope community (Damm 2001) =

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This community has been found across the north-south extent of Glacier National Park. It also occurs in Waterton Lakes National Park, but was only sampled in one location.

GLOBAL RANGE:

NATIONS: CA, US

STATES/PROVINCES: AB, MT:S2?

USFS ECOREGIONS: M332C:CC, M333C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.257, GLAC.308, GLAC.87, GLAC.2656, CD713, CD236, CD235, CD246, CD481, CD541, CD432, CD735, CD648, WATE.9034.

LOCAL DESCRIPTION AUTHORS: S.V. Cooper

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Damm 2001, Western Ecology Working Group n.d.

XX. HIERARCHY PLACEMENT UNDETERMINED

Gravel Bar Early Successional Vegetation

GRAVEL BAR EARLY SUCCESSIONAL VEGETATION

IDENTIFIER: NOT APPLICABLE

NVC Classification

Physiognomic Class	N/A
Physiognomic Subclass	N/A
Physiognomic Group	N/A
Physiognomic Subgroup	N/A
Formation	N/A
Alliance	N/A
Alliance (English name)	N/A
Association	Gravel Bar Early Successional Vegetation
Association (English name)	

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland (CES306.804)

ELEMENT CONCEPT

GLOBAL SUMMARY: This community has only been identified from Glacier National Park, Montana, or Waterton Lakes National Park, Alberta. It occurs on gravel or cobble floodplains or within active channels of streams and large rivers. These are early successional plant communities found on a variety of erosional and depositional fluvial features, including stream and river terraces, gravel or cobble bars, eroding streambanks, river beds, sloping alluvial deposits adjacent to avalanche chutes, old stream meanders, and in some cases, lake shores. There is little soil formation; the substrate is all sand with rock, cobble, or gravel. Water is probably present during spring floods, but after inundation, sites are rapidly drained. Stands are typically in high disturbance zones. They occur scattered throughout Glacier and Waterton, at almost all elevations; samples ranged from 975 to 1770 m (3198 to 5800 ft). Most sites are flat or gently sloping. Occurrences of these communities are highly variable in cover and species composition, ranging from sparsely vegetated by predominantly herbaceous species, to dense cover by tree sapling and shrubs. The most important tree found with very high constancy as seedlings or saplings is *Populus balsamifera ssp. trichocarpa*; conifers can include *Abies lasiocarpa*, *Pinus contorta*, *Pinus flexilis*, *Pseudotsuga menziesii*, or *Picea engelmannii*. Important shrubs include *Ribes inerme*, *Ribes lacustre*, *Rosa acicularis*, *Rubus idaeus*, *Rubus parviflorus*, *Juniperus communis*, *Dasiphora floribunda*, *Salix exigua*, *Salix drummondiana*, *Salix bebbiana*, *Salix lucida*, *Salix melanopsis*, *Cornus sericea*, *Dryas drummondii*, or *Alnus incana*. Which shrubs or trees are present and their abundance is variable from stand to stand. Herbaceous plants are also variable in abundance and composition; typically individual species have <5% cover, or often are found only in trace amounts. Some of the more commonly present taxa include weedy species such as *Melilotus* spp., *Medicago lupulina*, *Verbascum thapsus*, *Leucanthemum vulgare*, *Taraxacum officinale*, *Solidago* spp., *Cirsium vulgare*, *Fragaria virginiana*, *Tragopogon dubius*, *Agrostis stolonifera*, and *Centaurea* spp. Common graminoids include *Equisetum* spp., *Elymus glaucus*, *Pseudoroegneria spicata*, *Calamagrostis purpurascens*, and *Festuca* spp. Forbs can include *Artemisia campestris*, *Erigeron compositus*, *Agoseris glauca*, *Achillea millefolium*, *Sedum lanceolatum*, *Comandra umbellata*, *Mentha arevensis*, *Symphotrichum laeve*, *Solidago multiradiata*, *Chamerion angustifolium* (= *Epilobium angustifolium*), *Eriogonum umbellatum*, *Lomatium dissectum*, *Packera cana* (= *Senecio canus*), *Crepis elegans*, *Campanula rotundifolia*, *Heterotheca villosa*, *Vicia americana* and *Castilleja* spp. Nonvascular cover is insignificant in most occurrences.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM: Palustrine

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: These are early successional plant communities found on a variety of erosional and depositional fluvial features, including stream and river terraces, gravel or cobble bars, eroding streambanks, river beds, sloping alluvial deposits adjacent to avalanche chutes, old stream meanders, and in some cases, lake shores. Sites include gravel or cobble floodplains or within active channels of streams and large rivers. There is little soil formation; the substrate is all sand with rock, cobble, or gravel. Water is probably present during spring floods, but after inundation, sites are rapidly drained. Stands are typically in high disturbance zones. They occur scattered throughout Glacier and Waterton, at almost all elevations; samples ranged from 975 to 1770 m (3198 to 5800 ft). Most sites are flat or gently sloping.

GLOBAL ENVIRONMENT: This association has only been identified from Glacier National Park, Montana, or Waterton Lakes National Park, Alberta. Until further inventory provides additional information about its distribution elsewhere, there is no global description provided.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: Occurrences of these communities are highly variable, ranging from sparsely vegetated by predominantly herbaceous species, to dense cover by tree sapling and shrubs. The variability is related to time since deposition or scouring of the surface by flooding or erosion. Species composition is also highly variable, although there are some patterns related to elevation, time since disturbance, and adjacency to populations of weedy or invasive species. In addition, taxa found on these gravel or cobble bars are adapted to highly aerated conditions and lack of soil development. The most important tree found with very high constancy as seedlings or saplings is *Populus balsamifera ssp. trichocarpa*; conifers can include *Abies lasiocarpa*, *Pinus contorta*, *Pinus flexilis*, *Pseudotsuga menziesii*, or *Picea engelmannii*. Important shrubs include *Ribes inerme*, *Ribes lacustre*, *Rosa acicularis*, *Rubus idaeus*, *Rubus parviflorus*, *Juniperus communis*, *Dasiphora floribunda*, *Salix exigua*, *Salix drummondiana*, *Salix bebbiana*, *Salix lucida*, *Salix melanopsis*, *Cornus sericea*, *Dryas drummondii*, or *Alnus incana*. Which shrubs or trees are present and their abundance is variable from stand to stand.

Herbaceous plants are also variable in abundance and composition; typically individual species have <5% cover, or often are found only in trace amounts. Some of the more commonly present taxa include weedy species such as *Melilotus spp.*, *Medicago lupulina*, *Verbascum thapsus*, *Leucanthemum vulgare*, *Taraxacum officinale*, *Solidago spp.*, *Cirsium vulgare*, *Fragaria virginiana*, *Tragopogon dubius*, *Agrostis stolonifera*, and *Centaurea spp.* Common graminoids include *Equisetum spp.*, *Elymus glaucus*, *Pseudoroegneria spicata*, *Calamagrostis purpurascens*, and *Festuca spp.* Forbs can include *Artemisia campestris*, *Erigeron compositus*, *Agoseris glauca*, *Achillea millefolium*, *Sedum lanceolatum*, *Comandra umbellata*, *Mentha arevensis*, *Symphytotrichum laeve*, *Solidago multiradiata*, *Chamerion angustifolium (= Epilobium angustifolium)*, *Eriogonum umbellatum*, *Lomatium dissectum*, *Packera cana (= Senecio canus)*, *Crepis elegans*, *Campanula rotundifolia*, *Heterotheca villosa*, *Vicia americana* and *Castilleja spp.*

GLOBAL VEGETATION: This association has only been identified from Glacier National Park, Montana, or Waterton Lakes National Park, Alberta. Until further inventory provides additional information about its distribution elsewhere, there is no global description provided.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Populus balsamifera ssp. trichocarpa</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Populus balsamifera ssp. trichocarpa</i> , <i>Salix exigua</i> , <i>S. melanopsis</i> , <i>Cornus sericea</i> , <i>Salix lucida</i>
Short shrub/sapling	Needle-leaved evergreen sapling	<i>Abies lasiocarpa</i> , <i>Pinus contorta</i> , <i>Pinus flexilis</i> , <i>Pseudotsuga menziesii</i> , <i>Picea engelmannii</i>
Herb (field)	Dwarf-shrub	<i>Dryas drummondii</i>
Herb (field)	Forb	<i>Melilotus spp.</i> , <i>Medicago lupulina</i> , <i>Verbascum thapsus</i> , <i>Leucanthemum vulgare</i> , <i>Taraxacum officinale</i> , <i>Solidago spp.</i> , <i>Cirsium vulgare</i> , <i>Fragaria virginiana</i> , <i>Tragopogon dubius</i> , <i>Agrostis stolonifera</i> , and <i>Centaurea spp.</i>

Global Stratum

Lifeform

Species

CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Populus balsamifera ssp. trichocarpa*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: Invasives: *Melilotus spp.*, *Medicago lupulina*, *Verbascum thapsus*, *Leucanthemum vulgare*, *Taraxacum officinale*, *Cirsium vulgare*, *Centaurea spp.*, *Tragopogon dubius*, *Agrostis stolonifera*, *Poa palustris*, *Poa compressa* and *Bromus inermis*.

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: GNR (28-Apr-2004).

CLASSIFICATION

STATUS: NonStandard

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: This is not an NVC plant association, but rather is a collection of floristically somewhat similar plant communities found on recently-created fluvial/alluvial surfaces. With further study, they could be classified into 2 or more associations.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: Occurs throughout both Parks at elevations up into the subalpine, wherever fluvial/alluvial processes result in depositional features along stream or river courses.

GLOBAL RANGE: This association has only been identified from Glacier National Park, Montana, or Waterton Lakes National Park, Alberta. No additional information about its distribution is available until further inventory is conducted.

NATIONS: US, CA

STATES/PROVINCES: MT, AB

USFS ECOREGIONS: M332C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES: Only 2 vegetation plots were found during the inventory phase, however many locations were sampled by the accuracy assessment phase.

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC.120, GLAC.68, AAGL.1195, AAGL.1201, AAGL.1210, AAGL.438, AAGL.442, AAGL.443, AAGL.614, AAGL.B128, AAGL.B22, AAGL.B224, AAGL.B28, AAGL.B280, AAGL.B343, AAGL.B361, AAGL.B367, AAGL.C1, AAGL.C133, AAGL.C147, AAGL.C175, AAGL.C86, AAGL.C95, AAGL.D1011, AAGL.D1130, AAGL.D1340, AAGL.D470, AAGL.D804, AAGL.D850, AAGL.D872, AAGL.D882, AAGL.D894, AAWA.117, AAWA.170, AAWA.179, AAWA.188, AAWA.19, AAWA.316, AAWA.46.

LOCAL DESCRIPTION AUTHORS: M. Reid

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Western Ecology Working Group n.d.

Penstemon ellipticus Dwarf-Shrubland ROCKY LEDGE PENSTEMON DWARF-SHRUBLAND

IDENTIFIER: NOT APPLICABLE

NVC Classification

Physiognomic Class	N/A
Physiognomic Subclass	N/A
Physiognomic Group	N/A
Physiognomic Subgroup	N/A
Formation	N/A
Alliance	N/A
Alliance (English name)	N/A
Association	<i>Penstemon ellipticus</i> Dwarf-Shrubland
Association (English name)	Rocky Ledge Penstemon Dwarf-Shrubland

ECOLOGICAL SYSTEM(S): Rocky Mountain Alpine Bedrock and Scree (CES306.809)

ELEMENT CONCEPT

GLOBAL SUMMARY: This is a very tentatively classified dwarf-shrubland community documented in Glacier National Park, Montana. This low, open shrubland occurs on steep slopes on shallow sandy loam soils along fissures in bedrock outcrops. It was sampled between 1952 and 2391 m (6400-7840 feet) in elevation. Large rock outcrops can have bands of vegetation running across

the slope. These are "benches" or shelves in the rock where soil and moisture accumulate. There can be abundant moss growing over the bedrock. In many cases the appearance of the vegetation consists of a band of dwarf-subshrubs, <0.5 m tall, running along a fissure in a rock outcrop. The total shrub cover is highly variable, ranging from 5% to over 40%, and consists primarily of *Penstemon ellipticus*. *Abies lasiocarpa* saplings (slightly taller, 2-5 m) can be present as well with 3% cover. Other occasional shrubs include *Ribes lacustre*, *Salix arctica*, *Salix nivalis*, *Juniperus communis*, *Vaccinium membranaceum*, and *Dasiphora floribunda*, with very low cover. A scattering of graminoids and forbs occur with a total of less than 10% cover and include *Carex raynoldsii*, *Poa alpina*, *Festuca brachyphylla*, *Juncus drummondii*, *Agrostis humilis* (= *Agrostis thurberiana*), *Danthonia intermedia*, *Vahlodea atropurpurea*, *Erigeron peregrinus*, *Saxifraga spp.*, *Arnica cordifolia*, *Erythronium grandiflorum*, *Hypericum scouleri*, *Saxifraga ferruginea*, and *Sedum lanceolatum*.

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM:

WATERTON-GLACIER INTERNATIONAL PEACE PARK ENVIRONMENT: This low, open shrubland occurs on steep slopes on shallow sandy loam soils along fissures in bedrock outcrops. It was sampled between 1952 and 2391 m (6400-7840 feet) in elevation. Large rock outcrops can have bands of vegetation running across the slope. These are "benches" or shelves in the rock where soil and moisture accumulate. There can be abundant moss growing over the bedrock.

GLOBAL ENVIRONMENT: This association has only been identified from Glacier National Park, Montana, or Waterton Lakes National Park, Alberta. Until further inventory provides additional information about its distribution elsewhere, there is no global description provided.

VEGETATION DESCRIPTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK VEGETATION: This proposed association is somewhat variable in total cover and species composition, inline with it's occurrence in rock outcrops or fissures of bedrock at high elevations. The appearance is often of a band of dwarf-shrubs, <0.5 m tall, running along a fissure in a rock outcrop. The total shrub cover is variable, ranging from <5% to over 40%, and consists primarily of *Penstemon ellipticus*. *Abies lasiocarpa* saplings (slightly taller, 2-5 m) can be present. Other occasional shrubs include *Ribes lacustre*, *Salix arctica*, *Salix nivalis*, *Juniperus communis*, *Vaccinium membranaceum*, and *Dasiphora floribunda*, with very low cover. A scattering of graminoids and forbs occur with a total of less than 10% cover and include *Carex raynoldsii*, *Poa alpina*, *Festuca brachyphylla*, *Juncus drummondii*, *Agrostis humilis* (= *Agrostis thurberiana*), *Danthonia intermedia*, *Vahlodea atropurpurea*, *Erigeron peregrinus*, *Saxifraga spp.*, *Arnica cordifolia*, *Erythronium grandiflorum*, *Hypericum scouleri*, *Saxifraga ferruginea*, and *Sedum lanceolatum*.

GLOBAL VEGETATION: This association has only been identified from Glacier National Park, Montana, or Waterton Lakes National Park, Alberta. Until further inventory provides additional information about its distribution elsewhere, there is no global description provided.

MOST ABUNDANT SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Subshrub	<i>Penstemon ellipticus</i>

Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
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CHARACTERISTIC SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK: *Penstemon ellipticus*

GLOBAL:

OTHER NOTEWORTHY SPECIES

WATERTON-GLACIER INTERNATIONAL PEACE PARK:

GLOBAL:

CONSERVATION STATUS RANK

GLOBAL RANK & REASONS: . GNR.

CLASSIFICATION

STATUS: Proposed

CLASSIFICATION CONFIDENCE: 3 - Weak

WATERTON-GLACIER INTERNATIONAL PEACE PARK COMMENTS: The single plot sampled was initially called *Penstemon fruticosus* Dwarf-shrubland, and the dominant species in the plot was keyed as *Penstemon fruticosus*. Lesica's (2002) flora of Glacier National Park states that *Penstemon ellipticus* can often be misidentified as *Penstemon fruticosus*. Communications with T. Carolin (pers. comm. 2004) suggest that it is unlikely that *Penstemon fruticosus* occurs in Glacier National Park at all, and that this single plot is probably dominated by *Penstemon ellipticus*. This suggests that a number of other plots with *Penstemon fruticosus* in their species lists as a component are also incorrect as to this taxon, and should be corrected in the plots database. Several additional stands were located during accuracy assessment of the vegetation map, suggesting that this plant community may be more common in the IPP than initially thought.

GLOBAL COMMENTS:

GLOBAL SIMILAR ASSOCIATIONS:

GLOBAL RELATED CONCEPTS:

ELEMENT DISTRIBUTION

WATERTON-GLACIER INTERNATIONAL PEACE PARK RANGE: This community was sampled in the vicinity of Granite Park Chalet, Two Medicine Pass, and near the Garden Wall in Glacier National Park. It is likely to be found in small patches elsewhere in the International Peace Park.

GLOBAL RANGE: This association has only been identified from Glacier National Park, Montana, or Waterton Lakes National Park, Alberta. No additional information about its distribution is available until further inventory is conducted.

NATIONS: US, CA?

STATES/PROVINCES: MT:S2S3, AB?

USFS ECOREGIONS: M333C:CC, M332C:CC

FEDERAL LANDS: NPS (Glacier); PC (Waterton Lakes?)

ELEMENT SOURCES

WATERTON-GLACIER INTERNATIONAL PEACE PARK INVENTORY NOTES:

WATERTON-GLACIER INTERNATIONAL PEACE PARK PLOTS: GLAC. 2019, AAGL.487, AAGL.B158, AAGL.B243, AAGL.C148, AAGL.C29.

LOCAL DESCRIPTION AUTHORS: G. KITTEL

GLOBAL DESCRIPTION AUTHORS: Western Ecology Group

REFERENCES: Western Ecology Working Group n.d.

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Information In Vegetation Descriptions

Below we provide information about the data that are included in each description of the plant associations found in the International Peace Park Final Vegetation Classification. The information herein is kept fairly general.

GLOBAL NAME

Association name based on scientific names of dominant or characteristic plant species following standardized taxonomy and nomenclature of Kartesz (1999). The association (or plant association) is the finest level of the classification system. It is the level at which community inventory and conservation actions are aimed.

COMMON NAME

Association common name; same as the Global Name, but with common names instead of scientific names for the species, using standardized plant common names adapted from Kartesz (1999).

IDENTIFIER

A unique code for the Association from NatureServe's community database by which the Association may be more easily identified.

PHYSIOGNOMIC CLASS

The first level of the National Vegetation Classification System which is a vegetation structural classification adapted from UNESCO (1973) and Driscoll et al. (1984). This level is based on the structure of the vegetation. This is determined by the height and relative percentage of cover of the dominant lifeforms: tree, shrub, dwarf-shrub, herbaceous and nonvascular.

PHYSIOGNOMIC SUBCLASS

The second level of the National Vegetation Classification System. This level is determined by the predominant leaf phenology of classes defined by a tree, shrub or dwarf-shrub stratum, the persistence and growth form of herbaceous and nonvascular vegetation, and particle size of the substrate for sparse vegetation (e.g., consolidated rocks, gravel/cobble).

PHYSIOGNOMIC GROUP

The third level of the National Vegetation Classification System. This level generally represents a grouping of vegetation units based on leaf characters, such as broad-leaved, needle-leaved, microphyllous, and xeromorphic. These units are identified and named with broadly defined macroclimatic types to provide a structural-geographic orientation, but the ecological climate terms do not define the groups *per se*.

PHYSIOGNOMIC SUBGROUP

The fourth level of the National Vegetation Classification System represents a distinction between natural vegetation, including natural, semi-natural and some modified vegetation, and cultural vegetation (planted/cultivated).

FORMATION

The fifth level of the National Vegetation Classification System represents a grouping of community types that share a definite physiognomy or structure and broadly defined environmental factors, such as elevation and hydrologic regime.

ALLIANCE

The sixth level of the National Vegetation Classification System reflecting a physiognomically uniform group of plant associations sharing one or more diagnostic species (dominant, differential, indicator, or characteristic), which (generally) are found in the uppermost stratum of the vegetation.

ALLIANCE (English name)

A translation of the Alliance name using standardized plant common names adapted from Kartesz (1999).

ASSOCIATION

Association name based on scientific names of dominant or characteristic plant species following standardized taxonomy and nomenclature of Kartesz (1999). The association (or plant association) is the finest level of the classification system. It is the level at which community inventory and conservation action are aimed.

ASSOCIATION (English name)

A translation of the Association name using standardized plant common names adapted from Kartesz (1999).

ECOLOGICAL SYSTEMS (Name and Identifier)

Ecological system(s) to which the Association has been attributed. Ecological systems are a standard ecological classification unit in NatureServe's N classification standard. They represent recurring groups of biological communities that are found in similar physical environments and are influenced by similar dynamic ecological processes, such as fire or flooding. They are intended to provide a classification unit that is readily mappable, often from remote imagery, and readily identifiable by conservation and resource managers in the field.

ELEMENT CONCEPT

GLOBAL SUMMARY

A brief description of the range, physiognomic structure, floristic composition, environmental setting and dynamics of the Association.

ENVIRONMENTAL DESCRIPTION

ENVIRONMENTAL DESCRIPTION

USFWS WETLAND SYSTEM

The USFWS Wetland system is listed if the association occurs in a wetland alliance. Values include Palustrine, Lacustrine, Riverine, Estuarine and Tidal.

Waterton-Glacier International Peace Park Environment

Important environmental determinants of the biological composition or structure of this association within the park (if known).

Global Environment

Most important environmental determinants of the biological composition or structure of this association and/or its subtypes.

VEGETATION DESCRIPTION

VEGETATION DESCRIPTION

Waterton-Glacier International Peace Park Vegetation

Vegetation description for the association, if different from global concept.

Global Vegetation

Additional comments on vegetation attributes of the Association including species richness, diversity, physiognomic structure, spatial distribution of vegetation, strata height, dominant lifeforms, coverage of unvegetated substrate, and additional compositional comments.

MOST ABUNDANT SPECIES

Waterton-Glacier International Peace Park

Stratum

Lifeform

Species

Most abundant species by stratum and lifeform. Species that were present on at least 50 percent of the plots, and had relatively high cover when present.

Global

Stratum

Lifeform

Species

Most abundant species by stratum and lifeform. Species that were present on at least 50 percent of the plots, and had relatively high cover when present.

CHARACTERISTIC SPECIES

Waterton-Glacier International Peace Park

Characteristic species for the Association, as it occurs in the Park, must be in at least 80 percent of the plots

Global

Scientific names of plant species not necessarily most abundant, but which are characteristic or diagnostic of the Association when taken singly or in combination with other species.

OTHER NOTEWORTHY SPECIES

Waterton-Glacier International Peace Park

High-ranked species, animals, endemics, disjuncts, or exotics that are found within occurrences of this Association.

Global

High-ranked species, animals, endemics, disjuncts, or exotics that are found within occurrences of this Association.

CONSERVATION STATUS RANK

GLOBAL RANK

The Heritage Conservation Status Global Rank which best characterizes the relative rarity or endangerment of the Association worldwide.

Values for Global Rank:

- G1** = Critically imperiled globally = Generally 5 or fewer occurrences and/or very few remaining acres or very vulnerable to elimination throughout its range due to other factor(s)
- G2** = Imperiled globally = Generally 6-20 occurrences and/or few remaining acres or very vulnerable to elimination throughout its range due to other factor(s)
- G3** = Rare or uncommon = Generally 21-100 occurrences; either very rare and local throughout its range or found locally, even abundantly, within a restricted range or vulnerable to elimination throughout its range due to specific factor(s)
- G4** = Widespread, abundant, and apparently secure, but with cause for long-term concern = Uncommon but not rare (although it may be quite rare in parts of its range, especially at the periphery); apparently not vulnerable in most of its range
- G5** = Demonstrably widespread, abundant and secure = Common, widespread, and abundant (although it may be quite rare in parts of its range, especially at the periphery); not vulnerable in most of its range
- G#G#** = Numeric range rank (range no greater than 2) = Greater uncertainty about a rank is expressed by indicating the full range of ranks which may be appropriate; for example, a G1G3 rank indicates the rank could be G1, G2, or G3
- GNR** = Not yet ranked = Status has not yet been assessed
- GNA** = Rank not applicable

GH = Historical = Presumed eliminated throughout its range, with no or virtually no likelihood that it will be rediscovered, but with potential for restoration (e.g., *Castanea dentata* Forest)

GX = Extirpated = Eliminated throughout its range, with no restoration potential due to extinction of dominant or characteristic species

GU = Unrankable = Status cannot be determined at this time

Qualifiers:

? = Inexact numeric rank = A question mark added to a rank expresses an uncertainty about the rank in the range of 1 in either way on the 1-5 scale; for example, a G2? rank indicates that the rank is thought to be G2, but could be G1 or G3 (Note: G1? and G5? are both valid ranks)

Q = Questionable taxonomy = A "Q" added to a rank denotes questionable taxonomy; it modifies the degree of imperilment and is only used in cases where the type would have a less imperiled rank if it were not recognized as a valid type (i.e., if it were combined with a more common type); a GUQ rank often indicates that the type is unrankable because of daunting taxonomic questions

For non-natural types, a Global Rank of GNA = Rank not applicable is assigned One of the following indicates why the Association is not ranked:

Cultural - indicates that the Association is cultivated. Planted/cultivated areas are defined as being dominated by vegetation that has been planted in its current location by humans and/or is treated with annual tillage, a modified conservation tillage, or other intensive management or manipulation.

Ruderal - indicates that the Association is considered ruderal. Ruderal communities are vegetation resulting from succession following anthropogenic disturbance of an area. They are generally characterized by unnatural combinations of species (primarily native species, though they often contain slight to substantial numbers and amounts of species alien to the region as well).

Modified/Managed - indicates that the Association is modified or managed. Modified/managed communities are vegetation resulting from the management or modification of natural/near-natural vegetation, but producing a structural and floristic combination not clearly known to have a natural analogue.

Invasive - indicates that the Association is weedy and invasive. Invasive communities are dominated by invasive, often alien species. These communities are spontaneous, self-perpetuating, and not the (immediate) result of planting, cultivation, or human maintenance. Land occupied by invasive communities is generally permanently altered (converted) unless restoration efforts are undertaken.

GLOBAL REASONS

Reason for assigning the Global Rank, such as number of occurrences, number of hectares, total area reduction from original, threats, degradation, etc.

CLASSIFICATION

STATUS

The status of the Association in relation to NatureServe's standard International Vegetation Classification.

Values for Status:

Standard – the Association has been formally recognized, described, and accepted by NatureServe Central Ecology as a standard Association.

Provisional – the Association is a candidate for acceptance into the standard classification, but has not yet been comprehensively reviewed by Central Ecology.

CLASSIFICATION CONFIDENCE

The degree of confidence associated with the classification of the Association. This confidence is based on the quality and type of data used in the analysis as well as the extent to which the entire (or potential) range of the Association was considered.

Values for Classification Confidence:

1 STRONG

Classification is based on recent field data. Information is based on Element Occurrences or other data based on occurrences that can be relocated. Classification considers information collected across the entire range or potential range of the Association. Classification may be based on quantitative or qualitative data.

2 MODERATE

Classification is based on data that is of questionable quality, limited numbers of sample points, or data from a limited range.

3 WEAK

Classification is based on secondary or anecdotal information. Or a new type for which data have only been collected at a very small number of sites.

COMMENTS

Waterton-Glacier International Peace Park

Any other comments about this Association specific to the park, including notes about possible problems in photointerpretation.

Global

Any other comments about this Association not covered in the fields above such as landscape relationships, inclusion communities, etc.

GLOBAL SIMILAR ASSOCIATIONS

A list of other Associations that may be similar to the community being described along with their unique identifiers and any comments pertaining to their similarities.

GLOBAL RELATED CONCEPTS

Names used by agencies or other published or unpublished classification systems to describe community types that may be related to this Association. These might include other local or regional vegetation classifications. Also provided is the citation for the reference which contains the related concept as well as an indication of what the relationship of the related concept is to the Association being described.

Values for Relationship:

B – Broader: the concept of the Other Community is broader than the Association concept

F – Finer: the concept of the Other Community is finer (more narrow) than the Association concept

I – Intersects: the concepts of the Other Community and the Association overlap (i.e., neither fully includes the other) and are related in a way that is more complex than a simple “broader/finer” relationship

= - Equivalent: concept designated in Other Community Name is equivalent to the Association concept

? – Unknown: the relationship of the Other Community to the Association has not been determined

OTHER COMMENTS

OTHER COMMENTS

Any other general comments regarding the Association's occurrence on the park.

ELEMENT DISTRIBUTION

RANGE

Waterton-Glacier International Peace Park

Description of where the Association is found in the park (if known).

Global

Description of the Association's present range, including states of occurrence.

NATIONS

Nations of occurrence of the Association.

STATES/PROVINCES

U.S. states and Canadian provinces of occurrence of the Association.

SUBNATIONAL CONSERVATION STATUS RANK

The Heritage Conservation Status Subnational Rank which best characterizes the relative rarity or endangerment of the Association within the subnational jurisdiction.

Values for Subnational Rank:

See Values for Global Status Ranks above.

USFS ECOREGIONS

The USFS ecoregions of occurrence of the Association, along with the level of confidence of its occurrence. These designations follow Keys et al. (1995) for areas east of the dry line and Bailey et al. (1994) west of the dry line.

Values for Occurrence Status:

C: Confident or certain

P: Predicted or probable

?: Possible

X: Presumed extirpated

FEDERAL LANDS

The Federal lands of occurrence of the Association, grouped by Federal agency.

ELEMENT SOURCES

INVENTORY NOTES

Comments regarding the sampling of the Association on the park.

PLOTS DEFINING THIS TYPE

A list of codes of sampled plots used to define and describe the Association on the park.

LOCAL DESCRIPTION AUTHORS

Names of persons primarily responsible for the local description information.

GLOBAL DESCRIPTION AUTHORS

Names of persons primarily responsible for the global description information.

REFERENCES

Sources of information used to define or describe the Association. Short citations are provided in this field; see full bibliography for complete citation for each reference.

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USGS-NPS Vegetation Mapping Program Waterton-Glacier International Peace Park

AUGUST 2007

Appendix H

Field Keys to Plant Associations of Waterton-Glacier International Peace Park

Field Keys to Plant Associations of Glacier-Waterton Lakes International Peace Park

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Use of the Vegetation Key

The following section offers some instructions, useful hints, and caveats for using the vegetation key to arrive at a vegetation type (plant association). In the past, at least in Montana on lands under the U.S. National Forest Service (NPS) and Bureau of Land Management, the focus on vegetation inventory has been on potential, as reflected by “habitat type” classifications (Pfister et al. 1977, Mueggler and Stewart 1980); the NPS also tended to follow this approach in Glacier National Park because there was not a convenient alternative. In Waterton Lakes National Park, Canada, a recently published report (Achuff et al. 2001) was oriented towards categorizing existing vegetation but was based on limited sampling and a number of types of vegetation were inadequately represented. The vegetation key presented here is intended to be used for categorizing existing vegetation, not potential vegetation, though in some instances they could be one and the same. Some of the language below is addressed to specific user groups but the key is intended for general use, enabling interested parties to identify particular types of vegetation and place them in an ecological context in regard to environment, composition and community succession.

In the keys, where the couplet leads to an association, we provide the name of the plant association and a code comprised of the 6-character acronyms of the species, to record on the field form for that association. In some cases, a simple note follows the code; NO PLOTS means we postulate the association occurs in the study area, but we have no data to substantiate its occurrence, and **hence no description is provided**. Descriptions for plant associations are provided in a separate appendix to this report; Appendix G: Descriptions to Plant Associations of Waterton-Glacier IPP. Waterton-Glacier IPP-specific descriptions have been generated for all P.As., but be aware they are based on highly variable numbers of plots per type (see “ELEMENT SOURCES” section of each description in Appendix G to determine the number of plots upon which a local description is based).

Instructions:

- 1) Seek and select a sampling site (representative of stand) that is homogeneous in environment, vegetation and history of use (so far as you are able to infer it from on-ground inspection). The size of a homogeneous stand may vary highly, from hundreds of acres of even-age post-fire successional *Pinus contorta* on gently undulating benchlands to alpine communities that may be on the order of a few square meters (or less in the case of highly specialized habitats, such as cliff face crevices). Be particularly cognizant that environmental gradients can be particularly steep in riparian zones, where different rock types adjoin, and at footslope or toeslope positions in mountainous terrain; steep gradients may dictate the use of an appropriately configured/sized sampling plot.
- 2) A list of the species used in the key has been provided (Appendix A; become familiar with the taxa. Accurately identify and estimate canopy cover for all indicator species used in the key. The canopy cover concept employed is that of Daubenmire (1959); a vertical projection about the outermost perimeter of a plant’s canopy expressed as a fraction of the area being sampled.

In the past (see keys referred to above), and perhaps inadvertently in these keys and vegetation descriptions, the following terms have been used when referring to species canopy cover (c.c.) classes. In the present keys, we have attempted to cite actual canopy cover values rather than classes.

Present: trace to 100% c.c.; contrasted with **Absent:** 0% c.c.

Common: Having 1% or more c.c.; contrasted with **Scarce:** having less than 1% c.c.

Well Represented: Species having at least 5% c.c.; contrasted with **Poorly Represented:** less than 5%

Abundant: Species having 25% or greater c.c.; versus **Not Abundant:** species with less than 25% c.c.

- 3) Where the vegetation is depauperate (unusually sparse) due to intensive grazing (quite possibly due to wildlife and trespass cattle), browsing, or a closed canopy stage of forest succession adjust

the key downward to reflect the reduced canopy cover (e.g., “well represented” would become “common” or 5% might be reduced to some lesser percentage).

- 4) Gravel bars (fluvio-lacustrine geomorphic surfaces) are particularly difficult to classify because the plants colonizing them after scouring tend to be very heterogeneous, and can succeed rapidly in the absence of further disturbance. Some of these were sampled during the vegetation plot collection phase of the mapping effort; mostly they were dominated by herbaceous species and were generally sparse in cover. The accuracy assessment phase of the project sampled many more of these, and a significant number of them were densely vegetated with woody species, including cottonwood, aspen, or willow species. In the key, if these “gravel bars” can be keyed floristically to one of the tree- or shrub-dominated associations, this would be the correct way to key them. However, if their floristics do not successfully key to one of the associations, then read the “Gravel Bar Early Successional Vegetation” description in Appendix G to determine if the site fits the characteristics of one of these fluvio-lacustrine surfaces.
- 5) In past versions of the key, if severely disturbed or early seral conditions were encountered, extrapolation from the nearest undisturbed stand with similar (preferably identical) site conditions was recommended. The key now has classes that address many seral conditions, however. Early seral conditions following an intensive burn still may not be adequately represented. The first season following a fall fire may result in sparse vegetation (< 10% vascular plant cover) and the second season following may see any one of a number of forbs dominant; the classical case being fireweed (*Chamerion angustifolium*).

Important Note: There has been much debate and hand-wringing about how to treat early seral stands where trees will clearly develop into forests or woodlands. Even though the trees stocking these sites currently may be only the size of shrubs, say no taller than 2 m or sapling-sized, if their cover is sufficient, these sites should be keyed to a forest or woodland plant community type. Cartographers can apply a height modifier to a map class to indicate the structural immaturity of these stands; the local vegetation description will have to account for the fact that though the plots (stands) comprising a particular vegetation type are compositionally similar, they exhibit a considerable range in the height of the dominant strata.

- 6) The keys that follow are dichotomous for the most part: all criteria for one of the two choices of each couplet must be satisfied to obtain a correct determination. Occasionally a lead will have more than two choices, in which case the first description to fit the field observed condition should be selected. **Note:** there are quite a few couplets where one comes to a “dead end,” an “undefined” or “undescribed” vegetation type. For example one may key a stand to the “bottom” of the *Abies lasiocarpa* – *Picea engelmannii*-characterized types with no match to an existing vegetation type (presuming all indicator species have been correctly identified and their cover accurately estimated). At which point this sample could be marked as “No Fit” and with like examples can be accumulated until such time they can be analyzed to see how the classification might be modified (to accommodate the “no fits”) or another vegetation type (plant association) created. **Before a “No Fit” is declared one should, a) be scrupulously certain that an indicator species has not been overlooked or misidentified!, b) run the plot through the key again paying particular attention where slight changes in cover estimation values might result in a categorized plot.** There are multiple reasons for no match being found but, the most compelling one is that not all the landscape has been inventoried and there exist permutations of site and vegetation composition that have not been described and classified. Another reason resides in the construction of the keys with particular leads being written relatively “narrowly” so that a vegetation sample, obviously closely allied to an existing type falls just outside the defined parameters of the type (at least as embodied in the form of the dichotomous key).

- 7) **Comments regarding stand structure and terms used in keying tree-characterized stands:** (the following three paragraphs excerpted with minor editing from “Forest Stand Dynamics” by C. D. Oliver and B. C. Larson, published by John Wiley & Sons, Inc., New York, 520 pp.) Crowns of trees in pure, single-cohort stands usually occur in a single horizontal layer, although the crowns of the more vigorous specimens can extend higher in the layer and the foliage of suppressed trees occurs lower in the layer (viz. an even-aged stand of *Pinus contorta* with varying live crown ratios). Mixed-species stands may exhibit a contrasting structure with several distinct layers of tree crowns (viz. continuous upper mixed post-fire canopy of *Pseudotsuga menziesii*, *Larix occidentalis* and *P. contorta* with a lower layer of the putative climax dominant *Tsuga heterophylla*); each horizontal layer is denoted as a “stratum”. The extent of relative suppression and dominance **within each stratum** can be categorized by **crown classes**, of which four are generally recognized.

1) Dominant: Crowns extend above the general level of crown cover of other trees of the stratum under consideration and are not physically restricted from above, though they may be crowded by trees to the sides. **2) Co-dominant:** Crowns occur within the general level of crown stratum and are not physically restricted from above (by trees of the same layer), but are variously crowded by surrounding trees. **3) Intermediate:** Trees are shorter but their crowns extend into the general level of dominant and co-dominant trees, free from physical restrictions from above, but quite crowded on their perimeters. **4) Suppressed (overtopped):** Crowns occur nearly entirely below the general level of dominant and co-dominant trees and physically confined by crowns immediately above.

In describing vertical stratification, recognizing classes of tree strata, silviculturists generally label them with capital letters from the top down (see following diagram). The tallest stratum superposed on the rest is known as **A-** or the “**emergent**” stratum; to be truly emergent, trees of the layer should be scattered with crowns so much taller than those of lower layers that they can be best described as “emerging” (think here of the McDonald Creek drainage with salient *Larix occidentalis* veterans, the thick-barked survivors of at least one stand-replacing fire towering over the *Tsuga-* or *Thuja-*dominated lower stratum). The B-stratum is described as the upper continuous canopy. The C-stratum, D-stratum, etc. (known as understory strata in the aggregate) occur as progressively lower strata beneath the B-stratum; these strata may not be present, and if they are, they are not necessarily as continuous as the B-stratum. The forest floor stratum includes woody species in close proximity, not more than 2 m tall, to the soil surface. During the stand initiation (or brushy) stage of development all trees exist in the same stratum (viz. current status of most post-fire stands resulting from Red Bench Fire of 1988) but gradually they will differentiate into dominant, codominant, intermediate, and suppressed crown classes. Some of the trees (varies primarily by species) will be overtopped but not die, rather they will constitute a lower strata beneath the B-stratum vertical structural differentiation proceeds (Oliver and Larson 1996). Within each stratum, the trees are further differentiated into crown classes.

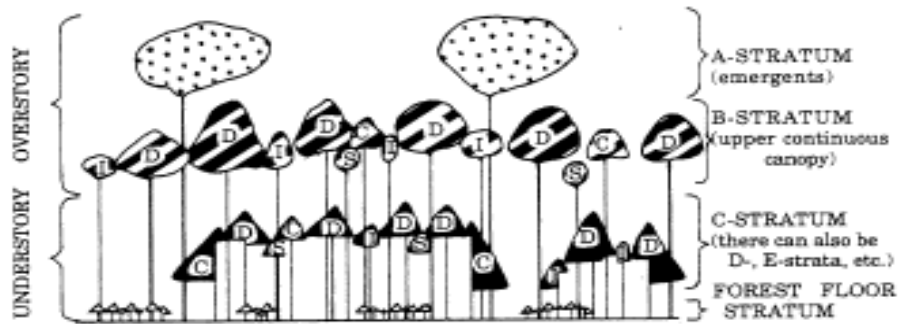


Figure 5.3 The relative positions of canopy (or crown) strata and crown classes. Canopy strata are the horizontal layers of tree crowns which are separate from higher and lower layers. Crown classes refer to trees within each stratum [D = dominant; C = codominant; I = intermediate; S = suppressed (overtopped), as defined in text]. Trees of each crown class can be found in each stratum. (After Richards, 1952; Oliver, 1978a; D. M. Smith, 1984, 1986).

Key to Lifeform Groups

After first establishing whether the area or plot in question is vegetated or not, this portion of the key separates various lifeform-dominated (or lifeform-characterized where true canopy cover-based dominance does not obtain) groups, i.e., forests and woodlands characterized by tree forms, shrublands (including dwarf-shrublands) recognized by the predominance of various shrub forms and herbaceous vegetation wherein either graminoids or forbs are dominant.

When a designated plant association is reached in the key, a unique acronym is provided following the name of the association for use on the field form. In addition, the notation “**NO PLOTS**” follows the names of all associations which are presently unsubstantiated in the International Peace Park. These leads in the key are provided in the event the user should encounter the plant association in question, since many of these are anticipated to occur (because they occur in landscapes adjacent to IPP). Associations with **NO PLOTS** have not been described in the descriptions document. Following the analysis of accuracy assessment (AA) points collected, some revisions in the key have been made. A notation has been made to appropriate leads that a plant association has been added to the key based on AA plots but that a description has not yet been provided.

- 1) Canopy cover of plant species (including bryophytes, lichens) exceeds 1% 2
- 1) Cover of plant species < 1%..... **Unvegetated surfaces/areas**

- 2) Canopy cover of vascular plant species exceeds 1%..... 3
- 2) Cover of vascular plant species < 1%.....
 **Sites characterized by non-vascular plant cover are not currently delineated/described in IPP Key**

- 3) Vascular plant species canopy cover ≥ 10%..... 4
- 3) Vascular plants cover < 10%..... **Go to Sparse Vegetation Key**

- 4) Total canopy cover of tree species (see species list by scientific name and lifeform in Appendix A) regardless of their size class (i. e. T1, T2, T3, S1, S2, H) is at least 25%; note that, **a)** early successional forests and woodlands with seedling and sapling trees key here and not in shrubland key, **b)** in some extreme woodland cases characterized by *Pinus albicaulis*, *P. flexilis* or *Larix lyallii* tree cover can be as little as 10%, **c)** overlook tree distribution pattern, they can occur random, regular or even clumped arrangements; though it is essential that plot capture an “average” condition avoid averaging two (or more) different types (viz. upper subalpine conditions where trees are inclined to occur in clumps in a matrix of herbaceous vegetation; the patch size of the component types may be smaller than the plot size conventionally used to inventory these structural types)
 **Go to Forest and Woodland Key**
- 4) Tree species, regardless of their size class, constitute < 25% canopy cover (unless special cases as denoted in **b)** in above lead 5

- 5) Shrub species, whether tall, medium or dwarf (< 50 cm height), comprise at least 10% canopy cover, individually or in the aggregate; if the stand has reduced total canopy cover (< 25%?) then the shrub component should comprise at least 25% of the total vegetative cover **Go to Shrubland Key**
- 5) Shrub species comprise < 10% canopy cover and if stand canopy cover is < 25% (?) the shrub component should constitute < 25% of the total..... 6

- 6) Canopy cover of herbs (forbs and graminoids) is at least 10% 7
- 6) Herb canopy cover is < 10% **Go to Sparse Vegetation Key**

- Note:** The following separation, types characterized as forb-dominated versus those characterized as graminoid-dominated, is problematic due to the fact that types named and categorized as graminoid-dominated are in fact not necessarily so; they may have only a few percent cover of the diagnostic graminoids and altogether not more than 10% graminoid cover (and much more than 10% forb cover): at this point use caution when running plots and stands through the key!

- 7) Contribution of perennial graminoid vegetation ≥ 10% of total herbaceous canopy cover
 **Go to Perennial Graminoid Key**
- 7) Not as above; perennial graminoids constitute < 10% of herbaceous canopy cover **Go to Forb Key**

Key to Forests and Woodlands

- 1a)** The ratio of relative canopy cover of the aggregate of coniferous tree species of the upper canopy (C) to the combined cover of all deciduous broadleaf tree species of the upper canopy (D) is ≥ 3.0 ($\geq 75\%$ coniferous to 25%, or less, deciduous broadleaf tree species) **Key to Coniferous Tree-Dominated Plant Associations**
- 1b)** Considering the upper canopy, relative canopy cover of **both** the coniferous and broadleaf deciduous components is $> 25\%$ **Key to Mixed Stands (Coniferous & Broadleaf Deciduous) Tree-Dominated Plant Associations**
- 1c)** Not as above; Comparing the same groups (C versus D) as defined in lead 1a, the ratio of C to D is < 0.33 ($< 25\% : 75\%$) go to **Key to Broadleaf Deciduous Tree-Dominated Plant Associations**

Key to Conifer-Dominated Plant Associations

(NOTE: The following key is generally constructed to identify as higher priority the more shade-tolerant (tending to be “climax” dominants) or moisture-dependent tree series; strong exceptions are the *Larix lyalli*, *Pinus albicaulis*, and *P. flexilis* series which are placed near the fore of the key due to their being associated with very limiting environmental parameters.)

- 1)** *Tsuga heterophylla* (western hemlock) canopy cover $\geq 25\%$ of the cover of the tree species with the greatest cover in the upper stratum (this does not include scattered tall emergent survivors, e.g., *Larix occidentalis*, of a previous disturbance) ***Tsuga heterophylla*-characterized Plant Associations**
- 1)** *Tsuga heterophylla* canopy cover $< 25\%$ of that of the tree species with the greatest cover in the upper stratum **2**
- 2)** *Thuja plicata* (western red cedar) canopy cover $\geq 25\%$ of the cover of the tree species with the greatest cover in the upper stratum (not counting tall survivors of a previous disturbance that project much above the main canopy, e.g., *Larix occidentalis* fire survivors towering 10-20 m above “main” canopy) ***Thuja plicata*-characterized Plant Associations**
- 2)** Canopy cover of *Thuja plicata* $< 25\%$ of the most abundant upper stratum tree species **3**
- 3)** *Larix lyalli* (subalpine larch) canopy cover $\geq 10\%$ or comprising at least 25% of the cover of the upper stratum ***Larix lyalli*-characterized Plant Associations**
- 3)** *Larix lyalli* canopy cover $< 25\%$ of the upper stratum (of trees) **4**
- 4)** *Pinus albicaulis* (whitebark pine) actual canopy cover in the upper stratum $\geq 5\%$ if the total canopy cover of upper stratum is $\leq 20\%$ and at least 25% of this stratum where total tree cover in upper stratum is $> 20\%$ ***Pinus albicaulis*-characterized Plant Associations**
- 4)** *Pinus albicaulis* comprising $< 5\%$ absolute canopy cover if total canopy cover $\leq 20\%$ and $< 25\%$ relative canopy cover if the total canopy cover is $> 20\%$ **5**
- 5)** *Pinus flexilis* (limber pine) having at least 10% relative canopy cover in the upper stratum ***Pinus flexilis*-characterized Plant Associations**
- 5)** Not as above; *P. flexilis* having $< 10\%$ canopy cover **6**
- 6)** *Picea engelmannii* (Engelmann spruce, or *P. engelmannii* x *P. glauca* hybrid swarms) the canopy dominant; generally constituting 90% or more of the tree canopy cover; other conifers of poor form (esp. *Abies lasiocarpa*) or on microsites (on raised beds in the case of subhydric to hydric sites or on swales and depressions in the case of subxeric and xeric sites); Foothill, Montane, and Subalpine environments with high water tables or Montane and Subalpine environments with droughty soil, extreme exposures ***Picea engelmannii*-characterized Plant Associations**
- 6)** Not as above **7**
- 7)** *Abies lasiocarpa* (subalpine fir) or *Picea engelmannii* (or *P. engelmannii* x *P. glauca* hybrid swarms), singly or their combined canopy cover, at least 25% of the canopy cover of the combined canopy cover of the other tree species of the upper stratum ***Abies lasiocarpa* – *Picea engelmannii*-characterized Plant Associations**
- 7)** *Abies lasiocarpa* and *Picea engelmannii*, singly or their combined canopy cover, $< 25\%$ of that of the summed coverage of the other upper stratum tree species **8**
- 8)** *Pseudotsuga menziesii* (Douglas-fir) having at least 25% canopy cover of that of the most abundant tree species of the upper stratum ***Pseudotsuga menziesii*-characterized Plant Associations**

- 8) *Pseudotsuga menziesii* having < 25% canopy cover of that of the most abundant tree species 9
- 9) *Pinus monticola* (white pine) having canopy cover \geq that of any other coniferous tree species of the upper stratum.....
..... ***Pinus monticola*-characterized Plant Associations (a placeholder; no IPP plots yet identified)**
- 9) *Pinus monticola* canopy cover in the upper canopy < that of any other conifer species 10
- 10) *Pinus contorta* (lodgepole pine) canopy cover of upper canopy at least four times that of the next most abundant tree species
..... ***Pinus contorta*-characterized Plant Associations**
- 10) *Pinus contorta* canopy cover less than four times that of the next most abundant tree of the upper canopy..... 11
- 11) *Larix occidentalis* (western larch) canopy cover equal to or greater than that of any other coniferous tree species of the upper
canopy..... ***Larix occidentalis*-characterized Plant Associations**
- 11) *L. occidentalis* having less canopy cover than any other coniferous tree species of the upper canopy..... 12
- 12) *Pinus ponderosa* (ponderosa pine) canopy cover is equal to or greater than that of any other upper canopy coniferous tree
species..... ***Pinus ponderosa*-characterized Plant Associations**
- 12) Not as above
- Go back to top of coniferous forest key and assess whether there is in fact sufficient tree cover (somewhere between 10 and 25% absolute cover minimum) to constitute a forest or woodland condition and rerun the plot through the key; the key is constructed so that a plot should key to one of the tree-characterized types presented above.**

Key to “Mixed” (Conifer & Deciduous) Tree-Dominated Plant Associations

- 1) *Populus balsamifera* ssp. *trichocarpa* (black cottonwood) of the upper stratum having $\geq 5\%$ canopy cover 2
 1) *P. balsamifera* ssp. *trichocarpa* having $< 5\%$ cover 7
- 2) *Equisetum arvense* (field horsetail, or other wet-site *Equisetum*, e.g., *E. fluviatile*), singly or combined, having $\geq 10\%$ canopy cover; [an observation **not critical** to keying stand; *Picea engelmannii*, or *P. engelmannii* X *P. glauca* hybrids, are the dominant conifers with others, if present, relegated to microsites]
 ***Populus balsamifera* ssp. *trichocarpa* – *Picea engelmannii* / *Equisetum arvense* Forest**
 (POPBST – PICENG / EQUARV)
- 2) *E. arvense* (or other wet-site *Equisetum* spp.) having $< 10\%$ cover 3
- 3) *Calamagrostis canadensis* (bluejoint reedgrass) and/or *C. stricta* (narrowleaf reedgrass) canopy cover $\geq 10\%$
 ***Populus balsamifera* ssp. *trichocarpa* – *Populus tremuloides* – Conifer / *Calamagrostis canadensis* Forest**
 (POPBST – POPTRE – CONIFER / CALCAN)
- 3) Not as above, *C. canadensis* and *C. stricta* or their combined cover $< 10\%$ 4
- 4) *Cornus sericea* (red-osier dogwood) or *Alnus incana* (thinlead or gray alder) canopy cover, either singly or combined, $\geq 5\%$
 ***Populus balsamifera* ssp. *trichocarpa* – *Populus tremuloides* – Conifer / *Cornus sericea* Forest**
 (POPBST – POPTRE – CONIFER / CORSER)
- 4) *C. sericea* and *A. incana* singly or their combined cover $< 5\%$ 5
- 5) At least two of the following forbs present; their cover, individually, or in any combination, $\geq 5\%$: *Osmorhiza occidentalis* (western sweet-cicely), *Angelica arguta* (sharptooth angelica), *Angelica dawsonii* (Dawson’s angelica), *Heracleum maximum* (cow-parsnip), *Veratrum viride* (green false hellebore), *Actaea rubra* (baneberry), *Galium triflorum* (sweetscented bedstraw), *Viola canadensis* (Canada violet);
 ***Populus balsamifera* ssp. *trichocarpa* – *Populus tremuloides* – Conifer / *Heracleum maximum* Forest**
 (POPBST – POPTRE – CONIFER / HERMAX)
- 5) Not as above, combined cover of any two of the above-listed forbs $< 5\%$ 6
- 6) *Clintonia uniflora* (queencup beadlily) or *Tiarella trifoliata* (threeleaf foamflower), or both, present and not confined to moist microsites
 ***Populus balsamifera* ssp. *trichocarpa* – *Populus tremuloides* – Conifer / *Clintonia uniflora* Forest**
 (POPBST – POPTRE – CONIFER / CLIUNI)
- 6) Not as above Undefined ***Populus balsamifera* ssp. *trichocarpa*-characterized type**
- 7) *Populus tremuloides* (trembling aspen) having greater canopy cover than other deciduous tree species present 8
 7) *P. tremuloides* canopy cover less than that of other deciduous tree species present 14
- 8) *Calamagrostis canadensis* (bluejoint reedgrass), or *C. stricta* (northern reedgrass) or their combined canopy cover $\geq 10\%$
 ***Populus balsamifera* ssp. *trichocarpa* – *Populus tremuloides* – Conifer / *Calamagrostis canadensis* Forest**
 (POPBST – POPTRE – CONIFER / CALCAN)
- 8) *C. canadensis* and *C. stricta* or their combined canopy cover $< 10\%$ 9
- 9) *Streptopus amplexifolius* (twisted stalk), *Senecio triangularis* (arrowleaf groundsel), *Mitella breweri* (Brewer’s mitrewort), *Mitella pentandra* (five-stamened mitrewort), *Gymnocarpium dryopteris* (oak fern), *Veratrum viride* (green false hellebore), *Heracleum maximum* (cow parsnip), (Lyll’s angelica), *Trautvetteria carolinensis* (false bugbane), *Trollius laxus* (American globeflower), *Gymnocarpium dryopteris* (oak fern) or *Athyrium filix-femina* (lady fern), singly or in any combination having a canopy cover $\geq 3\%$
 ***Populus tremuloides* – *Abies lasiocarpa* – *Picea engelmannii* / *Streptopus amplexifolius* Forest**
 (POPTRE – ABILAS – PICENG / STRAMP)
- 9) Canopy cover of any one of the above indicator species or any combination thereof $< 3\%$ 10
- 10) At least two of the following forbs present; *Osmorhiza occidentalis* (western sweet-cicely), *Angelica arguta* (sharptooth angelica), *Angelica dawsonii* (Dawson’s angelica), *Heracleum maximum* (cow-parsnip), *Veratrum viride* (green false hellebore), *Actaea rubra* (baneberry), *Galium triflorum* (sweetscented bedstraw), *Viola canadensis* (Canada violet); **and** individually, or in any combination, having at least 5% canopy cover
 ***Populus balsamifera* ssp. *trichocarpa* – *Populus tremuloides* – Conifer / *Heracleum maximum* Forest**

-(POPBST – POPTRE – CONIFER / HERMAX)
- 10) Not as above, combined cover of any two of the above-listed forbs < 5% 11
- 11) *Clintonia uniflora* (queencup beadlily) or *Tiarella trifoliata* (threeleaf foamflower), or both, present and not confined to moist microsites.....
**Populus balsamifera ssp. trichocarpa – Populus tremuloides – Conifer / Clintonia uniflora Forest**
 (POPBST – POPTRE – CONIFER / CLIUNI)
- 11) Not as above, neither *C. uniflora* nor *T. trifoliata* present, or if present, confined to moist microsites..... 12
- 12) *Spiraea betulifolia* (white spiraea) or *Symphoricarpos albus* (common snowberry), their individual or combined cover ≥ 15 %.....**Populus tremuloides – Conifer / Spiraea betulifolia – Symphoricarpos albus Forest**
 (POPTRE –CONIFER / SPIBET – SYMALB)
- 12) Not as above; *S. betulifolia* and *S. albus* or their combined cover < 15 % 13
- 13) *Calamagrostis rubescens* (pine grass) having ≥ 5% canopy cover
**Populus tremuloides – Conifer / Calamagrostis rubescens Forest**
 (POPTRE – CONIFER / CALRUB); **NO PLOTS**
- 13) *C. rubescens* having < 5% canopy cover
 ...**Undescribed community type characterized by a combination of *P. tremuloides* and conifers in the canopy**
- 14) *Betula papyrifera* (paper birch) having greater canopy cover in the upper stratum than other deciduous tree species 15
- 14) *B. papyrifera* having less canopy cover than any other deciduous tree species of the upper stratum.....
 **Undescribed community type characterized by a deciduous tree species and conifers in the canopy**
- 15) *Cornus sericea* (red-osier dogwood) or *Alnus incana* (thinlead or gray alder) canopy cover, either singly or combined ≥ 5%**Betula papyrifera – Conifer / Cornus sericea Forest (BETPAP – CONIFER / CORSER); NO PLOTS**
- 15) Not as above, *C. sericea* and *A. incana* canopy cover, individually or combined <5% 16
- 16) *Clintonia uniflora* (queencup beadlily) or *Tiarella trifoliata* (threeleaf foamflower), or both, present and not confined to moist microsites.....
**Betula papyrifera – Conifer / Clintonia uniflora Forest (BETPAP – CONIFER / CLIUNI)**
- 16) *C. uniflora* and *T. trifoliata* absent or, if either present, then confined to microsites
**Undescribed community characterized by an upper stratum combination of *B. papyrifera* and conifers**

Key to Deciduous Tree-Dominated Plant Associations

- 1) *Populus balsamifera* ssp. *trichocarpa* (black cottonwood) canopy cover at least 5% or at least 25% of that of the most abundant tree species **Populus balsamifera** ssp. *trichocarpa*-characterized Plant Associations (2)
- 1) *P. balsamifera* ssp. *trichocarpa* canopy cover < 5% or < 25% of that of the most abundant tree species 7
- 2) at least 5% cover of the individual or combined values of *Cornus sericea* (red-osier dogwood), *Alnus incana* (mountain alder), *Crataegus douglasii* (black hawthorn), *Lonicera involucrata* (twinflower honeysuckle), or “wet site” *Salix* spp. (willows, including, but not restricted to, *S. bebbiana* [Booth’s willow], *S. boothii* [Booth willow], *S. drummondiana* [Drummond willow], *S. geyeriana* [Geyer willow]); if a *Salix* spp. is rated FACW or OBL by National Wetland Inventory listing use it in this lead), do **not** include *S. scouleriana* [Scouler’s willow])
 **Populus balsamifera** ssp. *trichocarpa* / *Cornus sericea* Forest (POPBST / CORSER)
- 2) Not as above; the combined or individual cover of the above-listed shrub species, including “wet site” *Salix* spp. < 5% 3
- 3) The individual or combined cover of *Calamagrostis canadensis* (bluejoint reedgrass), *C. stricta* (narrow-spike reedgrass), *Alopecurus alpinus* (alpine foxtail), or *A. pratensis* (meadow foxtail) ≥ 10 %
 **Populus balsamifera** ssp. *trichocarpa* / *Calamagrostis canadensis* Forest (POPBST / CALCAN)
- 3) Not as above; the individual or combined cover of species of the above lead < 10 % 4
- 4) At least two of the following forbs present **and** individually, or in any combination, having at least 5% canopy cover: *Actaea rubra* (baneberry), *Angelica arguta* (sharptooth or Lyall’s angelica), *A. dawsonii* (Dawson’s angelica), *Athyrium filix-femina* (common ladyfern), *Heracleum maximum* (cow-parsnip), *Galium triflorum* (sweetscented bedstraw), *Geum macrophyllum* (largeleaf avens), *Osmorhiza occidentalis* (western sweet-cicely), *Senecio hydrophiloides* (tall groundsel), *Veratrum viride* (green false hellebore), *Viola canadensis* (Canada violet), *V. glabella* (pioneer violet)
 **Populus balsamifera** ssp. *trichocarpa* – (*Populus tremuloides*) / *Heracleum maximum* Forest
 [POPBST – (POPTRE) / HERMAX]
- 4) Not as above; individual or combined cover of any combination of any of the species in the lead above < 5% 5
- 5) *Rubus parviflorus* (thimbleberry) having ≥ 15% canopy cover or is the dominant shrub when total shrub cover is < 30%
 **Populus balsamifera** ssp. *trichocarpa* / *Rubus parviflorus* Forest (POPBST / RUBPAR; **NO PLOTS**)
- 5) *R. parviflorus* having < 15% canopy cover and is not the dominant of the tall shrub layer 6
- 6) Gravel bar or streambank environment usually lightly vegetated with a diversity of forbs, shrubs and *P. balsamifera* ssp. *trichocarpa* seedlings, saplings, and occasionally pole-sized stems
 **Populus balsamifera** ssp. *trichocarpa* / Recent Alluvial Bar (POPBST / BAR)
 From numerous AA points; see Hansen et al. 1995
- 6) Not as above Undefined **Populus balsamifera** ssp. *trichocarpa*-characterized community
- 7) *Populus tremuloides* having at least 5% canopy cover in the upper stratum
 **Populus tremuloides**-characterized Plant Associations (8)
- 7) *Populus tremuloides* having < 5% canopy in the upper stratum 19
- 8) The individual or combined canopy cover of the following shrubs ≥ 5%: *Cornus sericea*, *Crataegus douglasii*, *Lonicera involucrata* or “wet site” *Salix* spp. (see lead # 2 above for directions regarding willow species; do **not** include *S. scouleriana* [Scouler’s willow]) **Populus tremuloides** / *Cornus sericea* Forest (POPTRE / CORSER)
- 8) The individual or combined canopy cover of the shrub species in the couplet lead above, < 5% 9
- 9) The individual or combined cover of *Calamagrostis canadensis* (bluejoint reedgrass), *C. stricta* (narrow-spike reedgrass), *Alopecurus alpinus* (alpine foxtail), or *A. pratensis* (meadow foxtail) at least 5%
 **Populus tremuloides** / *Calamagrostis canadensis* Forest (POPTRE / CALCAN)
- 9) Individual or combined cover of species in the couplet lead above < 5% 10
- 10) At least two of the following forbs present: *Actaea rubra* (baneberry), *Angelica arguta* (sharptooth angelica), *Angelica dawsonii* (Dawson’s angelica), *Heracleum maximum* (cow-parsnip), *Veratrum viride* (green false hellebore), *Galium triflorum* (sweetscented bedstraw), *Geum macrophyllum* (largeleaf avens), *Osmorhiza occidentalis* (western sweet-cicely), *Senecio hydrophiloides* (tall groundsel), *S. triangularis* (arrowleaf groundsel), *Urtica dioica* (stinging nettle), *Viola canadensis* (Canada violet), *Viola glabella* (pioneer violet); **and** individually, or in any combination, having at least 5% canopy cover 11
- 10) Not as above; the individual or combined cover of any combination of any two of the species in the couplet above < 5% 12

- 11) *Urtica dioica* (stinging nettle) dominating the herb-dwarf-shrub layer (having greater canopy cover than any one member of this layer) **Populus tremuloides / Urtica dioica Forest (POPTRE / URTDIO)**
- 11) Not as above; *U. dioica* not dominating the herb/dwarf-shrub layer.....
 **Populus tremuloides / Heracleum maximum Forest (POPTRE / HERMAX)**
- 12) *Rubus parviflorus* (thimbleberry) having $\geq 15\%$ canopy cover; if *R. parviflorus* only $\geq 5\%$ then its cover in any combination with that of the following shrubs $\geq 15\%$: *Acer glabrum* (Rocky Mountain maple), *Prunus virginiana* (common chokecherry), *P. emarginata* (bittercherry), *Sorbus scopulina* (Green’s mountain ash), *Sorbus sitchensis* (western mountain ash).....
 **Populus tremuloides / Rubus parviflorus Forest (POPTRE / RUBPAR)**
 **From AA points only; NVC description available**
- 12) *Rubus parviflorus* having $< 15\%$ canopy cover and if its cover is $> 5\%$, then in combination with the above-listed shrubs, their aggregate cover $< 15\%$ **12**
- 13) *Amelanchier alnifolia* (serviceberry, saskatoon) having $\geq 10\%$ canopy cover; if *A. alnifolia* only $\geq 5\%$ then its cover in any combination with that of any other “tall” shrubs on site $\geq 15\%$; “tall” shrubs include *Acer glabrum* (Rocky Mountain maple), *Prunus virginiana* (common chokecherry), *P. emarginata* (bittercherry), *Sorbus scopulina* (Green’s mountain ash), *Sorbus sitchensis* (western mountain ash)
 **Populus tremuloides / Amelanchier alnifolia Avalanche Chute Shrubland (POPTRE / AMEALN)**
- 13) *A. alnifolia* having $< 10\%$ canopy cover or if its cover $\geq 5\%$ then any additional cover contributed by “tall” shrubs brings their total to $< 15\%$ **14**
- 14) *Calamagrostis rubescens* (pine grass) or *Carex geyeri* (elk sedge) or their combined cover $\geq 10\%$; occurs in buffer along eastern-front of IPP.....
 **Populus tremuloides / Calamagrostis rubescens Forest (POPTRE / CALRUB)**
 **From AA points only; NVC description available**
- 14) *C. rubescens* and *C. geyeri* or their combined canopy cover $< 10\%$ **15**
- 15) *Symphoricarpos occidentalis* (western snowberry) having at least 10% canopy cover
 **Populus tremuloides / Symphoricarpos occidentalis Forest (POPTRE / SYMOCC)**
- 15) *S. occidentalis* canopy cover $< 10\%$ **16**
- 16) *Symphoricarpos albus* (common snowberry) canopy cover $\geq 10\%$
 **Populus tremuloides / Symphoricarpos albus Forest (POPTRE / SYMALB)**
 **From AA points only; NVC description available**
- 16) *S. albus* canopy cover $< 10\%$ **17**
- 17) *Spiraea betulifolia* (white meadowsweet) having $\geq 15\%$ canopy cover or is the shrub-layer dominant
 **Populus tremuloides / Spiraea betulifolia Forest (POPTRE / SPIBET)**
- 17) Not as above **18**
- 18) *Poa pratensis* (Kentucky bluegrass), *Phleum pretense* (timothy), *Bromus inermis* (smooth brome), *Agrostis stolonifera* (redtop) or other exotic “pasture” grass, individually or in any combination, having $\geq 5\%$ canopy cover.....
 **Populus tremuloides / Invasive Perennial Grasses Forest (POPTRE / IPG)**
 **From AA points only; NVC description available**
- 18) Not as above; **Undefined P. tremuloides-dominated community**
- 19) *Betula papyrifera* (paper birch) has the greatest canopy cover of any tree in the upper stratum..... **20**
- 19) *B. papyrifera* not having the greatest canopy cover of any upper stratum tree species
 **Deciduous forest type not identified for IPP**
- 20) *Acer glabrum* (Rocky Mountain maple) canopy cover $\geq 10\%$
 **Betula papyrifera / Acer glabrum Forest (BETPAP / ACEGLA)**
- 20) *A. glabrum* cover $< 10\%$ **Undefined Betula papyrifera-characterized community**

Key to *Tsuga heterophylla*-characterized Plant Associations

- 1) *Oplopanax horridus* (devilsclub) having $\geq 5\%$ canopy cover
 ***Thuja plicata* – *Tsuga heterophylla* / *Oplopanax horridus* Rocky Mountain Forest**
 (THUPLI – TSUHET / OPLHOR) 2
- 1) *O. horridus* having $< 5\%$ canopy cover 2
- 2) *Athyrium filix-femina* (common lady fern) having canopy cover $\geq 5\%$
 ***Tsuga heterophylla* / *Athyrium filix-femina* Forest (TSUHET / ATHFIL)**
- 2) *A. filix-femina* having $< 5\%$ canopy cover 3
- 3) *Gymnocarpium dryopteris* (oak fern) having $\geq 5\%$ canopy cover or only or only present if the following forbs are represented by at least 3% cover, singly or in the aggregate; *Senecio triangularis* (arrowleaf groundsel), *Carex disperma* (softleaf sedge), *Streptopus amplexifolius* (twistedstalk), *Mitella breweri* (Brewer’s mitrewort), *M. pentandra* (fivestamen miterwort), *Prenanthes sagittata* (arrowleaf rattlesnakeroot).....
 ***Tsuga heterophylla* / *Gymnocarpium dryopteris* Forest (TSUHET / GYMDRY)**
- 3) Not as above; *G. dryopteris* with $< 5\%$ cover and even if present the cover of accompanying, above-listed forbs $< 3\%$ 4
- 4) *Clintonia uniflora* (queencup beadlily) or *Tiarella trifoliata* (threeleaf foamflower) present and not restricted to microsites ..
 5
- 4) *C. uniflora* and *T. trifoliata* absent, or if present, then confined to moist microsites (swales)
 **Undefined *Tsuga heterophylla*-characterized type**
 [To date no stands have been sampled that did not have at least scattered CLIUNI or TIATRI, however it is quite conceivable that at the “closed-canopy stage” of forest succession that both these undergrowth forbs could be absent and only mosses would be represented in the undergrowth of these highly shaded environments; because we are subscribing to an existing vegetation classification scheme, we expect eventually a *Tsuga*-dominated and moss-characterized, closed canopy successional stage will be described for the west side.]
- 5a) *Aralia nudicaulis* (wild sarsaparilla) having $\geq 1\%$ canopy cover
 ***Tsuga heterophylla* / *Aralia nudicaulis* Forest (TSUHET / ARANUD)**
- 5b) *A. nudicaulis* having $< 1\%$ canopy cover; *Menziesia ferruginea* (fool’s huckleberry) canopy cover $\geq 5\%$
 ***Tsuga heterophylla* / *Menziesia ferruginea* / *Clintonia uniflora* Forest**
 (TSUHET / MENFER / CLIUNI); **NO PLOTS**
- 5c) *M. ferruginea* having $< 5\%$ canopy cover; *Xerophyllum tenax* (beargrass) having $\geq 5\%$ canopy cover
 ***Tsuga heterophylla* / *Clintonia uniflora* – *Xerophyllum tenax* Forest**
 (TSUHET / CLIUNI – XERTEN) ; **NO PLOTS**
- 5d) Not as above ***Tsuga heterophylla* / *Clintonia uniflora* Forest (TSUHET / CLIUNI)**

Key to *Thuja plicata*-characterized Plant Associations

- 1) *Oplopanax horridus* (devilsclub) having $\geq 5\%$ canopy cover
 ***Thuja plicata* – *Tsuga heterophylla* / *Oplopanax horridus* Rocky Mountain Forest**
 (THUPLI – TSUHET / OPLHOR) 2
- 1) *O. horridus* having $< 5\%$ canopy cover 2
- 2) *Carex disperma* (softleaf sedge) having $\geq 5\%$ canopy cover
 ***Thuja plicata* / *Carex disperma* Forest (THUPLI / CARDIS)**
- 2) *C. disperma* having $< 5\%$ cover 3
- 3) *Athyrium filix-femina* (common lady fern) having canopy cover $\geq 5\%$
 ***Thuja plicata* / *Athyrium filix-femina* Forest (THUPLI / ATHFIL)**
- 3) *A. filix-femina* having $< 5\%$ canopy cover 4
- 4) *Gymnocarpium dryopteris* (oak fern) having $\geq 5\%$ canopy cover or only $\geq 1\%$, if the following forbs are represented by at least 3% cover, singly or in the aggregate; *Senecio triangularis* (arrowleaf groundsel), *Trautvetteria caroliniensis* (false bugbane), *Streptopus amplexifolius* (twistedstalk), *Mitella breweri* (Brewer’s mitrewort)
 ***Thuja plicata* / *Gymnocarpium dryopteris* Forest (THUPLI / GYMDRY)**
- 4) Not as above; *G. dryopteris* with $< 1\%$ cover and the cover of accompanying, above-listed forbs $< 3\%$ 5
- 5) *Clintonia uniflora* (queencup beadlily) or *Tiarella trifoliata* (threeleaf foamflower) present and not restricted to microsites ..
 6
- 5) *C. uniflora* and *T. trifoliata* absent, or if present, then confined to moist microsites (swales)
 **Undefined *Thuja plicata*-characterized type**
- 6a) *Aralia nudicaulis* (wild sarsaparilla) having $\geq 1\%$ canopy cover
 ***Thuja plicata* / *Aralia nudicaulis* Forest (THUPLI / ARANUD)**
- 6b) *A. nudicaulis* having $< 1\%$ canopy cover; *Menziesia ferruginea* (fool’s huckleberry) canopy cover $\geq 5\%$
 ***Thuja plicata* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (THUPLI / MENFER / CLIUNI; NO PLOTS)**
- 6c) *M. ferruginea* having $< 5\%$ canopy cover; *Xerophyllum tenax* (beargrass) having $\geq 5\%$ canopy cover
 ***Thuja plicata* / *Clintonia uniflora* – *Xerophyllum tenax* Forest (THUPLI / CLIUNI / XERTEN)**
- 6d) Not as above ***Thuja plicata* / *Clintonia uniflora* Forest (THUPLI / CLIUNI)**

Key to *Larix lyallii*-characterized Plant Associations

- 1) *Luzula glabrata* var. *hitchcockii* (Hitchcock's smooth woodrush) having $\geq 5\%$ canopy cover.....
.....*Larix lyallii* / *Vaccinium membranaceum* / *Luzula glabrata* var. *hitchcockii* Woodland
.....(LARLYA / VACMEM / LUZGVH)
- 1) *L. glabrata* having $< 5\%$ canopy cover Undefined *Larix lyallii*-characterized communities

Key to *Pinus albicaulis*-characterized Plant Associations

- 1) *Menziesia ferruginea* (fool's huckleberry, rusty menziesia) canopy cover ≥ 5 2
 1) *M. ferruginea* cover $< 5\%$ 3
- 2) *Luzula glabrata* var. *hitchcockii* (Hitchcock's smooth woodrush) or *Vaccinium scoparium* (grouse whortleberry) having $\geq 10\%$ canopy cover.....
 ***Pinus albicaulis* – *Abies lasiocarpa* / *Menziesia ferruginea* / *Luzula glabrata* Woodland**
 (PINALB – ABILAS / MENFER / LUZGLA, **NO PLOTS**)
- 2) Not as above; *Xerophyllum tenax* (beargrass) having $\geq 5\%$ cover
 ***Pinus albicaulis* – *Abies lasiocarpa* / *Menziesia ferruginea* / *Xerophyllum tenax* Woodland**
 (PINALB – ABILAS / MENFER / XERTEN)
- 3) *Luzula glabrata* var. *hitchcockii* (Hitchcock's smooth woodrush) having $\geq 5\%$ canopy cover 4
 3) *L. glabrata* having $< 5\%$ cover..... 5
- 4) *Vaccinium scoparium* (grouse whortleberry) or *V. myrtilus* (dwarf huckleberry) having $\geq 10\%$ canopy cover.....
 ***Pinus albicaulis* – *Abies lasiocarpa* / *Vaccinium scoparium* / *Luzula glabrata* Woodland**
 (PINALB – ABILAS / VACSCO / LUZGLA)
- 4) Not as above; *V. scoparium* and *V. myrtilus* having $< 10\%$ canopy cover
 ***Pinus albicaulis* – *Abies lasiocarpa* / *Luzula glabrata* Woodland**
 (PINALB – ABILAS / LUZGLA; **NO PLOTS**)
- 5) *Xerophyllum tenax* (bearberry) having $\geq 5\%$ canopy cover 6
 5) *X. tenax* having $< 5\%$ canopy cover 7
- 6) *Vaccinium scoparium* (grouse whortleberry) or *V. myrtilus* (bog bilberry) having 10% or more cover and greater cover than *Vaccinium membranaceum* (big or globe huckleberry).....
 ***Pinus albicaulis* – *Abies lasiocarpa* / *Vaccinium scoparium* / *Xerophyllum tenax* Woodland**
 (PINALB – ABILAS / VACSCO / XERTEN)
- 6) *V. scoparium* and *V. myrtilus* with $< 10\%$ cover and less cover than *V. membranaceum*
 ***Pinus albicaulis* – *Abies lasiocarpa* / *Vaccinium membranaceum* / *Xerophyllum tenax* Woodland**
 (PINALB – ABILAS / VACMEM / XERTEN)
- 7) *Dryas octopetala* (white or eightpetal mountain avens) present (sites at the upper limits of tree distribution or on wind-scoured exposures).....
 ***Pinus albicaulis* – (*Picea engelmannii*) / *Dryas octopetala* Woodland**
 (PINALB – PICENG / DRYOCT)
- 7) *D. octopetala* absent 8
- 8) *Vaccinium scoparium* (grouse whortleberry) or *V. myrtilus* (dwarf huckleberry) or their combined canopy cover $\geq 10\%$
 ***Pinus albicaulis* – *Abies lasiocarpa* / *Vaccinium scoparium* Woodland**
 (PINALB – ABILAS / VACSCO; **NO PLOTS**)
- 8) *V. scoparium* and *V. myrtilus*, singly or combined cover, having $< 10\%$ canopy cover 9
- 9) *Carex geyeri* (elk sedge) constituting the undergrowth dominant.....
 ***Pinus albicaulis* – *Abies lasiocarpa* / *Carex geyeri* Woodland (PINALB – ABILAS / CARGEY)**
- 9) *C. geyeri* not the undergrowth dominant..... ***Pinus albicaulis* – *Abies lasiocarpa* Woodlands / Undifferentiated**

Key to *Pinus flexilis*-characterized Plant Associations

- 1) *Arctostaphylos uva-ursi* (kinnikinnick) having $\geq 15\%$ canopy cover.....
 ***Pinus flexilis* / *Arctostaphylos uva-ursi* Woodland (PINFLE / ARCUVA)** 2
- 1) *A. uva-ursi* having $< 15\%$ cover..... 2
- 2) *Juniperus communis* (common juniper) or *J. horizontalis* (creeping juniper) having $\geq 15\%$ canopy cover or are the undergrowth dominants ***Pinus flexilis* / *Juniperus communis* Woodland (PINFLE / JUNCOM; NO PLOTS)**
 **From AA points only; NVC description available**
- 2) *J. communis* and *J. horizontalis* or their combined cover $< 15\%$ and not the undergrowth dominants..... 3
- 3) *Festuca campestris* (rough fescue) having $\geq 5\%$ canopy cover, or $>1\%$ in the presence of intensive grazing.....
 ***Pinus flexilis* / *Festuca campestris* Woodland (PINFLE / FESCAM; NO PLOTS)**
 **From AA points only; NVC description lacking**
- 3) *F. campestris* having $< 1\%$ canopy cover 4
- 4) *Festuca idahoensis* (Idaho fescue) having $\geq 5\%$ canopy cover.....
 ***Pinus flexilis* / *Festuca idahoensis* Woodland (PINFLE / FESIDA; NO PLOTS)**
 **From AA points only; NVC description lacking**
- 4) *F. idahoensis* with $< 5\%$ canopy cover **Undefined *Pinus flexilis* type; only *Pinus flexilis* / *Festuca kingii* is drier, but IPP is presumed outside of this type's range**

NOTE: The existence of *Pinus flexilis* / *Festuca campestris* beyond the boundaries of Montana has not been established so far; it has been separated from *Pinus flexilis* / *F. idahoensis* because *F. campestris* occurs under slightly more mesic conditions and is definitely restricted to ranges north of the Gravelly and East Pioneers and extends up into Canada, east of the Continental Divide. The presence of *P. flexilis* / *F. campestris* has been confirmed by Cooper and Pfister 1982 on the Blackfeet Indian Reservation but whether it occurs in the one-mile buffer strip is unknown.

Key to *Abies lasiocarpa* – *Picea engelmannii*-characterized Plant Associations

NOTE: When encountering a lead with more than 2 choices pick the first statement that matches plot composition/condition.

- 1a)** Stands occurring at upper treeline in exposed positions (wind-blasted) with tree canopy primarily dense and stature distinctly stunted, height often not exceeding 0.5 to 1.5 m and only rarely approaching 3 m [if environmental conditions match foregoing description but the tree height is greater than stated limits, then the stand/plot will “key out” much later in key in upper subalpine woodland types, e.g., ABILAS – PICENG / LUZGLA]..... ***Abies lasiocarpa* Krummholz (ABILAS KRUMM)**
- 1b)** *Oplopanax horridus* (devil’s club) canopy cover \geq 5%
 ***Abies lasiocarpa* – *Picea engelmannii* / *Oplopanax horridus* Forest (ABILAS – PICENG / OPLHOR)**
- 1c)** *O. horridus* canopy cover $<$ 5% **2**
- 2)** *Calamagrostis canadensis* (bluejoint reedgrass), or *C. stricta* (northern reedgrass) canopy cover \geq 10%.....
 ***Abies lasiocarpa* – *Picea engelmannii* / *Calamagrostis canadensis* Forest (ABILAS – PICENG / CALCAN)**
- 2)** *Calamagrostis canadensis* or *C. stricta* canopy cover $<$ 10%..... **3**
- 3)** *Cornus sericea* (= *C. stolonifera*, red-osier dogwood) or *Alnus incana* (thinlead or gray alder) having, either singly or combined, \geq 5% canopy cover..... ***Picea engelmannii* / *Cornus sericea* Woodland (PICENG / CORSER)**
- 3)** *C. sericea* and *A. incana* having, either singly or combined, $<$ 5% canopy cover..... **4**
- 4)** Any of the following forbs considered singly or in any combination having a canopy cover \geq 3%: *Angelica arguta* (Lyll’s angelica), *Athyrium filix-femina* (lady fern), *Geum macrophyllum* (largeleaf avens), *Gymnocarpium dryopteris* (oak fern), *Veratrum viride* (green false hellebore), *Heracleum maximum* (cow parsnip), *Mitella breweri* (Brewer’s mitrewort), *Mitella pentandra* (five-stamened mitrewort), *Senecio triangularis* (arrowleaf groundsel), *Streptopus amplexifolius* (twisted stalk), *Trautvetteria carolinensis* (false bugbane), *Trollius laxus* (American globeflower)..... **5**
- 4)** Canopy cover of any one of the above indicator species or any combination thereof $<$ 3% **6**
- 5a)** *Menziesia ferruginea* (fool’s huckleberry) or *Alnus viridis* ssp. *sinuata* (mountain alder) or their combined canopy cover \geq 5%.....
 ***Abies lasiocarpa* – *Picea engelmannii* / *Menziesia ferruginea* / *Streptopus amplexifolius* Forest (ABILAS – PICENG / MENFER / STRAMP)**
- 5b)** *M. ferruginea* and *A. viridis* ssp. *sinuata* or their combined canopy cover $<$ 5 %; *Luzula glabrata* ssp. *hitchcockii* (smooth woodrush) cover \geq 5% and/or *Sibbaldia procumbens* (creeping sibbaldia) present and/or *Valeriana sitchensis* (Sitka valerian) having $>$ 10% cover
 ***Abies lasiocarpa* – *Picea engelmannii* / *Streptopus amplexifolius* – *Luzula glabrata* Woodland (ABILAS – PICENG / STRAMP – LUZGLA)**
- 5c)** Not as above; canopy cover of *L. glabrata* $<$ 5% and *Sibbaldia procumbens* absent and *V. sitchensis* cover $<$ 10%
 ***Abies lasiocarpa* – *Picea engelmannii* / *Streptopus amplexifolius* Forest (ABILAS – PICENG / STRAMP)**
- 6)** *Clintonia uniflora* (queencup beadleily) and/ or *Tiarella trifoliata* (threeleaf foamflower) present and not confined to moist microsites **7**
- 6)** *C. uniflora* and *T. trifoliata* absent or confined to moist microsites..... **8**
- 7a)** *Menziesia ferruginea* (fool’s huckleberry) canopy cover \geq 5% or *M. ferruginea* present and *Alnus viridis* ssp. *sinuata* (Sitka alder) having at least 10% cover
 ***Abies lasiocarpa* – *Picea engelmannii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (ABILAS – PICENG / MENFER / CLIUNI)**
- 7b)** *M. ferruginea* canopy cover $<$ 5% and, if present, then *A. viridis* cover $<$ 10%; *Vaccinium caespitosum* (dwarf huckleberry) or *Arctostaphylos uva-ursi* (bearberry) or their combined cover \geq 3%
 ***Abies lasiocarpa* – *Picea engelmannii* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (ABILAS – PICENG / VACCAE / CLIUNI)**
- 7c)** *V. caespitosum* and *A. uva-ursi* or their combined coverer $<$ 3%; *Xerophyllum tenax* (beargrass) canopy cover \geq 5%
 ***Abies lasiocarpa* – *Picea engelmannii* / *Clintonia uniflora* – *Xerophyllum tenax* Forest (ABILAS – PICENG / CLIUNI – XERTEN)**
- 7d)** *X. tenax* canopy cover $<$ 5%; the following community type is arrived at by default.....
 ***Abies lasiocarpa* – *Picea engelmannii* / *Clintonia uniflora* Forest (ABILAS – PICENG / CLIUNI)**

8) <i>Menziesia ferruginea</i> (fool’s huckleberry, rusty menziesia) canopy cover ≥ 5% or <i>M. ferruginea</i> present and <i>Alnus viridis</i> ssp. <i>sinuata</i> (Sitka alder) having ≥ 10 cover	9
8) <i>M. ferruginea</i> canopy cover < 5% and with the addition <i>A. viridis</i> their cover < 10%	10
9a) <i>Luzula glabrata</i> ssp. <i>hitchcockii</i> (Hitchcock’s smooth woodrush) canopy cover ≥ 5%	
..... <i>Abies lasiocarpa – Picea engelmannii / Menziesia ferruginea / Luzula glabrata</i> Woodland (ABILAS – PICENG / MENFER / LUZGLA)	
9b) <i>L. glabrata</i> canopy cover < 5%; <i>Vaccinium scoparium</i> (grouse whortleberry) or <i>Vaccinium myrtillus</i> (dwarf bilberry) canopy cover ≥ 15%.....	
..... <i>Abies lasiocarpa – Picea engelmannii / Menziesia ferruginea – Vaccinium scoparium</i> Woodland (ABILAS – PICENG / MENFER – VACSCO)	
9c) <i>V. scoparium</i> and <i>V. myrtillus</i> canopy cover < 5%; default type having <i>Xerophyllum tenax</i> (bearberry) having > 5% canopy cover and usually (with <i>V. membranaceum</i>) the undergrowth dominant (after <i>M. ferruginea</i>)	
..... <i>Abies lasiocarpa – Picea engelmannii / Menziesia ferruginea / Xerophyllum tenax</i> Forest (ABILAS – PICENG / MENFER / XERTEN)	
10) <i>Vaccinium caespitosum</i> (dwarf bilberry) canopy cover ≥3%: <i>V. caespitosum</i> cover may be less in the presence of 5% or more <i>Arctostaphylos uva-ursi</i> (kinnikinnick).....	
..... <i>Abies lasiocarpa – Picea engelmannii / Vaccinium caespitosum</i> Woodland (ABILAS – PICENG / VACCAE)	
10) <i>V. caespitosum</i> canopy cover < 3% and <i>A. uva-ursi</i> having < 5% cover in the presence of <i>V. caespitosum</i>	11
11) <i>Alnus viridis</i> ssp. <i>sinuata</i> (Sitka alder) canopy cover ≥ 15%	
..... <i>Abies lasiocarpa – Picea engelmannii / Alnus viridis</i> ssp. <i>sinuata</i> Forest (ABILAS – PICENG / ALNVIR)	
11) <i>A. viridis</i> ssp. <i>sinuata</i> cover < 15%.....	12
12) <i>Galium triflorum</i> (sweetscented bedstraw) or <i>Actaea rubra</i> (baneberry) present and not confined to microsites.....	
..... <i>Abies lasiocarpa – Picea engelmannii / Galium triflorum</i> Forest (ABILAS – PICENG / GALTRI)	
12) <i>G. triflorum</i> and <i>A. rubra</i> absent; if present, confined to micro-swales and moist depressions	13
13) <i>Linnaea borealis</i> (twinflower) having ≥ 3% canopy cover	
..... <i>Abies lasiocarpa – Picea engelmannii / Linnaea borealis</i> Forest (ABILAS – PICENG / LINBOR)	
13) <i>L. borealis</i> having < 3% canopy cover.....	14
14) <i>Valeriana sitchensis</i> (Sitka valerian), <i>Erigeron peregrinus</i> (subalpine fleabane), <i>Pedicularis bracteosa</i> (bracted lousewort), <i>Thalictrum occidentale</i> (western meadowrue), <i>Angelica dawsonii</i> (Dawson’s angelica) singly, or in any combination, dominate the herbaceous layer	
..... <i>Abies lasiocarpa – Picea engelmannii / Valeriana sitchensis</i> Woodland (ABILAS – PICENG / VALSIT)	
14) Not as above; the above-noted forbs, in any combination, do not dominate the undergrowth	15
15) <i>Xerophyllum tenax</i> (beargrass) or <i>Vaccinium membranaceum</i> (big huckleberry) having ≥ 5% canopy cover.....	16
15) <i>X. tenax</i> having < 5% canopy cover.....	17
16a) <i>Luzula glabrata</i> ssp. <i>hitchcockii</i> (smooth woodrush) canopy cover ≥ 3%	
..... <i>Abies lasiocarpa – Picea engelmannii / Xerophyllum tenax – Luzula glabrata</i> Woodland (ABILAS – PICENG / XERTEN – LUZGLA)	
16b) <i>L. glabrata</i> canopy cover < 3%; <i>Vaccinium scoparium</i> (grouse whortleberry) or <i>Vaccinium myrtillus</i> (dwarf bilberry) canopy cover ≥ 5%, singly	
..... <i>Abies lasiocarpa – Picea engelmannii / Vaccinium scoparium / Xerophyllum tenax</i> Woodland (ABILAS – PICENG / VACSCO / XERTEN)	
16c) <i>V. scoparium</i> and <i>V. myrtillus</i> canopy cover < 5%; <i>Vaccinium membranaceum</i> (big huckleberry) canopy cover generally ≥ 5%, though occasionally not even present	
..... <i>Abies lasiocarpa – Picea engelmannii / Vaccinium membranaceum / Xerophyllum tenax</i> Forest (ABILAS – PICENG / VACMEM / XERTEN)	
17) <i>Luzula glabrata</i> ssp. <i>hitchcockii</i> (smooth woodrush) canopy cover ≥ 3%.....	18
17) <i>L. glabrata</i> canopy cover < 3%	19

- 18) *Vaccinium scoparium* or *V. myrtillus* canopy cover, singly or in combination $\geq 5\%$
 ***Abies lasiocarpa – Picea engelmannii / Vaccinium scoparium / Luzula glabrata* Woodland**
 **(ABILAS – PICENG / VACSCO / LUZGLA; NO PLOTS)**
- 18) *V. scoparium* and *V. myrtillus* canopy cover $< 5\%$
 ***Abies lasiocarpa – Picea engelmannii / Luzula glabrata* Woodland (ABILAS – PICENG / LUZGLA)**
- 19) *Vaccinium scoparium* (grouse whortleberry) or *V. myrtillus* (dwarf bilberry) or their combined canopy cover $\geq 5\%$ **20**
- 19) *V. scoparium* and *V. myrtillus*, singly or in combination, having $< 5\%$ canopy cover **21**
- 20a) *Calamagrostis rubescens* (pine grass) or *Carex geyeri* (elk sedge) or their combined cover 5% or *Arctostaphylos uva-ursi* (bearberry) cover 1%
 ***Abies lasiocarpa – Picea engelmannii / Vaccinium scoparium / Calamagrostis rubescens* Woodland**
 **(ABILAS – PICENG / VACSCO / CALRUB; NO PLOTS)**
- 20b) Not as above; *Thalictrum occidentale* (western meadowrue), *Viola orbiculata* (round-leaved violet), or *Valeriana sitchensis* (Sitka valerian), individually or their combined cover $\geq 1\%$
 ***Abies lasiocarpa – Picea engelmannii / Vaccinium scoparium / Thalictrum occidentale* Woodland**
 **(ABILAS – PICENG / VACSCO / THAOCC)**
- 20c) Not as above; forbs of the couplet lead above having $< 1\%$ canopy cover
 ***Abies lasiocarpa – Picea engelmannii / Vaccinium scoparium* Woodland**
 **(ABILAS – PICENG / VACSCO; NO PLOTS)**
- 21) The cover of any one or any combination of the following shrubs $\geq 15\%$ (reduce criterium to 10% if early seral condition or disturbed condition is represented): *Acer glabrum* (Rocky Mountain maple), *Prunus virginiana* (common chokecherry), *P. emarginata* (bitter cherry), *Rubus parviflorus* (thimbleberry), *Amelanchier alnifolia* (serviceberry)
 ***Abies lasiocarpa – Picea engelmannii / Acer glabrum* Forest (ABILAS – PICENG / ACEGLA)**
- 21) Not as above; the single or combined cover of any assemblage of the above-listed shrubs $< 15\%$ **22**
- 22) *Dryas octopetala* (mountain avens) and/or *Saxifraga bronchialis* (spotted saxifrage) prominent in herb-dwarf-shrub layer
***Pinus albicaulis – (Picea engelmannii) / Dryas octopetala* Woodland (PINALB – (PICENG) / DRYOCT)**
- 22) *D. octopetala* and *S. bronchialis* not prominent in herb-dwarf-shrub layer
 **Undefined *Abies lasiocarpa – Picea engelmannii*-characterized communities**

Key to *Pseudotsuga menziesii*-characterized Plant Associations

- 1) *Cornus sericea* (red-osier dogwood) or wet-site *Salix* spp. (excluding *S. scouleriana*) having $\geq 5\%$ canopy cover
 ***Pseudotsuga menziesii* / *Cornus sericea* Woodland (PSEMEN / CORSER)**
- 1) *C. sericea* and wet-site *Salix* spp. having $< 5\%$ cover 2
- 2) Any of the following forbs having $> 3\%$ canopy cover, singly or in any combination: *Actaea rubra* (baneberry), *Angelica arguta* (Lyll's angelica), *A. dawsonii* (Dawson's angelica), *Galium triflorum* (sweet-scented bedstraw), *Heracleum maximum* (cow parsnip), *Osmorhiza occidentalis* (western sweetcicely), *Streptopus amplexifolius* (claspleaf twistedstalk), *Senecio triangularis* (arrowleaf groundsel), *Veratrum viride* (green false hellebore)
 ***Pseudotsuga menziesii* / *Heracleum maximum* Forest (PSEMEN / HERMAX);**
 **Originally called *P. menziesii* / *Angelica* spp.**
- 2) Not as above; the cover of any combination of the above-listed forbs $< 3\%$ 3
- 3) *Clintonia uniflora* (queencup beadlily) or *Tiarella trifoliata* (three-leaf foamflower), or both, present and **not** confined to moist microsites 4
- 3) Not as above 5
- 4a) *Menziesia ferruginea* (fool's huckleberry) canopy cover $\geq 5\%$ or *M. ferruginea* present and *Alnus viridis* ssp. *sinuata* (Sitka alder) having at least 10% cover ***Pseudotsuga menziesii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest**
 **(PSEMEN / MENFER / CLIUNI)**
- 4b) *M. ferruginea* canopy cover $< 5\%$ and *A. viridis* ssp. *sinuata* $< 10\%$ and *Xerophyllum tenax* having $\geq 5\%$ canopy cover
 ***Pseudotsuga menziesii* / *Clintonia uniflora* – *Xerophyllum tenax* Forest (PSEMEN / CLIUNI – XERTEN)**
- 4c) Not as above ***Pseudotsuga menziesii* / *Clintonia uniflora* Forest (PSEMEN / CLIUNI)**
- 5) *Vaccinium caespitosum* (dwarf bilberry) canopy cover $\geq 1\%$, or merely present (and not confined to microsites), if *Arctostaphylos uva-ursi* (kinnikinnick) cover is $\geq 5\%$
 ***Pseudotsuga menziesii* / *Vaccinium caespitosum* Forest (PSEMEN / VACCAE)**
- 5) *V. caespitosum* cover $< 1\%$ 6
- 6) *Linnaea borealis* (twinflower) having $\geq 3\%$ canopy cover
 ***Pseudotsuga menziesii* / *Linnaea borealis* Forest (PSEMEN / LINBOR; NO PLOTS)**
- 6) *L. borealis* having $< 3\%$ canopy cover 7
- 7) *Vaccinium membranaceum* (globe huckleberry) or *Xerophyllum tenax* (beargrass) having $\geq 5\%$ cover 8
- 7) *V. membranaceum* and *X. tenax* having $< 5\%$ cover 9
- 8) *Arctostaphylos uva-ursi* (kinnikinnick) or *Pinus ponderosa* (ponderosa pine) $\geq 5\%$ cover
 ***Pseudotsuga menziesii* / *Vaccinium membranaceum* / *Arctostaphylos uva-ursi* Forest**
 **(PSEMEN / VACMEM / ARCUVA; NO PLOTS)**
- 8) Not as above; *Xerophyllum tenax* (beargrass) having $\geq 5\%$ canopy cover
 ***Pseudotsuga menziesii* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest**
 **(PSEMEN / VACMEM / XERTEN)**
- 9) The cover of any one or any combination of the following shrubs $\geq 15\%$ (reduce criterion to 10% if early seral condition or disturbed condition is represented): *Acer glabrum* (Rocky Mountain maple), *Prunus virginiana* (common chokecherry), *P. emarginata* (bitter cherry), *Rubus parviflorus* (thimbleberry), *Amelanchier alnifolia* (serviceberry)
 ***Pseudotsuga menziesii* / *Acer glabrum* Forest (PSEMEN / ACEGLA)**
- 9) Not as above; the single or combined cover of any assemblage of the above-listed shrubs $< 15\%$ 10
- 10) *Symphoricarpos albus* (common snowberry) or *S. occidentalis* (western snowberry) having $\geq 10\%$ cover
 ***Pseudotsuga menziesii* / *Symphoricarpos albus* Forest (PSEMEN / SYMALB)**
- 10) *S. albus* and *S. occidentalis* having $< 10\%$ cover 11
- 11) *Spiraea betulifolia* (white spiraea) having $\geq 10\%$ canopy cover
 ***Pseudotsuga menziesii* / *Spiraea betulifolia* Forest (PSEMEN / SPIBET)**
- 11) *S. betulifolia* cover $< 10\%$ 12

- 12) *Calamagrostis rubescens* (pinegrass) having $\geq 5\%$ cover.....
 ***Pseudotsuga menziesii* / *Calamagrostis rubescens* Forest (PSEMEN / CALRUB)**
- 12) *C. rubescens* having $< 5\%$ cover..... 13
- 13) *Carex geyeri* (elk sedge) having $\geq 5\%$ canopy cover.....
 ***Pseudotsuga menziesii* / *Carex geyeri* Forest (PSEMEN / CARGEY)**
- 13) *C. geyeri* having $< 5\%$ cover..... 14
- 14) *Arctostaphylos uva-ursi* having $\geq 10\%$ cover ***Pseudotsuga menziesii* / *Arctostaphylos uva-ursi* Woodland
 (PSEMEN / ARCUVA)**
- 14) *A. uva-ursi* having $< 10\%$ cover..... 15
- 15) *Juniperus communis* (common juniper) and/or *J. horizontalis* (creeping or horizontal juniper) dominate the undergrowth
 ***Pseudotsuga menziesii* / *Juniperus communis* Woodland (PSEMEN / JUNCOM)**
- 15) *J. communis* and *J. horizontalis* not the undergrowth dominants..... 16
- 16) *Arnica cordifolia* (heartleaf arnica) and/or *Antennaria racemosa* (raceme pussytoes) dominate the undergrowth layer.....
 ***Pseudotsuga menziesii* / *Arnica cordifolia* Forest (PSEMEN / ARNCOR)**
- 16) *A. cordifolia* and *A. racemosa* not dominating the undergrowth layer..... 17
- 17) *Festuca idahoensis* (Idaho fescue) or *F. campestris* (= *F. scabrella*, rough fescue), their individual or combined cover $\geq 5\%$
 ***Pseudotsuga menziesii* / *Festuca idahoensis* Woodland (PSEMEN / FESIDA)**
- 17) The individual or combined cover of *F. idahoensis* and *F. campestris* $< 5\%$ cover (or $< 1\%$ in the presence of intensive
 grazing)..... **Undefined *Pseudotsuga menziesii*-characterized types**

Key to *Picea engelmannii*-characterized Plant Associations

NOTE: When encountering a lead with more than 2 choices pick the first statement that matches plot composition/condition.

- 1a)** Stands occurring at upper treeline in exposed positions (wind-blasted) with tree canopy primarily dense and stature distinctly stunted, height often not exceeding 0.5 to 1.5 m and only rarely approaching 3 m [if environmental conditions match foregoing description but the tree height is greater than stated limits, then the stand/plot will “key out” much later in key in upper subalpine woodland types, e.g., ABILAS – PICENG / LUZGLA]..... **Krummholz**
- 1b)** The following “wet-site” *Salix* spp. (willows) having at least 15% canopy cover; *Salix* spp. may be < 15% if the cover of *Alnus incana* (mountain alder) brings total to ≥ 15%: *Salix drummondiana* (Drummond’s willow) *S. boothii* (Booth’s willow), *S. geyeriana* (Geyer’s willow), *S. bebbiana* (Bebb’s willow), *S. pseudomonticola* (false mountain willow); (**non-exhaustive** list, would **not include** *S. scouleriana* (Scouler’s willow); include willows rated FACW or OBL according to National Wetland Indicators listing)..... ***Picea engelmannii* / *Salix drummondiana* Woodland (PICENG / SALDRU)**
- 1c)** Not as above: wetland *Salix* spp. having < 15% cover, even if combined with the cover of *A. incana*..... **2**
- 2)** *Equisetum arvense* (field horsetail, or other wet-site *Equisetum*, e.g., *E. fluviatile*), singly or combined, having ≥ 15% canopy cover ***Picea engelmannii* / *Equisetum arvense* Forest (PICENG / EQUARV)**
- 2)** *E. arvense* (or other wet-site *Equisetum* spp.) having < 15%..... **3**
- 3)** *Calamagrostis canadensis* (bluejoint reedgrass), or *C. stricta* (northern reedgrass) canopy cover ≥ 10%.....
 ***Abies lasiocarpa* – *Picea engelmannii* / *Calamagrostis canadensis* Forest (ABILAS – PICENG / CALCAN)**
- 3)** *Calamagrostis canadensis* or *C. stricta* canopy cover <10%..... **4**
- 4)** *Cornus sericea* (red-osier dogwood) or *Alnus incana* (mountain alder) their single or combined cover ≥ 5%.....
 ***Picea engelmannii* / *Cornus sericea* Woodland (PICENG / CORSER)**
- 4)** *C. sericea* and *A. incana* having < 5% canopy cover, alone or in combination **5**
- 5)** Any of the following forbs considered singly or in any combination having a canopy cover ≥ 3%: *Angelica arguta* (Lyll’s angelica), *Athyrium filix-femina* (lady fern), *Geum macrophyllum* (largeleaf avens), *Gymnocarpium dryopteris* (oak fern), *Veratrum viride* (green false hellebore), *Heracleum maximum* (cow parsnip), *Mitella breweri* (Brewer’s mitrewort), *Mitella pentandra* (five-stamened mitrewort), *Senecio triangularis* (arrowleaf groundsel), *Streptopus amplexifolius* (twisted stalk), *Trautvetteria caroliniensis* (false bugbane), *Trollius laxus* (American globeflower). **6**
- 5)** Canopy cover of any one of the above indicator species or any combination thereof < 3% **7**
- 6a)** *Menziesia ferruginea* (fool’s huckleberry) or *Alnus viridis* ssp. *sinuata* (mountain alder) or their combined canopy cover ≥ 5%..... ***Abies lasiocarpa* – *Picea engelmannii* / *Menziesia ferruginea* / *Streptopus amplexifolius* Forest (ABILAS – PICENG / MENFER / STRAMP)**
- 6b)** *M. ferruginea* and *A. viridis* ssp. *sinuata* or their combined canopy cover < 5 %; *Luzula glabrata* ssp. *hitchcockii* (smooth woodrush) cover ≥ 5% or *Sibbaldia procumbens* (creeping sibbaldia) present or *Valeriana sitchensis* (Sitka valerian) having >10% cover..... ***Abies lasiocarpa* – *Picea engelmannii* / *Streptopus amplexifolius* – *Luzula glabrata* Woodland (ABILAS – PICENG / STRAMP – LUZGLA)**
- 6c)** Not as above; canopy cover of *L. glabrata* < 5% and *Sibbaldia procumbens* absent and *V. sitchensis* cover <10%
 ***Abies lasiocarpa* – *Picea engelmannii* / *Streptopus amplexifolius* Forest (ABILAS – PICENG / STRAMP)**
- 7)** *Clintonia uniflora* (queencup beadleily) or *Tiarella trifoliata* (threeleaf foamflower), or both, present and not confined to moist microsites (small depressions or swales) **8**
- 7)** *C. uniflora* and *T. trifoliata* absent or confined to moist microsites..... **9**
- 8a)** *Menziesia ferruginea* (fool’s huckleberry) canopy cover ≥ 5% or *M. ferruginea* present and *Alnus viridis* ssp. *sinuata* (Sitka alder) having at least 10% cover
 ***Abies lasiocarpa* – *Picea engelmannii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (ABILAS – PICENG / MENFER / CLIUNI)**
- 8b)** *M. ferruginea* canopy cover < 5% and, if present, then *A. viridis* cover < 10%; *Vaccinium caespitosum* (dwarf huckleberry) or *Arctostaphylos uva-ursi* (bearberry) or their combined cover ≥ 3%.....
 ***Abies lasiocarpa* – *Picea engelmannii* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (ABILAS – PICENG / VACCAE / CLIUNI)**
- 8c)** *V. caespitosum* and *A. uva-ursi* or their combined cover < 3%; *Xerophyllum tenax* (beargrass) canopy cover ≥ 5%
 ***Abies lasiocarpa* – *Picea engelmannii* / *Clintonia uniflora* – *Xerophyllum tenax* Forest**

..... (ABILAS – PICENG / CLIUNI – XERTEN)

8d) *X. tenax* canopy cover < 5%; the following community type is arrived at by default.....
 *Abies lasiocarpa – Picea engelmannii / Clintonia uniflora* Forest
 (ABILAS – PICENG / CLIUNI)

9) *Menziesia ferruginea* (fool’s huckleberry, rusty menziesia) canopy cover ≥ 5% or *M. ferruginea* present and *Alnus viridis* ssp. *sinuata* (Sitka alder) having ≥ 10 cover 10

9) *M. ferruginea* canopy cover < 5% and in combination with *A. viridis* ssp. *sinuata* having < 10% cover 11

10a) *Luzula glabrata* ssp. *hitchcockii* (smooth woodrush) canopy cover ≥ 5%.....
 *Abies lasiocarpa – Picea engelmannii / Menziesia ferruginea / Luzula glabrata* Woodland
 (ABILAS – PICENG / MENFER / LUZGLA)

10b) *L. glabrata* canopy cover < 5%; *Vaccinium scoparium* (grouse whortleberry) or *Vaccinium myrtillus* (dwarf bilberry) canopy cover ≥ 15%.....
 *Abies lasiocarpa – Picea engelmannii / Menziesia ferruginea – Vaccinium scoparium* Woodland
 (ABILAS – PICENG / MENFER – VACSCO)

10c) *V. scoparium* and *V. myrtillus* canopy cover < 5%; default type having *Xerophyllum tenax* (bearberry) having > 5% canopy cover and usually (with *V. membranaceum*) the undergrowth dominant (after *M. ferruginea*).....
 *Abies lasiocarpa – Picea engelmannii / Menziesia ferruginea / Xerophyllum tenax* Forest
 (ABILAS – PICENG / MENFER / XERTEN)

11) *Vaccinium caespitosum* (dwarf bilberry) canopy cover ≥ 3%: *V. caespitosum* cover may be less in the presence of 5% or more *Arctostaphylos uva-ursi* (kinnikinnick).....
 *Abies lasiocarpa – Picea engelmannii / Vaccinium caespitosum* Woodland (ABILAS – PICENG / VACCAE)

11) *V. caespitosum* canopy cover < 3% and *A. uva-ursi* having < 5% cover in the presence of *V. caespitosum*..... 12

12) *Alnus viridis* ssp. *sinuata* (Sitka alder) canopy cover ≥ 15%.....
 *Abies lasiocarpa – Picea engelmannii / Alnus viridis* ssp. *sinuata* Forest (ABILAS – PICENG / ALNVIR)

12) *A. viridis* ssp. *sinuata* cover < 15%..... 13

13) *Galium triflorum* (sweetscented bedstraw) or *Actaea rubra* (baneberry) present and not confined to microsites.....
 *Abies lasiocarpa – Picea engelmannii / Galium triflorum* Forest (ABILAS – PICENG / GALTRI)

13) *G. triflorum* and *A. rubra* absent; if present, confined to micro-swailes and moist depressions 14

14) *Linnaea borealis* (twinflower) having ≥ 3% canopy cover
 *Abies lasiocarpa – Picea engelmannii / Linnaea borealis* Forest (ABILAS – PICENG / LINBOR)

14) *L. borealis* having < 3% canopy cover..... 15

15) *Valeriana sitchensis* (Sitka valerian), *Erigeron peregrinus* (subalpine fleabane), *Pedicularis bracteosa* (bracted lousewort), and *Thalictrum occidentale* (western meadowrue), *Angelica dawsonii* (Dawson’s angelica) singly, or in any combination, dominate the herbaceous layer
 *Abies lasiocarpa – Picea engelmannii / Valeriana sitchensis* Woodland (ABILAS – PICENG / VALSIT)

15) Not as above; the above-noted forbs, in any combination, do not dominate the undergrowth..... 16

16) *Xerophyllum tenax* (beargrass) or *Vaccinium membranaceum* (big huckleberry) having ≥ 5% canopy cover..... 17

16) *X. tenax* having < 5% canopy cover..... 18

17a) *Luzula glabrata* ssp. *hitchcockii* (smooth woodrush) canopy cover ≥ 3%
 *Abies lasiocarpa – Picea engelmannii / Xerophyllum tenax – Luzula glabrata* Woodland
 (ABILAS – PICENG / XERTEN – LUZGLA)

17b) *L. glabrata* canopy cover < 3%; *Vaccinium scoparium* (grouse whortleberry) or *Vaccinium myrtillus* (dwarf bilberry) canopy cover ≥ 5%, singly
 *Abies lasiocarpa – Picea engelmannii / Vaccinium scoparium / Xerophyllum tenax* Woodland
 (ABILAS – PICENG / VACSCO / XERTEN)

17c) *V. scoparium* and *V. myrtillus* canopy cover < 5%; *Vaccinium membranaceum* (big huckleberry) canopy cover generally ≥ 5%, though occasionally not even present.....
 *Abies lasiocarpa – Picea engelmannii / Vaccinium membranaceum / Xerophyllum tenax* Forest

..... (ABILAS – PICENG / VACMEM / XERTEN)

18) *Luzula glabrata* ssp. *hitchcockii* (smooth woodrush) canopy cover \geq 3% 19

18) *L. glabrata* canopy cover $<$ 3% 20

19) *Vaccinium scoparium* or *Vaccinium myrtillus* canopy cover, singly or in combination \geq 5%
 *Abies lasiocarpa* – *Picea engelmannii* / *Vaccinium scoparium* / *Luzula glabrata* Woodland
 (ABILAS – PICENG / VACSCO / LUZGLA; **NO PLOTS**)

19) *V. scoparium* and *V. myrtillus* canopy cover $<$ 5%
 *Abies lasiocarpa* – *Picea engelmannii* / *Luzula glabrata* Woodland (ABILAS – PICENG / LUZGLA)

20) *Vaccinium scoparium* (grouse whortleberry) or *V. myrtillus* (dwarf bilberry) or their combined canopy cover \geq 5% 21

20) *V. scoparium* and *V. myrtillus*, singly or in combination, having $<$ 5% canopy cover 22

21a) *Calamagrostis rubescens* (pine grass) or *Carex geyeri* (elk sedge) or their combined cover 5% or *Arctostaphylos uva-ursi* (bearberry) cover 1%
 *Abies lasiocarpa* – *Picea engelmannii* / *Vaccinium scoparium* / *Calamagrostis rubescens* Woodland
 (ABILAS – PICENG / VACSCO / CALRUB; **NO PLOTS**)

21b) Not as above; *Thalictrum occidentale* (western meadowrue), *Viola orbiculata* (round-leaved violet), or *Valeriana sitchensis* (Sitka valerian), individually or their combined cover \geq 1%
 *Abies lasiocarpa* – *Picea engelmannii* / *Vaccinium scoparium* / *Thalictrum occidentale* Woodland
 (ABILAS – PICENG / VACSCO / THAOCC)

21c) Not as above; forbs of the couplet lead above having $<$ 1% canopy cover
 *Abies lasiocarpa* – *Picea engelmannii* / *Vaccinium scoparium* Woodland
 (ABILAS – PICENG / VACSCO; **NO PLOTS**)

22) *Dryas octopetala* (white or eightpetal mountain avens) present (sites at the upper limits of tree distribution or on wind-scoured exposures).....
 *Pinus albicaulis* – (*Picea engelmannii*) / *Dryas octopetala* Woodland (PINALB – (PICENG) / DRYOCT)

22) *D. octopetala* absent..... 23

23) *Vaccinium caespitosum* (dwarf bilberry) canopy cover \geq 3%.....
 *Picea engelmannii* / *Vaccinium caespitosum* Woodland (PICENG / VACCAE)

23) Cover of *V. caespitosum* $<$ 3%..... 24

24) The cover of any one or any combination of the following shrubs \geq 15% (reduce criterium to 10% if early seral condition or disturbed condition is represented): *Acer glabrum* (Rocky Mountain maple), *Prunus virginiana* (common chokecherry), *P. emarginata* (bitter cherry), *Rubus parviflorus* (thimbleberry), *Amelanchier alnifolia* (serviceberry).....
 *Abies lasiocarpa* – *Picea engelmannii* / *Acer glabrum* Forest (ABILAS – PICENG / ACEGLA)

24) Not as above; the single or combined cover of any assemblage of the above-listed shrubs $<$ 15 % 25

25) *Juniperus communis* (common juniper) or *J. horizontalis* (creeping juniper) or their combined cover \geq 10% or they constitute the undergrowth dominants.....*Picea engelmannii* / *Juniperus communis* Woodland (PICENG / JUNCOM)

25) Not as above; *J. communis* and *J. horizontalis* having $<$ 10% cover and not the undergrowth dominants, either singly or their combined cover..... **Undefined *P. engelmannii*-characterized community.**

Key to *Pinus contorta*-characterized Plant Associations

- 1) *Calamagrostis canadensis* (bluejoint reedgrass), or *C. stricta* (slimstem reedgrass) having canopy cover $\geq 10\%$
 ***Pinus contorta* / *Calamagrostis canadensis* Forest (PINCON / CALCAN)**
- 1) Not as above; *C. canadensis* and *C. stricta* having $< 10\%$ canopy cover..... 2
- 2) *Cornus sericea* (red-osier dogwood), *Alnus incana* (mountain alder) or *Rhamnus alnifolia* (alderleaf buckthorn) having, either singly or combined, $\geq 5\%$ canopy cover..... ***Pinus contorta* / *Cornus sericea* Forest (PINCON / CORSER)**
- 2) *C. sericea*, *A. incana* and *R. alnifolia* having, either singly or combined, $< 5\%$ canopy cover..... 3
- 3) Any of the following forbs having $> 3\%$ canopy cover, singly or in any combination: *Actaea rubra* (baneberry), *Angelica arguta* (Lyll's angelica), *A. dawsonii* (Dawson's angelica), *Galium triflorum* (sweet-scented bedstraw), *Heracleum maximum* (cow parsnip), *Osmorhiza occidentalis* (western sweetcicely), *Streptopus amplexifolius* (claspleaf twistedstalk), *Senecio triangularis* (arrowleaf groundsel), *Veratrum viride* (green false hellebore).....
 ***Pinus contorta* / *Heracleum maximum* Woodland (PINCON / HERMAX);**
 **Originally called *P. contorta* / *Angelica* spp.**
- 3) Not as above; the cover of any combination of the above-listed forbs $< 1\%$ 4
- 4) *Clintonia uniflora* (queencup beadlily) and/or *Tiarella trifoliata* (three-leaf foamflower) present and **not** confined to moist microsites..... 5
- 4) *C. uniflora* and *T. trifoliata* absent or confined to moist microsites (distinct swales or collecting depressions/positions)..... 8
- 5) *Menziesia ferruginea* (fool's huckleberry) canopy cover $\geq 5\%$ or *M. ferruginea* present and *Alnus viridis* ssp. *sinuata* (Sitka alder) having at least 10% cover.....
 ***Pinus contorta* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (PINCON / MENFER / CLIUNI)**
- 5) *M. ferruginea* canopy cover $< 5\%$ and if this species is present the cover of *A. viridis* ssp. *sinuata* $< 10\%$ 6
- 6) *Vaccinium caespitosum* (dwarf bilberry) or *Arctostaphylos uva-ursi* (bearberry) or their combined cover $\geq 3\%$
 ***Pinus contorta* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (PINCON / VACCAE / CLIUNI)**
- 6) *V. caespitosum* and *A. uva-ursi* or their combined cover $< 3\%$ 7
- 7) *Xerophyllum tenax* (beargrass) canopy cover $\geq 5\%$
 ***Pinus contorta* / *Clintonia uniflora* – *Xerophyllum tenax* Forest (PINCON / CLIUNI – XERTEN)**
- 7) *X. tenax* canopy cover $< 5\%$; the following is a default type; should be forb-rich w/ *C. uniflora*, and/or *T. trifoliata* present ..
 ***Pinus contorta* / *Clintonia uniflora* Forest (PINCON / CLIUNI)**
- 8) *Menziesia ferruginea* (fool's huckleberry) canopy cover $\geq 5\%$ or *M. ferruginea* present and *Alnus viridis* ssp. *sinuata* (Sitka alder) having at least 10% cover..... 9
- 8) *M. ferruginea* canopy cover $< 5\%$ and *A. viridis* having $< 10\%$ cover..... 11
- 9) *Luzula glabrata* ssp. *hitchcockii* (smooth woodrush) canopy cover $\geq 5\%$
 ***Pinus contorta* / *Menziesia ferruginea* / *Luzula glabrata* Woodland**
 **(PINCON / MENFER / LUZGLA; NO PLOTS)**
- 9) *L. glabrata* ssp. *hitchcockii* canopy cover $< 5\%$ 10
- 10) *Vaccinium scoparium* (grouse whortleberry) or *V. myrtillus* (dwarf bilberry) canopy cover, singly or combined, $\geq 10\%$
 ***Pinus contorta* / *Menziesia ferruginea* / *Vaccinium scoparium* Woodland**
 **(PINCON / MENFER / VACSCO; NO PLOTS)**
- 10) *V. scoparium* and *V. myrtillus* canopy cover $< 10\%$; default type with *Xerophyllum tenax* and *Vaccinium membranaceum* consistently exhibiting $> 5\%$ canopy cover and usually having the greatest canopy cover after *M. ferruginea*
 ***Pinus contorta* / *Menziesia ferruginea* / *Xerophyllum tenax* Forest (PINCON / MENFER / XERTEN)**
 **From AA points only; NVC description lacking**
- 11) *Vaccinium caespitosum* (dwarf huckleberry) or *Arctostaphylos uva-ursi* (bearberry) or their combined cover $\geq 3\%$
 ***Pinus contorta* / *Vaccinium caespitosum* Woodland (PINCON / VACCAE)**
- 11) *V. caespitosum* or *A. uva-ursi* or their combined canopy cover $< 3\%$ 12

12) <i>Linnaea borealis</i> (twinflower) having $\geq 5\%$ canopy cover	14
..... <i>Pinus contorta</i> / <i>Linnaea borealis</i> Forest (PINCON / LINBOR)	
12) <i>L. borealis</i> having $< 5\%$ cover	15
13) <i>Xerophyllum tenax</i> (beargrass) or <i>Vaccinium membranaceum</i> (big or globe huckleberry) having $\geq 5\%$ canopy cover	14
13) <i>X. tenax</i> having $< 5\%$ canopy cover and <i>V. membranaceum</i> having $< 5\%$ cover	15
14a) <i>Luzula glabrata</i> ssp. <i>hitchcockii</i> (smooth woodrush) canopy cover $\geq 5\%$	
..... <i>Pinus contorta</i> / <i>Xerophyllum tenax</i> – <i>Luzula glabrata</i> Woodland	
..... (PINCON / XERTEN – LUZGLA; NO PLOTS)	
14b) <i>L. glabrata</i> canopy cover $< 5\%$; <i>Vaccinium scoparium</i> (grouse whortleberry) or <i>Vaccinium myrtillus</i> (dwarf bilberry) canopy cover $\geq 5\%$	
..... <i>Pinus contorta</i> / <i>Vaccinium scoparium</i> / <i>Xerophyllum tenax</i> Woodland (PINCON / VACSCO / XERTEN)	
14c) <i>V. scoparium</i> and <i>V. myrtillus</i> canopy cover $< 5\%$; <i>V. membranaceum</i> (big huckleberry) canopy cover generally $\geq 5\%$	
..... <i>Pinus contorta</i> / <i>Vaccinium membranaceum</i> / <i>Xerophyllum tenax</i> Forest (PINCON / VACMEM / XERTEN)	
15) <i>Vaccinium scoparium</i> (grouse whorleberry) or <i>V. myrtillus</i> (dwarf bilberry) canopy cover $\geq 5\%$	16
15) <i>V. scoparium</i> and <i>V. myrtillus</i> cover $< 5\%$	17
16a) <i>Calamagrostis rubescens</i> (pine grass) or <i>Carex geyeri</i> (elk sedge) or their combined cover 5% or <i>Arctostaphylos uva-ursi</i> (bearberry) cover $\geq 1\%$: common type east of Continental Divide in MT	
..... <i>Pinus contorta</i> / <i>Vaccinium scoparium</i> / <i>Calamagrostis rubescens</i> Woodland	
..... (PINCON / VACSCO / CALRUB); From AA points only; NVC description lacking	
16b) Not as above; <i>Thalictrum occidentale</i> (western meadowrue), <i>Viola orbiculata</i> (round-leaved violet), or <i>Valeriana sitchensis</i> (Sitka valerian), individually or their combined cover $\geq 1\%$	
..... <i>Pinus contorta</i> / <i>Vaccinium scoparium</i> / <i>Thalictrum occidentale</i> Woodland	
..... (PINCON / VACSCO / THAOCC; NO PLOTS)	
16c) Not as above; forbs of the couplet lead above having $< 1\%$ canopy cover	
..... <i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Woodland (PINCON / VACSCO; NO PLOTS)	
..... From AA points only; NVC description available	
17) The cover of any one or any combination of the following shrubs $\geq 15\%$ (reduce criterium to 10% if early seral condition or disturbed condition is represented): <i>Acer glabrum</i> (Rocky Mountain maple), <i>Prunus virginiana</i> (common chokecherry), <i>P. emarginata</i> (bitter cherry), <i>Rubus parviflorus</i> (thimbleberry), <i>Amelanchier alnifolia</i> (serviceberry)	
..... <i>Pinus contorta</i> / <i>Acer glabrum</i> Forest (PINCON / ACEGLA)	
..... From AA points only; NVC description lacking	
17) Not as above; the single or combined cover of any assemblage of the above-listed shrubs $< 15\%$	18
18) <i>Spiraea betulifolia</i> (white spiraea) canopy cover $\geq 10\%$	
..... <i>Pinus contorta</i> / <i>Spiraea betulifolia</i> Woodland (PINCON / SPIBET)	
18) <i>S. betulifolia</i> cover $< 10\%$	19
19) <i>Calamagrostis rubescens</i> (pine grass) canopy cover $\geq 5\%$	
..... <i>Pinus contorta</i> / <i>Calamagrostis rubescens</i> Forest (PINCON / CALRUB)	
19) <i>C. rubescens</i> canopy cover $< 5\%$	20
20) <i>Juniperus communis</i> (common juniper) and/or <i>J. horizontalis</i> (horizontal or creeping juniper) dominating the undergrowth	
..... <i>Pinus contorta</i> / <i>Juniperus communis</i> Woodland (PINCON / JUNCOM)	
20) Neither <i>J. communis</i> nor <i>J. horizontalis</i> (nor their combined cover) dominating the undergrowth	21
21) <i>Arnica cordifolia</i> (heartleaf arnica) or <i>A. latifolia</i> (broadleaf arnica) dominating the undergrowth	
..... <i>Pinus contorta</i> / <i>Arnica cordifolia</i> Woodland (PINCON / ARNCOR)	
21) Neither <i>A. cordifolia</i> nor <i>A. latifolia</i> the undergrowth dominants	
..... Undefined <i>Pinus contorta</i>-characterized community	

Key to *Larix occidentalis*-characterized Plant Associations

- 1) *Clintonia uniflora* (queencup beadlily) or *Tiarella trifoliata* (three-leaf foamflower), or both, present and **not** confined to moist microsites..... 2
- 1) Not as above..... 3
- 2a) *Menziesia ferruginea* (fool’s huckleberry) canopy cover \geq 5% or *M. ferruginea* present and *Alnus viridis* ssp. *sinuata* (Sitka alder) having at least 10% cover.....
 ***Larix occidentalis* / *Menziesia ferruginea* / *Clintonia uniflora* Forest (LAROCC / MENFER / CLIUNI; NO PLOTS)**
- 2b) *M. ferruginea* canopy cover < 5% and, if present, then *A. viridis* cover < 10%; and *Vaccinium caespitosum* (dwarf bilberry) having \geq 3% canopy cover.....
 ***Larix occidentalis* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest (LAROCC / VACCAE / CLIUNI)**
- 2c) Canopy cover of *Xerophyllum tenax* (beargrass) and/or *Vaccinium membranaceum* (big or globe huckleberry) or their combined cover \geq 5%
 ***Larix occidentalis* / *Clintonia uniflora* – *Xerophyllum tenax* Forest (LAROCC / CLIUNI – XERTEN)**
- 2d) Not as above ***Larix occidentalis* / *Clintonia uniflora* Forest (LAROCC / CLIUNI)**
- 3) *Vaccinium caespitosum* (dwarf bilberry) canopy cover \geq 3%.....
 ***Larix occidentalis* / *Vaccinium caespitosum* Woodland (LAROCC / VACCAE)**
- 3) *V. caespitosum* having < 3% cover 4
- 4) *Linnaea borealis* (twinflower) having \geq 5% canopy cover
 ***Larix occidentalis* / *Linnaea borealis* Forest (LAROCC / LINBOR)**
 **From AA points only; no NVC description available**
 (See Pfister et al. 1977 under *Pseudotsuga menziesii* / *L. borealis* or *Abies lasiocarpa* / *L. borealis* for a description of type and phases)
- 4) *L. borealis* having < 5% canopy cover 5
- 5) *Vaccinium membranaceum* or *Xerophyllum tenax* having \geq 5% cover 6
- 5) *V. membranaceum* and *X. tenax* having < 5% cover **Undefined *Larix occidentalis* Community; the *L. occidentalis* Alliance should have many of the same mesic types as *Pseudotsuga menziesii* Alliance based on similar ecological amplitude; see Pfister et al. 1977 for descriptions of types and phases.**
- 6) *Arctostaphylos uva-ursi* (kinnikinnick) or *Pinus ponderosa* (ponderosa pine) \geq 5% cover
 ***Larix occidentalis* / *Vaccinium membranaceum* / *Arctostaphylos uva-ursi* Forest (LAROCC / VACMEM / ARCUVA; NO PLOTS)**
- 6) Not as above; *Xerophyllum tenax* (beargrass) having \geq 5% canopy cover.....
 ***Larix occidentalis* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest (LAROCC / VACMEM / XERTEN; NO PLOTS)**

Key to *Pinus ponderosa*-characterized Plant Associations

- 1) The canopy cover of *Vaccinium caespitosum* (dwarf bilberry) alone, or in the company of *Arctostaphylos uva-ursi* (kinnikinnick), $\geq 3\%$ ***Pinus ponderosa* / *Vaccinium caespitosum* Woodland (PINPON / VACCAE)**
- 1) Not as above; *V. caespitosum* alone, or in combination with *A. uva-ursi*, having $< 3\%$ canopy cover **2**
- 2) *Symphoricarpos albus* (common snowberry) canopy cover $\geq 5\%$
..... ***Pinus ponderosa* / *Symphoricarpos albus* Forest (PINPON / SYMALB)**
..... **From AA points only; NVC description available**
- 2) *S. albus* cover $< 5\%$ **3**
- 3) *Festuca campestris* (Rough fescue) canopy cover $\geq 5\%$; reduce to as little as 1% if evidence of intensive grazing.....
..... ***Pinus ponderosa* / *Festuca campestris* Woodland (PINPON / FESCAM)**
..... **From AA points only; NVC description lacking**
- 3) *F. campestris* having $< 5\%$ canopy cover with no evidence of other than “normal” grazing pressure or $< 1\%$, even if significantly grazing-impacted..... **Undefined *Pinus ponderosa*-characterized community**

Note: Within the Waterton-Glacier IPP, *Pinus ponderosa* occurs only sporadically in the westernmost portion of Glacier National Park, where it is found only at lower elevations on coarse-textured and well-drained soils or steep slopes with high solar insulation loads.

Key to Shrubland Plant Associations

(Shrubs present canopy cover of at least 10%, either singly or in the aggregate)

- 1)** Height of the tallest dominant shrub not exceeding 0.5 m; this height should reflect its potential height, not its height under strongly limiting conditions, e.g., sites in process of post-fire succession, intensively browsed or relatively youthful in age classes represented (for whatever reasons); this category can include prostrate forms and diminutive forms, e.g., *Dryas octopetala*, *Arctostaphylos uva-ursi* and *Salix arctica* or those with taller stature and more open branching, e.g., *Vaccinium scoparium*, *Mahonia repens*, and *Kalmia microphylla* go to **Key to Dwarf-shrublands**
- 1)** Height of tallest dominant shrub exceeding 0.5 m; some species may not be currently reflecting their potential height, e.g., intensively browsed stands of *Amelanchier alnifolia* or post-burn and high-elevation site *Vaccinium membranaceum* (see NOTE immediately following this lead) go to **Key to “Taller” Shrublands**

Key to “Taller” Shrublands

- 1)** *Salix* spp. (willow species) associated with moisture regimes in excess of that delivered in precipitation alone (hygric to hydric) having canopy cover $\geq 10\%$ (this excludes *S. scouleriana* (Scouler’s willow) from consideration); **However**, if the cover of any of the following shrub species, considered singly or in any combination, is \geq than that of *Salix* spp. the plot should be keyed as a **non-Salix type**: *Betula nana* (dwarf birch), *B. pumila* v. *glandulosa* (bog birch), *B. occidentalis* (water birch), *Alnus viridis* (Sitka alder), *A. incana* (gray or thinleaf alder)..... **Key to Salix-characterized Plant Associations**
- 1)** Not as above, *Salix* spp. having $< 10\%$ canopy cover **Key to Non-Salix-characterized Plant Associations**

Key to Non-*Salix*-characterized Shrubland Plant Associations

- 1) Short stature *Populus tremuloides* (trembling aspen) dominating avalanche chutes or run-out aprons experiencing periodic snowslide disturbance 2
 1) Not as above..... 3
- 2) *Amelanchier alnifolia* (Saskatoon serviceberry) having at least 10% canopy cover
 ***Populus tremuloides* / *Amelanchier alnifolia* Avalanche Chute Shrubland (POPTRE / AMEALN)**
 2) *A. alnifolia* having < 10 % cover **Undefined *Populus tremuloides* “Shrubland” Community**
- 3) *Betula nana* (bog birch) having at least 10% canopy cover 4
 3) *B. nana* having < 10% canopy cover..... 5
- 4a) *Carex utriculata* (beaked sedge) with canopy cover ≥ 25 or the dominant graminoid.....
 ***Betula nana* / *Carex utriculata* Shrubland (BETNAN / CARUTR)**
 4b) Not as above: other wet-site *Carex* (sedge) species (including *C. aquatilis*, *C. lasiocarpa*, *C. limosa*, and *C. interior*) dominant and having at least 10% canopy cover, singly or in the aggregate.
 ***Betula nana* / *Carex* spp. Shrubland (BETNAN / CAREX)**
 4c) Not as above; *Carex* spp., individually or in the aggregate, having < 10% canopy cover and not the herb-layer dominants
 **Undefined *Betula nana* Shrubland Types**
- 5) *Betula occidentalis* (water birch) having at least 10 % canopy cover ***Betula occidentalis* Shrubland (BETOCC)**
 5) *B. occidentalis* having < 10 % cover..... 6a
- 6a) *Alnus incana* (mountain alder) having at least 10% canopy cover 6b
 6b) *Calamagrostis canadensis* (bluejoint reedgrass), *C. stricta* (narrow-spiked reedgrass), or *Senecio triangularis* (arrowleaf groundsel) canopy cover, individually or in the aggregate, $\geq 5\%$
 ***Alnus incana* / *Calamagrostis canadensis* Shrubland (ALNINC / CALCAN)**
 **From AA points only; NVC description available**
 6c) Not as in b. above, *Cornus sericea* (red-osier dogwood) cover $\geq 3\%$
 ***Alnus incana* / *Cornus sericea* Shrubland (ALNINC / CORSER)**
 **From AA points only; NVC description available**
 6d) Not as in b. & c. above, *C. canadensis*, *C. stricta*, *S. triangularis* singly or in any combination < 5% and *C. sericea* cover < 3%.....
 ***Alnus incana* Shrubland (ALNINC)**
 **From AA points only; NVC description available**
 6e) *A. incana* having < 10% canopy cover 7
- 7) *Alnus viridis* ssp. *sinuata* (Sitka alder) having at least 10% canopy cover 8
 7) *A. viridis* ssp. *sinuata* having < 10% canopy cover 9
- 8a) *Athyrium filix-femina* (lady fern) having $\geq 5\%$ canopy cover
 ***Alnus viridis* ssp. *sinuata* / *Athyrium filix-femina* Shrubland (ALNVSS / ATHFIL)**
 8b) *Athyrium filix-femina* having < 5% canopy cover and < 0.5 m in height; the following mesic to hygric forbs having at least 5% canopy cover, singly or in the aggregate: *Actaea rubra* (baneberry), *Angelica arguta* (sharptooth angelica), *A. dawsonii* (Dawson’s angelica), *Circaea alpina* (small enchanter’s nightshade), *Galium triflorum* (sweetscented bedstraw), *Gymnocarpium dryopteris* (oak fern), *Heracleum maximum* (cow parsnip), *Mitella breweri* (Brewer’s mitrewort), *M. pentandra* (five-stamened mitrewort), *Senecio triangularis* (arrowleaf groundsel), *Veratrum viride* (green false hellebore), *Viola glabella* (pioneer violet), *Streptopus amplexifolius* (claspleaf twistedstalk)
 ***Alnus viridis* ssp. *sinuata* / Mesic forbs Shrubland (ALNVSS / MESIC)**
 8c) Not as above; cover of the forbs listed in the couplet lead above, singly or in any combination, < 5%.....
 **Undefined *Alnus viridis* ssp. *sinuata* Shrubland Type**
- 9) *Cornus sericea* (red-osier dogwood) having at least 15% canopy cover alone or having greater than 5% cover if in combination with *Rhamnus alnifolia* (alderleaf buckthorn) and/or *Crataegus douglasii* (black hawthorn) and their combined covers exceeds 15%..... ***Cornus sericea* Shrubland (CORSER)**
 9) *C. sericea* canopy cover < 15%, even if combined with the cover values of *R. alnifolia* and/or *C. douglasii*. 10

- 10) *Rhamnus alnifolia* (alderleaf buckthorn) canopy cover \geq 15% ***Rhamnus alnifolia* Shrubland (RHAALN)**
 **From AA points only; NVC description available**
- 10) *R. alnifolia* having < 15 cover..... 11
- 11) *Crataegus douglasii* (black hawthorn) and/or *C. chrysoarpa* (fireberry hawthorn) having \geq 15% canopy cover or they dominate the tallest shrub layer
 ***Crataegus douglasii* – (*Crataegus chrysoarpa*) Shrubland (CRADOU)**
 **From AA points only; NVC description available**
- 11) *C. douglasii* and *C. chrysoarpa* having < 15% cover and not the dominants of the tallest shrub layer..... 12
- 12) *Ribes lacustre* (prickly currant) having \geq 10% canopy cover and forbs characteristic of hygric to subhydryc moisture regimes having at least 1% cover, including *Actaea rubra* (baneberry), *Angelica arguta* (sharptooth angelica) , *A. dawsonii* (Dawson’s angelica), *Circaea alpina* (small enchanter’s nightshade), *Cornus canadensis* (bunchberry dogwood), *Galium triflorum* (sweetscented bedstraw), *Gymnocarpium dryopteris* (oak fern), *Heracleum maximum* (cow parsnip), *Mitella breweri* (Brewer’s mitrewort), *M. pentandra* (five-stamened mitrewort), *Senecio triangularis* (arrowleaf groundsel), *Veratrum viride* (green false hellebore), *Viola glabella* (pioneer violet) *Streptopus amplexifolius* (claspleaf twistedstalk)
 ***Ribes lacustre* / *Chamerion angustifolium* Shrubland (RIBLAC / CHAANG)**
- 12) *R. lacustre* having < 10% canopy cover; the converse of the second portion of lead above (i.e., above-listed forbs characteristic of mesic to subhydryc regimes having < 1% cover (singly or in any aggregate) does not have to be satisfied 13
- 13) *Menziesia ferruginea* (fool’s huckleberry, rusty menziesia) having at least 10% cover, or as little as 5% **if accompanied** by the single coverage or any combination of the following shrubs [*Alnus viridis ssp. sinuata* (Sitka alder), *A. incana* (mountain alder), *Lonicera involucrata* (twinberry honeysuckle), *Ribes lacustre* (prickly currant), *Ribes hudsonianum* (northern black currant), *Rhamnus alnifolia* (alderleaf buckthorn), *Spiraea splendens* (rose meadowsweet)] that would cause total to exceed 10%
 ***Menziesia ferruginea* / *Xerophyllum tenax* Shrubland (MENFER / XERTEN)**
- 13) Not as above, i.e., *M. ferruginea* cover < 10%, or if greater, then it’s cover combined with any single value or assemblage of the above listed shrubs still totals < 10%..... 14
- 14) *Rubus parviflorus* (thimbleberry) having 1) \geq 15% canopy cover or \geq 5% cover if in combination with any single occurrence or combination of the following shrub to produce \geq 15% cover [*Sorbus scopulina* (Green’s mountain ash), *S. sitchensis* (Sitka mountain ash), *Lonicera involucrata* (twinberry honeysuckle), *Acer glabrum* (Rocky Mountain maple)] 15
- 14) Not as above; *R. parviflorus* having <15% cover alone and if having \geq 5% cover then its combination with any assemblage of the shrubs listed in lead immediately above totals < 15%..... 16
- 15) Any one, or any combination, of the following forbs having \geq 5% canopy cover: *Heracleum maximum* (cow parsnip), *Angelica arguta* (sharptooth angelica), *A. dawsonii* (Dawson’s angelica), *Osmorhiza occidentalis* (western sweetcicely), *Veratrum viride* (green false hellebore), *Viola canadensis* (Canada violet), *V. glabella* (pioneer violet), *Actaea rubra* (baneberry), or *Galium triflorum* (sweetscented bedstraw).....
 ***Rubus parviflorus* / *Chamerion angustifolium* – *Heracleum maximum* Shrubland (RUBPAR / HERMAX)**
- 15) Not as above: single or collective cover of the above-listed forbs < 5%.....
 **Undefined *Rubus parviflorus* Shrubland**
- 16) *Elaeagnus commutata* (silverberry) canopy cover \geq 15% in the tallest layer of shrubs.....
 ***Elaeagnus commutata* Shrubland (ELACOM)**
- 16) *E. commutata* canopy cover < 15%..... 17
- 17) *Vaccinium membranaceum* (big or thinleaf huckleberry) canopy cover \geq 10%; if < 10%, then *Sorbus scopulina* (Green’s mountain ash) and or *S. sitchensis* (Sitka or western mountain ash) cover sufficient to bring their combined cover to \geq 10%
 ***Vaccinium membranaceum* / *Xerophyllum tenax* Shrubland (VACMEM / XERTEN)**
- 17) Not as above: *V. membranaceum* cover < 10% even with the addition of *S. scopulina* and/or *S. sitchensis*..... 18
- 18a) *Acer glabrum* (mountain maple) \geq 15% or > 10%, if *Prunus virginiana* (common chokecherry) or *P. emarginata* (bitter cherry) sufficient to make their combined cover \geq 15% 18b
- 18b) Community located in avalanche path, chute or runout area
 ***Acer glabrum* Avalanche Chute Shrubland (ACEGLA CHUTE)**
- 18e) Community not located in avalanche environment but rather a bottomland or possibly subirrigated position ...
 ***Acer glabrum* Drainage Bottom Shrubland (ACEGLA BOTTOM); NO PLOTS**

- 18d)** *A. glabrum* cover < 10%, *Prunus virginiana* (common chokecherry) or *P. emarginata* (bittercherry) or their combined canopy cover ≥ 15%
 **[*Prunus virginiana* – (*Prunus americana*) Shrubland (PRUVIR)]**
 **From AA points only; NVC description available**
- 18e)** *A. glabrum*, *P. virginiana*, *P. emarginata* or any combination of their individual or combined cover < 15% **19**
- 19)** *Amelanchier alnifolia* (serviceberry) canopy cover ≥ 15% **or** *A. alnifolia* ≥ 3% and its cover, combined with that of any assemblage of the following shrubs, ≥ 10%: *Prunus virginiana* (common chokecherry), *P. emarginata* (bitter cherry), *Acer glabrum* (Rocky Mountain maple), *Rubus parviflorus* (thimbleberry), *Sorbus scopulina* (Green’s mountain ash) **20**
- 19)** *A. alnifolia* canopy cover < 15% or if > 3% cover then when combined with any mix of the other shrubs listed above their summed cover < 10% **21**
- 20)** Bunchgrasses having at least 10% canopy cover, singly or in any combination [including *Pseudoroegneria spicata* (bluebunch wheatgrass), *Festuca campestris* (rough fescue), *Festuca idahoensis* (Idaho fescue), *Achnatherum richardsonii* (= *Stipa richardsonii*, Richardson’s needlegrass), *A. nelsonii* ssp. *dorei* (Dore’s needlegrass), *A. nelsonii* ssp. *nelsonii* (Columbia needlegrass), *A. occidentale* v. *occidentale* (western needlegrass), *Koeleria macrantha* (prairie junegrass), *Bromus marginatus* (mountain brome), *B. inermis* ssp. *pumpellianus* (Pumpelly’s brome)]
 ***Amelanchier alnifolia* / *Pseudoroegneria spicata* – Bunchgrass Shrubland (AMEALN / BUNCH)**
- 20)** Not as above: bunchgrass cover, whether represented by a single species or the combined cover of any assemblage of the above-listed grasses < 10 % (be sure to evaluate the effects of grazing and revise criteria downward in light of substantial consumption/disturbance) ***Amelanchier alnifolia* / (Mixed Grass, Forb) Shrubland (AMEALN / MIXED)**
- 21)** *Symphoricarpos occidentalis* (western snowberry) canopy cover ≥ 15%
 ***Symphoricarpos occidentalis* Shrubland (SYMOCC)**
- 21)** *S. occidentalis* canopy cover < 15% **22**
- 22)** *Symphoricarpos albus* (common snowberry) canopy cover ≥ 15%
 ***Symphoricarpos albus* Shrubland (SYMALB)**
- 22)** *S. albus* cover < 15 % **23**
- 23)** *Rosa woodsii* (Woods’ rose) and/or *Rosa acicularis* (prickley rose) canopy cover ≥ 15 %
 ***Rosa woodsii* Shrubland (ROSWOO)**
- 23)** Not as above, *R. woodsii* and *R. acicularis* or their combined canopy cover < 15 % **24**
- 24)** *Dasiphora floribunda* (shrubby cinquefoil) having ≥ 10% cover or is the dwarf-shrub layer dominant [Note: in exceptional cases *Juniperus communis* (common juniper) may be the shrub-layer dominant]; in the case of reduced overall herbaceous canopy cover, *D. floribunda* having ≥ 5 cover **25**
- 24)** Not as above; *D. floribunda* with < 10% cover and not the undergrowth dominant **27**
- 25)** The individual or combined cover of any combination of the following graminoids at least 5%, *Festuca campestris*, *F. idahoensis*, *Danthonia intermedia* (timber oatgrass), *Elymus trachycaulus* (slender wheatgrass), *Elymus caninus* (bearded wheatgrass) or *Carex scirpoidea* (northern single-spiked sedge) **23**
- 25)** Not as above; the above-cited graminoids, either individually or in combination, having < 5% canopy cover
 ***Dasiphora floribunda* / *Artemisia michauxiana* Dwarf-shrubland (DASFLO / ARTMIC)**
- 26)** The canopy cover of graminoids in lead 22 (do not consider that of *F. idahoensis*) ≥ 5 %, alone or in any combination
 ***Dasiphora floribunda* / *Festuca campestris* Shrub Herbaceous Vegetation (DASFLO / FESCAM)**
- 26)** Not as above; the single or combined canopy cover of any lead 22 graminoids, except *F. idahoensis*, < 1%
 ***Dasiphora floribunda* / *Festuca idahoensis* Shrub Herbaceous Vegetation (DASFLO / FESIDA)**
- 27)** *Artemisia tridentata* ssp. *vaseyana* (mountain big sagebrush) canopy cover ≥ 10% **28**
- 27)** *A. tridentata* ssp. *vaseyana* having < 10% cover
Carefully evaluate canopy cover of all shrubs and re-enter key; if no matches are found, then an unreported/undefined shrubland community type may be present!
- 28)** Canopy cover of *Festuca campestris* (rough fescue) ≥ 5% or only > 1% if ungulate grazing is/was intensive
 ***Artemisia tridentata* ssp. *vaseyana* / *Festuca campestris* Shrub Herbaceous Vegetation**
 **(ARTTSV / FESCAM)**

- 28) *F. campestris* cover < 5% (< 1% even if grazed)..... 29
- 29) *Festuca idahoensis* (Idaho fescue) canopy cover \geq 5% or only \geq 1% if demonstrated ungulate grazing is/was intensive.....
...**Artemisia tridentata ssp. vaseyana / Festuca idahoensis Shrub Herbaceous Vegetation (ARTTSV / FESIDA)**
- 29) *F. idahoensis* has < 5% cover (< 1%, even if grazed).....
..... **Undefined *A. tridentata* ssp. vaseyana-characterized community**

Key to *Salix* (willow)-characterized Shrubland Plant Associations (exclusive of dwarf willow species)

NOTE: In the course of AA sampling *Salix sitchensis* has ostensibly been found, even occurring as a community dominant. Some are of the opinion that these occurrences are just extreme forms of *Salix drummondiana*. When encountering putative *S. sitchensis*, please collect a voucher specimen(s) for expert verification. If *S. sitchensis* does occur, in all probability it is a close ecological analog of *S. drummondiana*. In using these keys and the classification, treat possible *S. sitchensis* as *S. drummondiana*.

- 1) *Salix candida* (sageleaf willow) canopy cover \geq 10% or having greater cover than other *Salix* spp. (willow species) present; *Carex utriculata* (beaked sedge) dominates the undergrowth.....
***Salix candida* / *Carex utriculata* Shrubland (SALCAN / CARUTR)**
From WLNP AA points only; listed for NVC and MT
- 1) *S. candida* cover < 10% and it has less cover than other willow species present..... 2
- 2) *Salix commutata* (undergreen willow) cover \geq 10% or having the greatest cover among *Salix* spp. present.....
***Salix commutata* / Mesic Graminoid Shrubland (SALCOM MESIC GRAMINOID)**
- 2) *S. commutata* having < 10% cover and not having the greatest cover among *Salix* spp. present..... 3
- 3) *Salix glauca* (grayleaf willow) having \geq 10% canopy cover***Salix glauca* Shrubland (SALGLA)**
- 3) Not as above; *S. glauca* having < 10% cover..... 4
- 4a) *Salix drummondiana* (Drummond willow) having a greater canopy cover than the individual or combined cover of *Salix boothii* (Booth willow) and *Salix geyeriana* (Geyer willow)..... 5
- 4b) *S. boothii* and *S. geyeriana*, singly or in combination, having greater canopy cover than *S. drummondiana*..... 7
- 4c) Not as above; *Salix lutea* (yellow willow) or *S. pseudomonticola* (false mountain willow) having greater canopy cover than any other willow present..... 11
- 4d) Not as above, *Salix bebbiana* (Bebb willow), *S. exigua* (narrowleaf or sandbar willow), *S. melanopsis* (dusky willow) or *S. scouleriana* (Scouler's willow) having greater canopy cover than any of the five above-named *Salix* spp..... 12
- 5) *Carex utriculata* (beaked sedge), *C. vesicaria* (inflated sedge), or *C. atherodes* (awned sedge), or *C. aquatilis* (water sedge), individually or in combination, having \geq 10% canopy cover.....
***Salix drummondiana* / *Carex utriculata* Shrubland (SALDRU / CARUTR)**
- 5) Not as above..... 6
- 6) *Calamagrostis canadensis* (bluejoint reedgrass), *C. stricta* (narrow-spike reedgrass) or *Deschampsia caespitosa* (tufted hairgrass), singly or in any combination, having \geq 5% canopy cover.....
***Salix drummondiana* / *Calamagrostis canadensis* Shrubland (SALDRU / CALCAN)**
- 6) Not as above; *C. canadensis*, *C. stricta* and *D. caespitosa*, singly or combined, having < 5% canopy cover.....
***Salix drummondiana* / Mesic Forbs Shrubland (SALDRU / MESIC FORBS)**
- 7) *Salix geyeriana* (Geyer willow) having greater canopy cover than *Salix boothii* (Booth's willow)..... 8
- 7) *S. geyeriana* having less canopy cover than *S. boothii*..... 9
- 8) The undergrowth is dominated by mesic to hydric-indicating forbs including, but not restricted to *Mertensia ciliata* (tall fringed bluebells), *Senecio triangularis* (arrowleaf groundsel), *S. hydrophiloides* (tall groundsel), *Geum macrophyllum* (largeleaf avens), *Heracleum maximum* (cowparsnip), *Veratrum viride* (green false hellebore), *Pedicularis groenlandica* (elephanthead lousewort), *Trollius laxus* (American globeflower), *Urtica dioica* (stinging nettle), *Maianthemum stellatum* (starry false lily-of-the-valley): (Note: not all of the aforementioned species are necessarily found in GNP).....
***Salix geyeriana* / Mesic Forbs Shrubland (SALGEY / MESIC FORBS)**
- 8) Not as above..... **Undefined *S. geyeriana* shrubland**
- 9) The following sedges singly, or in any combination, having \geq 10% canopy cover: *Carex utriculata* (beaked sedge), *C. vesicaria* (inflated sedge), *C. atherodes* (awned sedge), *C. aquatilis* (water sedge).....
***Salix boothii* / *Carex utriculata* Shrubland (SALBOO / CARUTR)**
From AA points only; NVC description available
- 9) Not as above;..... 10

- 10) *Calamagrostis canadensis* (bluejoint reedgrass), *C. stricta* (narrow-spike reedgrass) or *Deschampsia caespitosa* (tufted hairgrass), singly or in any combination, having $\geq 5\%$ canopy cover.....
 ***Salix boothii* / *Calamagrostis canadensis* Shrubland (SALBOO / CALCAN)**
 **From AA points only; NVC description available**
- 10) Not as above: *C. canadensis*, *C. stricta* and *D. caespitosa*, singly or combined, having $< 5\%$ canopy cover.....
 ***Salix boothii* / Mesic Forbs Shrubland (SALBOO / MESIC FORBS)**
- 11) *Salix pseudomonticola* (false mountain willow) having greater canopy cover than *S. lutea* (yellow willow).....
 ***Salix pseudomonticola* Shrubland (SALPSE)**
 **From AA points only; NVC description lacking**
- 11) *S. lutea* having greater canopy cover than *S. pseudomonticola*..... **12**
- 12a) *Carex utriculata* (beaked sedge), *C. vesicaria* (inflated sedge), or *C. atherodes* (awned sedge), or *C. aquatilis* (water sedge), individually or in combination, having $\geq 10\%$ canopy cover.....
 ***Salix lutea* / *Carex utriculata* Shrubland (SALLUT / CARUTR; NO PLOTS)**
- 12b) Not as above; *Calamagrostis canadensis* (bluejoint reedgrass), *C. stricta* (narrow-spike reedgrass) or *Deschampsia caespitosa* (tufted hairgrass), singly or in any combination, having $\geq 5\%$ canopy cover.....
 ***Salix lutea* / *Calamagrostis canadensis* Shrubland (SALLUT / CALCAN; NO PLOTS)**
- 12c) Not as above; *C. canadensis*, *C. stricta*, and *D. caespitosa*, singly or in any combination, having $< 5\%$ cover
 **Undefined *Salix lutea* shrubland**
- 13) *Salix bebbiana* (Bebb willow) having a greater canopy cover than any other individual *Salix* spp. or the combined cover of other *Salix* spp. ***Salix bebbiana* Shrubland (SALBEB)**
- 13) *S. bebbiana* canopy cover less than that of other individual willows **14**
- 14) *Salix exigua* (narrowleaf willow) or *S. melanopsis* (dusky willow) or their combined cover greater than that of any other *Salix* spp. (willow species); invasive, non-native grasses important in the undergrowth such as *Agrostis stolonifera*, *Poa palustris*, or *Phalaris arundinacea* ***Salix exigua* / *Agrostis stolonifera* Shrubland (SALEXI / AGRSTO)**
 **From AA points only, NVC and Hansen et al. 1995 descriptions available**
- 14) *S. exigua* and *S. melanopsis* or their combined cover less than that of other individual *Salix* (willow) species..... **15**
- 15) *S. scouleriana* (Scouler's willow) is the dominant willow species ***Salix scouleriana* Shrubland (SALSCO)**
 **From AA points only; NVC description lacking**
- 15) *S. scouleriana* is not the dominant willow species..... **Unidentified willow community**

Key to Dwarf-shrub Plant Associations

A) *Salix nivalis* (snow willow), *Salix arctica* (Arctic willow), *Kalmia microphylla* (alpine laurel), *Phyllodoce empetriformis* (pink mountainheath), *Phyllodoce glanduliflora* (yellow mountainheath), *Cassiope mertensiana* (Merten’s mountain heather), *Vaccinium scoparium* (grouse whortleberry), *V. myrtilus* (dwarf bilberry) or *Vaccinium caespitosum* (dwarf huckleberry) having 15% canopy cover or are the dominant species of the dwarf-shrub and herb layer

Key to “Moister, Wetter Site” Dwarf-shrub Plant Associations

A) Not as above; any of the following species having $\geq 15\%$ canopy cover, individually or in combination; *Arctostaphylos uva-ursi* (bearberry), *Artemisia tridentata ssp. vaseyana* (mountain big sagebrush), *Dasiphora floribunda* (shrubby cinquefoil), *Dryas* spp. (mountain avens), *Juniperus horizontalis* (creeping juniper), *Penstemon ellipticus* (rocky ledge penstemon), *Spiraea betulifolia* (white spiraea).....

Key to “Drier Site” Dwarf-shrub Plant Associations

Key to “Moister, Wetter Site” Dwarf-shrub Plant Associations

- 1) *Kalmia microphylla* canopy cover $\geq 10\%$ 2
- 1) *K. microphylla* canopy cover $< 10\%$ 4
- 2) *Carex scopulorum* (Holm’s Rocky Mountain Sedge), having $\geq 10\%$ canopy cover
 ***Kalmia microphylla* / *Carex scopulorum* Dwarf-shrubland (KALMIC / CARSCO; NO PLOTS)**
- 2) Not as above; *C. scopulorum* having $< 10\%$ cover 3
- 3) *Carex nigricans* (Black Alpine Sedge) or *Sibbaldia procumbens* (Creeping Sibbaldia) or their combined cover $\geq 5\%$
 ***Kalmia microphylla* / *Carex nigricans* Dwarf-shrubland (KALMIC / CARNIG)**
- 3) *C. nigricans* or *Sibbaldia procumbens* or their combined cover $< 5\%$
 **Undefined *Kalmia microphylla* Dwarf-shrubland**
- 4) *Phyllodoce glanduliflora* (yellow mountainheath) or *Phyllodoce empetriformis* (pink mountainheath), singly or combined having $\geq 10\%$ canopy cover (typically of snowbed, or late-persisting snowfields)
 ***Phyllodoce glanduliflora* / *Sibbaldia procumbens* Dwarf-shrubland (PHYGLA / SIBPRO)**
- 4) Not as above: *P. glanduliflora* and *P. empetriformis*, their individual or combined cover, $< 10\%$ 5
- 5) *Salix nivalis* (= *S. reticulata* ssp. *nivalis*, snow willow) or *Salix arctica* (Arctic willow; **Note**, that the most recent systematic treatment of *Salix* recognizes *S. arctica* v. *petraea*, which all GNP specimens have been identified as, to be in fact *S. petrophila*) having minimum of 10 % cover alone or in any combination **and** *Dryas octopetala* (mountain-avens) cover $< 5\%$ 6
- 5) *S. nivalis* or *S. arctica* or their combined cover $< 10\%$ 10
- 6) *Caltha leptosepala* (marsh marigold), *Trollius laxus* (American globeflower), *Tofieldia glutinosa* (sticky tofieldia), *Hypericum formosum* (Scouler’s St. Johnswort) [other hygric-hydric forbs, including *Carex scopulorum* (?) to be listed] having at least 5% canopy cover, singly or their combined cover
 ***Salix nivalis* / *Caltha leptosepala* Dwarf-shrubland (SALNIV / CALLEP; NO PLOTS)**
- 6) Not as above; wet-site forbs, considered singly or in any combination, having $< 5\%$ cover..... 7
- 7) *Carex nigricans* (black alpine sedge) or *Sibbaldia procumbens* (creeping sibbaldia) or their combined cover $\geq 5\%$ (snowbed communities of depressed and protected exposures with long-persisting snow) dominated by discontinuous mat of *S. arctica* the interstices of which are occupied by gray lichen soil crust.....
 ***Salix arctica* / *Carex nigricans* Dwarf-shrubland (SALARC / CARNIG)**
- 7) Not as above; *C. nigricans* and *S. procumbens* singly or their combined cover $< 5\%$ 8
- 8) *Dryas octopetala* (mountain-avens) canopy cover $\geq 5\%$ **and** *Kobresia* spp. (bog sedges) **or** *Carex scirpoidea* (northern singlespike sedge) having $\geq 5\%$ cover **and/or** the following forbs dominating the forb component, *Polygonum viviparum* (alpine bistort), *P. bistortoides* (American bistort), *Zigadenus elegans* (mountain deathcamas).....
 ***Dryas octopetala* – *Polygonum viviparum* Dwarf-shrub Herbaceous Vegetation (DRYOCT – POLVIV)**
- 8) Not as above:..... 9
- 9) Vegetation carpet (turf) covering mostly sloping landforms with *Arnica rydbergii* (Rydberg’s arnica), and *Arenaria capillaris* (slender mountain sandwort) present with cover $\geq 1\%$, indicating persisting snow cover; other forbs present, including variously

Polygonum bistortoides (American bistort), *P. viviparum* (alpine bistort), *Hedysarum sulphurescens* (white sweetvetch), *Gentiana calycosa* (Rainier pleated gentian), *Astragalus bourgovii* (Bourgov's milkvetch) indicate more mesic soil moisture regime than other turf types

.....***Salix arctica* – (*Salix petrophila*, *Salix nivalis*) / *Polygonum bistortoides* Dwarf-shrubland (SALARC / POLBIS)**

9) Not as above;..... Undefined *Salix arctica* and *S. nivalis* communities

10) *Vaccinium scoparium* (grouse whortleberry) or *V. myrtillus* (dwarf bilberry) or any combination of the two exhibiting $\geq 10\%$ canopy cover..... *Vaccinium (myrtillus, scoparium) / Luzula glabrata var. hitchcockii* Dwarf-shrubland (VACSCO / LUZGVH)****

10) *V. scoparium* and *V. myrtillus* or any combination of the two having $< 10\%$ canopy cover Undefined dwarf-shrub communities (see key to “Drier Site” dwarf-shrubland P. As.)

Key to “Drier Site” Dwarf-shrub Plant Associations

- 1) *Vaccinium caespitosum* (dwarf bilberry) having $\geq 5\%$ canopy cover
 ***Vaccinium caespitosum* Dwarf-shrubland (VACCAE; NO PLOTS)**
- 1) *V. caespitosum* having $< 5\%$ canopy cover 2
- 2) *Spiraea betulifolia* (white spiraea) having $\geq 15\%$ canopy or $\geq 10\%$ if accompanied by additional coverages of *Symphoricarpos albus* (common snowberry) or *Juniperus communis* (common juniper).....
***Spiraea betulifolia* Dwarf-shrubland (SPIBET)**
- 2) Not as above..... 3
- 3) *Penstemon ellipticus* (rocky ledge penstemon) having $\geq 10\%$ canopy cover or the dominant shrub of the dwarf-shrub & herb layer***Penstemon ellipticus* Dwarf-shrubland (PENELL)**
- 3) *P. ellipticus* having $< 15\%$ cover and not the dominant shrub of the dwarf-shrub layer 4
- 4) *Dryas octopetala* (eight-petal mountain avens) having $\geq 10\%$ canopy cover or, if accompanied by dwarf *Salix* spp (willow species), their combined cover $\geq 10\%$ 5
- 4) Not as above; *D. octopetala* having $< 10\%$ cover or if accompanied by dwarf *Salix* spp. their combined cover $< 10\%$ 7
- 5) Relatively mesic sites with protected slopes and having a relatively high vegetative cover; *Carex scirpoidea* (northern single-spike sedge), *Kobresia myosuroides* (Ballard’s bog sedge), *Kobresia simpliciuscula* (simple bog sedge), their individual or combined cover $\geq 5\%$ and/or the following forbs dominating the forb component, *Polygonum viviparum* (alpine bistort), *P. bistortoides* (American bistort), *Zigadenus elegans* (mountain deathcamas), *Hedysarum sulphurescens* (white sweetvetch)
***Dryas octopetala* – *Polygonum viviparum* Dwarf-shrub Herbaceous Vegetation (DRYOCT – POLVIV)**
- 5) Not as above; all of the above-named species, singly or in any combination, having $< 5\%$ cover..... 6
- 6) Relatively xeric sites of exposed positions (rigdgetops, slope shoulders, saddles, etc.) with graminoid cover equaling or exceeding that of forbs (*Carex rupestris* (curly sedge), *Festuca brachyphylla* (alpine fescue), *F. idahoensis* (Idaho fescue), *Calamagrostis purpurascens* (purple reedgrass) ; *C. koelerioides* (fire reedgrass): forbs tend to be cushion plants such as *Minuartia* spp. (= *Arenaria* spp., sandworts), *Silene acaulis* (moss campion), *Douglasia montana* (Rocky Mountain dwarf primrose), *Oxytropis campestris* (field locoweed), *Antennaria umbrinella* (umber pusseytoes)
***Dryas octopetala* – *Carex rupestris* Dwarf-shrub Herbaceous Vegetation (DRYOCT – CARRUP)**
- 6) Not as above**Undefined *Dryas octopetala*-characterized community**
- 7) *Dryas drummondii* (yellow mountain-avens) having $\geq 10\%$ canopy cover or is the dwarf-shrub layer dominant ($> 5\%$ cc) where total dwarf-shrub & herb layer canopy is depauperate (usually found in gravel-bar riparian environments).....
 ***Dryas drummondii* / *Chamerion latifolium* Dwarf-shrubland (DRYDRU / CHALAT)**
- 7) *D. drummondii* having $< 10\%$ canopy cover or is not the dwarf-shrub layer dominant of sites with overall reduced canopy cover 8
- 8) *Arctostaphylos uva-ursi* (kinnikinnick) having $\geq 10\%$ canopy cover alone or its cover at least 3% and with the additional contribution of *Dasiphora floribunda* (= *Pentaphylloides floribunda*, *Potentilla fruticosa*, shrubby cinquefoil) and/or *Juniperus horizontalis* (creeping juniper) their combined cover $\geq 10\%$ %; (**however**, if *D. floribunda* is at least 10% and dominant (having greater cover than any other shrub spp.), then go to lead 11)..... 9
- 8) Not as above: *A. uva-ursi* having $< 10\%$ cover and even if its cover is $\geq 3\%$ but that of accompanying sub-shrubs *D. floribunda* and *J. horizontalis* does not bring the total to $\geq 10\%$ then..... 11
- 9) *Festuca campestris* (= *F. scabrella*, rough fescue), or *Festuca idahoensis* (Idaho fescue), *Danthonia intermedia* (timber oatgrass), *Danthonia parryi* (Parry’s oatgrass) or *Carex scirpoidea* (northern singlespike sedge) in any combination having canopy cover $\geq 5\%$, or only 1% where grazing (native or domesticated ungulates) is demonstrated **and** *Pseudoroegneria spicata* (bluebunch wheatgrass) having $< 5\%$ cover
***Arctostaphylos uva-ursi* / *Festuca campestris* – *Festuca idahoensis* Dwarf-shrubland (ARCUVA / FESCAM – FESIDA)**
- 9) Not as above; *F. campestris*, *F. idahoensis*, *D. intermedia*, *D. parryi*, or *C. scirpoidea* in any combination, having $< 5\%$ cover (or $< 1\%$ if grazing is indicated) and with the potential to contribute minimal cover ($< 5\%$)..... 10

- 10) *Pseudoroegneria spicata* (bluebunch wheatgrass) cover \geq 5%
 **Arctostaphylos uva-ursi / Pseudoroegneria spicata Dwarf-shrubland (ARCUVA / PSESPI)**
- 10) *P. spicata* cover < 5% **Arctostaphylos uva-ursi / Solidago multiradiata Dwarf-shrubland**
 **(ARCUVA / SOLMUL)**
- 11) *Dasiphora floribunda* (shrubby cinquefoil) with \geq 10% cover or is the dwarf-shrub layer dominant; in the case of reduced overall herbaceous canopy cover, *D. floribunda* having \geq 5 cover **12**
- 11) Not as above; *D. floribunda* with < 10% cover and not the undergrowth dominant **14**
- 12) The individual or combined cover of any combination of the following graminoids at least 5%, *Festuca campestris*, *F. idahoensis*, *Danthonia intermedia* (timber oatgrass), *Elymus trachycaulus* (= *Agropyron caninum*, slender or bearded wheatgrass), *Bromus marginatus* (mountain brome), *Bromus inermis* ssp. *pumpellianus* (Pumpelly's brome), *Carex hoodii* (Hood's sedge), or *Carex scirpoidea* (northern singlespike sedge) **13**
- 12) Not as above; the above-cited graminoids, either individually or in combination, having < 5% canopy cover
 **Dasiphora floribunda / Artemisia michauxiana Dwarf-shrubland (DASFLO / ARTMIC)**
- 13) The cover of graminoids in lead 12, with the exception of *F. idahoensis*, \geq 1%, alone or in any combination
 **Dasiphora floribunda / Festuca campestris Shrub Herbaceous Vegetation (DASFLO / FESCAM)**
- 13) Not as above; the single or combined canopy cover of any lead 16 graminoids, except *F. idahoensis*, < 1%
 **Dasiphora floribunda / Festuca idahoensis Shrub Herbaceous Vegetation (DASFLO / FESIDA)**
- 14) *Artemisia tridentata* ssp. *vaseyana* (mountain big sagebrush) having at least 10% canopy cover **15**
- 14) *A. tridentata* ssp. *vaseyana* having < 10% cover **Undefined Dwarf-shrubland**
- 15) Canopy cover of *Festuca campestris* (rough fescue) \geq 5% or only > 1% if ungulate grazing is/was intensive
 **Artemisia tridentata ssp. vaseyana / Festuca campestris Shrub Herbaceous Vegetation (ARTTSV / FESCAM)**
- 15) *F. campestris* has < 5% cover (< 1% even if grazed) **16**
- 16) *Festuca idahoensis* (Idaho fescue) canopy cover \geq 5% or only \geq 1% if demonstrated ungulate grazing is/was intensive
 **Artemisia tridentata ssp. vaseyana / Festuca idahoensis Shrub Herbaceous Vegetation (ARTTSV / FESIDA)**
- 16) *F. idahoensis* has < 5% cover (< 1% even if grazed)
 **Undefined *A. tridentata* ssp. vaseyana-characterized community**

Key to Graminoid Dominated/Characterized Plant Associations

NOTE: In the following Graminoid Dominated/Characterized Key not all the leads result in keying to a plant association having a graminoid in the title; this is because despite the apparent graminoid importance the plots actually showed greater ecological similarity and considerable floristic resemblance to types named for important forbs. **Included here**, in addition to vegetation types dominated by members of the **Poaceae** (grasses), are communities dominated or “characterized” by members of the families **Juncaceae** (rush family, including *Juncus* spp. [rush], *Luzula* spp. [woodrush]); **Cyperaceae** (sedge family, including *Carex* spp. [sedge], *Cyperus* spp. [galingale], *Dulichium arundinaceum* [dulichium, threeway sedge], *Eleocharis* spp. [spike rush], *Eriophorum* spp. [cotton grass], *Kobresia* spp. [kobresia or bog sedge], *Scirpus* spp. [bulrush]; **Typhaceae** (cattail family, *Typha* spp. [cattails]; **Juncaginaceae** (arrow grass family, including *Lilaea scilloides* (flowering quillwort) and *Triglochin* spp. [arrow grass]). **Not included here** as “graminoid” types are vegetation types named for members of the ferns and “fern allies” including **Equisetaceae** (horsetail family), **Lycopodiaceae** (club moss family), **Marsileaceae** (pepperwort family), **Ophioglossaceae** (grape fern family), **Polypodiaceae** (fern family), **Selaginellaceae** (spike moss family); these herbaceous, non-graminoid groups are found under the forb key.

- A) *Carex* (sedge) spp. or *Kobresia* (Kobresia or bog sedge) spp. having $\geq 15\%$ canopy cover or dominant taxa of the tallest layer **Key to “*Carex* (sedge)- and *Kobresia* (bog sedge)-dominated/characterized Plant Associations”**
 A) *Carex* and *Kobresia* spp. having $< 15\%$ canopy cover and not the dominant taxa of the tallest layer
 **Key to “Non-sedge Graminoid-dominated Plant Associations”**

Key to *Carex* (Sedge)-and *Kobresia* (Bog Sedge)-dominated/characterized Plant Associations

- 1) *Carex utriculata* (beaked sedge), *Carex aquatilis* (water sedge), *Carex buxbaumii* (Buxbaum's sedge), *Carex lasiocarpa* (woollyfruit sedge), *Carex limosa* (mud sedge) or *Dulichium arundinaceum* (threeway sedge) present and/or dominant in stand, either individually or together in various combinations. *Deschampsia caespitosa* may be a co-dominant 2
 1) Not as above 8
- 2a) *Carex limosa* (mud sedge) canopy cover $\geq 25\%$ or it is the greatest cover of sedges present
 ***Carex limosa* Herbaceous Vegetation (CARLIM)**
 **From AA points only; NVC description available**
- 2b) *Dulichium arundinaceum* (threeway sedge) having at least 5 % canopy cover
 ***Dulichium arundinaceum* Herbaceous Vegetation (DULARU)**
 **From AA points only; NVC description available**
- 2c) Not as above, *D. arundinaceum* has $< 5\%$ cover, *Carex lasiocarpa* (woollyfruit sedge) having at least 5% cover, *Carex utriculata* can be present in near equal abundance, or absent ***Carex lasiocarpa* Herbaceous Vegetation (CARLAS)**
- 2d) *Carex lasiocarpa* (woollyfruit sedge) not present or, if so, then $< 1\%$ canopy cover 3
- 3) *Carex buxbaumii* (Buxbaum's sedge) present with at least 5% cover, *Carex utriculata* can be present in near equal abundance ***Carex buxbaumii* Herbaceous Vegetation (CARBUX)**
- 3) *Carex buxbaumii* (Buxbaum's sedge) not present or having $< 5\%$ cover 4
- 4) *Carex utriculata* (beaked sedge) or *Carex aquatilis* (water sedge) the dominant sedges, either individually or together; other graminoid species may be present in high abundance as well 5
- 4) Not as above; *C. utriculata* (beaked sedge) or *C. aquatilis* (water sedge) not the dominant sedges; other graminoid species not necessarily present in high abundance 9
- 5) *Carex aquatilis* (water sedge) individually has the highest cover, if *Carex utriculata* (beaked sedge) is present (or other sedges not listed above), it/they contribute(s) not more than one third of the total cover. Other graminoid species may be present and abundant 6
- 5) *Carex aquatilis* (water sedge) is not present or is not the dominant sedge (may have equal cover to *C. utriculata*, [beaked sedge]) 7
- 6) *Deschampsia caespitosa* (tufted hairgrass) present with at least 10% cover and is co-dominant with *Carex aquatilis* (water sedge), no *Carex utriculata* (beaked sedge) present
 ***Carex aquatilis* – *Deschampsia caespitosa* Herbaceous Vegetation (CARAQU – DESCAL; NO PLOTS)**

- 6) *Deshampsia caespitosa* (tufted hairgrass) not present, or if so, then with < 1% cover or clearly not a co-dominant. *Carex aquatilis* (water sedge) individually has the highest cover, if *Carex utriculata* (beaked sedge) is present (or other sedges not listed above), it/they contribute(s) not more than one third of the total cover ***Carex aquatilis* Herbaceous Vegetation (CARAQU)**
- 7) *Carex aquatilis* (water sedge) and *Carex utriculata* (beaked sedge) are both present and in near equal abundance, if not equal than one is not less than two-thirds cover of the other ***Carex aquatilis* – *Carex utriculata* Herbaceous Vegetation (CARAQU – CARUTR)**
- 7) *Carex utriculata* (beaked sedge) has the highest individual cover, if *Carex aquatilis* (water sedge) is present (or other sedges not listed above), it/they contribute(s) not more than one third of the total cover Other graminoid species may be present and abundant **8**
- 8) *Deshampsia caespitosa* (tufted hairgrass) present with at least 10% cover and is co-dominant with *Carex utriculata*, no *Carex aquatilis* present ***Carex utriculata* – *Deshampsia caespitosa* Herbaceous Vegetation (CARUTR – DESCAR; **NO PLOTS**)**
- 8) *Carex utriculata* (beaked sedge) has the highest individual cover, if *Carex aquatilis* (water sedge) is present (or other sedges not listed above), it/they contribute(s) not more than one third of the total cover..... ***Carex utriculata* Herbaceous Vegetation (CARUTR)**
- 9) *Carex vesicaria* (blister sedge), *C. atherodes* (wheat sedge), *C. lenticularis* (lakeshore sedge), *C. scopulorum* (Holm’s Rocky Mountain sedge), or *C. nigricans* (black alpine sedge) present or dominant, either individually or together, often with various combinations of rich forb cover **10**
- 9) Sedges species, **other than those listed in lead above**, present or dominant..... **16**
- 10) *Carex vesicaria* (blister sedge) or *C. lenticularis* (lakeshore sedge) present..... **11**
- 10) *C. vesicaria* (blister sedge) and/or *C. lenticularis* (lakeshore sedge) not present, **13**
- 11) *Carex vesicaria* (blister sedge) the most abundant graminoid present ***Carex vesicaria* Herbaceous Vegetation (CARVES)**
- 11) *C. vesicaria* not the most abundant graminoid present **12**
- 12) *C. lenticularis* (lakeshore sedge) present, having greatest sedge cover..... **Pick between 12a and 12b**
- 12a) *Tofieldia glutinosa* (Sticky Tofieldia), *Trollius laxus* (American globeflower), *Parnassia fimbriata* (Fringed Grass-of-Parnassus), *Equisetum variegatum* (variegated horsetail), *Epilobium anagallidifolium* (= *E. alpinum*, pimpernel willowherb), or *Packera cymbalarioides* (= *Senecio cymbalarioides*, cleftleaf groundsel) having individually or in any combination, ≥ 5% canopy cover; a high subalpine to alpine habitat with continuously saturated soils having appreciable organic matter ***Trollius laxus* – *Parnassia fimbriata* Herbaceous Vegetation (TROLAX – PARFIM)**
- 12b) Not as above **Undefined *Carex lenticularis* Herbaceous Vegetation (CARLEN; **NO PLOTS**)**
- 13) *Carex atherodes* (wheat sedge) the dominant sedge ***Carex atherodes* Herbaceous Vegetation (CARATH)**
 **From AA points only & NVC description**
- 13) *C. atherodes* (wheat sedge) not the dominant sedge **14**
- 14) *Carex scopulorum* (Holm’s Rocky Mountain sedge) having at least 15% canopy cover or is the dominant graminoid, with or without numerous and abundant forb species, such as *Caltha leptosepala* (white marsh-marigold), *Senecio cymbalarioides* (cleftleaf groundsel), *Pedicularis groenlandica* (elephanthead lousewort), *Veronica wormskjoldii* (American alpine speedwell) ***Carex scopulorum* Herbaceous Vegetation (CARSCO; **NO PLOTS**)**
- 14) *C. scopulorum* (Holm’s Rocky Mountain sedge) exhibiting < 15% cover and is not dominant graminoid **13**
- 15) Canopy cover of *Carex nigricans* (black alpine sedge) alone or combined with that of *Sibbaldia procumbens* (creeping sibbaldia) ≥ 5%; sites are long-persisting snowbeds ***Carex nigricans* – *Sibbaldia procumbens* Herbaceous Vegetation (CARNIG – SIBPRO)**
- 15) *C. nigricans* (black alpine sedge) alone or in combination with *S. procumbens* having < 5% canopy cover..... **16**
- 16) *Kobresia myosuroides* (Bellardi bog sedge) having greater canopy cover than other *Carex* or *Kobresia* spp; *Euphrasia disjuncta* (= *E. arctica*, arctic or polar eyebright), *Gentiana prostrata* (moss gentian) and *Carex capillaris* (hair sedge) have

constant presence but low cover in the herb-layer
 ***Kobresia myosuroides* – *Euphrasia disjuncta* Herbaceous Vegetation (KOBMYO – EUPDIS)**

16) Not as above; *K. myosuroides* (Bellardi bog sedge) having less canopy cover than other *Carex* or *Kobresia* spp 17

17) *Carex athrostachya* (slenderbeak sedge) the dominant sedges (having the most cover of any sedge present)
 ***Carex athrostachya* Herbaceous Vegetation (CARATHY)**
 **From AA points only, NVC description lacking**

17) *C. athrostachya* (slenderbeak sedge) not the dominant sedge 18

18) *Carex microptera* (smallwing sedge) the dominant sedge
 ***Carex microptera* Herbaceous Vegetation (CARMIC)**
 **From AA points only; NVC description available**

18) *C. microptera* not the dominant sedge 19

19) *Carex paysonis* (Payson’s sedge) or *Carex phaeocephala* (dunhead sedge) having $\geq 10\%$ cover
 ***Carex paysonis* – *Sibbaldia procumbens* Herbaceous Vegetation (CARPAY – SIBPRO)**

19) *C. paysonis* (Payson’s sedge) having $< 10\%$ cover 20

20) *Carex scirpoidea* (northern single-spike sedge) canopy cover $\geq 5\%$, or if $< 5\%$ combined with the cover of other graminoids (*Festuca idahoensis*, *F. campestris*, *Danthonia intermedia*) their total cover is $\geq 5\%$ (however, *C. scirpoides* usually dominates the graminoid layer, and forms dense swards of turf); *Zigadenus elegans* (mountain death camas), *Hedysarum sulphurescens* (white sweetvetch), *Cirsium hookerianum* (white thistle), *Symphotrichum foliaceum* (= *Aster foliaceus*, alpine leafybract aster), *Suksdorfia ranunculifolia* (bittercup suksdorfia) and *Crepis runcinata* (fiddleleaf hawksbeard) contributing the most cover of any forbs
 ***Carex scirpoidea* – *Zigadenus elegans* Herbaceous Vegetation (CARSCI – ZIGELE)**

20) Not as above; *C. scirpoidea* cover $< 5\%$ 21

21) *Carex spectabilis* (showy sedge) with $\geq 5\%$ canopy cover or the dominant sedge in a somewhat depauperate pioneer community of recently deglaciated rubble and talus slopes
 ***Carex spectabilis* – *Arnica diversifolia* Herbaceous Vegetation (CARSPE – ARNDIV)**

21) *C. spectabilis* having $< 5\%$ canopy cover 22

22) *Carex geyeri* (elk sedge) having $\geq 10\%$ canopy cover or only 5% if accompanied by *Hieracium cynoglossoides* (= *H. albertinum*, houndstongue hawkweed) and *Lomatium dissectum* (fernleaf bisquitroot), the single or combined canopy cover of these herbs $\geq 5\%$ ***Carex geyeri* Herbaceous Vegetation (CARGEY)**

22) *C. geyeri* canopy cover $< 10\%$ and otherwise not as above 23

23) *Carex albonigra* (black-and-white sedge) and/or *Carex rupestris* (curly sedge) the dominant graminoids
 ***Carex albonigra* – *Myosotis asiatica alpestris* Herbaceous Vegetation (CARALB – MYOALP)**

23) Not as above **Undefined *Carex* – dominated types**

Key to Non-Sedge, Graminoid-Dominated/Characterized Plant Associations

- 1) *Typha latifolia* (common cattail) or *T. angustifolia* (narrow-leaved cattail), individually or in combination, $\geq 15\%$ canopy cover ***Typha latifolia* Western Herbaceous Vegetation (TYPLAT)**
- 1) *T. latifolia* and *T. angustifolia*, individually or in combination, having $< 15\%$ canopy cover 2
- 2) *Schoenoplectus tabernaemontani* (= *Scirpus validus*, *S. tabernaemontani*, softstem bulrush) having $\geq 15\%$ canopy cover and is the dominant graminoid ***Schoenoplectus tabernaemontani* Herbaceous Vegetation (SCHTAB)**
- 2) *S. tabernaemontani* having $< 15\%$ cover and is not the dominant graminoid 3
- 3) *Equisetum fluviatile* (water horsetail) having $\geq 15\%$ canopy cover ***Equisetum fluviatile* Herbaceous Vegetation (EQUFLU)**
- 3) *E. fluviatile* having $< 15\%$ copy cover 4
- 4) *Eleocharis palustris* (common spikerush) having $\geq 15\%$ canopy cover and is the dominant graminoid ***Eleocharis palustris* Herbaceous Vegetation (ELEPAL)**
- 4) *E. palustris* $< 15\%$ canopy cover and not the dominant graminoid 5
- 5) *Phalaris arundinacea* (reed canarygrass) cover $\geq 15\%$... ***Phalaris arundinacea* (PHAARU) Herbaceous Vegetation**
 **From AA points only; NVC and Hansen et al. 1995 descriptions exist**
- 5) *P. arundinacea* cover $< 15\%$ 6
- 6) *Calamagrostis canadensis* (bluejoint reedgrass) or *Calamagrostis stricta* (narrow-spiked reedgrass) having $\geq 15\%$ canopy cover or the dominant graminoid ***Calamagrostis canadensis* Western Herbaceous Vegetation (CALCAN)**
- 6) *C. canadensis* and *C. stricta* having $< 15\%$ cover and not the dominants graminoids 7
- 7) *Deschampsia caespitosa* (tufted hairgrass) with canopy cover $\geq 15\%$ or is the dominant graminoid ***Deschampsia caespitosa* Herbaceous Vegetation (DESCAE)**
- 7) *D. caespitosa* having $< 15\%$ and not the dominant graminoid 8
- 8) *Luzula glabrata* ssp. *hitchcockii* (= *L. hitchcockii*, smooth woodrush) having $\geq 10\%$ canopy cover ***Luzula glabrata* var. *hitchcockii* – *Erythronium grandiflorum* Herbaceous Vegetation**
 **(LUZGLA – ERYGRA)**
- 8) *L. glabrata* having $< 10\%$ canopy cover 9
- 9) *Juncus parryi* (Parry’s rush) or *Juncus drummondii* (Drummond’s rush) or their combined cover $\geq 10\%$ or either species present and in conjunction with *Sibbaldia procumbens* (creeping sibbaldia) constituting $\geq 10\%$ cover ***Juncus parryi* – *Sibbaldia procumbens* Herbaceous Vegetation (JUNPAR – SIBPRO)**
- 9) *J. parryi* and *J. drummondii* their single or combined cover $< 10\%$, even with the addition of *S. procumbens* cover 10
- 10) *Poa palustris* (fowl bluegrass) canopy cover \geq that of any other herbaceous species ***Poa palustris* Herbaceous Vegetation (POAPAL)**
 **From AA points only; NVC description available**
- 10) Not as above, *P. palustris* canopy cover $<$ that of any other herbaceous species 11
- 11) *Juncus balticus* (Baltic rush) canopy cover \geq that of any other herbaceous species ***Juncus balticus* Herbaceous Vegetation (JUNBAL)**
 **From AA points only; NVC description available**
- 11) *J. balticus* canopy cover $<$ than that of any other herbaceous species 12
- 12) *Bromus inermis* ssp. *pumpellianus* (Pumpelly’s brome) or *Bromus marginatus* (= *B. carinatus* var. *linearis*, mountain brome) having $\geq 10\%$ canopy cover, individually or combined ***Bromus marginatus* – *Pseudoroegneria spicata* Herbaceous Vegetation (BROMAR)**
- 12) *B. inermis* ssp. *pumpellianus* or *B. marginatus* having $< 10\%$ cover 13
- 13) *Elymus repens* (quackgrass) having $\geq 25\%$ of the total graminoid canopy cover ***Elymus repens* Semi-natural Herbaceous Vegetation (ELYREP)**

13) <i>E. repens</i> cover < 25 % of the graminoid total.....	14
14) <i>Phleum pratense</i> (timothy), <i>Poa pratensis</i> (Kentucky bluegrass), <i>Bromus inermis</i> (smooth brome), (or other exotic pasture grasses) their individual or combined canopy covers ≥ 25% of the total graminoid canopy cover..... <i>Phleum pratense – Poa pratensis – Bromus inermis</i> Semi-natural Herbaceous Vegetation (PHLPRA – POAPRA)	
14) Not as above; exotic pasture grasses, individually or their combined cover, < 25% of total graminoid cover.....	15
15) <i>Calamagrostis rubescens</i> (pine grass) canopy cover ≥ 15%; tends to occur as early seral stage following fire; forb component canopy cover may be > that of <i>C. rubescens</i>	<i>Calamagrostis rubescens</i> Herbaceous Vegetation (CALRUB)
15) <i>C. rubescens</i> having < 15% canopy cover	16
16) <i>Achnatherum nelsonii</i> ssp. <i>dorei</i> (= <i>Stipa nelsonii</i> ssp. <i>dorei</i> , <i>Stipa occidentalis</i> var. <i>minor</i> , Columbia needlegrass) having cover ≥ 10% or ≥ 1%, if the cover of <i>Danthonia parryi</i> (Parry’s oatgrass) is sufficient to make their joint contribution ≥ 10% and <i>Festuca campestris</i> (= <i>F. scabrella</i> , rough fescue) cover not exceeding 5%	<i>Achnatherum nelsonii – Lupinus sericea</i> Herbaceous Vegetation (ACHNEL – LUPSER)
16) Not as above	17
17) <i>Festuca campestris</i> (= <i>F. scabrella</i> , rough fescue), <i>Festuca idahoensis</i> (Idaho fescue), <i>Festuca brachyphylla</i> (alpine fescue), individually or any combination having ≥ 5% canopy cover or these species having ≥ 1% if intensive grazing can be demonstrated or if these grasses in conjunction with the accessory graminoids, <i>Calamagrostis purpurascens</i> (purple reedgrass) and/or <i>Carex rupestris</i> (curly sedge) comprise ≥ 5% cover.....	18
17) <i>F. campestris</i> , <i>Festuca idahoensis</i> , and <i>Festuca brachyphylla</i> having < 5% canopy cover, singly or in any combination and even if grazed < 1% and if in combination with accessory graminoids <i>C. purpurascens</i> and/or <i>C. rupestris</i> comprise < 5% cover in total.....	30
18) At least two of the following species present in any combination and having ≥ 1% canopy cover: <i>Arenaria capillaris</i> (thread-leaved sandwort), <i>Minuartia</i> (= <i>Arenaria</i>) <i>obtusiloba</i> (twinflower sandwort), <i>M. rubella</i> (beautiful sandwort), <i>Potentilla diversifolia</i> (varileaf cinquefoil), <i>Arnica rydbergii</i> (Rydberg’s arnica), <i>Eriogonum flavum</i> (yellow buckwheat), <i>Bupleurum americanum</i> (American thow wax) or <i>Antennaria umbrinella</i> (umber pussytoes) [habitat remark: alpine sites with persistent snowbeds (though not nearly so long-lasting as those typified by <i>Carex nigricans</i> or <i>Luzula glabrata</i>)..... <i>Festuca idahoensis – (Festuca campestris) / Potentilla diversifolia</i> Herbaceous Vegetation [FESIDA – (FESCAM) / POTDIV]	
18) Not as above	19
19) <i>Festuca campestris</i> having ≥ 5% canopy cover, or ≥ 1% in the case of intensive ungulate grazing or intrinsically lightly vegetated sites.....	20
19) <i>F. campestris</i> having < 5% canopy cover or < 1% even if intensive grazing demonstrated or site is intrinsically thinly vegetated.....	24
20) <i>Achnatherum richardsonii</i> (= <i>Stipa richardsonii</i> , Richardson’s needlegrass) canopy cover ≥ 10%	<i>Festuca campestris – (Festuca idahoensis) – Achnatherum richardsonii</i> Herbaceous Vegetation [FESCAM – (FESIDA) – ACHRIC]
20) <i>A. richardsonii</i> having < 10% canopy cover.....	21
21) Any of the following species, <i>Geranium viscosissimum</i> (sticky geranium), <i>Potentilla glandulosa</i> (sticky cinquefoil), <i>Potentilla gracilis</i> (slender cinquefoil), <i>Carex petasata</i> (Liddon’s sedge) and <i>C. hoodii</i> (Hood’s sedge) having, either individually or in any aggregate, ≥ 1% cover	<i>Festuca campestris – Festuca idahoensis – Geranium viscosissimum</i> Herbaceous Vegetation (FESCAM – FESIDA – GERVIS)
21) Not as above; canopy cover of <i>G. viscosissimum</i> , <i>P. glandulosa</i> , <i>P. gracilis</i> , <i>C. petasata</i> and <i>C. hoodii</i> , individually or in the aggregate, < 1% and the cover of <i>P. spicata</i> may or may not be greater than 5%.....	22
22) <i>Pseudoroegneria spicata</i> (= <i>Elymus spicatus</i> , bluebunch wheatgrass) having ≥ 5% canopy cover or greater cover than other bunchgrass species (not including <i>F. campestris</i>).....	<i>Festuca campestris – Pseudoroegneria spicata</i> Herbaceous Vegetation (FESCAM – PSESPI)
22) Not as above; <i>P. spicata</i> having < 5% canopy cover	23

- 23) *Festuca idahoensis* (Idaho fescue) cover \geq 5% or greater than 1% in the presence of significant ungulate grazing or if $<$ 5% then the combined cover of *F. campestris*, *F. idahoensis* and *Danthonia intermedia* (timber oatgrass) \geq 5%
 ***Festuca campestris* – *Festuca idahoensis* Herbaceous Vegetation (FESCAM – FESIDA)**
- 23) Not as above; *F. idahoensis* having $<$ 5% cover **Undefined *Festuca campestris* Type(s)**
- 24) *Festuca idahoensis* (Idaho fescue) with canopy cover \geq 5% (or \geq 1% where intensive grazing or intrinsically reduced vegetative cover can be demonstrated) **25**
- 24) *F. idahoensis* having $<$ 5% canopy cover (or $<$ 1% even where intensive grazing can be demonstrated)..... **30**
- 25) At least two of the following species present in any combination and having \geq 1% canopy cover: *Arenaria capillaris* (thread-leaved sandwort), *Minuartia* (= *Arenaria*) *obtusiloba* (twinflower sandwort), *M. rubella* (beautiful sandwort), *Potentilla diversifolia* (varileaf cinquefoil), *Arnica rydbergii* (Rydberg’s arnica), *Eriogonum flavum* (yellow buckwheat), *Bupleurum americanum* (American thorum wax) or *Antennaria umbrinella* (umber pussytoes) [habitat remark: alpine to alpine sites with persistent snowbeds (though not nearly so long-lasting as those typified by *Carex nigricans* or *Luzula glabrata*)].....
 ***Festuca idahoensis* – (*Festuca campestris*) / *Potentilla diversifolia* Herbaceous Vegetation**
 **[FESIDA – (FESCAM) – POTDIV]**
- 25) Not as above **26**
- 26) *Achnatherum richardsonii* (= *Stipa richardsonii*, Richardson’s needlegrass) having \geq 10% cover.....
 ***Festuca idahoensis* – *Achnatherum richardsonii* Herbaceous Vegetation (FESIDA – ACHRIC)**
 **From AA points only; NVC description available**
- 26) Not as above (determine grazing pressure; *A. richardsonii* highly palatable and grazing-labile so adjust its cover upward and rerun in first line of couplet) **27**
- 27) *Danthonia intermedia* (timber oatgrass) or *Elymus trachycaulus* (= *Agropyron caninum*, slender wheatgrass) or their combined cover \geq 5% and/or *Geranium viscosissimum* (sticky geranium) and/or *Potentilla gracilis* (slender cinquefoil) singly or combined cover \geq 1%
 ***Festuca idahoensis* – *Elymus trachycaulus* Herbaceous Vegetation (FESIDA – ELYTRA)**
- 27) Not as above **28**
- 28) Not as above; *Carex filifolia* (threadleaf sedge) having \geq 5% canopy cover.....
 ***Festuca idahoensis* – *Carex filifolia* Herbaceous Vegetation (FESIDA – CARFIL)**
- 28) Not as above; **29**
- 29) *Pseudoroegneria spicata* (bluebunch wheatgrass) having \geq 10% cover (criteria relaxed to 5% in presence of grazing)
 ***Festuca idahoensis* – *Pseudoroegneria spicata* Herbaceous Vegetation (FESIDA – PSESPI)**
- 29) Not as above; *P. spicata* having $<$ 10% cover, or $<$ 5% even if grazing is a factor
 **Undefined *Festuca idahoensis* Type(s)**
- 30) *Pseudoroegneria spicata* (bluebunch wheatgrass) having \geq 10% cover, or where grazing impacts suspected \geq 5%
 ***Pseudoroegneria spicata* – *Poa secunda* Herbaceous Vegetation (PSESPI – POASEC)**
- 30) *P. spicata* having $<$ 10% cover (or $<$ 5% where grazing impacts suspected).....
 **Undefined graminoid dominated/characterized types**

Key to Forb-Dominated/Characterized Plant Associations

Note: 1) There are communities that span range of total canopy cover from conventional “Herbaceous Vegetation” (canopy cover > 10 %) to “Sparse Vegetation” (cover < 15 %); these communities can be found in that portion of the key that follows immediately **as well as** the “Sparsely Vegetated Community Types” portion of the key; **2)** there are fluvial-lacustrine environments (formerly referred to herein as “Gravel Bars”) that are highly variable in total vegetation cover as well as composition; if, upon progressing through the key immediately below, there is no match then consider the description **Gravel Bar Early Successional Vegetation** in **Appendix G** (intended to capture a range of vegetative cover on fluvial-lacustrine surfaces).

- 1)** Aquatic environments: wetlands and deepwater habitats dominated by plants that grow principally on or below the water’s surface for most of the growing season, in most years. Plant communities requiring surface water for optimum growth and reproduction, best developed in relatively permanent water or under conditions of repeated flooding. Plants are either attached to the substrate or float freely in the water column above the bottom or on the surface and emergents comprise < 5 % canopy cover **2**
- 1)** Not as above; site characterized as upland or emergent wetland (distinguished by erect, rooted, herbaceous hydrophytes) **4**
- 2)** *Nuphar lutea* ssp. *polysepala* (= *N. polysepala*, Rocky Mountain pond-lily) having at least 5 % cover on water surface..... ***Nuphar lutea* ssp. *polysepala* Herbaceous Vegetation (NUPLUT)**
- 2)** Not as above, *N. lutea* having < 5 % surface cover **3**
- 3)** *Stuckenia* (= *Potamogeton*) *pectinata* (sago pondweed) dominant in the water column ***Stuckenia pectinata* – *Myriophyllum (sibiricum, spicatum)* Herbaceous Vegetation (STUPEC)**
- 3A)** Not as above, *Myriophyllum sibiricum* dominating the water column..... ***Myriophyllum sibiricum* Herbaceous Vegetation (MYRSIB)**
- 3B)** Not as above **Aquatic type(s) yet undescribed for Waterton-Glacier IPP**
- 4)** *Typha latifolia* (common cattail) or *T. angustifolia* (narrow-leaved cattail), individually or in combination, ≥ 15% canopy cover ***Typha latifolia* Western Herbaceous Vegetation (TYPLAT)**
- 4)** *T. latifolia* and *T. angustifolia*, individually or in combination, having < 15% canopy cover..... **5**
- 5)** *Equisetum fluviatile* (water horsetail) having ≥ 15% canopy cover ***Equisetum fluviatile* Herbaceous Vegetation (EQUFLU)**
- 5)** *E. fluviatile* having < 15% copy cover **6**
- 6)** *Eleocharis palustris* (common spikerush) having ≥ 15% canopy cover..... ***Eleocharis palustris* Herbaceous Vegetation (ELEPAL)**
- 6)** Not as above, *E. palustris* having < 15% canopy cover **7**
- 7)** *Senecio triangularis* (arrowleaf groundsel) having at least 5% cover or, present and with any combination of *Streptopus amplexifolius* (twisterstalk), *Mimulus lewisii* (Lewis’ monkeyflower), *Mimulus tilingii* (Tiling’s monkeyflower), *Saxifraga lyallii* (redstem saxifrage) having ≥ 5% canopy cover ***Senecio triangularis* Herbaceous Vegetation (SENTRI)**
- 7)** Not as above:..... **8**
- 8)** Any of the following herbs, singly or in any combination, having 5% canopy cover; *Trollius laxus* (American Globeflower), *Tofieldia glutinosa* (Sticky Tofieldia), *Parnassia fimbriata* (Fringed Grass-of-Parnassus), *Carex lenticularis* (Lentil-fruited Sedge), *Carex podocarpa* (Shortstalk Sedge): [habitat remark: wet sites with saturated and mostly peaty soils] ***Trollius laxus* – *Parnassia fimbriata* Herbaceous Vegetation (TROLAX – PARFIM)**
- 8)** Not as above; any combination of the cited herbs < 5% canopy cover **9**
- 9)** *Athyrium americanum* (= *A. distentifolium*, Alpine Ladyfern) and *Cryptogramma acrostichoides* (= *C. crispa*, American rockbrake) their individual or combined cover greater than that of any other herbaceous species: [habitat remark: sites open boulderfields] ***Athyrium americanum* – *Cryptogramma acrostichoides* Sparse Vegetation (ATHAME – CRYACR)**
- 9)** Neither *A. americanum* nor *C. acrostichoides* nor their combined cover constituting the dominant herb component **10**
- 10)** *Saxifraga mertensiana* (Wood Saxifrage) having at least 1% canopy cover; sites are cliff crevices and cliff overhangs ***Saxifraga mertensiana* Herbaceous Vegetation (SAXMER)**

- 10) *S. mertensiana* having < 1% cover and sites not related to cliff features 11
- 11) The following forbs having ≥ 10% cover, either singly or in any combination; *Valeriana sitchensis* (Sitka Valerian) *Veratrum viride* (green false hellebore), *Erigeron peregrinus* (subalpine fleabane), *Hypericum scouleri* (= *H. formosum*, Scouler's St. Johnswort), *Arnica diversifolia* (Rayless Arnica)
 ***Valeriana sitchensis* – *Veratrum viride* Herbaceous Vegetation (VALSIT – VERVIR)**
- 11) Not as above; any combination of the above-cited herbs < 10% canopy cover..... 12
- 12) *Argentina* (= *Potentilla*) *anserina* (silverweed cinquefoil) the dominant forb (having greatest cover of any forb)
 ***Argentina anserina* Herbaceous Vegetation (ARGANS)**
- 12) *A. anserina* not the dominant forb..... 13
- 13) The following forbs having ≥ 10% cover, either singly or any combination; *Heracleum maximum* (= *H. lanatum*, Cow Parsnip), *Angelica arguta* (Lyll's Angelica), *Angelica dawsonii* (Dawson's Angelica), *Osmorhiza occidentalis* (Western Sweetroot) *Senecio hydrophiloides* (Tall Groundsel); ***Heracleum maximum* Herbaceous Vegetation (HERMAX)**
- 13) Not as above; any combination of the cited herbs < 10% canopy cover 14
- 14) *Xerophyllum tenax* (beargrass) having ≥ 10% canopy cover
 ***Xerophyllum tenax* Herbaceous Vegetation (XERTEN)**
- 14) *X. tenax* having < 10% canopy cover..... 15
- 15) Any combination of at least two of the following forbs present with cover ≥ 5%; *Aquilegia flavescens* (yellow columbine), *Senecio megacephalus* (rock ragwort), *Epilobium anagallidifolium* (= *E. alpinum*, pimpernel willowherb), *Chamerion angustifolium* (common fireweed), and *Symphotrichum foliaceum* (= *Aster foliaceus*, alpine leafybract aster): [habitat remark: high subalpine and alpine sites with open vegetation and steep talus slopes having much exposed substrate].....
 ***Aquilegia flavescens* – *Senecio megacephalus* Sparse Vegetation (AQUFLA – SENMEG)**
- 15) Not as above; 16
- 16) *Chamerion* (= *Epilobium*) *angustifolium* (common fireweed) having at least 20% **and** greater canopy cover than any other forb; usually sites have experienced recent disturbance, usually fire, may previously have been forests, or shrublands.....
 ***Chamerion angustifolium* Herbaceous Vegetation (CHAANG)**
- 16) *C. angustifolium* having < 20% canopy cover and less canopy cover than at least one other forb..... 17
- 17) *Arenaria capillaris* (Slender Mountain Sandwort) or *Arnica rydbergii* (Rydberg's Arnica) dominate the herbaceous layer ..
 ***Arenaria capillaris* / *Polytrichum piliferum* Herbaceous Vegetation (ARECAP / POLPIL)**
- 17) Neither *A. capillaris* nor *A. rydbergii* dominate the herbaceous layer 18
- 18) *Silene acaulis* (Moss Campion), *Myosotis asiatica* (= *M. alpestris*, Asian forget-me-not), *Minuartia obtusiloba* (= *Arenaria obtusiloba*, Twinflower Sandwort), *Smelowskia calycina* (Alpine Smelowskia), *Polemonium viscosum* (Sticky Polemonium), *Carex albonigra* (black-and-white sedge) in any combination dominate the herb layer, which can be depauperate (< 15% vascular cover in these fellfield settings)
 ***Carex albonigra* – *Myosotis asiatica* Herbaceous Vegetation (CARALB – MYOASI)**
- 18) Not as above 19
- 19) *Phacelia hastata* (silverleaf phacelia), *Phacelia sericea* (silky phacelia), *Penstemon ellipticus* (rocky ledge penstemon), *P. lyallii* (Lyll's penstemon) *Minuartia nuttallii* (*Arenaria nuttallii*, Nuttall's sandwort) or *Eriogonum ovalifolium* (cushion buckwheat) either individually or their combined cover ≥ 3%
 ***Phacelia hastata* – (*Penstemon ellipticus*) Sparse Vegetation (PHAHAS – PENELL)**
- 19) Not as above; none of the above-listed forbs having > 3% cover, either individually or in any combination..... 20
- 20) Fellfields or talus/scree slopes sparsely mantled with vascular plants (usually < 15% cover) with *Saxifraga bronchialis* (Yellowdot Saxifrage) dominant though meager in cover, usually not more than 10%;.....
 ***Saxifraga bronchialis* Scree Slope Sparse Vegetation (SAXBRO)**
- 20) Not as above **Undefined Forb community type(s)**

Key to Sparsely Vegetated Community Types

Note: there are communities that span the canopy cover range from conventional “Herbaceous Vegetation” (canopy cover > 10 %) to “Sparse Vegetation” (cover < 15 %); these communities can be found in the “Sparsely Vegetated Community Types” as well as that portion of the key that immediately precedes this.

- 1) Fluvial environments including gravel bars, shorelines, (including drawdown zones of lacustrine environments) having sparse vegetation (canopy cover < 10 %) **Gravel Bar Early Successional Vegetation (GRABAR)**
Note: the above category, which was formerly referred to as “Sparsely Vegetated Gravel Bars”, is described in Appendix G.
- 1) Not as above..... 2
- 2) *Athyrium americanum* (= *A. distentifolium*, alpine ladyfern) and/or *Cryptogramma acrostichoides* (= *C. crispa*, American rockbrake) their individual or combined cover greater than that of any other herbaceous species; sites mostly open boulderfields ***Athyrium americanum* – *Cryptogramma acrostichoides* Sparse Vegetation (ATHAME – CRYACR)**
- 2) Neither *A. americanum* nor *C. acrostichoides* nor their combined cover constituting the dominant herb component..... 3
- 3) *Saxifraga mertensiana* (wood saxifrage) having at least 1% canopy cover; sites are cliff crevices and cliff overhangs.....
 ***Saxifraga mertensiana* Cliff-crevice Sparse Vegetation (SAXMER)**
- 3) *S. mertensiana* having < 1% cover and sites not related to cliff features 4
- 4) Any combination of at least two of the following forbs present with canopy cover ≥ 5%; *Aquilegia flavescens* (yellow columbine), *Senecio megacephalus* (rock ragwort), *Epilobium anagallidifolium* (= *E. alpinum*, pimpernel willowherb), *Chamerion angustifolium* (common fireweed), and *Symphotrichum foliaceum* (= *Aster foliaceus*, alpine leafybract aster); high subalpine and alpine sites with open vegetation and steep talus slopes having much exposed substrate.....
 ***Aquilegia flavescens* – *Senecio megacephalus* Sparse Vegetation (AQUFLA – SENMEG)**
- 4) Not as above, any combination of the above-cited forbs having < 5 % canopy cover 5
- 5) Dwarf shrubs or subshrubs (or dwarfed forms of species commonly known as “short shrubs”) constitute the dominant aspect of vegetation though their cover may be < 10 % because of the overall sparseness of vegetative cover 6
- 5) Not as above; dwarf shrubs do not constitute the dominant aspect of vegetation..... 8
- 6) *Penstemon ellipticus* (rocky ledge penstemon) having ≥ 10% canopy cover or is the dominant “shrub” of the dwarf-shrub & herb layer ***Penstemon ellipticus* Dwarf-shrubland (PENELL)**
- 6) *P. ellipticus* having < 10 % cover and not the dominant shrub of the dwarf-shrub layer 6
- 7) *Dasiphora floribunda* (shrubby cinquefoil) is the dominant dwarf-shrub (having greater cover than any other dwarf-shrub)..
 ***Dasiphora floribunda* / *Artemisia michauxiana* Dwarf-shrubland (DASFLO / ARTMIC)**
- 7) *D. floribunda* not the dominant dwarf-shrub
 **Undefined Dwarf-shrub-characterized type or one not recognized to occur as “Sparse Vegetation”**
- 8) *Phacelia hastata* (silverleaf phacelia), *Phacelia sericea* (silky phacelia), *Penstemon ellipticus* (rocky ledge penstemon), *Minuartia nuttallii* (*Arenaria nuttallii*, Nuttall’s sandwort) or *Eriogonum ovalifolium* (cushion buckwheat) either individually or their combined cover ≥ 3%.....
 ***Phacelia hastata* – (*Penstemon ellipticus*) Sparse Vegetation (PHAHAS – PENELL)**
- 8) Not as above; none of the above-listed forbs having > 3% cover, either individually or in any combination..... 9
- 9) Fellfields or talus/scree slopes sparsely mantled with vascular plants (usually < 15 % cover) with *Saxifraga bronchialis* (Yellowdot Saxifrage) present in varying amounts, rarely having more than 10% cover;
 ***Saxifraga bronchialis* Scree Slope Sparse Vegetation (SAXBRO)**
- 9) Not as above..... **“Undefined Sparse Vegetation” (USV)***

***Note:** Undefined Sparse Vegetation is not a described “type” or formal plant association. It is a category to capture the sparse, often unique vegetation of upland surfaces. With additional formal plot data collection, it would be possible to classify several additional sparsely vegetated plant associations for the IPP from those included in the key above.

Appendix 1: List of Indicator Plant Species Found in the Field Key (Organized Alphabetically within Life Form)

Note: These are species with which it is critical to become familiar to accurately identify plant associations of the vegetation classification. These species are used in the field key to help identify plant associations. Many are not necessarily dominant in the association for which they are indicators and in fact may be relatively inconspicuous; thus make a diligent search for them when assessing a polygon or plot.

TREES

Abies lasiocarpa (subalpine fir)
Betula papyrifera (paper birch)
Larix lyallii (subalpine larch)
Larix occidentalis (western larch)
Picea engelmannii (Engelmann spruce)
Picea engelmannii x *P. glauca* (hybrid swarms)
Pinus albicaulis (whitebark pine)
Pinus contorta (lodgepole pine)
Pinus flexilis (limber pine)
Pinus monticola (white pine)
Pinus ponderosa (ponderosa pine)
Populus balsamifera ssp. *trichocarpa* (black cottonwood)
Populus tremuloides (trembling aspen)
Pseudotsuga menziesii (Douglas-fir)
Thuja plicata (western red cedar)
Tsuga heterophylla (western hemlock)

SHRUBS (exclusive of *Salix* spp.)

Acer glabrum (mountain maple)
Alnus incana (mountain alder)
Alnus viridis ssp. *sinuata* (Sitka alder)
Amelanchier alnifolia (Saskatoon serviceberry)
Artemisia tridentata ssp. *vaseyana* (mountain big sagebrush)
Betula nana (bog birch)
Betula occidentalis (water birch)
Cornus sericea (red-osier dogwood)
Crataegus chrysocarpa (fireberry hawthorn)
Crataegus douglasii (black hawthorn)
Dasiphora floribunda (shrubby cinquefoil)
Elaeagnus commutata (silverberry)
Lonicera involucrate (twinflower honeysuckle)
Menziesia ferruginea (fool's huckleberry)
Rhamnus alnifolia (buckthorn)
Oplopanax horridus (devilsclub)
Prunus emarginata (bitter cherry)
Prunus virginiana (common chokecherry)
Rhamnus alnifolia (buckthorn)
Ribes hudsonianum (northern black currant)
Ribes lacustre (prickly current)
Rosa acicularis (prickly rose)
Rosa woodsii (Woods' rose)
Rubus parviflorus (thimbleberry)
Sorbus scopulina (Green's mountain ash)
Sorbus sitchensis (western mountain ash)
Symphoricarpos albus (common snowberry)
Symphoricarpos occidentalis (western snowberry)
Vaccinium membranaceum (thinleaf or big huckleberry)

DWARF SHRUBS

Arctostaphylos uva-ursi (bearberry)
Cassiope mertensiana (Merten's mountain heather)
Cornus canadensis (bunchberry dogwood)
Dasiphora floribunda (= *Pentaphylloides floribunda*, *Potentilla fruticosa*, shrubby cinquefoil)
Dryas drummondii (Drummond's mountain avens)
Dryas octopetala (eight-petal mountain avens)
Dryas spp. (mountain avens)
Juniperus communis (common juniper)
Juniperus horizontalis (creeping juniper)
Kalmia microphylla (alpine laurel)
Linnaea borealis (twinflor)
Mahonia repens (Oregon grape)
Penstemon ellipticus (rocky ledge penstemon)
Phyllodoce empetriformis (pink mountainheath)
Phyllodoce glanduliflora (yellow mountainheath)
Salix arctica v. *petraea* (arctic willow; recent syst. revisions place in *S. petrophila*)
Salix nivalis (= *S. reticulata* ssp. *nivalis*, snow willow)
Spiraea betulifolia (white spiraea)
Vaccinium caespitosum (dwarf huckleberry)
Vaccinium myrtillus (dwarf bilberry)
Vaccinium scoparium (grouse whortleberry)

WILLOWS

Salix bebbiana (Bebb willow)
Salix boothii (Booth willow)
Salix candida (sageleaf willow)
Salix commutata (undergreen willow)
Salix drummondiana (Drummond willow)
Salix exigua (narrowleaf or sandbar willow)
Salix geyeriana (Geyer willow)
Salix glauca (grayleaf willow)
Salix lutea (yellow willow)
Salix pseudomonticola (false mountain willow)
Salix sitchensis (Sitka willow)
Salix scouleriana (Scoulers' willow)

GRAMINOIDS (exclusive of sedges [Carices])

Achnatherum nelsoni ssp. *doreii* (= *Stipa nelsonii* ssp. *dorei*, *Stipa occidentalis* var. *minor*, Columbia needlegrass)
Achnatherum richardsonii (Richardson's needlegrass)
Alopecurus alpinus (alpine foxtail)
Alopecurus pratensis (meadow foxtail)
Bromus inermis (smooth brome)
Bromus inermis ssp. *pumpellianus* (Pumpelly's brome)
Bromus marginatus (= *B. carinatus* var. *linearis*, mountain brome)
Calamagrostis canadensis (bluejoint reedgrass)
Calamagrostis koelerioides (fire reedgrass)
Calamagrostis rubescens (pine grass)
Calamagrostis stricta (narrow-spike reedgrass)
Danthonia intermedia (timber oatgrass)
Deschampsia caespitosa (tufted hairgrass)
Eleocharis palustris (common spikerush)
Elymus caninus (bearded wheatgrass)
Elymus repens (quackgrass)
Elymus trachycaulus (slender wheatgrass)

Equisetum arvense (field horsetail)
Equisetum fluviatile (water horsetail)
Equisetum variegatum (variegated horsetail)
Festuca brachyphylla (alpine fescue)
Festuca campestris (= *F. scabrella*, rough fescue)
Festuca idahoensis (Idaho fescue)
Juncus balticus (Baltic rush)
Juncus drummondii (Drummond's rush)
Juncus parryi (Parry's rush)
Kobresia myosuroides (Ballardi bog sedge)
Kobresia simpliciuscula (simple bog sedge)
Koeleria macrantha (= *K. cristata* june grass)
Luzula glabrata var. *hitchcockii* (= *L. hitchcockii*, Hitchcock's smooth woodrush)
Phleum pratense (timothy)
Poa pratensis (Kentucky bluegrass)
Pseudoroegneria spicata (= *Elymus spicatus*, *Agropyron spicatum*, bluebunch wheatgrass)
Schoenoplectus tabernaemontani (= *Scirpus validus*, *S. tabernaemontani*, softstem bulrush)
Typha angustifolia (narrow-leaved cattail)
Typha latifolia (common cattail)

CARICES

Carex albonigra (black-and-white sedge)
Carex aquatilis (water sedge)
Carex atherodes (awned sedge)
Carex athrostachya
Carex buxbaumii (Buxbaum's sedge)
Carex capillaris (hair sedge)
Carex disperma (softleaf sedge)
Carex filifolia (threadleaf sedge)
Carex geyeri (elk sedge)
Carex interior (interior sedge)
Carex lasiocarpa (woollyfruit sedge)
Carex lenticularis (lakeshore sedge)
Carex limosa (mud sedge)
Carex microptera (smallwing sedge)
Carex nigricans (Black alpine sedge)
Carex paysonis (Payson's sedge)
Carex petasata (Liddon's sedge)
Carex phaeocephala (dunhead sedge)
Carex podocarpa (shortstalk sedge)
Carex rupestris (curly sedge)
Carex scirpoidea (northern singlespike sedge)
Carex scopulorum (Holm's Rocky Mountain sedge)
Carex spectabilis (showy sedge)
Carex utriculata (beaked sedge)
Carex vesicaria (inflated sedge)
Dulichium arundinaceum (dulichium, threeway sedge)
Kobresia myosauroides (Ballard's bog sedge)
Kobresia simpliciuscula (simple bog sedge)

FORBS

Actaea rubra (baneberry)
Angelica arguta (sharptooth angelica)
Angelica dawsonii (Dawson's angelica)
Antennaria umbrinella (umber pusseytoes)
Aquilegia flavescens (yellow columbine)

Arenaria capillaris (slender mountain sandwort)
Arenaria spp. (sandworts)
Argentina (= *Potentilla anserina*) (silverweed cinquefoil)
Arnica cordifolia (heartleaf arnica)
Arnica diversifolia (rayless arnica)
Arnica rydbergii (Rydberg's arnica)
Artemisia michauxiana (Michaux's wormwood)
Astragalus bourgovii (Bourgov's milkvetch)
Athyrium americanum (= *A. distentifolium*, alpine ladyfern)
Athyrium filix-femina (lady fern)
Caltha leptosepala (elkslip marsh marigold)
Chamerion angustifolium (common fireweed)
Circaea alpina (enchanger's nightshade)
Cirsium hookerianum (white thistle)
Clintonia uniflora (queencup beadlily)
Cornus canadensis (bunchberry dogwood)
Crepis runcinata (fiddleleaf hawksbeard)
Cryptogramma acrostichoides (= *C. crispa*, American rockbrake)
Douglasia montana (Rocky Mountain dwarf primrose)
Epilobium anagallidifolium (= *E. alpinum*, pimpernel willowherb)
Erigeron peregrinus (subalpine fleabane)
Eriogonum flavum (yellow buckwheat)
Eriogonum ovalifolium (cushion buckwheat)
Erythronium grandiflorum (yellow avalanche lily)
Euphrasia disjuncta (= *E. arctica*, arctic or polar eyebright)
Galium triflorum (sweetscented bedstraw)
Gentiana calycosa (Rainier pleated gentian)
Gentiana prostrata (moss gentian)
Geranium viscosissimum (sticky geranium)
Geum macrophyllum (largeleaf avens)
Gymnocarpium dryopteris (oak fern)
Hedysarum sulphurescens (white sweetvetch)
Heracleum maximum (cowparsnip)
Hieracium cynoglossoides (= *H. albertinum*, houndstongue hawkweed)
Hypericum formosum (Scouler's St. Johnswort)
Hypericum scouleri (= *H. formosum*, Scouler's St. Johnswort)
Linnaea borealis (twinflower)
Lomatium dissectum (fernleaf bisquitroot)
Lupinus sericeus (silky lupine)
Maianthemum stellatum (starry false lily-of-the-valley)
Mertensia ciliata (tall fringed bluebells)
Mimulus lewisii (Lewis' monkeyflower)
Mimulus tilingii (Tiling's monkeyflower)
Minuartia nuttallii (*Arenaria nuttallii*, Nuttall's sandwort)
Minuartia obtusiloba (= *Arenaria obtusiloba*, Twinflower Sandwort)
Mitella breweri (Brewer's mitrewort)
Mitella pentandra (five-stamened mitrewort)
Myosotis asiatica (= *M. alpestris*, Asian forget-me-not)
Myriophyllum sibiricum (shortspike watermilfoil)
Nuphar lutea ssp. *polysepala* (= *N. polysepala*, Rocky Mountain pond-lily)
Osmorhiza occidentalis (western sweetcicely)
Oxytropis campestris (field locoweed)
Packera cymbalarioides (= *Senecio cymbalarioides*, cleftleaf groundsel)
Parnassia fimbriata (fringed grass-of-Parnassus)
Pedicularis groenlandica (elephanthead lousewort)
Penstemon ellipticus (rocky ledge penstemon)

Penstemon lyallii (Lyll's penstemon)
Phacelia hastata (silverleaf phacelia)
Phacelia sericea (silky phacelia)
Polemonium viscosum (sticky polemonium)
Polygonum bistortoides (American bistort)
Polygonum viviparum (alpine bistort)
Polytrichum piliferum (a moss)
Potentilla diversifolia (varileaf cinquefoil)
Potentilla glandulosa (sticky cinquefoil)
Potentilla gracilis (slender cinquefoil)
Saxifraga bronchialis (yellowdot saxifrage)
Saxifraga lyallii (redstem saxifrage)
Saxifraga mertensiana (wood saxifrage)
Senecio hydrophiloides (tall groundsel)
Senecio megacephalus (rock ragwort)
Senecio triangularis (arrowleaf groundsel)
Sibbaldia procumbens (Creeping Sibbaldia)
Silene acaulis (Moss Champion)
Smelowskia calycina (Alpine Smelowskia)
Streptopus amplexifolius (twisterstalk)
Stuckenia pectinatus (= *Potamogeton pectinatus*, sago pondweed)
Suksdorfia ranunculifolia (bittercup suksdorfia)
Symphyotrichum foliaceum (= *Aster foliaceus*, alpine leafybract aster)
Taraxacum officinale (common dandelion)
Thalictrum occidentale (western meadowrue)
Tiarella trifoliata (threeleaf foamflower)
Tofieldia glutinosa (sticky tofieldia)
Trautvetteria caroliniensis (false bugbane)
Trollius laxus (American globeflower)
Urtica dioica (stinging nettle)
Valeriana sitchensis (Sitka Valerian)
Veratrum viride (green false hellebore)
Veronica wormskjoldii (American alpine speedwell)
Viola canadensis (Canada violet)
Viola glabella (pioneer violet)
Viola orbiculata (round-leaved violet)
Xerophyllum tenax (beargrass)
Zigadenus elegans (mountain deathcamas)

USGS-NPS Vegetation Mapping Program Waterton-Glacier International Peace Park

AUGUST 2007

Appendix I

Final Vegetation Classification of Waterton-Glacier International Peace Park

The table on the following pages provides the final vegetation classification of Waterton-Glacier International Peace Park (IPP) as derived from the Waterton-Glacier IPP Vegetation Mapping Project. We present the classification organized with the first version of the National Vegetation Classification (NVC) hierarchy as adopted by the FGDC (1997). For simplification, we use only the Class, Subclass, and Formation levels of the physiognomic portion of the hierarchy, along with the floristic Alliance level. Under the alliance, plant associations are ordered by their Community Global Element (CEGL) code; the plant community's database code. For each association we provide global conservation status, state distribution, state conservation status, and listings of both vegetation sampling plots and accuracy assessment observation sites representing the vegetation type.

The following pages are formatted to legal-size page (8.5" x 14") in landscape position.

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
I	Forest						
I.A	Evergreen forest						
I.A.8.N.b	Rounded-crowned temperate or subpolar needle-leaved evergreen forest						
	Pinus contorta Forest Alliance						
	CEGL000135	Pinus contorta / Arnica cordifolia Forest	Lodgepole Pine / Heartleaf Leopardbane Forest	G4?	ID:S3?, MT:S3?, WY:S3?	GLAC.74	AAGL.1448
	CEGL000139	Pinus contorta / Calamagrostis rubescens Forest	Lodgepole Pine / Pinegrass Forest	G5	ID:S4, MT:S5, OR, WA?, WY:S4?	GLAC.2009, GLAC.2099	AAGL.359, AAGL.D1204, AAGL.D164
	CEGL000153	Pinus contorta / Linnaea borealis Forest	Lodgepole Pine / American Twinflower Forest	G5	AB, MT:S5, OR:S2, WY:S3?	WATE.5027, WATE.5038	AAWA.323
	CEGL000164	Pinus contorta / Spiraea betulifolia Forest	Lodgepole Pine / Shinyleaf Meadowsweet Forest	G3G4	AB, ID, MT?, WY:S3	GLAC.255, WATE.4086, WATE.4130, WATE.5044	AAGL.1489, AAGL.1490, AAGL.188, AAGL.9142, AAWA.240
	CEGL000168	Pinus contorta / Vaccinium caespitosum Forest	Lodgepole Pine / Dwarf Blueberry Forest	G5	AB, CO, ID:S4?, MT:S5, OR:S3, UT	GLAC.1006, GLAC.2227, GLAC.2240, GLAC.2274, GLAC.2604, GLAC.2606, GLAC.2645, GLAC.2661, WATE.5088, WATE.5089	AAGL.217, AAGL.80, AAGL.B236, AAGL.B279, AAGL.B327, AAGL.B364, AAGL.B45, AAGL.D1111, AAGL.D1353, AAGL.D191, AAGL.D568, AAWA.166, AAWA.265, AAWA.80, AAWA.85
	CEGL000172	Pinus contorta / Vaccinium scoparium Forest	Lodgepole Pine / Grouseberry Forest	G5	CA?, CO:S4, ID:S5, MT:S5, OR:S3, UT:S4S5, WA:S4, WY:S5	none	AAGL.147

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
	CEGL000174	Pinus contorta / Vaccinium scoparium / Calamagrostis rubescens Forest	Lodgepole Pine / Grouseberry / Pinegrass Forest	G3Q	BC, OR:S3, WA	none	AAGL.B99
	CEGL005913	Pinus contorta / Vaccinium membranaceum / Xerophyllum tenax Forest	Lodgepole Pine / Square-twig Blueberry / Bear-grass Forest	G4G5	AB, ID, MT:S4, OR?, WA	GLAC.196, GLAC.2638, GLAC.2650, GLAC.69, GLAC.8, WATE.4058, WATE.5013	AAGL.130, AAGL.134, AAGL.B64, AAGL.B80, AAGL.B98, AAGL.D797, AAWA.251, AAWA.32
	CEGL005916	Pinus contorta / Clintonia uniflora Forest	Lodgepole Pine / Bride's Bonnet Forest	G5	AB, ID, MT:S5, OR, WA	GLAC.1022, GLAC.1023, GLAC.2008, GLAC.2013, GLAC.2057, GLAC.2058, GLAC.2200, GLAC.2205, GLAC.2503, GLAC.2663, WATE.4006, WATE.4007, WATE.4050, WATE.5006, WATE.5026, WATE.5028, WATE.5035, WATE.5039, WATE.5041, WATE.5095, WATE.5141, WATE.5146, WATE.5147, WATE.9015, WATE.9024, WATE.9028, WATE.9030	AAGL.1442, AAGL.1459, AAGL.1460, AAGL.1742, AAGL.1755, AAGL.B240, AAGL.B270, AAGL.B392, AAGL.C127, AAGL.C174, AAGL.C26, AAGL.C97, AAGL.D1403, AAWA.05
	CEGL005922	Pinus contorta / Menziesia ferruginea / Clintonia uniflora Forest	Lodgepole Pine / Fool's-huckleberry / Bride's Bonnet Forest	G4G5	AB, ID, MT:S4, OR?, WA?	GLAC.2294, GLAC.293, GLAC.60, WATE.5036, WATE.9016	AAGL.B179, AAGL.B222, AAWA.169, AAWA.31
	CEGL005923	Pinus contorta / Vaccinium caespitosum / Clintonia uniflora Forest	Lodgepole Pine / Dwarf Blueberry / Bride's Bonnet Forest	G4?	AB, ID?, MT:S4, WA	GLAC.1005, GLAC.129, GLAC.130, GLAC.2260, GLAC.2291, GLAC.2296, GLAC.52, GLAC.6, GLAC.7, WATE.4011, WATE.5018, WATE.5042, WATE.5139	AAGL.1414, AAGL.1445, AAGL.1452, AAGL.B209, AAGL.C188, AAGL.D656, AAGL.D831, AAGL.D843, AAWA.273, AAWA.98
	CEGL005924	Pinus contorta / Vaccinium scoparium / Xerophyllum tenax Forest	Lodgepole Pine / Grouseberry / Bear-grass Forest	G3G4	AB, ID, MT:S3, WA, WY?	GLAC.12, GLAC.13, GLAC.75	AAGL.125, AAGL.1462, AAGL.B135, AAGL.B267, AAGL.B288, AAGL.B313, AAGL.B5, AAGL.D842
	CEGL005928	Pinus contorta / Menziesia ferruginea Forest	Lodgepole Pine / Fool's-huckleberry Forest	G3G4	AB?, ID, MT:S3?	GLAC.330	none
	Park Special 8	Pinus contorta / Acer glabrum Forest	Lodgepole Pine / Mountain Maple Forest	GNR	AB, MT	none	AAGL.644, AAGL.724, AAGL.968, AAGL.B0, AAGL.B154, AAGL.B303, AAGL.C111, AAWA.290

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
	Park Special 9	<i>Pinus contorta</i> / <i>Menziesia ferruginea</i> / <i>Xerophyllum tenax</i> Forest	Lodgepole Pine / Fool's-huckleberry / Bear-grass Forest	GNR	MT	none	AAGL.B177, AAWA.198, AAWA.81
	Pinus ponderosa Forest Alliance						
	CEGL000203	<i>Pinus ponderosa</i> / <i>Symphoricarpos albus</i> Forest	Ponderosa Pine / Common Snowberry Forest	G4?	CA:S2, ID:S3, MT:S4, OR:S1, SD:S4, WA:S3, WY:S2?	none	AAGL.D884
I.A.8.N.c	Conical-crowned temperate or subpolar needle-leaved evergreen forest						
	Picea engelmannii Forest Alliance						
	CEGL005925	<i>Picea engelmannii</i> / <i>Juniperus communis</i> Forest	Engelmann Spruce / Common Juniper Forest	G3	ID:S2, MT:S2, WY:S3	GLAC.239	none
	CEGL005926	<i>Picea engelmannii</i> / <i>Vaccinium caespitosum</i> Forest	Engelmann Spruce / Dwarf Blueberry Forest	G4G5	MT:S4, UT:S4S5, WY?	GLAC.2269	AAGL.D121
	Pseudotsuga menziesii Forest Alliance						
	CEGL000418	<i>Pseudotsuga menziesii</i> / <i>Acer glabrum</i> Forest	Douglas-fir / Rocky Mountain Maple Forest	G4?	AB, CO:S1, ID:S3, MT?, OR:S2, UT:S4?, WY:S3?	WATE.5064	AAGL.1587, AAGL.408, AAGL.56, AAGL.C21, AAGL.C59, AAGL.D1452, AAWA.110, AAWA.112, AAWA.177, AAWA.186, AAWA.209, AAWA.216, AAWA.222, AAWA.279, AAWA.47
	CEGL000424	<i>Pseudotsuga menziesii</i> / <i>Arctostaphylos uva-ursi</i> Forest	Douglas-fir / Bearberry or Kinikinnick Forest	G4	AB, CO:S3, MT:S4, NM:S4	GLAC.122, GLAC.185, GLAC.78, WATE.4026, WATE.4027, WATE.4032, WATE.4053	AAGL.B393, AAGL.B61, AAWA.235, AAWA.238, AAWA.254, AAWA.300
	CEGL000427	<i>Pseudotsuga menziesii</i> / <i>Arnica cordifolia</i> Forest	Douglas-fir / Heartleaf Leopardbane Forest	G4	ID:S3, MT:S4, WY:S3S4	GLAC.199	none

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
	CEGL000430	Pseudotsuga menziesii / Carex geyeri Forest	Douglas-fir / Geyer's Sedge Forest	G4?	CO:S3, ID:S4?, MT:S4, OR:S3, WA:S1, WY	GLAC.207	none
	CEGL000439	Pseudotsuga menziesii / Juniperus communis Forest	Douglas-fir / Common Juniper Forest	G4	CO:S1S2, ID:S3, MT:S4, WY:S3S4	GLAC.205, GLAC.93	AAWA.307
	CEGL000457	Pseudotsuga menziesii / Spiraea betulifolia Forest	Douglas-fir / Shinyleaf Meadowsweet Forest	G5	AB, ID:S3S4, MT:S4, OR:S4, WY:S2S3	GLAC.2282, GLAC.39, WATE.4047	AAGL.1736, AAGL.1759, AAGL.211, AAGL.349, AAGL.358, AAGL.B101, AAGL.B305, AAGL.B394
	CEGL000459	Pseudotsuga menziesii / Symphoricarpos albus Forest	Douglas-fir / Common Snowberry Forest	G5	AB, BC?, ID:S4, MT:S5, OR:S2, WA:S4, WY:S2	GLAC.177, GLAC.2055, GLAC.2226, GLAC.2523, GLAC.2534, GLAC.32, WATE.5057	AAGL.1732, AAGL.1741, AAGL.1763, AAGL.379, AAGL.B109, AAGL.B92, AAGL.C145, AAGL.D1425, AAGL.D462, AAGL.D890, AAWA.184
	CEGL000465	Pseudotsuga menziesii / Vaccinium caespitosum Forest	Douglas-fir / Dwarf Blueberry Forest	G5	AB, ID:S2, MT:S5, OR:S3, WA:S3	GLAC.2262, GLAC.2265	AAGL.D1355, AAGL.D1394, AAGL.D1429, AAGL.D85, AAGL.D858, AAWA.77
	CEGL005850	Pseudotsuga menziesii / Clintonia uniflora Forest	Douglas-fir / Bride's Bonnet Forest	G4G5	AB, ID, MT, OR, WA	GLAC.163, GLAC.2069, GLAC.2078, GLAC.213, GLAC.2206, GLAC.2213, GLAC.2223, GLAC.2256, GLAC.2257, GLAC.2267, GLAC.2516, GLAC.2614, GLAC.2639, GLAC.2664, GLAC.35, GLAC.36, GLAC.42, WATE.4010, WATE.5048, WATE.5058, WATE.5087	AAGL.1220, AAGL.1748, AAGL.C94, AAGL.D867, AAGL.D97
	CEGL005851	Pseudotsuga menziesii / Menziesia ferruginea / Clintonia uniflora Forest	Douglas-fir / Fool's-huckleberry / Bride's Bonnet Forest	G3?	AB, ID, MT, OR?, WA?	GLAC.2242	none

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
	CEGL005852	Pseudotsuga menziesii / Vaccinium membranaceum / Xerophyllum tenax Forest	Douglas-fir / Square-twig Blueberry / Bear-grass Forest	G4G5	AB, ID, MT, OR?, WA	GLAC.2283, GLAC.2616	AAGL.1739, AAGL.400, AAGL.B115, AAGL.B187, AAGL.B213, AAGL.B309, AAGL.B339, AAGL.C196, AAGL.C52, AAGL.C55
	CEGL005853	Pseudotsuga menziesii / Heracleum maximum Forest	Douglas-fir / Cow-parsnip Forest	G2?	AB, ID, MT, WY	GLAC.166, GLAC.2529, WATE.4040	AAGL.B311, AAWA.142, AAWA.89
	CEGL005854	Pseudotsuga menziesii / Clintonia uniflora - Xerophyllum tenax Forest	Douglas-fir / Bride's Bonnet - Bear-grass Forest	G4G5	AB, ID, MT, OR, WA	GLAC.2005, GLAC.2018, GLAC.2052, GLAC.228, GLAC.2613, GLAC.90	AAGL.137, AAGL.B297, AAGL.B34, AAGL.B36, AAGL.B57, AAGL.C5, AAGL.C73
Thuja plicata Forest Alliance							
	CEGL000471	Thuja plicata / Aralia nudicaulis Forest	Western Red-cedar / Wild Sarsaparilla Forest	G2	BC?, ID?, MT, WA:S2	GLAC.2051, GLAC.2053, GLAC.2547	none
	CEGL005931	Thuja plicata / Carex disperma Forest [Provisional]	Western Red-cedar / Softleaf Sedge Forest	G2?	MT:S2?	GLAC.2219	none
	CEGL005930	Thuja plicata / Clintonia uniflora - Xerophyllum tenax Forest	Western Red-cedar / Bride's Bonnet - Bear-grass Forest	G4?	ID, MT, WA	GLAC.2001	AAGL.C121
	CEGL000474	Thuja plicata / Clintonia uniflora Forest	Western Red-cedar / Bride's Bonnet Forest	G4	BC?, ID:S4?, MT:S4, WA:S3	GLAC.2054, GLAC.2211, GLAC.2509, GLAC.2510, GLAC.2601	AAGL.C113, AAGL.C114, AAGL.C137
	CEGL000476	Thuja plicata / Gymnocarpium dryopteris Forest	Western Red-cedar / Northern Oak Fern Forest	G3	BC?, ID:S2, MT:S3, WA	GLAC.2230	AAGL.C179
Tsuga heterophylla Forest Alliance							
	CEGL000488	Tsuga heterophylla / Aralia nudicaulis Forest	Western Hemlock / Wild Sarsaparilla Forest	G3	BC?, ID, MT, WA:S2S3	GLAC.2500, GLAC.2501, GLAC.2617	none

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
	CEGL000493	Tsuga heterophylla / Clintonia uniflora Forest	Western Hemlock / Bride's Bonnet Forest	G4	ID:S4, MT:S3, WA:S4	GLAC.162, GLAC.2065, GLAC.2204, GLAC.2215, GLAC.2546, GLAC.2600, GLAC.2618	AAGL.C126, AAGL.C129, AAGL.C132, AAGL.C158, AAGL.C183, AAGL.C197
	CEGL000494	Tsuga heterophylla / Gymnocarpium dryopteris Forest	Western Hemlock / Northern Oak Fern Forest	G3G4	ID:S3, MT:S2, WA:S3S4	GLAC.2217, GLAC.2628	AAGL.C138, AAGL.C19
I.A.8.N.d	Cylindrical-crowned temperate or subpolar needle-leaved evergreen forest						
	Abies lasiocarpa - Picea engelmannii Forest Alliance						
	CEGL000294	Abies lasiocarpa - Picea engelmannii / Acer glabrum Forest	Subalpine Fir - Engelmann Spruce / Rocky Mountain Maple Forest	G5	CO, ID:S3, MT, NM:S5, UT:S5, WY:S3	GLAC.198, GLAC.203	AAGL.1728, AAWA.154, AAWA.180, AAWA.289
	CEGL000311	Abies lasiocarpa - Picea engelmannii / Galium triflorum Forest	Subalpine Fir - Engelmann Spruce / Sweet-scent Bedstraw Forest	G4	MT:S4	GLAC.2011	AAGL.1524
	CEGL000315	Abies lasiocarpa - Picea engelmannii / Linnaea borealis Forest	Subalpine Fir - Engelmann Spruce / American Twinflower Forest	G5	AB, ID:S5, MT:S5, OR:S4, UT?, WA:S4, WY:S4	GLAC.2520, WATE.4055	AAWA.84
	CEGL000340	Abies lasiocarpa - Picea engelmannii / Vaccinium caespitosum Forest	Subalpine Fir - Engelmann Spruce / Dwarf Blueberry Forest	G5	CO:S4, ID:S3, MT:S5, UT:S4S5, WA:S3?	GLAC.181, GLAC.217	AAGL.D1203, AAGL.D902
	CEGL005892	Abies lasiocarpa - Picea engelmannii / Clintonia uniflora - Xerophyllum tenax Forest	Subalpine Fir - Engelmann Spruce / Bride's Bonnet - Bear-grass Forest	G4G5	AB, ID, MT, OR?, WA	GLAC.2225, GLAC.2281, GLAC.229, GLAC.2519, GLAC.79, WATE.4062, WATE.5118, WATE.9038	AAGL.1573, AAGL.1575, AAGL.1743, AAGL.2215, AAGL.859, AAGL.B2, AAWA.135

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
	CEGL005893	Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Clintonia uniflora Forest	Subalpine Fir - Engelmann Spruce / Fool's-huckleberry / Bride's Bonnet Forest	G4G5	AB, ID, MT, OR?, WA?	GLAC.18, GLAC.2040, GLAC.226, GLAC.256, GLAC.2612, GLAC.2615, GLAC.275, GLAC.294, GLAC.323, GLAC.84, WATE.4020, WATE.4064, WATE.4088, WATE.4107, WATE.4108, WATE.5046, WATE.5117, WATE.5121, WATE.5127	AAGL.1574, AAGL.228, AAGL.229, AAGL.882, AAGL.896, AAGL.B148, AAGL.B163-K, AAGL.B391, AAGL.D1459, AAWA.207, AAWA.241, AAWA.312, AAWA.317
	CEGL005894	Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea - Vaccinium scoparium Forest	Subalpine Fir - Engelmann Spruce / Fool's-huckleberry - Grouseberry Forest	G2G4	AB, BC, ID, MT, OR?, WA?	WATE.5053	AAWA.305, AAWA.76
	CEGL005895	Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Xerophyllum tenax Forest	Subalpine Fir - Engelmann Spruce / Fool's-huckleberry / Bear-grass Forest	G4G5	AB, ID, MT, OR, WA	GLAC.1003, GLAC.2039, GLAC.241, GLAC.2634, GLAC.305, WATE.4091, WATE.4092, WATE.4098, WATE.4104, WATE.4118, WATE.4124, WATE.5078, WATE.5079, WATE.5101, WATE.5126, WATE.9037	AAGL.B18, AAGL.B216, AAGL.B261, AAGL.B318, AAGL.B32, AAGL.B360, AAGL.C204, AAGL.C40, AAGL.C42, AAWA.150, AAWA.153, AAWA.225, AAWA.248, AAWA.277, AAWA.298, AAWA.308, AAWA.41
	CEGL005912	Abies lasiocarpa - Picea engelmannii / Clintonia uniflora Forest	Subalpine Fir - Engelmann Spruce / Bride's Bonnet Forest	G5	AB, ID:S4, MT:S5, OR:S4, WA:S3	GLAC.138, GLAC.176, GLAC.200, GLAC.2015, GLAC.2075, GLAC.215, GLAC.2234, GLAC.2235, GLAC.2246, GLAC.225, GLAC.2264, GLAC.2268, GLAC.2279, GLAC.2513, GLAC.3, WATE.4012, WATE.4019, WATE.4063, WATE.5049, WATE.5050, WATE.5116, WATE.5128, WATE.5130, WATE.9039	AAGL.106, AAGL.1217, AAGL.1218, AAGL.1222, AAGL.1321, AAGL.1405, AAGL.1523, AAGL.1542, AAGL.1549, AAGL.1578, AAGL.1756, AAGL.1786, AAGL.308, AAGL.746, AAGL.B242, AAGL.B384, AAGL.C141, AAGL.C48, AAWA.130, AAWA.83
	CEGL005914	Abies lasiocarpa - Picea engelmannii / Vaccinium scoparium / Xerophyllum tenax Forest	Subalpine Fir - Engelmann Spruce / Grouseberry / Bear-grass Forest	G4G5	AB, ID, MT:S4	GLAC.2025, GLAC.240, GLAC.273, WATE.4116	none

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
	CEGL005917	Abies lasiocarpa - Picea engelmannii / Vaccinium membranaceum / Xerophyllum tenax Forest	Subalpine Fir - Engelmann Spruce / Square-twig Blueberry / Bear-grass Forest	GNR	AB, ID, MT, OR?, WA, WY	GLAC.1, GLAC.100, GLAC.2023, GLAC.2068, GLAC.219, GLAC.24, GLAC.270, GLAC.279, GLAC.298, GLAC.333, GLAC.49, WATE.4060, WATE.4090, WATE.5105, WATE.5123, WATE.9031	AAGL.216, AAGL.452, AAGL.643, AAGL.889, AAGL.B119, AAGL.B129, AAGL.B262, AAGL.B53, AAGL.C116, AAGL.C149, AAGL.C192, AAGL.C36, AAGL.C47, AAGL.C8, AAGL.C92, AAGL.D170, AAGL.D714, AAWA.246, AAWA.258, AAWA.261, AAWA.287, AAWA.291, AAWA.40
	CEGL005918	Abies lasiocarpa - Picea engelmannii / Vaccinium caespitosum / Clintonia uniflora Forest	Subalpine Fir - Engelmann Spruce / Dwarf Blueberry / Bride's Bonnet Forest	G3G4	AB, MT	GLAC.2233, GLAC.2266, GLAC.2273	AAGL.647, AAGL.D1422
	CEGL005919	Abies lasiocarpa - Picea engelmannii / Vaccinium scoparium / Thalictrum occidentale Forest	Subalpine Fir - Engelmann Spruce / Grouseberry / Western Meadowrue Forest	G3G4	AB, ID?, MT, WY?	WATE.4034, WATE.5051, WATE.5052	none
I.A.8.N.e	Temporarily flooded temperate or subpolar needle-leaved evergreen forest						
	Abies lasiocarpa Temporarily Flooded Forest Alliance						
	CEGL000297	Abies lasiocarpa - Picea engelmannii / Alnus viridis ssp. sinuata Forest	Subalpine Fir - Engelmann Spruce / Sitka Alder Forest	G4	ID:S3, MT:S4	GLAC.63	none
	CEGL000336	Abies lasiocarpa - Picea engelmannii / Streptopus amplexifolius Forest	Subalpine Fir - Engelmann Spruce / Clasping Twisted-stalk Forest	G4	AB, ID:S4, MT:S3, OR:S2, UT:S2S3, WA:S2S3, WY:S2	GLAC.16, GLAC.189, GLAC.2021, GLAC.2037, GLAC.2045, GLAC.2228, GLAC.236, GLAC.237, GLAC.2514, GLAC.45, GLAC.81, GLAC.91, WATE.4028, WATE.4115, WATE.5019, WATE.5020, WATE.5066, WATE.5122	AAGL.1216, AAGL.1221, AAGL.1292, AAGL.1296, AAGL.1353, AAGL.1543, AAGL.1680, AAGL.1826, AAGL.1944, AAGL.249, AAGL.277, AAGL.B112, AAGL.B117, AAGL.B121, AAGL.B144, AAGL.B203, AAGL.B250, AAGL.B266, AAGL.B33, AAGL.B344, AAGL.B65, AAGL.B74, AAGL.B82, AAGL.C11, AAGL.C122, AAGL.C155, AAGL.C44, AAWA.230
	Tsuga heterophylla Temporarily Flooded Forest Alliance						
	CEGL000491	Tsuga heterophylla / Athyrium filix-femina Forest	Western Hemlock / Common Ladyfern Forest	G2Q	ID:S2, MT:S2	GLAC.2216	AAGL.C102

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
I.A.8.N.f	Seasonally flooded temperate or subpolar needle-leaved evergreen forest						
	Abies lasiocarpa Seasonally Flooded Forest Alliance						
	CEGL000300	Abies lasiocarpa - Picea engelmannii / Calamagrostis canadensis Forest	Subalpine Fir - Engelmann Spruce / Bluejoint Forest	G5	AB, CO:S3, ID:S3, MT:S5, OR, UT:S4?, WA?, WY:S2	GLAC.2010, GLAC.242, GLAC.268, GLAC.281, GLAC.59, GLAC.82, WATE.5085	AAGL.1249, AAGL.1304, AAGL.1308, AAGL.1352, AAGL.1671, AAGL.310, AAGL.311, AAGL.B254, AAGL.B347, AAGL.B363, AAGL.B83
	CEGL000322	Abies lasiocarpa - Picea engelmannii / Oplopanax horridus Forest	Subalpine Fir - Engelmann Spruce / Devil's-club Forest	G3	AB, ID:S2, MT:S2	GLAC.2285, GLAC.2288, GLAC.2536, GLAC.99	AAGL.C152, AAGL.C167, AAGL.C176, AAGL.C177, AAGL.C201, AAGL.C27, AAGL.C54, AAGL.C78
	Picea engelmannii Seasonally Flooded Forest Alliance						
	CEGL005927	Picea engelmannii / Equisetum arvense Forest	Engelmann Spruce / Field Horsetail Forest	G4	AB, CO:S2, ID:S2, MT:S4, OR:S3, UT:S3?, WA:S3, WY:S2	GLAC.2222, GLAC.2251, GLAC.2277, GLAC.43, GLAC.77, WATE.5145, WATE.9017, WATE.9018	AAGL.12670, AAGL.275, AAGL.B368, AAWA.132
	Pinus contorta Seasonally Flooded Forest Alliance						
	CEGL000138	Pinus contorta / Calamagrostis canadensis Forest	Lodgepole Pine / Bluejoint Forest	G5	CA?, ID:S5, MT, OR:SU, UT:S3S4, WY	GLAC.2201, GLAC.264, GLAC.2648, GLAC.295	AAGL.1319, AAGL.1383, AAGL.B375, AAGL.C16
	Thuja plicata Seasonally Flooded Forest Alliance						
	CEGL000473	Thuja plicata / Athyrium filix-femina Forest	Western Red-cedar / Common Ladyfern Forest	G3G4	ID:S3, MT:S3, OR:S2, WA:S2	GLAC.2506	none

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	CEGL000479	Thuja plicata - Tsuga heterophylla / Oplopanax horridus Rocky Mountain Forest	Western Red-cedar - Western Hemlock / Devil's-club Rocky Mountain Forest	G3	BC?, ID:S3, MT:S3, OR:S1, WA:S2S3	GLAC.2042, GLAC.2064, GLAC.2665	AAGL.C115, AAGL.C76
I.B	Deciduous forest						
I.B.2.N.b	Montane or boreal cold-deciduous forest						
	Larix occidentalis Forest Alliance						
	CEGL005880	Larix occidentalis / Clintonia uniflora Forest	Western Larch / Bride's Bonnet Forest	GNR	ID, MT, OR, WA	GLAC.2056, GLAC.2210, GLAC.2218, GLAC.2231, GLAC.2236, GLAC.2258, GLAC.2287, GLAC.2511, GLAC.2515, GLAC.2640, GLAC.2643	AAGL.1219, AAGL.C104, AAGL.C110, AAGL.C15, AAGL.C156, AAGL.C171, AAGL.C189, AAGL.D1180, AAGL.D306, AAGL.D896
	CEGL005881	Larix occidentalis / Clintonia uniflora - Xerophyllum tenax Forest	Western Larch / Bride's Bonnet - Bear-grass Forest	GNR	ID, MT, OR, WA	GLAC.2014, GLAC.2017, GLAC.2286, GLAC.2535, GLAC.2611	AAGL.C194, AAGL.C22, AAGL.C50
	CEGL005882	Larix occidentalis / Vaccinium caespitosum Forest	Western Larch / Dwarf Blueberry Forest	GNR	ID, MT, WA	GLAC.2255, GLAC.2261, GLAC.2290	AAGL.D1402, AAGL.D592
	CEGL005883	Larix occidentalis / Vaccinium caespitosum / Clintonia uniflora Forest	Western Larch / Dwarf Blueberry / Bride's Bonnet Forest	GNR	ID, MT, WA	GLAC.1009, GLAC.2297, GLAC.2533	AAGL.C81, AAGL.D1441
	Park Special 7	Larix occidentalis / Linnaea borealis Forest	Western Larch / American Twinflower Forest	GNR	MT	none	AAGL.C103, AAGL.C123, AAGL.C151, AAGL.D34
	Populus tremuloides Forest Alliance						
	CEGL000575	Populus tremuloides / Calamagrostis rubescens Forest	Quaking Aspen / Pinegrass Forest	G5?	ID:S3?, MT:S4, NV?, OR?, UT:S5, WA:S2, WY:S3S4	none	AAGL.1911, AAGL.1964, AAGL.B103, AAGL.B113, AAGL.B274
	CEGL000595	Populus tremuloides / Heracleum maximum Forest	Quaking Aspen / Cow-parsnip Forest	G3	AB, MT:S3, SK?	GLAC.14, GLAC.151, GLAC.170, GLAC.174, GLAC.193, GLAC.261, GLAC.28, GLAC.31, GLAC.34, GLAC.44, GLAC.5, GLAC.72, GLAC.9, GLAC.94, WATE.4005, WATE.4009, WATE.4015, WATE.4017, WATE.4021, WATE.4024, WATE.4031, WATE.4067,	AAGL.1617, AAGL.1914, AAGL.1950, AAGL.1962, AAGL.1963, AAGL.1991, AAGL.1992, AAGL.B153, AAGL.B184, AAGL.B281, AAGL.B48, AAGL.B88, AAGL.B9, AAWA.214, AAWA.231, AAWA.286, AAWA.292, AAWA.322,

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						WATE.5043, WATE.5082, WATE.5097, WATE.5137, WATE.9019	AAWA.36
	CEGL000602	Populus tremuloides / Rubus parviflorus Forest	Quaking Aspen / Thimbleberry Forest	G2	ID:S2?, UT:S2?, WY:S2	none	AAGL.D689, AAWA.10, AAWA.234
	CEGL000607	Populus tremuloides / Spiraea betulifolia Forest	Quaking Aspen / Shinyleaf Meadowsweet Forest	G4Q	MT, SD, WY:S3S4	GLAC.55	none
	CEGL000609	Populus tremuloides / Symphoricarpos albus Forest	Quaking Aspen / Common Snowberry Forest	G3?	MT:S3?, OR:S3, WA:S2?, WY	none	AAGL.B157, AAGL.D64
	CEGL003748	Populus tremuloides / Invasive Perennial Grasses Forest	Quaking Aspen / Invasive Perennial Grasses Forest	GNR	CA, CO, ID, MT, NV, UT, WY	none	AAGL.1834, AAWA.24
	CEGL005848	Populus tremuloides / Symphoricarpos occidentalis Forest [Provisional]	Quaking Aspen / Western Snowberry Forest	GNR	AB	WATE.5014, WATE.5016	AAGL.C90, AAWA.260
	CEGL005849	Populus tremuloides / Urtica dioica Forest [Provisional]	Quaking Aspen / Stinging Nettle Forest	G2G3	AB, MT	WATE.4008	none
	CEGL005911	Populus tremuloides - Conifer / Spiraea betulifolia - Symphoricarpos albus Forest	Quaking Aspen - Conifer / Shinyleaf Meadowsweet - Common Snowberry Forest	G3?	AB?, MT:S3?	GLAC.116, GLAC.2249, GLAC.67	AAGL.1684, AAWA.51
I.B.2.N.d	Temporarily flooded cold-deciduous forest						
	Abies lasiocarpa - Populus tremuloides Forest Alliance						
	CEGL005908	Populus tremuloides - Abies lasiocarpa - Picea engelmannii / Streptopus amplexifolius Forest	Quaking Aspen - Subalpine Fir - Engelmann Spruce / Claspig Twisted-stalk Forest	G2G3	AB, MT	GLAC.134, GLAC.192, GLAC.2043, GLAC.245, WATE.5083, WATE.5148	AAWA.18, AAWA.194
	Populus balsamifera ssp. trichocarpa Temporarily Flooded Forest Alliance						
	CEGL000542	Populus balsamifera ssp. trichocarpa - (Populus tremuloides) / Heracleum maximum Forest	Black Cottonwood - (Quaking Aspen) / Cow-parsnip Forest	G2	AB, MT:S2	GLAC.141, GLAC.175, GLAC.53, WATE.5023, WATE.5115, WATE.5135, WATE.9003	AAGL.1869, AAGL.1873, AAGL.711, AAGL.B163, AAGL.B178, AAGL.B290, AAGL.B31, AAGL.B58, AAGL.B75, AAWA.122, AAWA.145, AAWA.23

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	CEGL000672	Populus balsamifera ssp. trichocarpa / Cornus sericea Forest	Black Cottonwood / Red-osier Dogwood Forest	G3G4	AB, CA:S1?, ID:S3, MT:S3?, OR:S2, WA:S2?, WY	GLAC.132, GLAC.15, GLAC.2006, GLAC.2044, GLAC.2048, GLAC.2061, GLAC.2062, GLAC.2085, GLAC.22, GLAC.2275, GLAC.2276, GLAC.2280, GLAC.2284, GLAC.2298, GLAC.23, GLAC.2642, GLAC.27, GLAC.51, GLAC.66, WATE.5015, WATE.5084, WATE.9008	AAGL.1382, AAGL.1838, AAGL.1880, AAGL.1897, AAGL.1916, AAGL.1920, AAGL.595, AAGL.B156, AAGL.B181, AAGL.B218, AAGL.B239, AAGL.B291, AAGL.B342, AAGL.B42, AAGL.B43, AAGL.B60, AAGL.C125, AAGL.C13, AAGL.C91, AAGL.D297, AAGL.D684, AAWA.04, AAWA.141, AAWA.148, AAWA.15, AAWA.176, AAWA.25, AAWA.62
	CEGL005845	Populus balsamifera ssp. trichocarpa / Calamagrostis canadensis Forest [Provisional]	Black Cottonwood / Bluejoint Forest	G2?	AB, MT?	WATE.5144	AAGL.1704
	CEGL005905	Populus balsamifera ssp. trichocarpa - Populus tremuloides - Conifer / Cornus sericea Forest	Black Cottonwood - Quaking Aspen - Conifer / Red-osier Dogwood Forest	G2G3	AB, MT:S2?	GLAC.224, GLAC.46, GLAC.83, WATE.9029	AAGL.1610, AAGL.1611, AAGL.880, AAGL.91, AAGL.B169, AAGL.B321, AAGL.B38, AAGL.C120, AAGL.C96, AAGL.D298, AAGL.D332, AAGL.D341, AAGL.D615, AAWA.162, AAWA.197
	CEGL005906	Populus balsamifera ssp. trichocarpa - Populus tremuloides - Conifer / Clintonia uniflora Forest	Black Cottonwood - Quaking Aspen - Conifer / Bride's Bonnet Forest	G3?	AB?, ID?, MT:S3?	GLAC.10, GLAC.2007, GLAC.2202, GLAC.254, GLAC.265, GLAC.70, GLAC.80, GLAC.89	AAGL.B260
	CEGL005907	Populus balsamifera ssp. trichocarpa - Picea engelmannii / Equisetum arvense Forest	Black Cottonwood - Engelmann Spruce / Field Horsetail Forest	G2?	AB, MT:S2?	GLAC.2089, WATE.5086	AAGL.D791
	CEGL005909	Populus balsamifera ssp. trichocarpa - Populus tremuloides - Conifer / Calamagrostis canadensis Forest	Black Cottonwood - Quaking Aspen - Conifer / Bluejoint Forest	G2?	MT:S2?	GLAC.329, GLAC.71, GLAC.995	AAGL.1666, AAGL.1676, AAGL.897
Populus tremuloides Temporarily Flooded Forest Alliance							
	CEGL000582	Populus tremuloides / Cornus sericea Forest	Quaking Aspen / Red-osier Dogwood Forest	G4	AB, CA?, CO:S2S3, ID:S3, MT:S3, OR:S2?, UT, WA:S1S2	GLAC.2079, GLAC.54, WATE.5017, WATE.5138, WATE.9023	AAGL.1885, AAGL.983, AAGL.997, AAGL.B186, AAGL.B39, AAGL.D613, AAWA.101, AAWA.149, AAWA.158, AAWA.16, AAWA.183, AAWA.210, AAWA.215, AAWA.221, AAWA.239, AAWA.309, AAWA.95

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I.B.2.N.e	Seasonally flooded cold-deciduous forest						
	Populus tremuloides Seasonally Flooded Forest Alliance						
	CEGL000574	Populus tremuloides / Calamagrostis canadensis Forest	Quaking Aspen / Bluejoint Forest	G3	AB, CO:S3, ID:S2, MT:S2, OR:S1, WA:S1, WY?	GLAC.128, GLAC.133, GLAC.2253, WATE.4037, WATE.5032	AAGL.1646, AAGL.797, AAGL.B106
I.C	Mixed evergreen-deciduous forest						
I.C.3.N.a	Mixed needle-leaved evergreen - cold-deciduous forest						
	Populus balsamifera ssp. trichocarpa Temporarily Flooded Forest Alliance						
	CEGL005910	Populus balsamifera ssp. trichocarpa - Populus tremuloides - Conifer / Heracleum maximum Forest	Black Cottonwood - Quaking Aspen - Conifer / Cow-parsnip Forest	G2?	MT	GLAC.169, GLAC.29, GLAC.41, GLAC.50	AAGL.1663, AAGL.1941, AAGL.286, AAGL.666, AAGL.679, AAGL.690, AAGL.B105, AAGL.B296, AAGL.B320, AAGL.B371, AAGL.B377, AAGL.B95, AAWA.105, AAWA.109, AAWA.218
II	Woodland						
II.A	Evergreen woodland						
II.A.4.N.a	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland						
	Pinus albicaulis Woodland Alliance						
	CEGL000128	Pinus albicaulis - Abies lasiocarpa Woodland	Whitebark Pine - Subalpine Fir Woodland	G5?	ID:S3, MT:S5, WY	GLAC.238, GLAC.303	none
	CEGL000754	Pinus albicaulis - (Abies lasiocarpa) / Carex geyeri Woodland	Whitebark Pine - (Subalpine Fir) / Geyer's Sedge Woodland	G2G3	ID:S1, MT:S1, OR:S2S3, WY:S2	GLAC.209	none

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
	CEGL005840	Pinus albicaulis - (Picea engelmannii) / Dryas octopetala Woodland	Whitebark Pine - (Engelmann Spruce) / Eight-petal Mountain-avens Woodland	G2G3?	AB:S2?	WATE.4125, WATE.5011, WATE.5108	AAGL.B388
Pinus contorta Woodland Alliance							
	CEGL000764	Pinus contorta / Juniperus communis Woodland	Lodgepole Pine / Common Juniper Woodland	G5	CO:S3, ID:S3, MT:S3, NV?, UT:S4?, WY:S3	GLAC.201, GLAC.62	AAGL.175, AAGL.B225, AAWA.13, AAWA.203
	CEGL005915	Pinus contorta / Heracleum maximum Woodland	Lodgepole Pine / Cow-parsnip Woodland	G3?	AB, MT:S2S3	GLAC.152, GLAC.2602, WATE.4023, WATE.4025, WATE.4046, WATE.4049, WATE.4054, WATE.4056, WATE.9022	AAGL.B123, AAGL.B151
	CEGL005921	Pinus contorta / Clintonia uniflora - Xerophyllum tenax Woodland	Lodgepole Pine / Bride's Bonnet - Bear-grass Woodland	G4G5	AB, ID, MT:S4, OR?, WA?	GLAC.1004, GLAC.1021, GLAC.2070, GLAC.2071, GLAC.2090, GLAC.2229, GLAC.2647, GLAC.2660, WATE.5077	AAGL.C46
	CEGL005929	Pinus contorta / Cornus sericea Woodland	Lodgepole Pine / Red-osier Dogwood Woodland	G2G3	AB, CA?, MT:S2S3	GLAC.2299, WATE.5129	none
Pinus flexilis Woodland Alliance							
	CEGL000802	Pinus flexilis / Arctostaphylos uva-ursi Woodland	Limber Pine / Bearberry or Kinikinnick Woodland	G4	AB, CO:S2?, MT, NM:S4	GLAC.197, GLAC.310, GLAC.48, WATE.4042, WATE.4048, WATE.4052, WATE.5002, WATE.5003, WATE.5008	AAGL.392, AAGL.410, AAGL.51
	CEGL000805	Pinus flexilis / Festuca idahoensis Woodland	Limber Pine / Idaho Fescue Woodland	G5	ID:S2, MT:S5, WY:S2	none	AAGL.49
	CEGL000806	Pinus flexilis / Festuca campestris Woodland	Limber Pine / Prairie Fescue Woodland	G3	MT:S3	none	AAGL.189
	CEGL000807	Pinus flexilis / Juniperus communis Woodland	Limber Pine / Common Juniper Woodland	G5	CA?, CO:S3, ID:S3, MT:S4, NV?,	none	AAGL.252, AAGL.B188, AAGL.B247, AAGL.B252

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
					OR:S1, UT, WY:S2?		
		Pinus ponderosa Woodland Alliance					
	CEGL000185	Pinus ponderosa / Festuca campestris Woodland	Ponderosa Pine / Prairie Fescue Woodland	G3G4	BC?, ID:S1, MT:S3, WA:S1	none	AAGL.D1347, AAGL.D340
	CEGL005841	Pinus ponderosa / Vaccinium caespitosum Woodland	Ponderosa Pine / Dwarf Blueberry Woodland	G3?	ID, MT:S2S3, WA	GLAC.2254, GLAC.2259	AAGL.D1122
II.A.4.N.b		Conical-crowned temperate or subpolar needle-leaved evergreen woodland					
		Pseudotsuga menziesii Woodland Alliance					
	CEGL000429	Pseudotsuga menziesii / Calamagrostis rubescens Woodland	Douglas-fir / Pinegrass Woodland	G5	BC:S3?, ID:S4?, MT:S5, OR:S3, UT:S2?, WA:S5, WY:S4?	GLAC.168, GLAC.2080, GLAC.211, GLAC.227	AAGL.348, AAGL.D1172
	CEGL000900	Pseudotsuga menziesii / Festuca idahoensis Woodland	Douglas-fir / Idaho Fescue Woodland	G4	ID:S3, MT:S4, WA:S2, WY:S1	GLAC.140, GLAC.158, GLAC.179, GLAC.214	AAGL.360, AAWA.124
II.A.4.N.c		Cylindrical-crowned temperate or subpolar needle-leaved evergreen woodland					
		Abies lasiocarpa Woodland Alliance					
	CEGL000317	Abies lasiocarpa - Picea engelmannii / Luzula glabrata var. hitchcockii Woodland	Subalpine Fir - Engelmann Spruce / Hitchcock's Smooth Woodrush Woodland	G5	AB, ID:S5, MT:S5, WA:S2, WY:S1	WATE.5010	AAGL.B27
	CEGL005823	Abies lasiocarpa - Picea engelmannii / Valeriana sitchensis Woodland	Subalpine Fir - Engelmann Spruce / Sitka Valerian Woodland	G2?	AB, MT:S2?	GLAC.107, GLAC.148, WATE.5012, WATE.5025	AAGL.267, AAGL.B397, AAGL.C51, AAWA.185, AAWA.79

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	CEGL005896	Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Luzula glabrata var. hitchcockii Woodland	Subalpine Fir - Engelmann Spruce / Fool's-huckleberry / Hitchcock's Smooth Woodrush Woodland	G4?	AB, ID, MT, WA?	GLAC.2635, WATE.4117	AAGL.B284, AAWA.314
	CEGL005897	Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Streptopus amplexifolius Woodland	Subalpine Fir - Engelmann Spruce / Fool's-huckleberry / Claspig Twisted-stalk Woodland	G3G4	AB, ID, MT, WA?	GLAC.278, GLAC.283, GLAC.37, GLAC.47, WATE.4075, WATE.4099, WATE.4119, WATE.5113, WATE.9007, WATE.9032, WATE.9036	AAGL.1298, AAGL.1300, AAGL.1313, AAGL.1488, AAGL.212, AAGL.B145, AAGL.B162, AAGL.B302, AAGL.B357, AAGL.B402, AAGL.C173, AAGL.C208, AAGL.C65, AAWA.144, AAWA.282, AAWA.48
	CEGL005898	Abies lasiocarpa - Picea engelmannii / Xerophyllum tenax - Luzula glabrata var. hitchcockii Woodland	Subalpine Fir - Engelmann Spruce / Bear-grass - Hitchcock's Smooth Woodrush Woodland	G4G5	AB, ID, MT, WA	WATE.5104, WATE.5106, WATE.9033	AAGL.B131, AAGL.B324, AAGL.B380, AAGL.C164, AAGL.C53, AAWA.190, AAWA.196, AAWA.70
	CEGL005920	Abies lasiocarpa - Picea engelmannii / Streptopus amplexifolius - Luzula glabrata var. hitchcockii Woodland	Subalpine Fir - Engelmann Spruce / Claspig Twisted-stalk - Hitchcock's Smooth Woodrush Woodland	G2G3	AB, ID?, MT:S2?	GLAC.156, GLAC.2024, GLAC.218, GLAC.234, WATE.4096, WATE.4113, WATE.5061, WATE.5112	AAGL.11111, AAGL.2, AAGL.856, AAGL.B152, AAGL.B352, AAGL.B354, AAGL.C24, AAGL.C35, AAGL.C85, AAWA.164
Pinus albicaulis - Abies lasiocarpa Woodland Alliance							
	CEGL005836	Pinus albicaulis - Abies lasiocarpa / Menziesia ferruginea / Xerophyllum tenax Woodland	Whitebark Pine - Subalpine Fir / Fool's-huckleberry / Bear-grass Woodland	G3?	AB, ID, MT	GLAC.282, WATE.5092, WATE.5093, WATE.5109	AAGL.D879
	CEGL005837	Pinus albicaulis - Abies lasiocarpa / Vaccinium membranaceum / Xerophyllum tenax Woodland	Whitebark Pine - Subalpine Fir / Square-twig Blueberry / Bear-grass Woodland	G3?	AB, ID, MT, WA?	GLAC.118, GLAC.2636, GLAC.284	AAGL.B292, AAGL.B310
	CEGL005838	Pinus albicaulis - Abies lasiocarpa / Vaccinium scoparium / Xerophyllum tenax Woodland	Whitebark Pine - Subalpine Fir / Grouseberry / Bear-grass Woodland	G3?	AB, ID, MT, WA?	GLAC.2637, GLAC.2653, GLAC.274, GLAC.306, WATE.4123	AAGL.D61, AAWA.259
	CEGL005839	Pinus albicaulis - Abies lasiocarpa / Vaccinium scoparium / Luzula glabrata var. hitchcockii Woodland	Whitebark Pine - Subalpine Fir / Grouseberry / Hitchcock's Smooth Woodrush Woodland	G3?	AB, ID, MT, WY?	WATE.4102, WATE.4105, WATE.4106, WATE.4128	AAGL.B1, AAGL.B49, AAWA.152
II.A.4.N.d Temporarily flooded temperate or subpolar needle-leaved evergreen woodland							
Picea engelmannii Temporarily Flooded Woodland Alliance							
	CEGL002677	Picea engelmannii / Cornus sericea Woodland	Engelmann Spruce / Red-osier Dogwood Woodland	G3	AB?, CO:SU,	GLAC.2243, GLAC.2293, GLAC.2295, GLAC.2517, GLAC.2531, GLAC.2532,	AAGL.1237, AAGL.1267, AAGL.1288, AAGL.1752, AAGL.B20, AAGL.C168,

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					ID:S2, MT:S3, OR:S1, UT?, WA:S2?, WY:S3?	GLAC.2627, GLAC.88	AAGL.C88, AAGL.D162, AAGL.D624, AAGL.D747, AAGL.D932
		Pseudotsuga menziesii Temporarily Flooded Woodland Alliance					
	CEGL000899	Pseudotsuga menziesii / Cornus sericea Woodland	Douglas-fir / Red-osier Dogwood Woodland	G4	CO:S2, ID:S4, MT:S3	GLAC.165, GLAC.2646	none
II.A.4.N.e		Seasonally flooded temperate or subpolar needle-leaved evergreen woodland					
		Picea engelmannii Seasonally Flooded Woodland Alliance					
	CEGL005843	Picea engelmannii / Salix drummondiana Woodland	Engelmann Spruce / Drummond's Willow Woodland	G2G3	AB?, MT:S2?	GLAC.267, GLAC.86	AAGL.1038, AAGL.1248, AAGL.1251, AAGL.1255, AAGL.1259, AAGL.1268, AAGL.B214, AAGL.B237
II.B		Deciduous woodland					
II.B.2.N.a		Cold-deciduous woodland					
		Betula papyrifera Woodland Alliance					
	CEGL005844	Betula papyrifera / Acer glabrum Woodland	Paper Birch / Rocky Mountain Maple Woodland	G2G3	MT	GLAC.2036, GLAC.2059, GLAC.2207, GLAC.2504	AAGL.C187
	CEGL005904	Betula papyrifera - Conifer / Clintonia uniflora Woodland	Paper Birch - Conifer / Bride's Bonnet Woodland	G3G4	AB?, ID, MT:S3?	GLAC.2034, GLAC.2035, GLAC.2203, GLAC.2212, GLAC.2508, GLAC.2623	AAGL.C139, AAGL.C199, AAGL.C200, AAGL.C41
		Larix lyallii Woodland Alliance					
	CEGL005884	Larix lyallii / Vaccinium membranaceum / Luzula glabrata var. hitchcockii Woodland	Subalpine Larch / Square-twig Blueberry / Hitchcock's Smooth Woodrush Woodland	G2G3	AB, ID?, MT:S2S3	GLAC.150, WATE.4036, WATE.4080, WATE.4081, WATE.4095, WATE.4097, WATE.4100, WATE.4121, WATE.5062, WATE.5080, WATE.5091, WATE.5099, WATE.5100, WATE.5111	AAGL.76, AAGL.B223, AAGL.B26, AAGL.B278, AAGL.B307, AAGL.B335, AAGL.B356, AAGL.B373, AAGL.B63, AAGL.B91, AAWA.03, AAWA.212, AAWA.66
III		Shrubland					
III.A		Evergreen shrubland					

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
III.A.3.N.a	Needle-leaved evergreen shrubland						
	Abies lasiocarpa - Picea engelmannii - Pinus flexilis Krummholz Shrubland Alliance						
	CEGL000985	Abies lasiocarpa - Picea engelmannii Krummholz Shrubland	Subalpine Fir - Engelmann Spruce Krummholz Shrubland	G4	AB, CO, MT:S4, UT?, WY	GLAC.247, WATE.4112	AAGL.B142, AAGL.B176, AAWA.201, AAWA.255
III.B	Deciduous shrubland						
III.B.2.N.a	Temperate cold-deciduous shrubland						
	Acer glabrum Shrubland Alliance						
	CEGL001061	Acer glabrum Avalanche Chute Shrubland	Rocky Mountain Maple Avalanche Chute Shrubland	G5	MT:S5, WY	GLAC.137, GLAC.202, GLAC.25, GLAC.26, GLAC.260, GLAC.277, GLAC.307, GLAC.321, GLAC.322, GLAC.61	AAGL.2245, AAGL.781, AAGL.B255, AAGL.B355, AAGL.B55, AAGL.C205, AAGL.C79, AAWA.72
	Amelanchier alnifolia Shrubland Alliance						
	CEGL001065	Amelanchier alnifolia / Pseudoroegneria spicata - Bunchgrass Shrubland	Saskatoon Serviceberry / Bluebunch Wheatgrass - Bunchgrass Shrubland	G3G4Q	AB, MT:S2?, WY:S3S4	GLAC.161, GLAC.2, GLAC.204, GLAC.212, GLAC.216, GLAC.2214, GLAC.2224, GLAC.2505, GLAC.2512, GLAC.2518, GLAC.2522, GLAC.2625, GLAC.2626, GLAC.2641, GLAC.2651, GLAC.2657, GLAC.2658, GLAC.4, WATE.4014, WATE.4059, WATE.5030, WATE.5131, WATE.5133, WATE.9027	AAGL.1083, AAGL.1085, AAGL.1111, AAGL.1127, AAGL.177, AAGL.198, AAGL.253, AAGL.355, AAGL.411, AAGL.477, AAGL.736, AAGL.761, AAGL.764, AAGL.780, AAGL.784, AAGL.B256, AAGL.B259, AAGL.B285, AAGL.B299, AAGL.B345, AAGL.B385, AAGL.B400, AAGL.B41, AAGL.D1257, AAWA.06, AAWA.103, AAWA.111, AAWA.114, AAWA.118, AAWA.163, AAWA.167, AAWA.189, AAWA.191, AAWA.224, AAWA.264, AAWA.56, AAWA.63, AAWA.73
	CEGL005885	Amelanchier alnifolia / (Mixed Grass, Forb) Shrubland	Saskatoon Serviceberry / (Mixed Grass, Forb) Shrubland	GNR	AB, MT	GLAC.1002, GLAC.167, GLAC.2209, GLAC.2237, GLAC.2238, GLAC.2624, GLAC.2659, GLAC.30, GLAC.38, GLAC.64, GLAC.76, WATE.4089, WATE.5021, WATE.9001, WATE.9010, WATE.9011	AAGL.2190, AAGL.365, AAGL.B114, AAGL.B150, AAGL.B193, AAGL.B229, AAGL.B287, AAGL.B301, AAGL.B369, AAGL.B381, AAGL.B76, AAGL.C109, AAGL.C144, AAGL.C191, AAGL.C207, AAGL.C37, AAGL.D1072, AAGL.D337, AAWA.146, AAWA.147, AAWA.172, AAWA.229, AAWA.27, AAWA.280, AAWA.294

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	CEGL005886	Populus tremuloides / Amelanchier alnifolia Avalanche Chute Shrubland	Quaking Aspen / Saskatoon Serviceberry Avalanche Chute Shrubland	G3?	AB, MT, WY	GLAC.2245, GLAC.304, WATE.5149, WATE.9009, WATE.9040	AAGL.1612, AAGL.1923, AAGL.730, AAGL.812, AAGL.886, AAGL.969, AAGL.970, AAGL.986, AAGL.B155, AAGL.B200, AAGL.B56, AAGL.D667, AAWA.121, AAWA.168, AAWA.227, AAWA.275
	Park Special 6	Salix scouleriana Shrubland	Scouler's Willow Shrubland	GNR	MT	none	AAGL.C193
Prunus virginiana Shrubland Alliance							
	CEGL001108	Prunus virginiana - (Prunus americana) Shrubland	Choke Cherry - (American Plum) Shrubland	G4Q	CO:S3, ID:S3, MT:S4, NV, OR:S3, SD, WA:S2?, WY:S2?	none	AAGL.B16, AAGL.B232
Spiraea betulifolia Shrubland Alliance							
	CEGL005835	Spiraea betulifolia Shrubland	Shinyleaf Meadowsweet Shrubland	G3?	AB?, MT:S3	GLAC.182, GLAC.195, GLAC.2033, GLAC.276, GLAC.300	AAGL.2217
Symphoricarpos albus Shrubland Alliance							
	CEGL005890	Symphoricarpos albus Shrubland	Common Snowberry Shrubland	G4?	MT:S4?	GLAC.2012, GLAC.2083, GLAC.2101, GLAC.2208, GLAC.2247, GLAC.2252, GLAC.2263	AAGL.B190, AAGL.C131, AAGL.D1007, AAGL.D1240, AAGL.D1363, AAGL.D1421, AAGL.D654, AAGL.D847
III.B.2.N.b	Subalpine or subpolar cold-deciduous shrubland						
Menziesia ferruginea Shrubland Alliance							
	CEGL005888	Menziesia ferruginea / Xerophyllum tenax Shrubland	Fool's-huckleberry / Bear-grass Shrubland	G3G4	AB, ID?, MT:S3, WA?	GLAC.253, WATE.4109	AAGL.1005, AAGL.B245, AAGL.B326, AAGL.C66, AAGL.D1166, AAWA.192, AAWA.253, AAWA.58
Rubus parviflorus Shrubland Alliance							
	CEGL001127	Rubus parviflorus / Chamerion angustifolium - Heracleum maximum Shrubland	Thimbleberry / Fireweed - Cow-parsnip Shrubland	G4	AB, MT:S3, WA:S4	GLAC.124, GLAC.142, GLAC.186, GLAC.2046, GLAC.220, GLAC.262, GLAC.299, GLAC.301, GLAC.328, GLAC.95	AAGL.898, AAGL.909, AAGL.921, AAGL.B191, AAGL.B319, AAGL.B96, AAGL.C190, AAGL.C2, AAGL.C202,

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
							AAGL.C67, AAGL.D1050, AAWA.43, AAWA.78
		Vaccinium membranaceum Shrubland Alliance					
	CEGL005891	Vaccinium membranaceum / Xerophyllum tenax Shrubland	Square-twig Blueberry / Bear-grass Shrubland	G3?	AB:SU, ID?, MT:S3?, WA	CD595, CD596, CD521, CD594, GLAC.2003, GLAC.2004, GLAC.2038, GLAC.20500, GLAC.249, GLAC.259, GLAC.269, GLAC.327	AAGL.2188, AAGL.B14, AAGL.B253, AAGL.B271, AAGL.B94, AAGL.C100, AAGL.C185, AAGL.C45, AAGL.D1367
III.B.2.N.d		Temporarily flooded cold-deciduous shrubland					
		Alnus incana Temporarily Flooded Shrubland Alliance					
	CEGL001141	Alnus incana Shrubland	Speckled Alder Shrubland	GNRQ	CA:S3S4, ID:S3, MT:S3, UT:S3, WA:S3S4, WY:S3	none	AAGL.D1461
	CEGL001143	Alnus incana / Calamagrostis canadensis Shrubland	Speckled Alder / Bluejoint Shrubland	G3Q	CO, ID, MT:S3, NM:S1?, OR:S1, WA:S2, WY	none	AAGL.B248
	CEGL001145	Alnus incana / Cornus sericea Shrubland	Speckled Alder / Red-osier Dogwood Shrubland	G3G4	CA:S2?, CO:S3, ID:S3, MT:S3S4, NM:S3S4, NV, OR:S3, UT:S2S3, WA:S3, WY	none	AAGL.D18
		Alnus viridis ssp. sinuata Temporarily Flooded Shrubland Alliance					
	CEGL001156	Alnus viridis ssp. sinuata / Athyrium	Sitka Alder / Common Ladyfern -	G4	BC?,	GLAC.101, GLAC.143, GLAC.2049,	AAGL.1607, AAGL.279, AAGL.B180,

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
		felix-femina - <i>Cinna latifolia</i> Shrubland	Slender Woodreed Shrubland		CA:S2?, ID:S2, MT, OR:S3?, WA:S3	GLAC.208, GLAC.263, GLAC.324	AAGL.B362, AAGL.C162, AAGL.C56, AAGL.D1293, AAGL.D587
	CEGL002633	<i>Alnus viridis</i> ssp. <i>sinuata</i> / Mesic Forbs Shrubland	Sitka Alder / Mesic Forbs Shrubland	G3G4	AB, ID?, MT, OR, WA:S3S4	GLAC.17, GLAC.2032, GLAC.2050, GLAC.2063, GLAC.221, GLAC.223, GLAC.272, GLAC.297, WATE.9004, WATE.9005, WATE.9006	AAGL.1303, AAGL.910, AAGL.941, AAGL.943, AAGL.944, AAGL.B120, AAGL.B182, AAGL.B208, AAGL.B226, AAGL.B316, AAGL.B346, AAGL.B379, AAGL.B403, AAGL.B8, AAGL.C150, AAGL.C159, AAGL.C43, AAGL.C58, AAGL.D1097, AAWA.129, AAWA.21, AAWA.22
Cornus sericea Temporarily Flooded Shrubland Alliance							
	CEGL001165	<i>Cornus sericea</i> Shrubland	Red-osier Dogwood Shrubland	G4Q	CO:S3, ID:S3, MT:S3, NV, OR:S4, UT, WA:S2S4, WY	GLAC.2102, GLAC.2507	AAGL.887, AAGL.888, AAGL.C93, AAGL.D259
Crataegus (douglasii, succulenta) Temporarily Flooded Shrubland Alliance							
	CEGL001093	<i>Crataegus douglasii</i> - (<i>Crataegus chrysocarpa</i>) Shrubland	Black Hawthorn - (Golden-fruit Hawthorn) Shrubland	G2Q	MT:S2, SD, WY?	none	AAGL.322, AAGL.C209
Elaeagnus commutata Temporarily Flooded Shrubland Alliance							
	CEGL001098	<i>Elaeagnus commutata</i> Shrubland	American Silverberry Shrubland	G2Q	AB:SU, ID:S2, MT:S2?	GLAC.136, GLAC.157	AAGL.437, AAWA.33
	Park Special 4	<i>Salix pseudomonticola</i> Shrubland	False Mountain Willow Shrubland	GNR	MT	GLAC.125	AAGL.B138
Rhamnus alnifolia Temporarily Flooded Shrubland Alliance							
	CEGL001132	<i>Rhamnus alnifolia</i> Shrubland	Alderleaf Buckthorn Shrubland	G3	ID:S3, MT:S5,	none	AAGL.D686

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
					OR, WA:S1?, WY		
		Ribes lacustre Temporarily Flooded Shrubland Alliance					
	CEGL005889	Ribes lacustre / Chamerion angustifolium Shrubland [Provisional]	Bristly Black Currant / Fireweed Shrubland	G2?	MT:S2?	GLAC.271	AAGL.B46
		Rosa woodsii Temporarily Flooded Shrubland Alliance					
	CEGL001126	Rosa woodsii Shrubland	Woods' Rose Shrubland	G5	CA, ID:S4, MT:S5, NV:S3?, OR:SU, SK?	GLAC.190	AAGL.788, AAGL.819, AAWA.283
		Salix (exigua, interior) Temporarily Flooded Shrubland Alliance					
	CEGL001199	Salix exigua / Agrostis stolonifera Shrubland	Coyote Willow / Creeping Bentgrass Shrubland	GNA	NM	none	AAGL.D959
		Salix bebbiana Temporarily Flooded Shrubland Alliance					
	CEGL001173	Salix bebbiana Shrubland	Bebb's Willow Shrubland	G3?	AB, CO:S2, ID, MT:S3?, NM, SD:S2, WY:S2S3	WATE.9002, WATE.9014	AAWA.102, AAWA.293, AAWA.297, AAWA.42, AAWA.61, AAWA.65, AAWA.68
		Salix boothii Temporarily Flooded Shrubland Alliance					
	CEGL001178	Salix boothii / Carex utriculata Shrubland	Booth's Willow / Beaked Sedge Shrubland	G4	CA?, CO:S3, ID:S4, OR:S3, UT:S3?, WY:S2S3	none	AAGL.1214, AAGL.D526, AAGL.D853
	CEGL001180	Salix boothii / Mesic Forbs Shrubland	Booth's Willow / Mesic Forbs Shrubland	G3	CA:S2?, CO:S3, ID:S3, MT,	GLAC.135	AAGL.594

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
					NV:S3, OR:SU, UT:S3?, WY		
Salix drummondiana Temporarily Flooded Shrubland Alliance							
	CEGL001192	Salix drummondiana / Mesic Forbs Shrubland	Drummond's Willow / Mesic Forbs Shrubland	G4	AB, CO:S4, MT, WY	GLAC.119, GLAC.131, GLAC.144, GLAC.2060, GLAC.21, GLAC.2300, GLAC.231, GLAC.57, WATE.4073	AAGL.1287, AAGL.445, AAGL.588, AAGL.589, AAGL.598, AAGL.607, AAGL.973, AAGL.B104, AAGL.B112-K, AAGL.B146, AAGL.B211, AAGL.B235, AAGL.B336, AAGL.B349, AAGL.B351, AAGL.B78, AAGL.C25, AAGL.D1060, AAGL.D1331, AAWA.151, AAWA.161
	CEGL002667	Salix drummondiana / Calamagrostis canadensis Shrubland	Drummond's Willow / Bluejoint Shrubland	G3	AB?, BC?, CO:S3, ID:S2, MT, WA:S2?	GLAC.121, GLAC.188, GLAC.2076, GLAC.244, GLAC.2649, GLAC.58, GLAC.97	AAGL.1191, AAGL.1200, AAGL.1864, AAGL.436, AAGL.440, AAGL.B125, AAGL.B127, AAGL.B294, AAGL.B383, AAGL.B40, AAGL.B89, AAWA.301
Salix geyeriana Temporarily Flooded Shrubland Alliance							
	CEGL002666	Salix geyeriana / Mesic Forbs Shrubland	Geyer's Willow / Mesic Forbs Shrubland	G3	CO:S3, ID:S3, MT, UT:S2S3, WY:S2	GLAC.2528	AAWA.139
Salix glauca Temporarily Flooded Shrubland Alliance							
	CEGL001136	Salix glauca Shrubland	Grayleaf Willow Shrubland	G3?	AB, MT:S2, WY	GLAC.108, WATE.5022	AAGL.2231
Symphoricarpos occidentalis Temporarily Flooded Shrubland Alliance							
	CEGL001131	Symphoricarpos occidentalis Shrubland	Western Snowberry Shrubland	G4G5	AB:S4S5, CO:S3, IA?, MB:S5, MT:S4S5, ND:S4?,	GLAC.2278, GLAC.2609, GLAC.2610	none

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
					NE:S4, SD:SU, SK, WY?		
III.B.2.N.e		Seasonally flooded cold-deciduous shrubland					
		Betula nana Seasonally Flooded Shrubland Alliance					
	CEGL001079	Betula nana / Carex utriculata Shrubland	Swamp Birch / Beaked Sedge Shrubland	G4?	AB, CA?, ID:S3, MT:S4, OR:S2	GLAC.2221, GLAC.2250, GLAC.2644, WATE.9025, WATE.9026	AAGL.1029, AAGL.585, AAGL.D14, AAWA.178
	CEGL005887	Betula nana / Carex spp. Shrubland	Swamp Birch / Sedge species Shrubland	GNR	AB, MT	GLAC.2271, WATE.5069, WATE.5070, WATE.5072, WATE.5075	AAGL.593, AAWA.278, AAWA.59
		Betula occidentalis Seasonally Flooded Shrubland Alliance					
	CEGL001080	Betula occidentalis Shrubland	Water Birch Shrubland	G3G4	AB, CO, ID:S2, MT:S3, NV?, UT, WA:S1, WY:S3	WATE.9012	none
		Salix boothii Seasonally Flooded Shrubland Alliance					
	CEGL001175	Salix boothii / Calamagrostis canadensis Shrubland	Booth's Willow / Bluejoint Shrubland	G3G4Q	CO:S2, ID:S3, MT?, NV, OR:S1?, UT:S2?, WA?, WY:S2?	none	AAGL.606, AAGL.D599
		Salix commutata Seasonally Flooded Shrubland Alliance					
	CEGL003497	Salix commutata / Mesic Graminoid Shrubland	Undergreen Willow / Mesic Graminoid Shrubland	GNR	MT	GLAC.105, GLAC.2022, GLAC.251	AAGL.599, AAGL.B50, AAGL.C57
		Salix drummondiana Seasonally Flooded Shrubland Alliance					
	CEGL002631	Salix drummondiana / Carex utriculata Shrubland	Drummond's Willow / Beaked Sedge Shrubland	G4	BC, CO:S3,	GLAC.145	AAGL.1044, AAGL.1212, AAGL.611, AAGL.627, AAGL.B35, AAGL.C101,

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
					ID:S3, MT:S4, UT?, WA:S3, WY		AAGL.D1008, AAGL.D1208
IV	Dwarf-shrubland						
IV.A	Evergreen dwarf-shrubland						
IV.A.1.N.b	Creeping or matted needle-leaved or microphyllous evergreen dwarf-shrubland						
	Arctostaphylos uva-ursi Dwarf-shrubland Alliance						
	CEGL005830	Arctostaphylos uva-ursi / Festuca campestris - Festuca idahoensis Dwarf-shrubland	Bearberry or Kinikinnick / Prairie Fescue - Idaho Fescue Dwarf-shrubland	G3G4	AB, MT	CD474, CD231, CD149, CD41, CD514, CD15, CD78, CD39, CD42, CD38, CD712, CD35, CD36, CD38, CD39, CD17, CD80, GLAC.155, GLAC.159, GLAC.2662, GLAC.311, GLAC.33, GLAC.56, GRAS-00-006, GRAS-00-008, GRAS-00-014, GRAS-00-016, GRAS-00-022, GRAS-00-026, GRAS-00-028, GRAS-00-029, GRAS-00-034, GRAS-00-035, GRAS-00-042, GRAS-00-044, GRAS-00-047, GRAS-01-002, GRAS-01-018, GRAS-01-020, GRAS-01-029, GRAS-01-031, GRAS-01-032, GRAS-01-039, GRAS-01-041, GRAS-01-043, GRAS-01-049, GRAS-01-050, GRAS-99-015, GRAS-99-040, GRAS-99-041, GRAS-99-042, GRAS-99-050, GRAS-99-056, GRAS-99-057, WATE.4030, WATE.4033, WATE.4041, WATE.4045, WATE.4051, WATE.4066, WATE.5009, WATE.5040, WATE.5067, WATE.5096, WATE.5102, WATE.5119, WATE.5132	AAGL.182, AAGL.2223, AAGL.2224, AAGL.236, AAGL.55, AAGL.B23, AAGL.B249, AAGL.B4, AAGL.B97, AAWA.104, AAWA.120, AAWA.159, AAWA.175, AAWA.199, AAWA.243, AAWA.250, AAWA.28, AAWA.303, AAWA.45, AAWA.53, AAWA.87
	CEGL005831	Arctostaphylos uva-ursi / Pseudoroegneria spicata Dwarf-shrubland	Bearberry or Kinikinnick / Bluebunch Wheatgrass Dwarf-shrubland	G2G3	AB, MT	CD484, GLAC.65, WATE.4022, WATE.5031, WATE.5037, WATE.5103, WATE.5143	AAGL.2216, AAGL.2273, AAWA.14, AAWA.284, AAWA.320
	CEGL005832	Arctostaphylos uva-ursi / Solidago multiradiata Dwarf-shrubland	Bearberry or Kinikinnick / Rocky Mountain Goldenrod Dwarf-shrubland	G2G3	AB?, MT:S2?	CD723, CD724, CD372, CD224, CD461, CD225, CD286, CD287, CD248, CD220, CD238, CD100, CD101, CD234, CD488, CD76, CD77, CD387	AAGL.2090, AAGL.2091, AAGL.B100, AAWA.128

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Dryas drummondii Dwarf-shrubland Alliance							
	CEGL005834	Dryas drummondii / Chamerion latifolium Dwarf-shrubland	Drummond's Mountain-avens / Dwarf Fireweed Dwarf-shrubland	G3?	AB, MT	GLAC.139, WATE.5142, WATE.5150	none
Phyllodoce glanduliflora Dwarf-shrubland Alliance							
	CEGL005877	Phyllodoce glanduliflora / Sibbaldia procumbens Dwarf-shrubland	Yellow Mountain-health / Creeping Glow-wort Dwarf-shrubland	G2G3	AB, MT:S2S3	CD610, CD744, CD127, CD394, CD531, CD532, CD530, CD653, CD124, CD121, CD203, CD581, CD604, CD747, CD317, CD339	AAGL.2141, AAGL.2206, AAGL.C128, AAGL.C68
IV.A.1.N.g	Saturated needle-leaved or microphyllous evergreen dwarf-shrubland						
Kalmia microphylla Saturated Dwarf-shrubland Alliance							
	CEGL001402	Kalmia microphylla / Carex nigricans Dwarf-shrubland	Alpine Laurel / Black Alpine Sedge Dwarf-shrubland	G3G4	AB?, BC?, CA, MT, OR:S2, WA:S3	CD413, CD612, CD645, CD649, CD123, CD122, CD569, CD527, CD588, CD622, CD574, CD578, CD572, CD335, CD334, CD345, CD341, CD744	AAGL.C124
IV.B	Deciduous dwarf-shrubland						
IV.B.2.N.a	Cespitose cold-deciduous dwarf-shrubland						
Vaccinium (caespitosum, myrtilus, scoparium) Dwarf-shrubland Alliance							
	CEGL005879	Vaccinium (myrtilus, scoparium) / Luzula glabrata var. hitchcockii Dwarf-shrubland	(Whortleberry, Grouseberry) / Hitchcock's Smooth Woodrush Dwarf-shrubland	G2G3	AB, MT:S2S3	CD601, GLAC.183, GLAC.2002, GLAC.285	AAGL.D633, AAGL.D637
IV.B.2.N.b	Creeping or matted cold-deciduous dwarf-shrubland						
Salix arctica Dwarf-shrubland Alliance							
	CEGL001431	Salix arctica - (Salix petrophila, Salix nivalis) / Polygonum bistortoides Dwarf-shrubland	Arctic Willow - (Alpine Willow, Snow Willow) / American Bistort Dwarf-shrubland	G2G3Q	AB, CO?, MT:S2S3, WY	CD409, CD266, CD613, CD631, CD736, CD746, CD208, CD196, CD609, CD434, CD396, CD414, CD529, CD199, GLAC.153, WATE.4071	AAGL.2208
	CEGL005878	Salix arctica / Carex nigricans Dwarf-shrubland	Arctic Willow / Black Alpine Sedge Dwarf-shrubland	GNR	AB?, MT:S2	CD573, CD584, CD580, CD563, CD565, CD598, CD751, CD125, CD750, CD571, CD611	none
V	Herbaceous Vegetation						
V.A	Perennial graminoid vegetation						

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V.A.5.N.c	Medium-tall sod temperate or subpolar grassland						
	Calamagrostis rubescens Herbaceous Alliance						
	CEGL005862	Calamagrostis rubescens Herbaceous Vegetation	Pinegrass Herbaceous Vegetation	G3G4?	MT:S3S4, WY	GLAC.2241, GLAC.2607, GRAS-00-031	AAGL.D906
	Elymus repens Herbaceous Alliance						
	CEGL005868	Elymus repens Semi-natural Herbaceous Vegetation	Creeping Wild Rye Semi-natural Herbaceous Vegetation	GNA	CO, MT	GRAS-01-012, GRAS-01-035, GRAS-01-045	AAGL.1194, AAGL.1208, AAGL.444, AAGL.B198, AAGL.D1392, AAWA.127
V.A.5.N.d	Medium-tall bunch temperate or subpolar grassland						
	Achnatherum nelsonii Herbaceous Alliance						
	CEGL005860	Achnatherum nelsonii - Lupinus sericeus Herbaceous Vegetation	Nelson's Needlegrass - Pursh's Silky Lupine Herbaceous Vegetation	G2G3	AB, ID, MT:S2?	GLAC.2084, GLAC.2608, WATE.4016, WATE.5029, WATE.5034, WATE.5054, WATE.5136	none
	Festuca campestris Herbaceous Alliance						
	CEGL001629	Festuca campestris - Pseudoroegneria spicata Herbaceous Vegetation	Prairie Fescue - Bluebunch Wheatgrass Herbaceous Vegetation	G4	AB, MT:S4, ND	CD463, CD462, CD477, CD475, CD482, GRAS-01-030, GRAS-01-042, WATE.4087, WATE.5024, WATE.5033	none
	CEGL005875	Festuca campestris - Festuca idahoensis Herbaceous Vegetation	Prairie Fescue - Idaho Fescue Herbaceous Vegetation	G3	AB, ID:S1, MT:S3, OR:S3, WA:S1	GRAS-00-032, GRAS-99-011, GRAS-99-023, GRAS-99-025, GRAS-99-026, GRAS-99-027, GRAS-99-053	AAGL.1097, AAGL.1164, AAGL.2259, AAGL.B370, AAGL.B77, AAWA.137, AAWA.304
	Festuca idahoensis Herbaceous Alliance						
	CEGL001614	Festuca idahoensis - Elymus trachycaulus Herbaceous Vegetation	Idaho Fescue - Slender Wild Rye Herbaceous Vegetation	G4	CO:S1, MT:S3S4, WY:S3	GLAC.2087	AAGL.1160
	CEGL001624	Festuca idahoensis - Pseudoroegneria spicata Herbaceous Vegetation	Idaho Fescue - Bluebunch Wheatgrass Herbaceous Vegetation	G4	AB, CA, ID:S3, MT:S4, WA:S2, WY:S3	GLAC.178, GLAC.2248, GLAC.2630, WATE.4082, WATE.5056	AAGL.D232
	CEGL001625	Festuca idahoensis - Achnatherum	Idaho Fescue - Richardson's	G3	MT:S3,	none	AAGL.1107

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
		richardsonii Herbaceous Vegetation	Needlegrass Herbaceous Vegetation		WY:S2?		
	CEGL001898	Festuca idahoensis - Carex filifolia Herbaceous Vegetation	Idaho Fescue - Threadleaf Sedge Herbaceous Vegetation	G3	AB, MT:S3, WY:S3	WATE.5134	none
	CEGL005869	Festuca campestris - (Festuca idahoensis) - Achnatherum richardsonii Herbaceous Vegetation	Prairie Fescue - (Idaho Fescue) - Richardson's Needlegrass Herbaceous Vegetation	G2G3?	ID?, MT, OR?, WA?	GLAC.1007, GLAC.2100, GLAC.2244, GLAC.2270, GLAC.2526, GLAC.2603, GLAC.2605, GLAC.2631	AAGL.D165, AAGL.D898, AAGL.D979
	CEGL005870	Festuca campestris - Festuca idahoensis - Geranium viscosissimum Herbaceous Vegetation	Prairie Fescue - Idaho Fescue - Sticky Geranium Herbaceous Vegetation	G3?	AB, MT:S3?, OR?, WA?	GLAC.160, GLAC.164, GLAC.171, GLAC.187, GLAC.19, GLAC.2621, GLAC.2629, GRAS-00-001, GRAS-00-003, GRAS-00-004, GRAS-00-010, GRAS-00-012, GRAS-00-015, GRAS-00-020, GRAS-00-023, GRAS-00-036, GRAS-00-048, GRAS-01-003, GRAS-01-004, GRAS-01-005, GRAS-01-007, GRAS-01-009, GRAS-01-010, GRAS-01-011, GRAS-01-014, GRAS-01-015, GRAS-01-016, GRAS-01-021, GRAS-01-023, GRAS-01-028, GRAS-01-034, GRAS-01-037, GRAS-01-044, GRAS-01-046, GRAS-01-047, GRAS-01-048, GRAS-99-001, GRAS-99-002, GRAS-99-005, GRAS-99-008, GRAS-99-010, GRAS-99-013, GRAS-99-018, GRAS-99-019, GRAS-99-020, GRAS-99-021, GRAS-99-024, GRAS-99-029, GRAS-99-030, GRAS-99-031, GRAS-99-032, GRAS-99-033, GRAS-99-035, GRAS-99-038, GRAS-99-039, GRAS-99-044, GRAS-99-046, GRAS-99-049, GRAS-99-052, GRAS-99-055, WATE.4018, WATE.4038, WATE.5065, WATE.5140	AAGL.1148, AAGL.2249, AAGL.B102, AAGL.B12, AAGL.B13, AAGL.B174, AAGL.B251, AAGL.B265, AAGL.B333, AAWA.107, AAWA.165, AAWA.271, AAWA.272, AAWA.306
Poa pratensis Semi-natural Herbaceous Alliance							
	CEGL005874	Phleum pratense - Poa pratensis - Bromus inermis Semi-natural Herbaceous Vegetation	Timothy - Kentucky Bluegrass - Smooth Brome Semi-natural Herbaceous Vegetation	GNA	AB, MT, WY	GLAC.1001, GLAC.117, GLAC.180, GLAC.191, GLAC.194, GLAC.2088, GLAC.40, GRAS-00-002, GRAS-00-009, GRAS-00-011, GRAS-00-013, GRAS-00-017, GRAS-00-018, GRAS-00-021, GRAS-00-024, GRAS-00-033, GRAS-00-046, GRAS-01-001, GRAS-01-006, GRAS-01-008, GRAS-01-013, GRAS-01-019,	AAGL.1078, AAGL.1161, AAGL.B183, AAGL.B195, AAGL.B244, AAGL.B334, AAGL.B84, AAGL.C163, AAGL.C170, AAGL.C99, AAGL.D1113, AAGL.D641, AAWA.195, AAWA.325

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
						GRAS-01-022, GRAS-01-024, GRAS-01-025, GRAS-01-026, GRAS-01-036, GRAS-99-003, GRAS-99-004, GRAS-99-006, GRAS-99-007, GRAS-99-009, GRAS-99-014, GRAS-99-016, GRAS-99-017, GRAS-99-022, GRAS-99-028, GRAS-99-036, GRAS-99-037, GRAS-99-043, GRAS-99-045, GRAS-99-047, GRAS-99-048, GRAS-99-051, GRAS-99-054, WATE.4013, WATE.4057, WATE.4065, WATE.5081, WATE.5094, WATE.5120, WATE.9020	
		Pseudoroegneria spicata Herbaceous Alliance					
	CEGL001677	Pseudoroegneria spicata - Poa secunda Herbaceous Vegetation	Bluebunch Wheatgrass - Curly Bluegrass Herbaceous Vegetation	G4?	BC?, CO:S1, ID, MT:S4?, OR:S1, UT:S2S4, WA:S2, WY:S2	GLAC.2066, GLAC.210	none
	CEGL005861	Bromus marginatus - Pseudoroegneria spicata Herbaceous Vegetation [Provisional]	Large Mountain Brome - Bluebunch Wheatgrass Herbaceous Vegetation	G2?	AB	WATE.5045, WATE.5047	AAGL.2148, AAGL.2222, AAWA.181, AAWA.233
V.A.5.N.e		Short sod temperate or subpolar grassland					
		Carex geyeri Herbaceous Alliance					
	CEGL005864	Carex geyeri Herbaceous Vegetation	Geyer's Sedge Herbaceous Vegetation	G4?	AB?, ID, MT, WY	CD294, CD252, CD251, CD241, CD233, CD478, CD247, CD702, GLAC.2633, GRAS-00-045	AAGL.B257
		Carex paysonis Herbaceous Alliance					
	CEGL005865	Carex paysonis - Sibbaldia procumbens Herbaceous Vegetation	Payson's Sedge - Creeping Glow-wort Herbaceous Vegetation	G3G4?	MT, WY	CD193, CD192, CD195, CD97, CD96, GLAC.2652	AAGL.600, AAGL.C112, AAGL.C84
V.A.5.N.g		Short alpine or subalpine sod grassland					
		Carex albonigra Herbaceous Alliance					
	CEGL005863	Carex albonigra - Myosotis asiatica Herbaceous Vegetation	Black-and-White Scale Sedge - Asian Forget-Me-Not Herbaceous	G2G3	AB, MT:S2?	CD359, CD457, CD174, CD173, CD188, CD189, CD190, CD302, CD303, CD522,	none

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
			Vegetation			CD523, CD725, CD728, CD61, CD274, CD299, CD636, CD60, CD58, CD50, CD49, CD57, CD69, CD275, CD89, CD640, CD133, CD164, CD4, CD6, CD471, CD472, CD144, CD55, WATE.4068, WATE.4076, WATE.4077, WATE.4083, WATE.4093, WATE.4101, WATE.4110, WATE.5007, WATE.5060, WATE.9035	
		Carex scirpoidea Herbaceous Alliance					
	CEGL005866	Carex scirpoidea - Zigadenus elegans Herbaceous Vegetation	Scirpus-like Sedge - Mountain Deathcamas Herbaceous Vegetation	G4G5	AB?, MT:S4S5	CD88, CD232, CD98, CD513, CD479, CD228, CD138, CD139, CD230, CD227, CD112, CD177, CD518, CD117, CD118	none
		Carex spectabilis Herbaceous Alliance					
	CEGL005867	Carex spectabilis - Arnica X diversifolia Herbaceous Vegetation	Northwestern Showy Sedge - Rayless Arnica Herbaceous Vegetation	G3G4	AB?, MT:S3S4	CD164, CD628, CD629, CD625, CD615, CD890, CD654	none
		Luzula glabrata var. hitchcockii Herbaceous Alliance					
	CEGL005873	Luzula glabrata var. hitchcockii - Erythronium grandiflorum Herbaceous Vegetation	Hitchcock's Smooth Woodrush / Yellow Avalanche Lily Herbaceous Vegetation	GNR	AB?, MT	CD213, CD438, CD544, CD212, CD120, CD435, CD548, CD543, CD542, CD344, CD404, CD577, CD706, CD567, CD587, CD257, CD399	none
V.A.5.N.h		Short alpine or subalpine dry bunch grassland					
		Festuca idahoensis Alpine Herbaceous Alliance					
	CEGL001623	Festuca idahoensis - (Festuca campestris) / Potentilla diversifolia Herbaceous Vegetation	Idaho Fescue - (Prairie Fescue) / Mountain Meadow Cinquefoil Herbaceous Vegetation	G3	AB?, ID:S2, MT:S3	CD240, CD25, CD26, CD220, CD34, CD150, CD131, CD24, CD283, CD306, CD641, CD642, CD500, CD288, CD105, CD160, CD81, CD262, CD19, CD226, CD515, CD237, CD18, CD20, CD487, CD223, CD493, CD263, CD102, CD103, CD99, CD106, CD107, CD639, CD282, CD285, CD280, CD21, GLAC.172, GLAC.2041, GRAS-00-005, GRAS-00-025, GRAS-00-027, GRAS-00-037, GRAS-00-038, GRAS-00-039, GRAS-00-040, GRAS-01-017, GRAS-01-033, GRAS-01-038, GRAS-01-040, GRAS-99-012	AAGL.2163, AAGL.2255, AAGL.B399

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
Juncus parryi Herbaceous Alliance							
	CEGL005871	Juncus parryi / Sibbaldia procumbens Herbaceous Vegetation	Parry's Rush / Creeping Glow-wort Herbaceous Vegetation	G3G4	AB, CO, MT:S3?, WY	CD406, CD204, CD206, CD203, CD558, CD440, CD540, CD525, CD324, CD430, CD338, CD191, CD526, CD582, CD346, CD566, CD507, CD633, CD619, CD349, CD348, CD347, CD706, CD734, CD735, CD289, CD270, CD290, CD509, CD431, CD296, CD268, CD360, CD357, CD180, GLAC.112, GLAC.2067, GLAC.252, GLAC.2654, GLAC.2655, WATE.4111, WATE.5124	AAGL.2189
Kobresia myosuroides Herbaceous Alliance							
	CEGL005872	Kobresia myosuroides - Euphrasia disjuncta Herbaceous Vegetation	Pacific Bog Sedge - Polar Eyebright Herbaceous Vegetation	G2?	MT	CD291, CD311	none
V.A.5.N.k	Seasonally flooded temperate or subpolar grassland						
Calamagrostis canadensis Seasonally Flooded Herbaceous Alliance							
	CEGL001559	Calamagrostis canadensis Western Herbaceous Vegetation	Bluejoint Western Herbaceous Vegetation	G4	AB, BC:S3S4, CA, CO:S4, ID:S4, MT:S4, ND, OR:S3S4, SD, UT:S2S3, WA:S3S4, WY:S2	GLAC.127, GLAC.2077, GLAC.2239, GLAC.266, GRAS-00-019, WATE.9021	AAGL.2175, AAGL.834, AAGL.946
Carex (rostrata, utriculata) Seasonally Flooded Herbaceous Alliance							
	CEGL001562	Carex utriculata Herbaceous Vegetation	Beaked Sedge Herbaceous Vegetation	G5	AB, AZ?, CA:S4, CO:S4, ID:S4, MT:S5, NM:S3,	GLAC.2072, GLAC.2292, GLAC.2521, GLAC.2525, GLAC.280, GLAC.92, WATE.5074, WATE.9013, WATE.9044, WATE.9054	AAGL.1042, AAGL.B143, AAGL.B173, AAGL.B286, AAGL.B71, AAGL.D1013, AAGL.D497, AAWA.204, AAWA.208, AAWA.318, AAWA.93

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
					NV, OR:S4, UT:S3S4, WA:S3S4, WY:S3		
Carex aquatilis Seasonally Flooded Herbaceous Alliance							
	CEGL001802	Carex aquatilis Herbaceous Vegetation	Aquatic Sedge Herbaceous Vegetation	G5	AB, AZ?, CA:S3, CO:S4, ID:S4, MT:S4, NM:S4, NV, OR:S4, UT:S3?, WA:S3, WY:S3	GLAC.85, WATE.4044	none
	CEGL001803	Carex aquatilis - Carex utriculata Herbaceous Vegetation	Aquatic Sedge - Beaked Sedge Herbaceous Vegetation	G4	AB, CO:S4, MT:S3, NB?, WY?	GLAC.2527, WATE.4043	AAGL.1046, AAWA.115, AAWA.311
Carex atherodes Seasonally Flooded Herbaceous Alliance							
	CEGL002220	Carex atherodes Herbaceous Vegetation	Awned Sedge Herbaceous Vegetation	G3G5	CO:S2?, IA, ID, MB:S2, MN, MT:S3S5, ND, SD	none	AAWA.281
Carex buxbaumii Seasonally Flooded Herbaceous Alliance							
	CEGL001806	Carex buxbaumii Herbaceous Vegetation	Brown Bog Sedge Herbaceous Vegetation	G3	AB?, CO:SU, ID:S1, MT:S3, OR:S3, UT:S2?,	GLAC.2502	AAGL.1057, AAGL.B215, AAWA.74

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
						CD781, CD2, WATE.4127	
		Carex vesicaria Seasonally Flooded Herbaceous Alliance					
	CEGL002661	Carex vesicaria Herbaceous Vegetation	Inflated Sedge Herbaceous Vegetation	G4Q	CA, CO:S1, ID:S3, MT, NV?, OR:S4, WA	GLAC.2081, GLAC.2082	AAGL.B189, AAGL.C172, AAGL.C72, AAGL.D362
		Deschampsia caespitosa Seasonally Flooded Herbaceous Alliance					
	CEGL001599	Deschampsia caespitosa Herbaceous Vegetation	Tufted Hairgrass Herbaceous Vegetation	G4	AB, AZ:S2?, CA?, CO:S4, ID:S3, MT:S4, NM, NV?, OR:S2, UT:S3S4, WA, WY	WATE.9043, WATE.9052	AAGL.439
		Dulichium arundinaceum Seasonally Flooded Herbaceous Alliance					
	CEGL001831	Dulichium arundinaceum Seasonally Flooded Herbaceous Vegetation	Threeway Sedge Seasonally Flooded Herbaceous Vegetation	G3	AK?, BC:S2, CA:S1?, ID:S2, MT:S2, OR:S3, WA:S2S3, WY?	none	AAGL.C136
		Eleocharis palustris Seasonally Flooded Herbaceous Alliance					
	CEGL001833	Eleocharis palustris Herbaceous Vegetation	Marsh Spikerush Herbaceous Vegetation	G5	AB, AK?, BC:S4, CA?, CO:S4, ID:S3, MT:S5,	WATE.5071, WATE.9045	AAGL.C182

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
					NE, NM, NV?, OR:S5, SD, SK, UT:S3?, WA:S3?, WY:S3		
		Juncus balticus Seasonally Flooded Herbaceous Alliance					
	CEGL001838	Juncus balticus Herbaceous Vegetation	Baltic Rush Herbaceous Vegetation	G5	AB:S5, BC:S3, CA?, CO:S5, ID:S5, MT:S5, NE, NM:S4, NV, OR:S5, SD, UT:S3S4, WA:S3S4, WY:S3	none	AAGL.B300
	Park Special 3	Carex athrostachya Herbaceous Vegetation	Slenderbeak Sedge Herbaceous Vegetation	GNR	MT	none	AAGL.1048
		Phalaris arundinacea Seasonally Flooded Herbaceous Alliance					
	CEGL001474	Phalaris arundinacea Western Herbaceous Vegetation	Reed Canarygrass Western Herbaceous Vegetation	G5	AB:S4, CO, ID:S4?, MT:S4, NM:S4?, UT, WA	none	AAGL.D1033
		Poa palustris Semi-natural Seasonally Flooded Herbaceous Alliance					
	CEGL001659	Poa palustris Herbaceous Vegetation	Fowl Bluegrass Herbaceous Vegetation	GNA	MT:S4, WY	none	AAGL.D937

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
V.A.5.N.I	Semipermanently flooded temperate or subpolar grassland						
	Schoenoplectus acutus - (Schoenoplectus tabernaemontani) Semipermanently Flooded Herbaceous Alliance						
	CEGL002623	Schoenoplectus tabernaemontani Temperate Herbaceous Vegetation	Softstem Bulrush Temperate Herbaceous Vegetation	G5	AB, BC:S4, CA:S4, CO, ID:S2, MT:S3, OR:S5, WA:S3S4, WY:S2?	WATE.9042	none
	Typha (angustifolia, latifolia) - (Schoenoplectus spp.) Semipermanently Flooded Herbaceous Alliance						
	CEGL002010	Typha (latifolia, angustifolia) Western Herbaceous Vegetation	(Broadleaf Cattail, Narrowleaf Cattail) Western Herbaceous Vegetation	G5	AB, AZ:S3, BC:S5, CA:S3, CO:S4, ID:S4, MT:S5, NE, NM:S5, NV, OR:S5, UT:S2S4, WA:S5, WY	WATE.9047	none
V.A.7.N.e	Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer						
	Artemisia tridentata ssp. vaseyana Shrub Herbaceous Alliance						
	CEGL001531	Artemisia tridentata ssp. vaseyana / Festuca campestris Shrub Herbaceous Vegetation	Mountain Big Sagebrush / Prairie Fescue Shrub Herbaceous Vegetation	G3Q	AB, BC, MT:S3, WA	GLAC.2289, GLAC.2530	AAGL.D1297, AAGL.D1330, AAGL.D373, AAGL.D455, AAGL.D566
	CEGL001533	Artemisia tridentata ssp. vaseyana / Festuca idahoensis Shrub Herbaceous Vegetation	Mountain Big Sagebrush / Idaho Fescue Shrub Herbaceous Vegetation	G5	AB?, CA?, CO:S3S4, ID:S4, MT:S4, NV:S3?,	GLAC.2086	none

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
					OR:S3, UT?, WA, WY:S3S4		
V.A.7.N.g		Medium-tall temperate or subpolar grassland with a sparse cold-deciduous shrub layer					
		Dasiphora fruticosa ssp. floribunda Shrub Herbaceous Alliance					
	CEGL001502	Dasiphora fruticosa ssp. floribunda / Festuca idahoensis Shrub Herbaceous Vegetation	Shrubby-cinquefoil / Idaho Fescue Shrub Herbaceous Vegetation	G4	ID:S1, MT:S2S3, WY:S4	CD135, CD114, CD701, CD741, CD715, CD33, CD45, CD44, CD468, CD89, GLAC.102, GLAC.173, GLAC.302	AAGL.982, AAGL.B107, AAGL.B401
	CEGL001503	Dasiphora fruticosa ssp. floribunda / Festuca campestris Shrub Herbaceous Vegetation	Shrubby-cinquefoil / Prairie Fescue Shrub Herbaceous Vegetation	G4	AB, MT:S3, SK	CD292, CD242, CD37, CD40, CD113, CD293, CD130, CD215, CD84, CD243, CD72, GLAC.11, GLAC.115, GLAC.206, GLAC.230, GRAS-00-007, GRAS-00-030, GRAS-01-027, GRAS-99-034, WATE.4029, WATE.4039, WATE.5005, WATE.5068	AAGL.1089, AAGL.1163, AAGL.1170, AAGL.2244, AAGL.2258, AAGL.50, AAGL.B15, AAGL.B396, AAWA.20, AAWA.256, AAWA.268, AAWA.269
	CEGL005833	Dasiphora fruticosa ssp. floribunda / Artemisia michauxiana Shrub Herbaceous Vegetation [Provisional]	Shrubby-cinquefoil / Michaux's Wormwood Shrub Herbaceous Vegetation	G3G4	AB, MT:S3	CD148, CD161, CD141, CD155, CD304, CD273, CD111, CD494, CD244, CD249, CD218, CD460, CD722, CD466, CD308, CD378, CD390, CD375, CD389, CD391, CD551, GLAC.123, GLAC.126, GLAC.2028, GLAC.246, GLAC.258, GLAC.325, WATE.4061, WATE.4074	AAGL.73, AAGL.B272, AAGL.B398, AAGL.C117, AAWA.108, AAWA.133, AAWA.245, AAWA.52
V.A.8.N.c		Short temperate or subpolar alpine grassland with a sparse needle-leaved or microphyllous evergreen dwarf-shrub layer					
		Dryas octopetala Dwarf-shrub Herbaceous Alliance					
	CEGL001892	Dryas octopetala - Carex rupestris Dwarf-shrub Herbaceous Vegetation	Eight-petal Mountain-avens - Curly Sedge Dwarf-shrub Herbaceous Vegetation	G4	AB, CO:S4, ID?, MT:S3	CD469, CD29, CD30, CD28, CD108, CD115, CD10, CD3, CD8, CD9, CD763, CD726, CD363, CD801, CD176, CD187, CD186, CD364, CD91, CD727, CD53, CD54, CD46, CD47, CD48, CD43, CD742, CD373, CD377, CD56, CD367, CD153, CD157, CD27, CD156, CD94, CD95, CD74, CD75, CD92, GLAC.154, WATE.4035, WATE.4069, WATE.4072, WATE.4084, WATE.4085, WATE.4094, WATE.4122, WATE.4126, WATE.5004, WATE.5090, WATE.5098	AAGL.2028, AAGL.2037, AAGL.2038, AAGL.2051, AAGL.2052, AAGL.2057, AAGL.2058, AAGL.2061, AAGL.2063, AAGL.2065, AAGL.2070, AAGL.2089, AAGL.B171, AAGL.B298, AAGL.B30, AAGL.B30-K, AAGL.B322, AAGL.B323, AAGL.B389, AAGL.B70, AAGL.C49

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	CEGL001894	Dryas octopetala - Polygonum viviparum Dwarf-shrub Herbaceous Vegetation	Eight-petal Mountain-avens - Serpent-grass Dwarf-shrub Herbaceous Vegetation	G3?	AB:S1S2, BC?, CO?, MT:S2, WY?	CD323, CD408, CD411, CD740, CD321, CD320, CD147, CD412, CD392, CD393, CD309, CD310, CD312, CD311, CD313, CD57, CD68, CD65, CD65, CD59, CD66, CD278, CD441, CD167, CD366, CD322, CD368, CD90, CD159, CD73, GLAC.232, GRAS-00-041, GRAS-00-043, WATE.4070, WATE.4078, WATE.4079, WATE.5125	AAGL.B134, AAGL.B136, AAGL.B306
V.B	Perennial forb vegetation						
V.B.2.N.a	Tall temperate or subpolar perennial forb vegetation						
	Valeriana sitchensis Herbaceous Alliance						
	CEGL001998	Valeriana sitchensis - Veratrum viride Herbaceous Vegetation	Sitka Valerian - American False Hellebore Herbaceous Vegetation	G4	AB, BC, MT, OR, WA:S4	CD176, CD181, CD182, CD397, CD400, CD401, CD402, CD586, CD214, CD576, CD439, CD570, CD545, CD568, CD700, CD405, GLAC.106, GLAC.109, GLAC.110, GLAC.113, GLAC.149, GLAC.2020, GLAC.2026, GLAC.235, GLAC.250, GLAC.287, GLAC.331, WATE.4114	AAGL.2180, AAGL.B11, AAGL.B67, AAGL.C12, AAGL.C3, AAWA.226
	Xerophyllum tenax Herbaceous Alliance						
	CEGL005859	Xerophyllum tenax Herbaceous Vegetation	Bear-grass Herbaceous Vegetation	GNR	AB, MT	CD770, CD607, CD259, CD620, CD784, CD608, CD183, GLAC.147, GLAC.2030, GLAC.2632, GLAC.286, GLAC.326	AAGL.B230, AAGL.B273, AAGL.C32, AAGL.C80, AAWA.182
V.B.2.N.b	Low temperate or subpolar perennial forb vegetation						
	Arenaria capillaris Herbaceous Alliance						
	CEGL005855	Arenaria capillaris / Polytrichum piliferum Herbaceous Vegetation	Slender Mountain Sandwort / Hairmoss Herbaceous Vegetation	G2G3	AB?, MT:S2S3	CD297, CD295, CD272, CD267, CD637, CD358, CD64	none
	Chamerion angustifolium Herbaceous Alliance						
	CEGL005856	Chamerion angustifolium Rocky Mountain Herbaceous Vegetation [Provisional]	Fireweed Rocky Mountain Herbaceous Vegetation	G4G5	AB, ID?, MT, WA?, WY?	GLAC.243	AAGL.B108, AAGL.B111, AAGL.B331, AAGL.B374

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
V.B.2.N.d	Temporarily flooded temperate perennial forb vegetation						
	Argentina anserina Herbaceous Alliance [Provisional]						
	CEGL005825	Argentina anserina Herbaceous Vegetation [Provisional]	Silverweed Herbaceous Vegetation	GNA	AB, MT	WATE.9050	none
	Heracleum maximum Temporarily Flooded Herbaceous Alliance						
	CEGL005857	Heracleum maximum Herbaceous Vegetation	Cow-parsnip Herbaceous Vegetation	G3G4	AB, MT:S3S4	GLAC.20, GLAC.2619, GLAC.2620, GLAC.2622, WATE.5114	AAGL.32, AAGL.B210, AAGL.B337, AAGL.B390, AAWA.202
	Senecio triangularis Temporarily Flooded Herbaceous Alliance						
	CEGL001987	Senecio triangularis Herbaceous Vegetation	Arrowleaf Ragwort Herbaceous Vegetation	G5?	AB, AK?, CA?, ID, MT:S3?, OR:S5, WA:S4, WY	CD353, CD350, CD589, CD560, CD562, CD559, CD603, CD501, CD737, CD623, CD644, CD616, CD630, CD318, CD646, CD738, CD265, CD512, CD202, CD597, CD626, CD739, GLAC.104, GLAC.111, GLAC.184, GLAC.2029, GLAC.248, GLAC.332, WATE.4103, WATE.4120, WATE.4129, WATE.5063, WATE.5107	AAGL.2198, AAGL.B350, AAGL.C31, AAGL.C4, AAWA.02, AAWA.236, AAWA.50
V.B.2.N.e	Semipermanently flooded temperate perennial forb vegetation						
	Equisetum fluviatile Semipermanently Flooded Herbaceous Alliance						
	CEGL002746	Equisetum fluviatile Herbaceous Vegetation	Water Horsetail Herbaceous Vegetation	G4	AB:S4, BC, ID:S3, MT:S4, OR:S3, WA:S3?	GLAC.114	AAGL.D253, AAGL.D58
V.B.2.N.f	Saturated temperate perennial forb vegetation						
	Trollius laxus Saturated Herbaceous Alliance						
	CEGL005858	Trollius laxus - Parnassia fimbriata Herbaceous Vegetation	American Globeflower - Fringed Grass-of-Parnassus Herbaceous Vegetation	G3?	AB, MT	CD410, CD629, CD422, CD547, CD546, CD732, CD421, CD398, CD424, CD352, CD351, CD575, CD518, CD564, CD426, CD428	none

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
V.C	Hydromorphic-rooted vegetation						
V.C.2.N.a	Permanently flooded temperate or subpolar hydromorphic-rooted vegetation						
	Myriophyllum sibiricum Permanently Flooded Herbaceous Alliance						
	CEGL002000	Myriophyllum sibiricum Herbaceous Vegetation	Siberian Water-milfoil Herbaceous Vegetation	GUQ	AB, CO:SU, WY?	WATE.9048, WATE.9049, WATE.9051, WATE.9053	AAGL.D130
	Nymphaea odorata - Nuphar spp. Permanently Flooded Temperate Herbaceous Alliance						
	CEGL002001	Nuphar lutea ssp. polysepala Herbaceous Vegetation	Yellow Pond-lily Herbaceous Vegetation	G5	BC:S5, CA, CO:S3, ID:S4, MT, OR:S5, WA:S4S5	GLAC.2073	AAGL.D1267
	Stuckenia pectinata Permanently Flooded Herbaceous Alliance						
	CEGL002003	Stuckenia pectinata - Myriophyllum (sibiricum, spicatum) Herbaceous Vegetation	Sago Pondweed - (Siberian Water-milfoil, Eurasian Water-milfoil) Herbaceous Vegetation	G3G4	AB, CA?, MT:S1, ND:SU, ON?, SD:SU, SK:SU	WATE.9041, WATE.9046	none
VII	Sparse Vegetation						
VII.A	Consolidated rock sparse vegetation						
VII.A.1.N.a	Cliffs with sparse vascular vegetation						
	Saxifraga (chrysantha, mertensiana) Sparsely Vegetated Alliance						
	CEGL005903	Saxifraga mertensiana Cliff Crevice Sparse Vegetation	Wood Saxifrage Cliff Crevice Sparse Vegetation	G2?	AB, MT:S2	CD491, CD492, CD517, CD600, CD524, CD550, CD552	none

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
VII.B	Boulder, gravel, cobble, or talus sparse vegetation						
VII.B.1.N.c	High mountain talus/scree						
	Aquilegia (caerulea, flavescens) Sparsely Vegetated Alliance						
	CEGL005899	Aquilegia flavescens - Senecio megapetalus Sparse Vegetation	Yellow Columbine - Rocky Ragwort Sparse Vegetation	G2G3	AB, MT:S2?	CD384, CD385, CD419, CD386, CD169, CD170, CD721, CD716, CD718, CD420, CD418, CD416, CD172, CD429, CD403, CD179, CD178, CD171, CD720, CD417, CD617, CD553, CD326, GLAC.103, GLAC.2031	AAGL.C166
	Athyrium americanum Sparsely Vegetated Alliance						
	CEGL005900	Athyrium americanum - Cryptogramma acrostichoides Sparse Vegetation	American Alpine Lady Fern - American Rockbrake Sparse Vegetation	G2G3	AB?, MT:S2?	CD556, CD557, CD591, CD592, CD327, CD593, CD331, CD779, CD354	AAGL.C165
	Park Special 1	Penstemon ellipticus Dwarf-shrubland	Rocky Ledge Penstemon Dwarf-shrubland	GNR	AB, MT	GLAC.2019	AAGL.487, AAGL.B158, AAGL.B243, AAGL.C148, AAGL.C29
	Phacelia hastata Sparsely Vegetated Alliance						
	CEGL005901	Phacelia hastata - (Penstemon ellipticus) Sparse Vegetation	Silverleaf Scorpionweed - (Rocky Ledge Penstemon) Sparse Vegetation	G2G3	AB, MT:S2?	CD332, CD554, CD555, CD602, CD638, CD775, CD780, CD783, CD618, CD276, CD82, CD305, CD771, CD495, CD643, CD261, CD465, CD281, CD365, CD71, CD388, CD83, CD793, CD797, GLAC.2027, WATE.5059, WATE.5110	AAGL.483, AAGL.B304, AAGL.B81, AAGL.B85, AAGL.C70, AAGL.C83, AAWA.213, AAWA.324
	Saxifraga bronchialis Sparsely Vegetated Alliance						
	CEGL005902	Saxifraga bronchialis Scree Slope Sparse Vegetation	Yellow-spot Saxifrage Scree Slope Sparse Vegetation	G3?	AB, MT:S2?	CD713, CD236, CD235, CD246, CD481, CD541, CD200, CD432, CD735, CD648, GLAC.257, GLAC.2656, GLAC.308, GLAC.87, WATE.9034	AAGL.266, AAGL.454, AAGL.488, AAGL.B233, AAGL.B308, AAGL.B341, AAGL.B386, AAGL.C107, AAGL.C134

NVC Classification	Database Code	Association Name	Translated Name	Global Status Rank	States And Ranks	List of Vegetation Sampling Plots	List of Accuracy Assessment Observation Sites
	Park Special 2	Gravel Bar Early Successional Vegetation	Gravel Bar Early Successional Vegetation	GNR	AB, MT	GLAC.120, GLAC.68	AAGL.1195, AAGL.1201, AAGL.1210, AAGL.438, AAGL.442, AAGL.443, AAGL.614, AAGL.B128, AAGL.B22, AAGL.B224, AAGL.B28, AAGL.B280, AAGL.B343, AAGL.B361, AAGL.B367, AAGL.C1, AAGL.C133, AAGL.C147, AAGL.C175, AAGL.C86, AAGL.C95, AAGL.D1011, AAGL.D1130, AAGL.D1340, AAGL.D470, AAGL.D804, AAGL.D850, AAGL.D872, AAGL.D882, AAGL.D894, AAWA.117, AAWA.170, AAWA.179, AAWA.188, AAWA.19, AAWA.316, AAWA.46
	Park Special 5	Undefined Sparse Vegetation	N/A	GNR	AB, MT	none	AAGL.489, AAGL.B133, AAGL.B207, AAGL.B90, AAGL.C0, AAGL.C142, AAGL.C180, AAGL.C23, AAGL.C77, AAGL.C87, AAWA.138, AAWA.17, AAWA.30, AAWA.55

USGS-NPS Vegetation Mapping Program Waterton-Glacier International Peace Park

AUGUST 2007

Appendix J

Map Classification Descriptions of Waterton-Glacier International Peace Park

Introduction to Map Class Descriptions

This appendix provides descriptions of the 48 map classes used to map Waterton-Glacier International Peace Park (IPP) for the U.S. Geological Survey (USGS)-National Park Service (NPS) Vegetation Mapping Program (VMP). Forty-two of the map classes represent U.S. National Vegetation Classification (NVC) types. The remaining six map classes represent non-vegetation units. With the NVC Standard undergoing a major revision by the Federal Geographic Data Committee's Vegetation Subcommittee, we decided to organize map classes representing vegetation types using a draft version of the revised NVC hierarchy. We organized map classes representing non-vegetated features (terrestrial natural and cultural units) into nonstandard, project-specific categories, yet used a format similar to the revised NVC.

The Waterton-Glacier International Peace Park (IPP) consists of two spatial database layers; Waterton Lakes National Park (WLNP) and environs, and Glacier National Park (GNP) and environs. The two spatial database layers match exactly at their coincident boundaries. Although each layer's attribute item table is set up and organized the same not every map class exists in both layers. Of the 48 total map classes, the WLNP layer has 38 map classes with one being unique to WLNP. The GNP layer has 47 map classes with 10 being unique to GNP.

These map class descriptions in concert with the plant community descriptions provided in Appendix G: Descriptions to Plant Associations of Waterton-Glacier IPP become useful documentation that supports the spatial database map layers, thus becoming a valuable tool for researchers and resource managers to better comprehend the vegetation of Waterton-Glacier IPP.

Organization of Map Class Descriptions

Description of the Map Class

Each map class description provides the formal map class name and the map class code used for mapping. We describe each map class from a mapping perspective. Location maps are provided for each map class to give visual reference of the map class distribution throughout Waterton-Glacier IPP. For some location maps, larger scale versions are provided to give a closer view of distribution pattern. These inset maps, however, do not necessarily mean the distribution of the map class is restricted to the inset area.

Relationship to the Vegetation Classification

In this section, the map class relationship to the vegetation classification is discussed, when applicable. Table J-1 is regularly referenced. This table is a listing of all map classes, and shows the relationship each map class has with NVC alliances and associations. More than 220 plant associations are recognized with the Waterton-Glacier IPP Vegetation Mapping Project, making the individual mapping of each type not feasible (a discussion regarding this is given in the main section of the report). Thus, map classes typically represent an aggregate of vegetation types. In addition those vegetation types may not necessarily be unique to just one map class. Thus, Table J-1 also shows what other map classes might capture a particular vegetation type in addition to the map class the said vegetation type is already listed under (these other map classes are listed under the column entitled "Link To Other Map Classes"). (Noteworthy, one will find the same vegetation type listed under all map classes linked to it; a vegetation type is listed as many times in the table as the number of map classes it is captured with.) If a vegetation type is not captured by any other map class, then "None" is listed, indicating the vegetation type is only captured by the map class that it is listed under.

Also, some undescribed types may be included and are denoted with an asterisk (*). These undescribed associations are types not established as NVC association types at the time of this report.

An attempt is also given, in the descriptions, to describe the vegetation types that are common to each map class and to also provide some distribution notes relating to the placement of each map class within Waterton-Glacier IPP, such as east or west of the Continental Divide (CD). For detailed descriptions of vegetation communities, refer to Appendix G.

Representative Pictures

Representative pictures are provided for a visual perspective of the map class. For map classes having greater diversity of characteristics, either from representing several vegetation types or from variations present within vegetation types, several pictures are provided to show the more apparent variations. Note, however, not all variations are necessarily shown.

Accuracy Assessment Results

At the conclusion of each map class description representing vegetation communities, a brief accuracy assessment (AA) summary of the map class is provided, when applicable. For quick visual reference, the following icons are provided to indicate general accuracy.

- ☺ Both the thematic accuracy and the entire 90% confidence interval meets or exceeds the VMP accuracy standard of 80%.
- ☻ The thematic accuracy and a portion of the 90% confidence interval meets or exceeds the VMP accuracy standard of 80%.
- ☹ The thematic accuracy is below the VMP accuracy standard of 80%. A portion of the 90% confidence interval, however, meets or exceeds the standard.
- ☹ Neither the thematic accuracy nor the entire 90% confidence interval meets or exceeds the VMP accuracy standard of 80%.

Results are provided for both GNP and WLNP vegetation layers. For a fuller explanation and AA results refer to the main section of the report.

Other Comments

Map classes are generally mapped to the VMP minimum mapping unit (MMU) standard of 0.5 ha (1.25 acres), unless otherwise noted. Additional discussions regarding inherent tendencies of mapping polygons below the MMU standard are provided in the main section of the report.

When using the crosswalk between map classes and vegetation types, note that one or more vegetation types might be present within a polygon of the spatial database layers. As well, inclusions of other vegetation types not directly crosswalked to a particular map class may be present within a polygon.

Throughout these map class descriptions, “RD” refers to relative density.

Page Reference to Map Classification Descriptions

SUBALPINE FIR - ENGELMANN SPRUCE FOREST (FFS)	35
SUBALPINE FIR - ENGELMANN SPRUCE WOODLAND (WFS)	39
KRUMMHOLZ SHRUBLAND (SFK)	43
WHITEBARK PINE WOODLAND (WWB)	46
SUBALPINE LARCH WOODLAND (WSL)	49
LODGEPOLE PINE FOREST (FLP)	51
LODGEPOLE PINE WOODLAND (WLP)	55
POPLAR - BIRCH FOREST (FAP)	57
MIXED CONIFER - DECIDUOUS FOREST (FEP)	60
LIMBER PINE WOODLAND (WLM)	63
DOUGLAS-FIR FOREST (FDF)	66

DOUGLAS-FIR WOODLAND (WDF)	69
WESTERN LARCH FOREST (FWL)	72
PONDEROSA PINE WOODLAND (WPP)	75
CEDAR - HEMLOCK FOREST (FCH AND FCS)	78
LODGEPOLE PINE WET FOREST (FPW)	82
ENGELMANN SPRUCE FOREST (FSP)	84
ENGELMANN SPRUCE - WET SHRUB FOREST (FSW)	86
BLACK COTTONWOOD FOREST (FCW)	88
MIXED CONIFER - POPLAR WET FOREST (FWM)	90
DECIDUOUS SHRUBLAND: AVALANCHE/SNOW BURIAL (SAD)	92
MIXED CONIFER - DECIDUOUS SHRUBLAND: AVALANCHE/SNOW BURIAL (SAM)	95
DECIDUOUS SHRUBLAND: DRY - MESIC (SDS)	98
GRASSLAND HERBACEOUS (HGL)	101
MIXED CONIFER REGENERATE FOREST (FCR)	105
MIXED REGENERATE SHRUBLAND (SMR)	107
BURNED VEGETATION: BARE SOIL (VBA)	110
DECIDUOUS WET SHRUBLAND (SWL)	112
DWARF-SHRUB/HERBACEOUS WET COMPLEX: MESIC - WET (CSW)	116
WET MEADOW HERBACEOUS (HWM)	120
SEMI-PERMANENTLY FLOODED HERBACEOUS (HSF)	123
PERMANENTLY FLOODED HERBACEOUS (HPF)	125
EXPOSED SHORELINE HERBACEOUS: PIONEERING VEGETATION (HES)	127
EXPOSED SHORELINE SPARSE VEGETATION (VSL AND VEE)	129
SAGEBRUSH - FESCUE SHRUB HERBACEOUS (HSS)	132
BEARBERRY DWARF-SHRUBLAND (DBB)	134
WHITE DRYAD DWARF-SHRUBLAND (DWD)	136
DWARF-SHRUB/HERBACEOUS COMPLEX: DRY - MESIC (CSA)	138
CLIFF/TALUS SPARSE VEGETATION (VCT)	142
HAYFIELD/CROPLAND (XHC)	144
GLACIER/SNOW FIELDS (NGS)	145
STREAM/RIVER (NST)	146
NATURAL AND ARTIFICIAL LAKE/POND (NLP)	148
RESIDENTIAL/COMMERCIAL AREA (NRC)	150
QUARRY (NQR)	152
ROAD/RAILROAD (NRR)	153

Table J-1. Map classification representing U.S. National Vegetational Classification vegetation types and general landcover units.

NVC (Vr2X)	Map Code	Map Class Description	Alliance Key	Alliance	CEGL Code	Association	Link To Other Map Classes
Forest and Woodland Class							
Temperate Forest and Woodland Subclass							
Cool Temperate Forest and Woodland Formation							
Rocky Mountain Subalpine and High Montane Forest and Woodland MacroGroup							
Rocky Mountain Subalpine Mesic Conifer Forest and Woodland Group							
	FFS	Subalpine Fir - Engelmann Spruce Forest					
			A.164	Picea engelmannii Forest Alliance			
					CEGL005926	Picea engelmannii / Vaccinium caespitosum Forest	None
					N/A	Undescribed Association	None
			A.168	Abies lasiocarpa - Picea engelmannii Forest Alliance			
					CEGL000294	Abies lasiocarpa - Picea engelmannii / Acer glabrum Forest	None
					CEGL000311	Abies lasiocarpa - Picea engelmannii / Galium triflorum Forest	None
					CEGL000315	Abies lasiocarpa - Picea engelmannii / Linnaea borealis Forest	None
					CEGL000340	Abies lasiocarpa - Picea engelmannii / Vaccinium caespitosum Forest	WFS
					CEGL005892	Abies lasiocarpa - Picea engelmannii / Clintonia uniflora - Xerophyllum tenax Forest	None
					CEGL005893	Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Clintonia uniflora Forest	SAM
					CEGL005894	Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea - Vaccinium scoparium Forest	WFS
					CEGL005895	Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Xerophyllum tenax Forest	WFS, SAM
					CEGL005912	Abies lasiocarpa - Picea engelmannii / Clintonia uniflora Forest	None
					CEGL005914	Abies lasiocarpa - Picea engelmannii / Vaccinium scoparium / Xerophyllum tenax Forest	WFS
					CEGL005917	Abies lasiocarpa - Picea engelmannii / Vaccinium membranaceum / Xerophyllum tenax Forest	WFS, SAM
					CEGL005918	Abies lasiocarpa - Picea engelmannii / Vaccinium caespitosum / Clintonia uniflora Forest	None
					CEGL005919	Abies lasiocarpa - Picea engelmannii / Vaccinium scoparium / Thalictrum occidentale Forest	None
					N/A	Undescribed Association	None
			A.177	Abies lasiocarpa Temporarily Flooded Forest Alliance			
					CEGL000297	Abies lasiocarpa - Picea engelmannii / Alnus viridis ssp. sinuata Forest	None
					CEGL000336	Abies lasiocarpa - Picea engelmannii / Streptopus amplexifolius Forest	WFS
					N/A	Undescribed Association	FSP

	A.190	Abies lasiocarpa Seasonally Flooded Forest Alliance		
		CEGL000300	Abies lasiocarpa - Picea engelmannii / Calamagrostis canadensis Forest	FSP
		CEGL000322	Abies lasiocarpa - Picea engelmannii / Oplomanax horridus Forest	FSP
	A.559	Abies lasiocarpa Woodland Alliance		
		CEGL000317	Abies lasiocarpa - Picea engelmannii / Luzula glabrata var. hitchcockii Woodland	WFS, SFK
		CEGL005823	Abies lasiocarpa - Picea engelmannii / Valeriana sitchensis Woodland	WFS, SFK
		CEGL005896	Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Luzula glabrata var. hitchcockii Woodland	WFS
		CEGL005897	Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Streptopus amplexifolius Woodland	FSP, WFS, SAM
		CEGL005898	Abies lasiocarpa - Picea engelmannii / Xerophyllum tenax - Luzula glabrata var. hitchcockii Woodland	WFS, SFK
		CEGL005920	Abies lasiocarpa - Picea engelmannii / Streptopus amplexifolius - Luzula glabrata var. hitchcockii Woodland	FSP, WFS
WFS	Subalpine Fir - Engelmann Spruce Woodland			
	A.164	Picea engelmannii Forest Alliance		
		CEGL005925	Picea engelmannii / Juniperus communis Forest	None
	A.177	Abies lasiocarpa Temporarily Flooded Forest Alliance		
		CEGL000336	Abies lasiocarpa - Picea engelmannii / Streptopus amplexifolius Forest	FFS
	A.168	Abies lasiocarpa - Picea engelmannii Forest Alliance		
		CEGL000340	Abies lasiocarpa - Picea engelmannii / Vaccinium caespitosum Forest	FFS
		CEGL005894	Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea - Vaccinium scoparium Forest	FFS
		CEGL005895	Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Xerophyllum tenax Forest	FFS, SAM
		CEGL005914	Abies lasiocarpa - Picea engelmannii / Vaccinium scoparium / Xerophyllum tenax Forest	FFS
		CEGL005917	Abies lasiocarpa - Picea engelmannii / Vaccinium membranaceum / Xerophyllum tenax Forest	FFS, SAM
	A.559	Abies lasiocarpa Woodland Alliance		
		CEGL000317	Abies lasiocarpa - Picea engelmannii / Luzula glabrata var. hitchcockii Woodland	FFS, SFK
		CEGL005823	Abies lasiocarpa - Picea engelmannii / Valeriana sitchensis Woodland	FFS, SFK
		CEGL005896	Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Luzula glabrata var. hitchcockii Woodland	FFS
		CEGL005897	Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Streptopus amplexifolius Woodland	FFS, SFK, SAM
		CEGL005898	Abies lasiocarpa - Picea engelmannii / Xerophyllum tenax - Luzula glabrata var. hitchcockii Woodland	FFS, SFK
		CEGL005920	Abies lasiocarpa - Picea engelmannii / Streptopus amplexifolius - Luzula glabrata var. hitchcockii Woodland	FFS, FSP

	A.811	Abies lasiocarpa - Picea engelmannii - Pinus flexilis Krummholz Shrubland Alliance		
		CEGL000985	Abies lasiocarpa - Picea engelmannii Krummholz Shrubland	SFK
SFK		Krummholz Shrubland		
	A.157	Pseudotsuga menziesii Forest Alliance		
		CEGL000424	Pseudotsuga menziesii / Arctostaphylos uva-ursi Forest	FDF, WDF
		CEGL000439	Pseudotsuga menziesii / Juniperus communis Forest	WDF
	A.531	Pinus albicaulis Woodland Alliance		
		CEGL000128	Pinus albicaulis - Abies lasiocarpa Woodland	WWB
		CEGL000754	Pinus albicaulis - (Abies lasiocarpa) / Carex geyeri Woodland	WWB
		CEGL005840	Pinus albicaulis - (Picea engelmannii) / Dryas octopetala Woodland	WWB
	A.540	Pinus flexilis Woodland Alliance		
		CEGL000802	Pinus flexilis / Arctostaphylos uva-ursi Woodland	WLM
		CEGL000807	Pinus flexilis / Juniperus communis Woodland	WLM
		N/A	Undescribed Association	WLM
	A.559	Abies lasiocarpa Woodland Alliance		
		CEGL000317	Abies lasiocarpa - Picea engelmannii / Luzula glabrata var. hitchcockii Woodland	FFS, WFS
		CEGL005823	Abies lasiocarpa - Picea engelmannii / Valeriana sitchensis Woodland	FFS, WFS
		CEGL005898	Abies lasiocarpa - Picea engelmannii / Xerophyllum tenax - Luzula glabrata var. hitchcockii Woodland	FFS, WFS
	A.560	Pinus albicaulis - Abies lasiocarpa Woodland Alliance		
		CEGL005836	Pinus albicaulis - Abies lasiocarpa / Menziesia ferruginea / Xerophyllum tenax Woodland	WWB
		CEGL005837	Pinus albicaulis - Abies lasiocarpa / Vaccinium membranaceum / Xerophyllum tenax Woodland	WWB
		CEGL005838	Pinus albicaulis - Abies lasiocarpa / Vaccinium scoparium / Xerophyllum tenax Woodland	WWB
		CEGL005839	Pinus albicaulis - Abies lasiocarpa / Vaccinium scoparium / Luzula glabrata var. hitchcockii Woodland	WWB
	A.811	Abies lasiocarpa - Picea engelmannii - Pinus flexilis Krummholz Shrubland Alliance		
		CEGL000985	Abies lasiocarpa - Picea engelmannii Krummholz Shrubland	WFS
Rocky Mountain Subalpine Whitebark Pine and Subalpine Larch Woodland Group				
		WWB	Whitebark Pine Woodland	
	A.531	Pinus albicaulis Woodland Alliance		
		CEGL000128	Pinus albicaulis - Abies lasiocarpa Woodland	SFK
		CEGL000754	Pinus albicaulis - (Abies lasiocarpa) / Carex geyeri Woodland	SFK

		CEGL005840	Pinus albicaulis - (<i>Picea engelmannii</i>) / <i>Dryas octopetala</i> Woodland	SFK
A.560	Pinus albicaulis - <i>Abies lasiocarpa</i> Woodland Alliance			
		CEGL005836	Pinus albicaulis - <i>Abies lasiocarpa</i> / <i>Menziesia ferruginea</i> / <i>Xerophyllum tenax</i> Woodland	SFK
		CEGL005837	Pinus albicaulis - <i>Abies lasiocarpa</i> / <i>Vaccinium membranaceum</i> / <i>Xerophyllum tenax</i> Woodland	SFK
		CEGL005838	Pinus albicaulis - <i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> / <i>Xerophyllum tenax</i> Woodland	SFK
		CEGL005839	Pinus albicaulis - <i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> / <i>Luzula glabrata</i> var. <i>hitchcockii</i> Woodland	SFK
		N/A	Undescribed Association	None
WSL	Subalpine Larch Woodland			
A.631	<i>Larix lyallii</i> Woodland Alliance			
		CEGL005884	<i>Larix lyallii</i> / <i>Vaccinium membranaceum</i> / <i>Luzula glabrata</i> var. <i>hitchcockii</i> Woodland	None
		N/A	Undescribed Association	None
Rocky Mountain Subboreal and Montane Conifer Forest Group				
FLP	Lodgepole Pine Forest			
A.118	<i>Pinus contorta</i> Forest Alliance			
		CEGL000135	<i>Pinus contorta</i> / <i>Arnica cordifolia</i> Forest	None
		CEGL000139	<i>Pinus contorta</i> / <i>Calamagrostis rubescens</i> Forest	FWL, WLP
		CEGL000153	<i>Pinus contorta</i> / <i>Linnaea borealis</i> Forest	None
		CEGL000164	<i>Pinus contorta</i> / <i>Spiraea betulifolia</i> Forest	WLP
		CEGL000168	<i>Pinus contorta</i> / <i>Vaccinium caespitosum</i> Forest	FWL, WLP
		CEGL000172	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Forest	WLP
		CEGL000174	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> / <i>Calamagrostis rubescens</i> Forest	WLP
		CEGL005913	<i>Pinus contorta</i> / <i>Vaccinium membranaceum</i> / <i>Xerophyllum tenax</i> Forest	WLP
		CEGL005916	<i>Pinus contorta</i> / <i>Clintonia uniflora</i> Forest	None
		CEGL005922	<i>Pinus contorta</i> / <i>Menziesia ferruginea</i> / <i>Clintonia uniflora</i> Forest	None
		CEGL005923	<i>Pinus contorta</i> / <i>Vaccinium caespitosum</i> / <i>Clintonia uniflora</i> Forest	FWL
		CEGL005924	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> / <i>Xerophyllum tenax</i> Forest	WLP
		CEGL005928	<i>Pinus contorta</i> / <i>Menziesia ferruginea</i> Forest	None
		Park Special 8	<i>Pinus contorta</i> / <i>Acer glabrum</i> Forest	None
		Park Special 9	<i>Pinus contorta</i> / <i>Menziesia ferruginea</i> / <i>Xerophyllum tenax</i> Forest	None
A.188	<i>Pinus contorta</i> Seasonally Flooded Forest Alliance			

		CEGL000138	Pinus contorta / Calamagrostis canadensis Forest	FPW
	A.512	Pinus contorta Woodland Alliance		
		CEGL000764	Pinus contorta / Juniperus communis Woodland	WLP
		CEGL005915	Pinus contorta / Heracleum maximum Woodland	WLP
		CEGL005921	Pinus contorta / Clintonia uniflora - Xerophyllum tenax Woodland	None
		CEGL005929	Pinus contorta / Cornus sericea Woodland	FPW
WLP	Lodgepole Pine Woodland			
	A.118	Pinus contorta Forest Alliance		
		CEGL000139	Pinus contorta / Calamagrostis rubescens Forest	FLP, FWL
		CEGL000164	Pinus contorta / Spiraea betulifolia Forest	FLP
		CEGL000168	Pinus contorta / Vaccinium caespitosum Forest	FLP, FWL
		CEGL000172	Pinus contorta / Vaccinium scoparium Forest	FLP
		CEGL000174	Pinus contorta / Vaccinium scoparium / Calamagrostis rubescens Forest	FLP
		CEGL005913	Pinus contorta / Vaccinium membranaceum / Xerophyllum tenax Forest	FLP
		CEGL005924	Pinus contorta / Vaccinium scoparium / Xerophyllum tenax Forest	FLP
	A.512	Pinus contorta Woodland Alliance		
		CEGL000764	Pinus contorta / Juniperus communis Woodland	FLP
		CEGL005915	Pinus contorta / Heracleum maximum Woodland	FLP
		N/A	Undescribed Association	None
Rocky Mountain Subalpine (Cool) Deciduous Broadleaf and Mixed Forest Group				
FAP	Poplar - Birch Forest			
	A.274	Populus tremuloides Forest Alliance		
		CEGL000575	Populus tremuloides / Calamagrostis rubescens Forest	SAD
		CEGL000595	Populus tremuloides / Heracleum maximum Forest	FCW, SAD
		CEGL000602	Populus tremuloides / Rubus parviflorus Forest	SAD
		CEGL000607	Populus tremuloides / Spiraea betulifolia Forest	SAD
		CEGL000609	Populus tremuloides / Symphoricarpos albus Forest	SAD
		CEGL003748	Populus tremuloides / Invasive Perennial Grasses Forest	SAD
		CEGL005848	Populus tremuloides / Symphoricarpos occidentalis Forest [Provisional]	SAD
		CEGL005849	Populus tremuloides / Urtica dioica Forest [Provisional]	SAD

	N/A	Undescribed Association	None
A.311	Populus balsamifera ssp. trichocarpa	Temporarily Flooded Forest Alliance	
	CEGL000542	Populus balsamifera ssp. trichocarpa - (Populus tremuloides) / Heracleum maximum Forest	FCW
	CEGL000672	Populus balsamifera ssp. trichocarpa / Cornus sericea Forest	FCW
	CEGL005906	Populus balsamifera ssp. trichocarpa - Populus tremuloides - Conifer / Clintonia uniflora Forest	FEP
	N/A	Undescribed Association	FEP, FCW, FWM
A.340	Populus tremuloides	Seasonally Flooded Forest Alliance	
	CEGL000574	Populus tremuloides / Calamagrostis canadensis Forest	FCW, SAD
A.300	Populus tremuloides	Temporarily Flooded Forest Alliance	
	CEGL000582	Populus tremuloides / Cornus sericea Forest	FCW, SAD
A.603	Betula papyrifera	Woodland Alliance	
	CEGL005844	Betula papyrifera / Acer glabrum Woodland	None
	N/A	Undescribed Association	FEP
A.913	Amelanchier alnifolia	Shrubland Alliance	
	CEGL005886	Populus tremuloides / Amelanchier alnifolia Avalanche Chute Shrubland	SAD
FEP	Mixed Conifer - Deciduous Forest		
A.274	Populus tremuloides	Forest Alliance	
	CEGL005911	Populus tremuloides - Conifer / Spiraea betulifolia - Symphoricarpos albus Forest	SAM
A.311	Populus balsamifera ssp. trichocarpa	Temporarily Flooded Forest Alliance	
	CEGL005905	Populus balsamifera ssp. trichocarpa - Populus tremuloides - Conifer / Cornus sericea Forest	FWM
	CEGL005906	Populus balsamifera ssp. trichocarpa - Populus tremuloides - Conifer / Clintonia uniflora Forest	FAP
	CEGL005909	Populus balsamifera ssp. trichocarpa - Populus tremuloides - Conifer / Calamagrostis canadensis Forest	FWM, SAM
	CEGL005910	Populus balsamifera ssp. trichocarpa - Populus tremuloides - Conifer / Heracleum maximum Forest	SAM
	N/A	Undescribed Association	FAP, FCW, FWM
A.422	Abies lasiocarpa - Populus tremuloides	Forest Alliance	
	CEGL005908	Populus tremuloides - Abies lasiocarpa - Picea engelmannii / Streptopus amplexifolius Forest	FWM, SAM
	N/A	Undescribed Association	None
A.424	Pinus contorta - Populus tremuloides	Forest Alliance	

		N/A	Undescribed Association	None
	A.603	Betula papyrifera Woodland Alliance		
		CEGL005904	Betula papyrifera - Conifer / Clintonia uniflora Woodland	None
		N/A	Undescribed Association	FAP
Rocky Mountain Lower Montane Forest and Woodland MacroGroup				
Rocky Mountain Montane Limber Pine - Juniper Woodland Group				
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WLM	Limber Pine Woodland			
	A.540	Pinus flexilis Woodland Alliance		
		CEGL000802	Pinus flexilis / Arctostaphylos uva-ursi Woodland	SFK
		CEGL000805	Pinus flexilis / Festuca idahoensis Woodland	None
		CEGL000806	Pinus flexilis / Festuca campestris Woodland	None
		CEGL000807	Pinus flexilis / Juniperus communis Woodland	SFK
		N/A	Undescribed Association	SFK
Rocky Mountain Mesic Montane Conifer Forest Group				
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FDF	Douglas-fir Forest			
	A.157	Pseudotsuga menziesii Forest Alliance		
		CEGL000418	Pseudotsuga menziesii / Acer glabrum Forest	SAM
		CEGL000424	Pseudotsuga menziesii / Arctostaphylos uva-ursi Forest	WDF, SFK
		CEGL000427	Pseudotsuga menziesii / Arnica cordifolia Forest	None
		CEGL000430	Pseudotsuga menziesii / Carex geyeri Forest	None
		CEGL000457	Pseudotsuga menziesii / Spiraea betulifolia Forest	WDF, SAM
		CEGL000459	Pseudotsuga menziesii / Symphoricarpos albus Forest	WDF, SAM
		CEGL000465	Pseudotsuga menziesii / Vaccinium caespitosum Forest	WDF
		CEGL005850	Pseudotsuga menziesii / Clintonia uniflora Forest	None
		CEGL005851	Pseudotsuga menziesii / Menziesia ferruginea / Clintonia uniflora Forest	SAM
		CEGL005852	Pseudotsuga menziesii / Vaccinium membranaceum / Xerophyllum tenax Forest	WDF, SAM
		CEGL005853	Pseudotsuga menziesii / Heracleum maximum Forest	None
		CEGL005854	Pseudotsuga menziesii / Clintonia uniflora - Xerophyllum tenax Forest	None
		N/A	Undescribed Association	WDF
	A.552	Pseudotsuga menziesii Woodland Alliance		

		CEGL000429	Pseudotsuga menziesii / Calamagrostis rubescens Woodland	WDF
A.568	Pseudotsuga menziesii Temporarily Flooded Woodland Alliance			
		CEGL000899	Pseudotsuga menziesii / Cornus sericea Woodland	SAM
WDF	Douglas-fir Woodland			
A.157	Pseudotsuga menziesii Forest Alliance			
		CEGL000424	Pseudotsuga menziesii / Arctostaphylos uva-ursi Forest	FDF, SFK
		CEGL000439	Pseudotsuga menziesii / Juniperus communis Forest	SFK
		CEGL000457	Pseudotsuga menziesii / Spiraea betulifolia Forest	FDF, SAM
		CEGL000459	Pseudotsuga menziesii / Symphoricarpos albus Forest	FDF, SAM
		CEGL000465	Pseudotsuga menziesii / Vaccinium caespitosum Forest	FDF
		CEGL005852	Pseudotsuga menziesii / Vaccinium membranaceum / Xerophyllum tenax Forest	FDF, SAM
		N/A	Undescribed Association	FDF
A.552	Pseudotsuga menziesii Woodland Alliance			
		CEGL000429	Pseudotsuga menziesii / Calamagrostis rubescens Woodland	FDF
		CEGL000900	Pseudotsuga menziesii / Festuca idahoensis Woodland	None
FWL	Western Larch Forest			
A.118	Pinus contorta Forest Alliance			
		CEGL000139	Pinus contorta / Calamagrostis rubescens Forest	FLP, WLP
		CEGL000168	Pinus contorta / Vaccinium caespitosum Forest	FLP, WLP
		CEGL005923	Pinus contorta / Vaccinium caespitosum / Clintonia uniflora Forest	FLP
A.275	Larix occidentalis Forest Alliance			
		CEGL005880	Larix occidentalis / Clintonia uniflora Forest	None
		CEGL005881	Larix occidentalis / Clintonia uniflora - Xerophyllum tenax Forest	None
		CEGL005882	Larix occidentalis / Vaccinium caespitosum Forest	None
		CEGL005883	Larix occidentalis / Vaccinium caespitosum / Clintonia uniflora Forest	None
		N/A	Undescribed Association	None
		Park Special 7	Larix occidentalis / Linnaea borealis Forest	None

Northern Rocky Mountain Ponderosa Pine Woodland Group

WPP Ponderosa Pine Woodland

	A.124	Pinus ponderosa Forest Alliance			
		CEGL000181	Pinus ponderosa / Calamagrostis rubescens Forest		None
		CEGL000203	Pinus ponderosa / Symphoricarpos albus Forest		None
	A.530	Pinus ponderosa Woodland Alliance			
		CEGL000185	Pinus ponderosa / Festuca campestris Woodland		None
		CEGL005841	Pinus ponderosa / Vaccinium caespitosum Woodland		None
		N/A	Undescribed Association		None
Rocky Mountain Cedar - Hemlock Rainforest Group					
FCH	Cedar - Hemlock Forest (mesic phase)				
	A.145	Tsuga heterophylla Forest Alliance			
		CEGL000488	Tsuga heterophylla / Aralia nudicaulis Forest		None
		CEGL000493	Tsuga heterophylla / Clintonia uniflora Forest		FCS
		CEGL000494	Tsuga heterophylla / Gymnocarpium dryopteris Forest		FCS
	A.166	Thuja plicata Forest Alliance			
		CEGL000471	Thuja plicata / Aralia nudicaulis Forest		None
		CEGL000474	Thuja plicata / Clintonia uniflora Forest		None
		CEGL000476	Thuja plicata / Gymnocarpium dryopteris Forest		FCS
		CEGL005930	Thuja plicata / Clintonia uniflora - Xerophyllum tenax Forest		None
		CEGL005931	Thuja plicata / Carex disperma Forest [Provisional]		FCS
	A.174	Tsuga heterophylla Temporarily Flooded Forest Alliance			
		CEGL000491	Tsuga heterophylla / Athyrium filix-femina Forest		FCS
	A.193	Thuja plicata Seasonally Flooded Forest Alliance			
		CEGL000473	Thuja plicata / Athyrium filix-femina Forest		FCS
		CEGL000479	Thuja plicata - Tsuga heterophylla / Oplopanax horridus Rocky Mountain Forest		FCS
Temperate Wetland Forest and Woodland Formation					
Rocky Mountain and Great Basin Wet Forest MacroGroup					
Northern Rocky Mountain Conifer Swamp and Riparian Forest Group					
FCS	Cedar - Hemlock Forest (wet phase)				
	A.145	Tsuga heterophylla Forest Alliance			
		CEGL000493	Tsuga heterophylla / Clintonia uniflora Forest		FCH

		CEGL000494	<i>Tsuga heterophylla</i> / <i>Gymnocarpium dryopteris</i> Forest	FCH
A.166	Thuja plicata Forest Alliance			
		CEGL000476	Thuja plicata / <i>Gymnocarpium dryopteris</i> Forest	FCH
		CEGL005931	Thuja plicata / <i>Carex disperma</i> Forest [Provisional]	FCH
A.174	<i>Tsuga heterophylla</i> Temporarily Flooded Forest Alliance			
		CEGL000491	<i>Tsuga heterophylla</i> / <i>Athyrium filix-femina</i> Forest	FCH
A.193	Thuja plicata Seasonally Flooded Forest Alliance			
		CEGL000473	Thuja plicata / <i>Athyrium filix-femina</i> Forest	FCH
		CEGL000479	Thuja plicata - <i>Tsuga heterophylla</i> / <i>Oplopanax horridus</i> Rocky Mountain Forest	FCH
Rocky Mountain Conifer Swamp and Riparian Forest Group				
FPW	Lodgepole Pine Wet Forest			
A.188	<i>Pinus contorta</i> Seasonally Flooded Forest Alliance			
		CEGL000138	<i>Pinus contorta</i> / <i>Calamagrostis canadensis</i> Forest	FLP
A.512	<i>Pinus contorta</i> Woodland Alliance			
		CEGL005929	<i>Pinus contorta</i> / <i>Cornus sericea</i> Woodland	FLP
FSP	Engelmann Spruce Forest			
A.177	<i>Abies lasiocarpa</i> Temporarily Flooded Forest Alliance			
		N/A	Undescribed Association	FFS
A.190	<i>Abies lasiocarpa</i> Seasonally Flooded Forest Alliance			
		CEGL000300	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Calamagrostis canadensis</i> Forest	FFS
		CEGL000322	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Oplopanax horridus</i> Forest	FFS
A.191	<i>Picea engelmannii</i> Seasonally Flooded Forest Alliance			
		CEGL005927	<i>Picea engelmannii</i> / <i>Equisetum arvense</i> Forest	None
A.566	<i>Picea engelmannii</i> Temporarily Flooded Woodland Alliance			
		CEGL002677	<i>Picea engelmannii</i> / <i>Cornus sericea</i> Woodland	FSW
A.559	<i>Abies lasiocarpa</i> Woodland Alliance			
		CEGL005897	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Menziesia ferruginea</i> / <i>Streptopus amplexifolius</i> Woodland	FFS, WFS, SAM
		CEGL005920	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Streptopus amplexifolius</i> - <i>Luzula glabrata</i> var. <i>hitchcockii</i> Woodland	FFS, WFS
FSW	Engelmann Spruce - Wet Shrub Forest			
A.572	<i>Picea engelmannii</i> Seasonally Flooded Woodland Alliance			

		CEGL005843	Picea engelmannii / Salix drummondiana Woodland	None
A.566	Picea engelmannii Temporarily Flooded Woodland Alliance			
		CEGL002677	Picea engelmannii / Cornus sericea Woodland	FSP
Northern Rocky Mountain Montane Riparian Forest Group				
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FCW	Black Cottonwood Forest			
A.274	Populus tremuloides Forest Alliance			
		CEGL000595	Populus tremuloides / Heracleum maximum Forest	FAP, SAD
A.300	Populus tremuloides Temporarily Flooded Forest Alliance			
		CEGL000582	Populus tremuloides / Cornus sericea Forest	FAP, SAD
A.311	Populus balsamifera ssp. trichocarpa Temporarily Flooded Forest Alliance			
		CEGL000542	Populus balsamifera ssp. trichocarpa - (Populus tremuloides) / Heracleum maximum Forest	FAP
		CEGL000672	Populus balsamifera ssp. trichocarpa / Cornus sericea Forest	FAP
		CEGL005845	Populus balsamifera ssp. trichocarpa / Calamagrostis canadensis Forest [Provisional]	None
		N/A	Undescribed Association	FAP, FEP, FWM
A.340	Populus tremuloides Seasonally Flooded Forest Alliance			
		CEGL000574	Populus tremuloides / Calamagrostis canadensis Forest	FAP, SAD
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FWM	Mixed Conifer - Deciduous Wet Forest			
A.311	Populus balsamifera ssp. trichocarpa Temporarily Flooded Forest Alliance			
		CEGL005905	Populus balsamifera ssp. trichocarpa - Populus tremuloides - Conifer / Cornus sericea Forest	FEP
		CEGL005907	Populus balsamifera ssp. trichocarpa - Picea engelmannii / Equisetum arvense Forest	None
		CEGL005909	Populus balsamifera ssp. trichocarpa - Populus tremuloides - Conifer / Calamagrostis canadensis Forest	FEP, SAM
		N/A	Undescribed Association	FAP, FEP, FCW
A.422	Abies lasiocarpa - Populus tremuloides Forest Alliance			
		CEGL005908	Populus tremuloides - Abies lasiocarpa - Picea engelmannii / Streptopus amplexifolius Forest	FEP, SAM
Shrubland and Grassland Class				
Temperate and Boreal Grassland, Meadow, and Shrubland Subclass				
Temperate Grassland, Forb Meadow, and Shrubland Formation				
Northern (Cool) Rocky Mountain - Vancouverian Montane Shrubland and Grassland MacroGroup				
Northern Rocky Mountain Avalanche Chute Shrubland Group				

SAD Deciduous Shrubland: Avalanche/Snow Burial

A.274	Populus tremuloides Forest Alliance		
	CEGL000575	Populus tremuloides / Calamagrostis rubescens Forest	FAP
	CEGL000595	Populus tremuloides / Heracleum maximum Forest	FAP, FCW
	CEGL000602	Populus tremuloides / Rubus parviflorus Forest	FAP
	CEGL000607	Populus tremuloides / Spiraea betulifolia Forest	FAP
	CEGL000609	Populus tremuloides / Symphoricarpos albus Forest	FAP
	CEGL003748	Populus tremuloides / Invasive Perennial Grasses Forest	FAP
	CEGL005848	Populus tremuloides / Symphoricarpos occidentalis Forest [Provisional]	FAP
	CEGL005849	Populus tremuloides / Urtica dioica Forest [Provisional]	FAP
A.340	Populus tremuloides Seasonally Flooded Forest Alliance		
	CEGL000574	Populus tremuloides / Calamagrostis canadensis Forest	FAP, FCW
A.300	Populus tremuloides Temporarily Flooded Forest Alliance		
	CEGL000582	Populus tremuloides / Cornus sericea Forest	FAP, FCW
A.913	Amelanchier alnifolia Shrubland Alliance		
	CEGL001065	Amelanchier alnifolia / Pseudoroegneria spicata - Bunchgrass Shrubland	SDS, HGL, SMR
	CEGL005885	Amelanchier alnifolia / (Mixed Grass, Forb) Shrubland	SDS, CSA, SMR
	CEGL005886	Populus tremuloides / Amelanchier alnifolia Avalanche Chute Shrubland	FAP
A.915	Acer glabrum Shrubland Alliance		
	CEGL001061	Acer glabrum Avalanche Chute Shrubland	SDS, CSW
A.919	Prunus virginiana Shrubland Alliance		
	CEGL001108	Prunus virginiana - (Prunus americana) Shrubland	SDS
A.931	Rubus parviflorus Shrubland Alliance		
	CEGL001127	Rubus parviflorus / Chamerion angustifolium - Heracleum maximum Shrubland	SDS, SMR
	N/A	Undescribed Association	SDS, SMR
A.950	Alnus incana Temporarily Flooded Shrubland Alliance		
	CEGL001141	Alnus incana Shrubland	SWL
	CEGL001143	Alnus incana / Calamagrostis canadensis Shrubland	SWL
	CEGL001145	Alnus incana / Cornus sericea Shrubland	SWL
A.966	Alnus viridis ssp. sinuata Temporarily Flooded Shrubland Alliance		

		CEGL001156	<i>Alnus viridis</i> ssp. <i>sinuata</i> / <i>Athyrium filix-femina</i> - <i>Cinna latifolia</i> Shrubland	SWL
		CEGL002633	<i>Alnus viridis</i> ssp. <i>sinuata</i> / Mesic Forbs Shrubland	SWL
		N/A	Undescribed Association	None
A.968	<i>Cornus sericea</i> Temporarily Flooded Shrubland Alliance			
		CEGL001165	<i>Cornus sericea</i> Shrubland	SWL
A.970	<i>Ribes lacustre</i> Temporarily Flooded Shrubland Alliance			
		CEGL005889	<i>Ribes lacustre</i> / <i>Chamerion angustifolium</i> Shrubland [Provisional]	SDS, CSW
A.973	<i>Salix drummondiana</i> Temporarily Flooded Shrubland Alliance			
		CEGL001192	<i>Salix drummondiana</i> / Mesic Forbs Shrubland	SWL
A.995	<i>Betula nana</i> Seasonally Flooded Shrubland Alliance			
		CEGL001079	<i>Betula nana</i> / <i>Carex utriculata</i> Shrubland	SWL
A.1003	<i>Salix commutata</i> Seasonally Flooded Shrubland Alliance			
		CEGL003497	<i>Salix commutata</i> / Mesic Graminoid Shrubland	SWL
A.2632	<i>Vaccinium membranaceum</i> Shrubland Alliance			
		CEGL005891	<i>Vaccinium membranaceum</i> / <i>Xerophyllum tenax</i> Shrubland	CSA, CSW, SMR
A.2633	<i>Menziesia ferruginea</i> Shrubland Alliance			
		CEGL005888	<i>Menziesia ferruginea</i> / <i>Xerophyllum tenax</i> Shrubland	SAM, SMR
N/A	Undescribed Alliance			
		Park Special 4	<i>Salix pseudomonticola</i> Shrubland	SWL
N/A	Undescribed Alliance			
		Park Special 6	<i>Salix scouleriana</i> Shrubland	None
SAM	Mixed Conifer - Deciduous Shrubland: Avalanche/Snow Burial			
A.157	<i>Pseudotsuga menziesii</i> Forest Alliance			
		CEGL000418	<i>Pseudotsuga menziesii</i> / <i>Acer glabrum</i> Forest	FDF
		CEGL000457	<i>Pseudotsuga menziesii</i> / <i>Spiraea betulifolia</i> Forest	FDF, WDF
		CEGL000459	<i>Pseudotsuga menziesii</i> / <i>Symphoricarpos albus</i> Forest	FDF, WDF
		CEGL005851	<i>Pseudotsuga menziesii</i> / <i>Menziesia ferruginea</i> / <i>Clintonia uniflora</i> Forest	FDF
		CEGL005852	<i>Pseudotsuga menziesii</i> / <i>Vaccinium membranaceum</i> / <i>Xerophyllum tenax</i> Forest	FDF, WDF
A.168	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> Forest Alliance			
		CEGL005893	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Menziesia ferruginea</i> / <i>Clintonia uniflora</i> Forest	FFS

		CEGL005895	Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Xerophyllum tenax Forest	FFS, WFS
		CEGL005917	Abies lasiocarpa - Picea engelmannii / Vaccinium membranaceum / Xerophyllum tenax Forest	FFS, WFS
A.274	Populus tremuloides Forest Alliance			
		CEGL005911	Populus tremuloides - Conifer / Spiraea betulifolia - Symphoricarpos albus Forest	FEP
A.311	Populus balsamifera ssp. trichocarpa Temporarily Flooded Forest Alliance			
		CEGL005909	Populus balsamifera ssp. trichocarpa - Populus tremuloides - Conifer / Calamagrostis canadensis Forest	FEP, FWM
		CEGL005910	Populus balsamifera ssp. trichocarpa - Populus tremuloides - Conifer / Heracleum maximum Forest	FEP
A.422	Abies lasiocarpa - Populus tremuloides Forest Alliance			
		CEGL005908	Populus tremuloides - Abies lasiocarpa - Picea engelmannii / Streptopus amplexifolius Forest	FWM, SAM
A.568	Pseudotsuga menziesii Temporarily Flooded Woodland Alliance			
		CEGL000899	Pseudotsuga menziesii / Cornus sericea Woodland	FDF
A.559	Abies lasiocarpa Woodland Alliance			
		CEGL005897	Abies lasiocarpa - Picea engelmannii / Menziesia ferruginea / Streptopus amplexifolius Woodland	FFS, WFS, SFK
A.2633	Menziesia ferruginea Shrubland Alliance			
		CEGL005888	Menziesia ferruginea / Xerophyllum tenax Shrubland	SAD, SMR

Northern Rocky Mountain Lower Montane Deciduous Shrubland Group

SDS Deciduous Shrubland: Dry - Mesic

A.913	Amelanchier alnifolia Shrubland Alliance			
		CEGL001065	Amelanchier alnifolia / Pseudoroegneria spicata - Bunchgrass Shrubland	SAD, HGL, SMR
		CEGL005885	Amelanchier alnifolia / (Mixed Grass, Forb) Shrubland	SAD, CSA, SMR
		N/A	Undescribed Association	HGL, CSA, SMR
A.915	Acer glabrum Shrubland Alliance			
		CEGL001061	Acer glabrum Avalanche Chute Shrubland	SAD, CSW
A.919	Prunus virginiana Shrubland Alliance			
		CEGL001108	Prunus virginiana - (Prunus americana) Shrubland	SAD
A.925	Symphoricarpos albus Shrubland Alliance			
		CEGL005890	Symphoricarpos albus Shrubland	SMR
A.931	Rubus parviflorus Shrubland Alliance			
		CEGL001127	Rubus parviflorus / Chamerion angustifolium - Heracleum maximum Shrubland	SDS, SAD

	N/A	Undescribed Association	SAD, SMR
A.956	Elaeagnus commutata Temporarily Flooded Shrubland Alliance		
	CEGL001098	Elaeagnus commutata Shrubland	SWL
A.958	Dasiphora fruticosa Temporarily Flooded Shrubland Alliance		
	N/A	Undescribed Association	None
A.959	Rosa woodsii Temporarily Flooded Shrubland Alliance		
	CEGL001126	Rosa woodsii Shrubland	SMR
A.961	Symphoricarpos occidentalis Temporarily Flooded Shrubland Alliance		
	CEGL001131	Symphoricarpos occidentalis Shrubland	SMR
A.970	Ribes lacustre Temporarily Flooded Shrubland Alliance		
	CEGL005889	Ribes lacustre / Chamerion angustifolium Shrubland [Provisional]	SAD, CSW
A.1534	Dasiphora fruticosa ssp. floribunda Shrub Herbaceous Alliance		
	N/A	Undescribed Association	HES
A.2636	Spiraea betulifolia Shrubland Alliance		
	CEGL005835	Spiraea betulifolia Shrubland	CSA, SMR

Rocky Mountain Montane Grassland Group

HGL Grassland Herbaceous

A.913	Amelanchier alnifolia Shrubland Alliance		
	CEGL001065	Amelanchier alnifolia / Pseudoroegneria spicata - Bunchgrass Shrubland	SAD, SDS, SMR
	N/A	Undescribed Association	SDS, CSA, SMR
A.1079	Arctostaphylos uva-ursi Dwarf-shrubland Alliance		
	CEGL005830	Arctostaphylos uva-ursi / Festuca campestris - Festuca idahoensis Dwarf-shrubland	DBB, HES, CSA
A.1251	Festuca idahoensis Herbaceous Alliance		
	CEGL001614	Festuca idahoensis - Elymus trachycaulus Herbaceous Vegetation	None
	CEGL001624	Festuca idahoensis - Pseudoroegneria spicata Herbaceous Vegetation	None
	CEGL001625	Festuca idahoensis - Achnatherum richardsonii Herbaceous Vegetation	None
	CEGL001898	Festuca idahoensis - Carex filifolia Herbaceous Vegetation	None
	CEGL005869	Festuca campestris - (Festuca idahoensis) - Achnatherum richardsonii Herbaceous Vegetation	None
	CEGL005870	Festuca campestris - Festuca idahoensis - Geranium viscosissimum Herbaceous Vegetation	None
A.1255	Festuca campestris Herbaceous Alliance		

		CEGL001629	Festuca campestris - Pseudoroegneria spicata Herbaceous Vegetation	None
		CEGL005875	Festuca campestris - Festuca idahoensis Herbaceous Vegetation	None
A.1265	Pseudoroegneria spicata Herbaceous Alliance			
		CEGL001677	Pseudoroegneria spicata - Poa secunda Herbaceous Vegetation	CSA
		CEGL005861	Bromus marginatus - Pseudoroegneria spicata Herbaceous Vegetation [Provisional]	CSA
A.1271	Achnatherum nelsonii Herbaceous Alliance			
		CEGL005860	Achnatherum nelsonii - Lupinus sericeus Herbaceous Vegetation	None
A.1313	Festuca idahoensis Alpine Herbaceous Alliance			
		CEGL001623	Festuca idahoensis - (Festuca campestris) / Potentilla diversifolia Herbaceous Vegetation	CSA
A.1409	Poa palustris Semi-natural Seasonally Flooded Herbaceous Alliance			
		CEGL001659	Poa palustris Herbaceous Vegetation	HWM
A.1534	Dasiphora fruticosa ssp. floribunda Shrub Herbaceous Alliance			
		CEGL001502	Dasiphora fruticosa ssp. floribunda / Festuca idahoensis Shrub Herbaceous Vegetation	CSA
		CEGL001503	Dasiphora fruticosa ssp. floribunda / Festuca campestris Shrub Herbaceous Vegetation	CSA
A.2637	Calamagrostis rubescens Herbaceous Alliance			
		CEGL005862	Calamagrostis rubescens Herbaceous Vegetation	None
A.2639	Carex geyeri Herbaceous Alliance			
		CEGL005864	Carex geyeri Herbaceous Vegetation	CSA
A.2658	Elymus repens Herbaceous Alliance			
		CEGL005868	Elymus repens Semi-natural Herbaceous Vegetation	HES
A.3535	Chamerion angustifolium Herbaceous Alliance			
		CEGL005856	Chamerion angustifolium Rocky Mountain Herbaceous Vegetation [Provisional]	HWM, SMR
A.3562	Poa pratensis Semi-natural Herbaceous Alliance			
		CEGL005874	Phleum pratense - Poa pratensis - Bromus inermis Semi-natural Herbaceous Vegetation	None

Rocky Mountain Successional Vegetation MacroGroup

Rocky Mountain Early Successional Forest, Shrubland, and Forb Meadow Group

FCR	Mixed Conifer Regenerate Forest				
		N/A	Undescribed Alliance	N/A	Undescribed Association
					Unknown
SMR	Mixed Regenerate Shrubland				
		A.913	Amelanchier alnifolia Shrubland Alliance		

		CEGL001065	Amelanchier alnifolia / Pseudoroegneria spicata - Bunchgrass Shrubland	SAD, SDS, HGL
		CEGL005885	Amelanchier alnifolia / (Mixed Grass, Forb) Shrubland	SAD, SDS, CSA
		N/A	Undescribed Association	SDS, HGL, CSA
A.925	Symphoricarpos albus Shrubland Alliance			
		CEGL005890	Symphoricarpos albus Shrubland	SDS
A.931	Rubus parviflorus Shrubland Alliance			
		CEGL001127	Rubus parviflorus / Chamerion angustifolium - Heracleum maximum Shrubland	SDS, SAD
		N/A	Undescribed Association	SDS, SAD
A.959	Rosa woodsii Temporarily Flooded Shrubland Alliance			
		CEGL001126	Rosa woodsii Shrubland	SDS
A.961	Symphoricarpos occidentalis Temporarily Flooded Shrubland Alliance			
		CEGL001131	Symphoricarpos occidentalis Shrubland	SDS
A.2632	Vaccinium membranaceum Shrubland Alliance			
		CEGL005891	Vaccinium membranaceum / Xerophyllum tenax Shrubland	SAD, CSA, CSW
A.2633	Menziesia ferruginea Shrubland Alliance			
		CEGL005888	Menziesia ferruginea / Xerophyllum tenax Shrubland	SAD, SAM
A.2636	Spiraea betulifolia Shrubland Alliance			
		CEGL005835	Spiraea betulifolia Shrubland	SDS, CSA
A.3535	Chamerion angustifolium Herbaceous Alliance			
		CEGL005856	Chamerion angustifolium Rocky Mountain Herbaceous Vegetation [Provisional]	HGL, HWM
VBA Burned Vegetation: Bare Soil				
		N/A	Undescribed Alliance	
		N/A	Undescribed Association	Unknown
Temperate and Boreal Wet Riparian, Freshwater Marsh, and Shrub Swamp Formation				
Western North America Freshwater Shrub, Marsh, and Wet Meadow MacroGroup				
Rocky Mountain Subalpine and Montane Riparian Shrubland Group				
SWL Deciduous Wet Shrubland				
A.947	Salix (exigua, interior) Temporarily Flooded Shrubland Alliance			
		CEGL001197	Salix exigua Temporarily Flooded Shrubland	None
		CEGL001199	Salix exigua / Agrostis stolonifera Shrubland	None

A.950	<i>Alnus incana</i> Temporarily Flooded Shrubland Alliance		
	CEGL001141	<i>Alnus incana</i> Shrubland	SAD
	CEGL001143	<i>Alnus incana</i> / <i>Calamagrostis canadensis</i> Shrubland	SAD
	CEGL001145	<i>Alnus incana</i> / <i>Cornus sericea</i> Shrubland	SAD
A.954	<i>Crataegus (douglasii, succulenta)</i> Temporarily Flooded Shrubland Alliance		
	CEGL001093	<i>Crataegus douglasii</i> - (<i>Crataegus chrysocarpa</i>) Shrubland	None
A.956	<i>Elaeagnus commutata</i> Temporarily Flooded Shrubland Alliance		
	CEGL001098	<i>Elaeagnus commutata</i> Shrubland	SDS
A.962	<i>Rhamnus alnifolia</i> Temporarily Flooded Shrubland Alliance		
	CEGL001132	<i>Rhamnus alnifolia</i> Shrubland	None
A.966	<i>Alnus viridis</i> ssp. <i>sinuata</i> Temporarily Flooded Shrubland Alliance		
	CEGL001156	<i>Alnus viridis</i> ssp. <i>sinuata</i> / <i>Athyrium filix-femina</i> - <i>Cinna latifolia</i> Shrubland	SAD
	CEGL002633	<i>Alnus viridis</i> ssp. <i>sinuata</i> / Mesic Forbs Shrubland	SAD
A.968	<i>Cornus sericea</i> Temporarily Flooded Shrubland Alliance		
	CEGL001165	<i>Cornus sericea</i> Shrubland	SAD
A.971	<i>Salix bebbiana</i> Temporarily Flooded Shrubland Alliance		
	CEGL001173	<i>Salix bebbiana</i> Shrubland	None
A.972	<i>Salix boothii</i> Temporarily Flooded Shrubland Alliance		
	CEGL001178	<i>Salix boothii</i> / <i>Carex utriculata</i> Shrubland	None
	CEGL001180	<i>Salix boothii</i> / Mesic Forbs Shrubland	None
A.973	<i>Salix drummondiana</i> Temporarily Flooded Shrubland Alliance		
	CEGL001192	<i>Salix drummondiana</i> / Mesic Forbs Shrubland	SAD
	CEGL002667	<i>Salix drummondiana</i> / <i>Calamagrostis canadensis</i> Shrubland	None
A.975	<i>Salix geyeriana</i> Temporarily Flooded Shrubland Alliance		
	CEGL002666	<i>Salix geyeriana</i> / Mesic Forbs Shrubland	None
A.980	<i>Salix lutea</i> Temporarily Flooded Shrubland Alliance		
	CEGL003780	<i>Salix lutea</i> Shrubland	None
A.986	<i>Alnus incana</i> Seasonally Flooded Shrubland Alliance		
	N/A	Undescribed Association	None
A.995	<i>Betula nana</i> Seasonally Flooded Shrubland Alliance		

		CEGL001079	Betula nana / Carex utriculata Shrubland	SAD
		CEGL005887	Betula nana / Carex spp. Shrubland	None
A.996	Betula occidentalis Seasonally Flooded Shrubland Alliance			
		CEGL001080	Betula occidentalis Shrubland	None
A.1001	Salix boothii Seasonally Flooded Shrubland Alliance			
		CEGL001175	Salix boothii / Calamagrostis canadensis Shrubland	None
A.1002	Salix candida Seasonally Flooded Shrubland Alliance			
		N/A	Undescribed Association	None
A.1003	Salix commutata Seasonally Flooded Shrubland Alliance			
		CEGL003497	Salix commutata / Mesic Graminoid Shrubland	SAD
A.1004	Salix drummondiana Seasonally Flooded Shrubland Alliance			
		CEGL002631	Salix drummondiana / Carex utriculata Shrubland	None
		N/A	Undescribed Association	None
A.2599	Salix sitchensis Seasonally Flooded Shrubland Alliance			
		N/A	Undescribed Association	None
N/A	Undescribed Alliance			
		Park Special 4	Salix pseudomonticola Shrubland	SAD

Rocky Mountain Wet Meadow and Snowbed Group

CSW Dwarf-shrub/Herbaceous Complex: Mesic - Wet

A.915	Acer glabrum Shrubland Alliance			
		CEGL001061	Acer glabrum Avalanche Chute Shrubland	SAD, SDS
A.970	Ribes lacustre Temporarily Flooded Shrubland Alliance			
		CEGL005889	Ribes lacustre / Chamerion angustifolium Shrubland [Provisional]	SDS, SAD
A.1084	Phyllodoce glanduliflora Dwarf-shrubland Alliance			
		CEGL005877	Phyllodoce glanduliflora / Sibbaldia procumbens Dwarf-shrubland	None
A.1096	Kalmia microphylla Saturated Dwarf-shrubland Alliance			
		CEGL001402	Kalmia microphylla / Carex nigricans Dwarf-shrubland	None
A.1117	Salix arctica Dwarf-shrubland Alliance			
		CEGL001431	Salix arctica - (Salix petrophila, Salix nivalis) / Polygonum bistortoides Dwarf-shrubland	None
		CEGL005878	Salix arctica / Carex nigricans Dwarf-shrubland	None

A.1300	Carex spectabilis Herbaceous Alliance		
	CEGL005867	Carex spectabilis - Arnica X diversifolia Herbaceous Vegetation	HWM
A.1308	Carex scirpoidea Herbaceous Alliance		
	CEGL005866	Carex scirpoidea - Zigadenus elegans Herbaceous Vegetation	HWM
A.1325	Juncus parryi Herbaceous Alliance		
	CEGL005871	Juncus parryi / Sibbaldia procumbens Herbaceous Vegetation	None
A.1326	Kobresia myosuroides Herbaceous Alliance		
	CEGL005872	Kobresia myosuroides - Euphrasia disjuncta Herbaceous Vegetation	None
A.1374	Juncus balticus Seasonally Flooded Herbaceous Alliance		
	CEGL001838	Juncus balticus Herbaceous Vegetation	HWM
A.1400	Calamagrostis canadensis Seasonally Flooded Herbaceous Alliance		
	CEGL001559	Calamagrostis canadensis Western Herbaceous Vegetation	HWM
A.1418	Carex nigricans Seasonally Flooded Herbaceous Alliance		
	CEGL005824	Carex nigricans - Sibbaldia procumbens Herbaceous Vegetation	HWM
A.1600	Xerophyllum tenax Herbaceous Alliance		
	CEGL005859	Xerophyllum tenax Herbaceous Vegetation	CSA
A.1611	Valeriana sitchensis Herbaceous Alliance		
	CEGL001998	Valeriana sitchensis - Veratrum viride Herbaceous Vegetation	HWM
A.1625	Athyrium americanum Sparsely Vegetated Alliance		
	CEGL005900	Athyrium americanum - Cryptogramma acrostichoides Sparse Vegetation	VCT
A.1661	Heracleum maximum Temporarily Flooded Herbaceous Alliance		
	CEGL005857	Heracleum maximum Herbaceous Vegetation	None
A.1667	Senecio triangularis Temporarily Flooded Herbaceous Alliance		
	CEGL001987	Senecio triangularis Herbaceous Vegetation	HWM
A.2630	Arenaria capillaris Herbaceous Alliance		
	CEGL005855	Arenaria capillaris / Polytrichum piliferum Herbaceous Vegetation	VCT
A.2631	Trollius laxus Saturated Herbaceous Alliance		
	CEGL005858	Trollius laxus - Parnassia fimbriata Herbaceous Vegetation	HWM
A.2632	Vaccinium membranaceum Shrubland Alliance		
	CEGL005891	Vaccinium membranaceum / Xerophyllum tenax Shrubland	SAD, CSA, SMR

A.2640	Carex paysonis Herbaceous Alliance		
	CEGL005865	Carex paysonis - Sibbaldia procumbens Herbaceous Vegetation	CSA
A.2641	Luzula glabrata var. hitchcockii Herbaceous Alliance		
	CEGL005873	Luzula glabrata var. hitchcockii - Erythronium grandiflorum Herbaceous Vegetation	None
N/A	Undescribed Alliance		
	Park Special 3	Carex athrostachya Herbaceous Vegetation	HWM

Western North America Emergent Marsh Group

HWM Wet Meadow Herbaceous

A.1300	Carex spectabilis Herbaceous Alliance		
	CEGL005867	Carex spectabilis - Arnica X diversifolia Herbaceous Vegetation	CSW
A.1308	Carex scirpoidea Herbaceous Alliance		
	CEGL005866	Carex scirpoidea - Zigadenus elegans Herbaceous Vegetation	CSW
A.1374	Juncus balticus Seasonally Flooded Herbaceous Alliance		
	CEGL001838	Juncus balticus Herbaceous Vegetation	CSW
A.1381	Phalaris arundinacea Seasonally Flooded Herbaceous Alliance		
	CEGL001474	Phalaris arundinacea Western Herbaceous Vegetation	HSF, HPF
A.1396	Carex atherodes Seasonally Flooded Herbaceous Alliance		
	CEGL002220	Carex atherodes Herbaceous Vegetation	HSF
A.1400	Calamagrostis canadensis Seasonally Flooded Herbaceous Alliance		
	CEGL001559	Calamagrostis canadensis Western Herbaceous Vegetation	CSW
A.1403	Carex (rostrata, utriculata) Seasonally Flooded Herbaceous Alliance		
	CEGL001562	Carex utriculata Herbaceous Vegetation	HSF, HPF
A.1408	Deschampsia caespitosa Seasonally Flooded Herbaceous Alliance		
	CEGL001599	Deschampsia caespitosa Herbaceous Vegetation	None
A.1409	Poa palustris Semi-natural Seasonally Flooded Herbaceous Alliance		
	CEGL001659	Poa palustris Herbaceous Vegetation	HGL
A.1411	Carex microptera Seasonally Flooded Herbaceous Alliance		
	CEGL001792	Carex microptera Herbaceous Vegetation	None
A.1413	Carex buxbaumii Seasonally Flooded Herbaceous Alliance		
	CEGL001806	Carex buxbaumii Herbaceous Vegetation	HSF, HPF

A.1415	Carex lasiocarpa Seasonally Flooded Herbaceous Alliance			
		CEGL001810	Carex lasiocarpa Herbaceous Vegetation	HSF, HPF
A.1418	Carex nigricans Seasonally Flooded Herbaceous Alliance			
		CEGL005824	Carex nigricans - Sibbaldia procumbens Herbaceous Vegetation	CSW
A.1422	Eleocharis palustris Seasonally Flooded Herbaceous Alliance			
		CEGL001833	Eleocharis palustris Herbaceous Vegetation	HPF, HES
A.1611	Valeriana sitchensis Herbaceous Alliance			
		CEGL001998	Valeriana sitchensis - Veratrum viride Herbaceous Vegetation	CSW
A.1667	Senecio triangularis Temporarily Flooded Herbaceous Alliance			
		CEGL001987	Senecio triangularis Herbaceous Vegetation	CSW
A.1678	Equisetum fluviatile Semipermanently Flooded Herbaceous Alliance			
		CEGL002746	Equisetum fluviatile Herbaceous Vegetation	HSF, HPF
A.2501	Carex vesicaria Seasonally Flooded Herbaceous Alliance			
		CEGL002661	Carex vesicaria Herbaceous Vegetation	HSF, HPF
A.2631	Trollius laxus Saturated Herbaceous Alliance			
		CEGL005858	Trollius laxus - Parnassia fimbriata Herbaceous Vegetation	CSW
A.2642	Argentina anserina Herbaceous Alliance [Provisional]			
		CEGL005825	Argentina anserina Herbaceous Vegetation [Provisional]	None
A.3535	Chamerion angustifolium Herbaceous Alliance			
		CEGL005856	Chamerion angustifolium Rocky Mountain Herbaceous Vegetation [Provisional]	HGL, SMR
N/A	Undescribed Alliance			
		Park Special 3	Carex athrostachya Herbaceous Vegetation	CSW

HSF Semi-permanently Flooded Herbaceous

A.1381	Phalaris arundinacea Seasonally Flooded Herbaceous Alliance			
		CEGL001474	Phalaris arundinacea Western Herbaceous Vegetation	HWM, HPF
A.1396	Carex atherodes Seasonally Flooded Herbaceous Alliance			
		CEGL002220	Carex atherodes Herbaceous Vegetation	HWM
A.1398	Dulichium arundinaceum Seasonally Flooded Herbaceous Alliance			
		CEGL001831	Dulichium arundinaceum Seasonally Flooded Herbaceous Vegetation	HPF
A.1403	Carex (rostrata, utriculata) Seasonally Flooded Herbaceous Alliance			

		CEGL001562	Carex utriculata Herbaceous Vegetation	HWM, HPF
A.1404	Carex aquatilis Seasonally Flooded Herbaceous Alliance			
		CEGL001802	Carex aquatilis Herbaceous Vegetation	HPF
		CEGL001803	Carex aquatilis - Carex utriculata Herbaceous Vegetation	HPF
A.1413	Carex buxbaumii Seasonally Flooded Herbaceous Alliance			
		CEGL001806	Carex buxbaumii Herbaceous Vegetation	HWM, HPF
A.1415	Carex lasiocarpa Seasonally Flooded Herbaceous Alliance			
		CEGL001810	Carex lasiocarpa Herbaceous Vegetation	HWM, HPF
A.1416	Carex limosa Seasonally Flooded Herbaceous Alliance			
		CEGL001811	Carex limosa Herbaceous Vegetation	HPF
A.1422	Eleocharis palustris Seasonally Flooded Herbaceous Alliance			
		CEGL001833	Eleocharis palustris Herbaceous Vegetation	HWM, HES
A.1436	Typha (angustifolia, latifolia) - (Schoenoplectus spp.) Semipermanently Flooded Herbaceous Alliance			
		CEGL002010	Typha (latifolia, angustifolia) Western Herbaceous Vegetation	HPF
A.1443	Schoenoplectus acutus - (Schoenoplectus tabernaemontani) Semipermanently Flooded Herbaceous Alliance			
		CEGL002623	Schoenoplectus tabernaemontani Temperate Herbaceous Vegetation	HPF
A.1678	Equisetum fluviatile Semipermanently Flooded Herbaceous Alliance			
		CEGL002746	Equisetum fluviatile Herbaceous Vegetation	HWM, HPF
A.2501	Carex vesicaria Seasonally Flooded Herbaceous Alliance			
		CEGL002661	Carex vesicaria Herbaceous Vegetation	HWM, HPF
HPF	Permanently Flooded Herbaceous			
A.1381	Phalaris arundinacea Seasonally Flooded Herbaceous Alliance			
		CEGL001474	Phalaris arundinacea Western Herbaceous Vegetation	HWM, HSF
A.1398	Dulichium arundinaceum Seasonally Flooded Herbaceous Alliance			
		CEGL001831	Dulichium arundinaceum Seasonally Flooded Herbaceous Vegetation	HSF
A.1403	Carex (rostrata, utriculata) Seasonally Flooded Herbaceous Alliance			
		CEGL001562	Carex utriculata Herbaceous Vegetation	HWM, HSF
A.1404	Carex aquatilis Seasonally Flooded Herbaceous Alliance			
		CEGL001802	Carex aquatilis Herbaceous Vegetation	HSF
		CEGL001803	Carex aquatilis - Carex utriculata Herbaceous Vegetation	HSF

A.1413	Carex buxbaumii Seasonally Flooded Herbaceous Alliance	CEGL001806	Carex buxbaumii Herbaceous Vegetation	HWM, HSF
A.1415	Carex lasiocarpa Seasonally Flooded Herbaceous Alliance	CEGL001810	Carex lasiocarpa Herbaceous Vegetation	HWM, HSF
A.1416	Carex limosa Seasonally Flooded Herbaceous Alliance	CEGL001811	Carex limosa Herbaceous Vegetation	HSF
A.1436	Typha (angustifolia, latifolia) - (Schoenoplectus spp.) Semipermanently Flooded Herbaceous Alliance	CEGL002010	Typha (latifolia, angustifolia) Western Herbaceous Vegetation	HSF
A.1443	Schoenoplectus acutus - (Schoenoplectus tabernaemontani) Semipermanently Flooded Herbaceous Alliance	CEGL002623	Schoenoplectus tabernaemontani Temperate Herbaceous Vegetation	HSF
A.1678	Equisetum fluviatile Semipermanently Flooded Herbaceous Alliance	CEGL002746	Equisetum fluviatile Herbaceous Vegetation	HWM, HSF
A.1761	Myriophyllum sibiricum Permanently Flooded Herbaceous Alliance	CEGL002000	Myriophyllum sibiricum Herbaceous Vegetation	None
A.1764	Stuckenia pectinata Permanently Flooded Herbaceous Alliance	CEGL002003	Stuckenia pectinata - Myriophyllum (sibiricum, spicatum) Herbaceous Vegetation	None
A.1984	Nymphaea odorata - Nuphar spp. Permanently Flooded Temperate Herbaceous Alliance	CEGL002001	Nuphar lutea ssp. polysepala Herbaceous Vegetation	None
A.2501	Carex vesicaria Seasonally Flooded Herbaceous Alliance	CEGL002661	Carex vesicaria Herbaceous Vegetation	HWM, HSF
N/A	Undescribed Alliance	N/A	Undescribed Association	None

Rocky Mountain Shoreline Vegetation Group

HES Exposed Shoreline Herbaceous: Pioneering Vegetation

A.1079	Arctostaphylos uva-ursi Dwarf-shrubland Alliance	CEGL001833	Eleocharis palustris Herbaceous Vegetation	HWM, HSF
A.1422	Eleocharis palustris Seasonally Flooded Herbaceous Alliance	CEGL005868	Elymus repens Semi-natural Herbaceous Vegetation	HGL
A.1534	Dasiphora fruticosa ssp. floribunda Shrub Herbaceous Alliance	CEGL005830	Arctostaphylos uva-ursi / Festuca campestris - Festuca idahoensis Dwarf-shrubland	DBB, HGL, CSA

	A.2629	Dryas drummondii Dwarf-shrubland Alliance			
		CEGL005834	Dryas drummondii / Chamerion latifolium Dwarf-shrubland		VSL, VEE
	A.2658	Elymus repens Herbaceous Alliance			
		N/A	Undescribed Association		SDS
	N/A	Undescribed Alliance			
		Park Special 2	Gravel Bar Early Successional Vegetation		VSL, VEE
VEE	Exposed Shoreline Sparse Vegetation (eroded embankment phase)				
	A.2629	Dryas drummondii Dwarf-shrubland Alliance			
		CEGL005834	Dryas drummondii / Chamerion latifolium Dwarf-shrubland		HES, VSL
	N/A	Undescribed Alliance			
		Park Special 2	Gravel Bar Early Successional Vegetation		HES, VSL
VSL	Exposed Shoreline Sparse Vegetation (wet riparian/basin phase)				
	A.2629	Dryas drummondii Dwarf-shrubland Alliance			
		CEGL005834	Dryas drummondii / Chamerion latifolium Dwarf-shrubland		HES, VEE
	N/A	Undescribed Alliance			
		Park Special 2	Gravel Bar Early Successional Vegetation		HES, VEE

Semi-Desert Scrub and Grassland Class

Cool Semi-Desert Scrub and Grassland Subclass

Cool Semi-Desert Scrub and Grassland Formation

Northern Great Basin Shrub Steppe and Grassland MacroGroup

Inter-Mountain Basin Montane Sagebrush Steppe Group

HSS Sagebrush - Fescue Shrub Herbaceous

	A.1526	Artemisia tridentata ssp. vaseyana Shrub Herbaceous Alliance			
		CEGL001531	Artemisia tridentata ssp. vaseyana / Festuca campestris Shrub Herbaceous Vegetation		None
		CEGL001533	Artemisia tridentata ssp. vaseyana / Festuca idahoensis Shrub Herbaceous Vegetation		None

Polar and High Montane Vegetation Class

Temperate and Boreal Alpine Vegetation Subclass

Alpine Scrub, Forb Meadow, and Grassland Formation

Rocky Mountain Alpine Scrub, Forb Meadow, and Grassland MacroGroup

Rocky Mountain Alpine Dry Scrub and Fell-field Group

DBB	Bearberry Dwarf-shrubland				
		A.1079	Arctostaphylos uva-ursi Dwarf-shrubland Alliance		
			CEGL005830	Arctostaphylos uva-ursi / Festuca campestris - Festuca idahoensis Dwarf-shrubland	HGL, HES, CSA
			CEGL005831	Arctostaphylos uva-ursi / Pseudoroegneria spicata Dwarf-shrubland	CSA
			CEGL005832	Arctostaphylos uva-ursi / Solidago multiradiata Dwarf-shrubland	CSA
DWD	White Dryad Dwarf-shrubland				
		A.1577	Dryas octopetala Dwarf-shrub Herbaceous Alliance		
			CEGL001892	Dryas octopetala - Carex rupestris Dwarf-shrub Herbaceous Vegetation	CSA
			CEGL001894	Dryas octopetala - Polygonum viviparum Dwarf-shrub Herbaceous Vegetation	CSA
Rocky Mountain Alpine Meadow Group					
CSA	Dwarf-shrub/Herbaceous Complex: Dry - Mesic				
		A.808	Juniperus communis Shrubland Alliance		
			N/A	Undescribed Association	None
		A.913	Amelanchier alnifolia Shrubland Alliance		
			CEGL005885	Amelanchier alnifolia / (Mixed Grass, Forb) Shrubland	SAD, SDS, SMR
			N/A	Undescribed Association	SDS, HGL, SMR
		A.963	Salix glauca Temporarily Flooded Shrubland Alliance		
			CEGL001136	Salix glauca Shrubland	None
		A.1079	Arctostaphylos uva-ursi Dwarf-shrubland Alliance		
			CEGL005830	Arctostaphylos uva-ursi / Festuca campestris - Festuca idahoensis Dwarf-shrubland	DBB, HGL, HES
			CEGL005831	Arctostaphylos uva-ursi / Pseudoroegneria spicata Dwarf-shrubland	DBB
			CEGL005832	Arctostaphylos uva-ursi / Solidago multiradiata Dwarf-shrubland	DBB
		A.1114	Vaccinium (caespitosum, myrtillus, scoparium) Dwarf-shrubland Alliance		
			CEGL005879	Vaccinium (myrtillus, scoparium) / Luzula glabrata var. hitchcockii Dwarf-shrubland	None
		A.1265	Pseudoroegneria spicata Herbaceous Alliance		
			CEGL001677	Pseudoroegneria spicata - Poa secunda Herbaceous Vegetation	HGL
			CEGL005861	Bromus marginatus - Pseudoroegneria spicata Herbaceous Vegetation [Provisional]	HGL
		A.1313	Festuca idahoensis Alpine Herbaceous Alliance		
			CEGL001623	Festuca idahoensis - (Festuca campestris) / Potentilla diversifolia Herbaceous Vegetation	HGL
		A.1534	Dasiphora fruticosa ssp. floribunda Shrub Herbaceous Alliance		

		CEGL001502	Dasiphora fruticosa ssp. floribunda / Festuca idahoensis Shrub Herbaceous Vegetation	HGL
		CEGL001503	Dasiphora fruticosa ssp. floribunda / Festuca campestris Shrub Herbaceous Vegetation	HGL
		CEGL005833	Dasiphora fruticosa ssp. floribunda / Artemisia michauxiana Shrub Herbaceous Vegetation [Provisional]	VCT
A.1577	Dryas octopetala Dwarf-shrub Herbaceous Alliance			
		CEGL001892	Dryas octopetala - Carex rupestris Dwarf-shrub Herbaceous Vegetation	DWD
		CEGL001894	Dryas octopetala - Polygonum viviparum Dwarf-shrub Herbaceous Vegetation	DWD
A.1600	Xerophyllum tenax Herbaceous Alliance			
		CEGL005859	Xerophyllum tenax Herbaceous Vegetation	CSW
A.1603	Aquilegia (caerulea, flavescens) Sparsely Vegetated Alliance			
		CEGL005899	Aquilegia flavescens - Senecio megacephalus Sparse Vegetation	VCT
A.2632	Vaccinium membranaceum Shrubland Alliance			
		CEGL005891	Vaccinium membranaceum / Xerophyllum tenax Shrubland	SAD, CSW, SMR
A.2634	Phacelia hastata Sparsely Vegetated Alliance			
		CEGL005901	Phacelia hastata - (Penstemon ellipticus) Sparse Vegetation	VCT
	Park Special 1		Penstemon ellipticus Dwarf-shrubland	VCT
A.2636	Spiraea betulifolia Shrubland Alliance			
		CEGL005835	Spiraea betulifolia Shrubland	SDS, SMR
A.2638	Carex albonigra Herbaceous Alliance			
		CEGL005863	Carex albonigra - Myosotis asiatica Herbaceous Vegetation	VCT
		CEGL005864	Carex geveeri Herbaceous Vegetation	HGL
A.2640	Carex paysonis Herbaceous Alliance			
		CEGL005865	Carex paysonis - Sibbaldia procumbens Herbaceous Vegetation	CSW
N/A	Undescribed Alliance			
	Park Special 5		Undefined Sparse Vegetation	VCT

Nonvascular and Sparse Vascular Vegetation Class

Mediterranean, Temperate, and Boreal Nonvascular and Sparse Vascular Vegetation Subclass

Temperate and Boreal Cliff, Scree, Talus, and Other Rock Vegetation Formation

Rocky Mountain Cliff, Scree, Talus, and Other Rock Vegetation MacroGroup

Rocky Mountain Alpine Cliff, Scree, and Other Rock Vegetation Group

VCT Cliff/Talus Sparse Vegetation

A.1534	Dasiphora fruticosa ssp. floribunda Shrub Herbaceous Alliance				
	CEGL005833	Dasiphora fruticosa ssp. floribunda / Artemisia michauxiana Shrub Herbaceous Vegetation [Provisional]			CSA
A.1603	Aquilegia (caerulea, flavescens) Sparsely Vegetated Alliance				
	CEGL005899	Aquilegia flavescens - Senecio megacephalus Sparse Vegetation			CSA
A.1625	Athyrium americanum Sparsely Vegetated Alliance				
	CEGL005900	Athyrium americanum - Cryptogramma acrostichoides Sparse Vegetation			CSW
A.1632	Saxifraga (chrysantha, mertensiana) Sparsely Vegetated Alliance				
	CEGL005903	Saxifraga mertensiana Cliff Crevice Sparse Vegetation			None
A.2630	Arenaria capillaris Herbaceous Alliance				
	CEGL005855	Arenaria capillaris / Polytrichum piliferum Herbaceous Vegetation			CSW
A.2634	Phacelia hastata Sparsely Vegetated Alliance				
	CEGL005901	Phacelia hastata - (Penstemon ellipticus) Sparse Vegetation			CSA
	Park Special 1	Penstemon ellipticus Dwarf-shrubland			CSA
A.2635	Saxifraga bronchialis Sparsely Vegetated Alliance				
	CEGL005902	Saxifraga bronchialis Scree Slope Sparse Vegetation			None
A.2638	Carex albonigra Herbaceous Alliance				
	CEGL005863	Carex albonigra - Myosotis asiatica Herbaceous Vegetation			CSA
N/A	Undescribed Alliance				
	Park Special 5	Undefined Sparse Vegetation			CSA

Agricultural Vegetation Class

Herbaceous Agricultural Vegetation Subclass

Cultivated Crop Formation

Temperate and Tropical Row Crop/Close Grown Crop MacroGroup

Temperate Row Crop/Close Grown Crop Group

XHC	Hayfield/Cropland	N/A	N/A	N/A	None
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Non-vegetated Land (non-NVC Class)

Terrestrial Natural Non-vegetated Land (non-NVC Subclass)

Glacier, Ice, and Snowfield (non-NVC Formation)

Perennial Glacier and Snowfield (non-NVC MacroGroup)

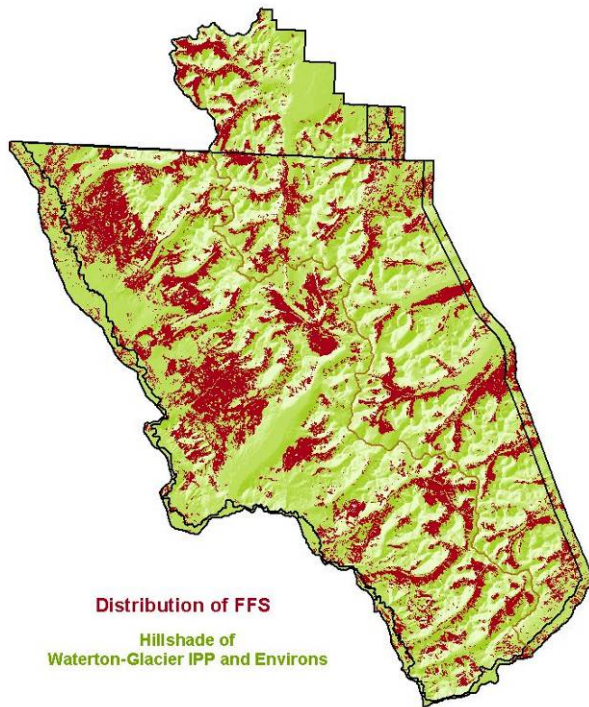
Mountain Perennial Glacier and Snowfield (non-NVC Group)

NGS	Glacier/Snowfield	N/A	N/A	N/A	None
Water-body (non-NVC Formation)					
Open Water-body (non-NVC MacroGroup)					
Open Water Stream/River and Lake/Pond (non-NVC Group)					
NST	Stream/River	N/A	N/A	N/A	None
NLP	Natural/Artificial Lake/Pond	N/A	N/A	N/A	None
Terrestrial Cultural Non-vegetated Land (non-NVC Subclass)					
Developed Land (non-NVC Formation)					
Developed and Other Cultural Area (non-NVC MacroGroup)					
Developed Area (non-NVC Group)					
NRC	Residential/Commercial Area	N/A	N/A	N/A	None
Other Cultural Area (non-NVC Group)					
NQR	Quarry	N/A	N/A	N/A	None
NRR	Road/Railroad	N/A	N/A	N/A	None

Subalpine Fir - Engelmann Spruce Forest (FFS)

Description of the Map Class

The Subalpine Fir - Engelmann Spruce Forest (FFS) map class is ubiquitous throughout the Waterton-Glacier IPP vegetation map, reaching all elevations in montane and subalpine. The FFS map class was also the most frequently used map class in the project (see the Distribution of FFS figure below).



We mapped FFS on a wide variety of aspects and slopes throughout Waterton-Glacier IPP. Stands can have a closed or open canopy with >25% total tree cover. Stands range from large and contiguous to small and isolated. The FFS map class represents large monotypic stands of subalpine fir and/or Engelmann spruce, or spruce-fir mixed with considerable amounts of Douglas-fir, western larch, and/or lodgepole, or spruce-fir mixed with lesser amounts of ponderosa pine, or spruce-fir mixed with significantly lesser amounts of western hemlock and/or western red-cedar, or spruce-fir mixed with significantly lesser amounts of deciduous trees (aspen, cottonwood, birch).

We mapped FFS when subalpine fir and/or Engelmann spruce were >75% RD to western red-cedar and/or western hemlock. Outside of cedar-hemlock, we mapped FFS when subalpine fir and/or Engelmann spruce were >25% RD to Douglas-fir, western

larch, and/or lodgepole pine. Also, the deciduous component of the stand was <25% RD to conifer trees.

The FFS map class captures not only mature stands of spruce-fir forests, but also early successional forests. Often, spruce-fir thrives in the cool of old growth lodgepole pine, western larch, or Douglas-fir forests, and once those forests breakdown (often from insect, disease, blowdown, or even logging adjacent to Waterton-Glacier IPP) and the spruce-fir reaches >25% RD to other trees in the emerging tree canopy layer, we capture the stand with the FFS map class.

Typically, when spruce-fir trees fall below 5 m in height, we use the Subalpine Fir - Engelmann Spruce Woodland (WFS) map class. However, in instances of young successional spruce-fir, we continued to use the FFS map class. This is somewhat uncommon, but is typical to stands of forest regeneration due to post fire, insect infestation, disease, blowdown, and logging (external to Waterton-Glacier IPP). For stands <5 m in height due to perennial environmental factors (e.g., high elevation, wind, avalanche and snow burial), we then used the WFS map class when deciduous shrubs <25% RD to spruce fir, or the Mixed Conifer - Deciduous Shrubland: Avalanche/Snow Burial (SAM) map class when deciduous shrubs >25% RD to spruce-fir.

For spruce-fir stands >5 m in height, tree canopy density was not the key factor in differentiating between the forest or woodland map classes (FFS vs. WFS). To make this distinction, we looked to the understory. We typically mapped FFS for stands with rich shrub/forb understories, and we typically mapped WFS for stands with understories characteristic of the Dwarf-shrub/Herbaceous Complex: Dry - Mesic (CSA) map class.

Occasionally, spruce-fir stands have a dog-hair growth pattern, similar to contiguous lodgepole pine stands. In these instances, the interpretation became difficult to discern whether to map these areas as FFS or the Lodgepole Pine Forest (FLP) map class. Some good examples of this occur at the border between WLNP and GNP in the Belly River basin, and in proximity of Two Medicine Lake. Furthermore, with only 25% RD of subalpine fir and/or Engelmann spruce needed to map a forest stand with the FFS map class, we trained our interpretive eyes away from the more dominant tree species, whether it was western larch, Douglas-fir, or lodgepole pine, and focused on the RD of spruce-fir, even though they were the lesser tree species in the stand.

Occasionally, an evenly mixed stand of Douglas-fir and lodgepole pine exhibited a signature on the aerial photos similar to that of the FFS map class. This was due to the common mixture of various conifer tree species usually associated with FFS. With only 25% RD of subalpine fir and/or Engelmann spruce needed to map with the FFS map class, a choppy mix of Douglas-fir and lodgepole pine could bias the photointerpreter towards the FFS map class.

When subalpine fir and/or Engelmann spruce is mixed with >25% RD deciduous trees (aspen, cottonwood, birch), we mapped the stand with the Mixed Conifer - Deciduous Forest (FEP) map class, regardless of stand tree height (even <5 m). When spruce-fir <5 m is mixed with >25% RD deciduous shrubs (not aspen, cottonwood, birch), we mapped using the Mixed Conifer - Deciduous Shrubland: Avalanche/Snow Burial (SAM) map class. Noteworthy, the SAM map class is host to numerous mixtures of conifer and deciduous tree and shrub species. In other words, all SAM map classes do not necessarily represent the spruce-fir/deciduous shrub mix. We believe, however, the spruce-fir/deciduous shrub mix to be much more common than deciduous shrub mixes with other conifers, such as Douglas-fir or lodgepole pine. In hindsight, knowing what we know now about classification and distribution, we could have mapped these scenarios separately from other conifer-deciduous shrub mixes.

Although FFS was used to capture spruce-fir forests in riparian and basin settings, when Engelmann spruce dominated the stand (90% RD of spruce) in wet-mesic settings, we used the Engelmann Spruce Forest (FSP) map class to represent the wet-mesic forest.

Overriding all of the above, we mapped stands of >10% RD of whitebark pine to any other species, including spruce-fir, with the Whitebark Pine Woodland (WWB) map class. Likewise, stands of >10% RD of limber pine were mapped with the Limber Pine Woodland (WLM) map class.

Relationship to the Vegetation Classification

The Subalpine Fir - Engelmann Spruce Forest (FFS) map class represents 24 described associations*. Of these 24 associations, 9 are unique to this map class, whereas the other 15 associations are also incorporated into other map classes. The 24 associations comprise 5 described alliances, of which 4 are also included in other map classes (the other one being unique to the FFS map class). Refer to Table J-1 for association and alliance relationship to other map classes.

In our study, we recognize the most common communities captured by FFS in the lower to mid subalpine to be *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest and *Abies lasiocarpa* - *Picea engelmannii* / *Alnus viridis* ssp. *sinuata* Forest. The later community is more indicative of very mesic sites. At higher subalpine, these two communities phase out and *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Xerophyllum tenax* Forest and *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* / *Xerophyllum tenax* Forest become prominent.

More common to west of the CD and located in the lower to mid subalpine are the *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* - *Xerophyllum tenax* Forest, *Abies lasiocarpa* - *Picea engelmannii* / *Clintonia uniflora* Forest, *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest, *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest, and *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium caespitosum* Forest.

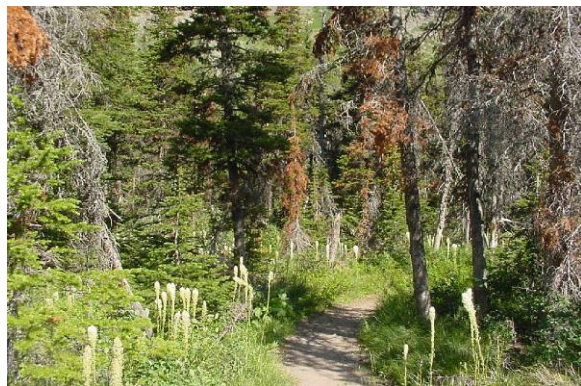
We believe numerous notable subalpine fir-Engelmann Spruce communities are captured with the FFS map class. Noteworthy are a few. The *Picea engelmannii* / *Vaccinium caespitosum* Forest is rare, located to the far northeast corner of GNP in proximity to Chief Mountain International Highway. Here, hybrid spruce are reaching lower elevations in frost pockets at the escarpment base to the foothills.

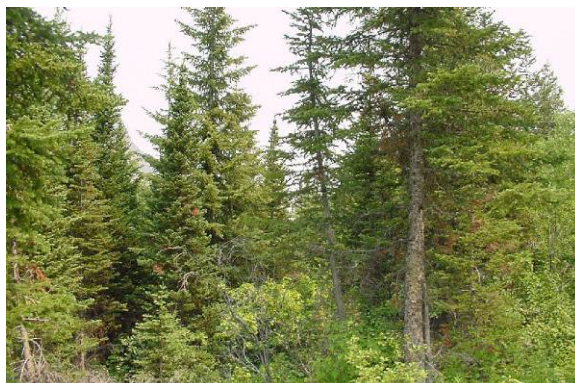
Also noteworthy is *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* / *Thalictrum occidentale* Forest, which is very common in Montana, but with the mild and moist climate at Waterton-Glacier IPP, it is uncommon to rare, and confined east of the CD.

We also observe *Abies lasiocarpa* - *Picea engelmannii* / *Calamagrostis canadensis* Forest as being captured by FFS on occasion, yet the Engelmann Spruce Forest (FSP) map class captures this particular forest community more readily. This is true of *Abies lasiocarpa* - *Picea engelmannii* / *Oplopanax horridus* Forest, too. Yet, *Oplopanax horridus* is at its eastern range of distribution, and is considered uncommon to rare at GNP and restricted west of the CD.

Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures





Accuracy Assessment Results

Glacier National Park

☺ Users' Accuracy: 88% with 90% confidence interval of 79–98% (n = 43)

☹ Producers' Accuracy: 67% with 90% confidence interval of 56–78% (n = 57)

Waterton Lakes National Park

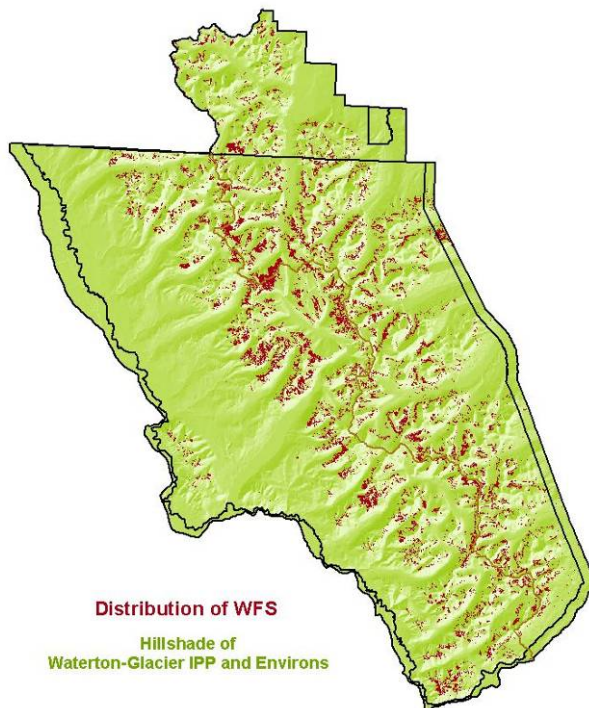
☺ Users' Accuracy: 63% with 90% confidence interval of 42–84% (n = 19)

☺ Producers' Accuracy: 80% with 90% confidence interval of 60–100% (n = 15)

Subalpine Fir - Engelmann Spruce Woodland (WFS)

Description of the Map Class

The Subalpine Fir - Engelmann Spruce Woodland (WFS) map class is common throughout the vegetation map on rocky cliffs of high mountain slopes and scree talus slopes in the upper montane to high subalpine. When mapping, WFS was most common near the tree line in the subalpine, and also common on rocky outcrops in the lower elevations. The WFS map class was frequently used in the mapping of Waterton-Glacier IPP (see the Distribution of WFS figure below).



We mapped WFS on a wide variety of aspects and slopes throughout Waterton-Glacier IPP. Stands can have a closed or open canopy, even down to 10% total tree cover. When stands are more closed (>60% total cover), trees can occasionally reach more than 10 m in height, as they approach forest characteristics in the understory. In fact, many fir-spruce forest and woodland communities overlap between the WFS and the Subalpine Fir - Engelmann Spruce Forest (FFS) map classes. When stands are sparse with spruce-fir (10-25% spruce-fir cover), the understory communities are often described and mapped with the Dwarf-shrub/Herbaceous Complex: Dry - Mesic (CSA) and the Cliff/Talus Sparse Vegetation (VCT) map classes. Spruce-fir types mapped with WFS range from large and contiguous to small and isolated. The WFS map class generally represents stands that are monotypic subalpine fir and/or Engelmann spruce, yet occasionally the spruce-fir is mixed with Douglas-fir,

western larch, and/or lodgepole pine. Stands mapped with the WFS map class have <25% RD of deciduous trees. Also, when WFS stands are mapped with spruce-fir <5 m in height, then <25% RD of deciduous shrubs. Deciduous shrubs, however, may be >25% RD when spruce-fir is >5 m in height.

We mapped spruce-fir as WFS when <5 m in height, with the exception of obvious reforestation scenarios; e.g., early forest succession from post fire, insect infestation, disease, blowdown, and even logging activities. These spruce-fir stands <5 m in height were typically in lower elevations. For these uncommon exceptions, we applied the Subalpine Fir - Engelmann Spruce Forest (FFS) map class. For stands <5 m in height due to perennial environmental factors (e.g., high elevation, wind, avalanche and snow burial), we then used the WFS map class when deciduous shrubs were <25% RD to spruce fir. If the deciduous shrubs were >25% RD to the short conifers, then we used the Mixed Conifer - Deciduous Shrubland: Avalanche/Snow Burial (SAM) map class.

For spruce-fir stands >5 m in height, tree canopy density was not the key factor in differentiating between the forest or woodland map classes (FFS vs. WFS). Granted, typically the heights for WFS are <10 m in height, but not necessarily restricted to that height. To make this distinction, we looked to the understory. We typically mapped WFS for stands with understories representative of the Dwarf-shrub/Herbaceous Complex: Dry - Mesic (CSA) map class. We mapped FFS for stands with rich shrub/forb understories.

When fir-spruce reached below 2 m in height, having a mat-like appearance on the aerial photos, we then applied the Krummholz Shrubland (SFK) map class to recognize the area.

When subalpine fir and/or Engelmann spruce is mixed with >25% RD deciduous trees (aspen, cottonwood, birch), we mapped the stand with the Mixed Conifer - Deciduous Forest (FEP) map class, regardless of stand tree height (even <5 m). When spruce-fir <5 m in height is mixed with >25% RD deciduous shrubs (not aspen, cottonwood, birch), we mapped using the Mixed Conifer - Deciduous Shrubland: Avalanche/Snow Burial (SAM) map class. Noteworthy, the SAM map class is host to numerous mixtures of conifer and deciduous tree and shrub species. In other words, all SAM map classes do not necessarily represent the spruce-fir/deciduous shrub mix. We believe, however, the spruce-fir/deciduous shrub mix to be much more common than deciduous shrub mixes with other conifers, such as Douglas-fir or lodgepole pine. In hindsight, knowing what we know now about classification and distribution, we could have mapped these scenarios separately from other conifer-deciduous shrub mixes.

As with the FFS map class, overriding all of the above, we mapped stands of >10% RD of whitebark pine to any other species, including spruce-fir, with the Whitebark Pine Woodland (WWB) map class. Likewise, stands of >10% RD of limber pine we mapped with the Limber Pine Woodland (WLM) map class.

Relationship to the Vegetation Classification

The Subalpine Fir - Engelmann Spruce Woodland (WFS) map class represents 14 described associations. Of these 14 associations, just 1 is unique to this map class, whereas the other 13 are also part of other map classes. The 14 associations are of 5 described alliances, of which 4 are also part of other map classes (the other being unique to the WFS map class). Refer to Table J-1 for association and alliance relationship to other map classes.

We recognize several subalpine fir-Engelmann Spruce communities are captured with the WFS map class. Most types are of the subalpine and are both east and west of the CD.

Our thinking is *Abies lasiocarpa* - *Picea engelmannii* Krummholz Shrubland is commonly captured by the WFS map class in very high elevations and in high-wind exposed locations. When this krummholz shrubland community is of mat-like physiognomy and is <2 m in height, we mapped it with the Krummholz Shrubland (SFK) map class. In instances where this community grows >2 m, having less of a mat-like appearance, we used the WFS map class to capture the community.

We believe very common to the WFS map class in the higher subalpine of more cool locations (north and east aspects) is *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Xerophyllum tenax* Forest, and *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Luzula glabrata* var. *hitchcockii* Woodland. Likewise in high-subalpine locations, but more on flat areas is *Abies lasiocarpa* - *Picea engelmannii* / *Luzula glabrata* var. *hitchcockii* Woodland.

Warmer locations (south and east aspects) in this same high-subalpine, WFS more likely captures *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium scoparium* / *Xerophyllum tenax* Forest and *Abies lasiocarpa* - *Picea engelmannii* / *Xerophyllum tenax* - *Luzula glabrata* var. *hitchcockii* Woodland.

For spruce-fir woodlands of wetter locations (wetness most likely due to slow melting snowpack) within this high-subalpine zone, the WFS map class most likely captures the *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* - *Luzula glabrata* var. *hitchcockii* Woodland. The *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Forest we believe more prevalently captured by WFS for wet sites of lower elevation in the subalpine.

In the mid-subalpine, except for the coolest locations, WFS very commonly captures *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest. Also, notable is the *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium caespitosum* Forest, which we consider less common to the WFS map class. This type is more prominent west of the CD in frost pockets and tough environments for

spruce-fir to establish. We also believe *Abies lasiocarpa* - *Picea engelmannii* / *Valeriana sitchensis* Woodland is somewhat common to the WFS map class for WLNP, although it is uncommon for GNP and only located east of CD.

We recognize a few more communities, but consider them uncommon to the WFS map class. Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures





Accuracy Assessment Results

Glacier National Park

☹ Users' Accuracy: 73% with 90% confidence interval of 61–86% (n = 41)

☺ Producers' Accuracy: 94% with 90% confidence interval of 85–102% (n = 32)

Waterton Lakes National Park

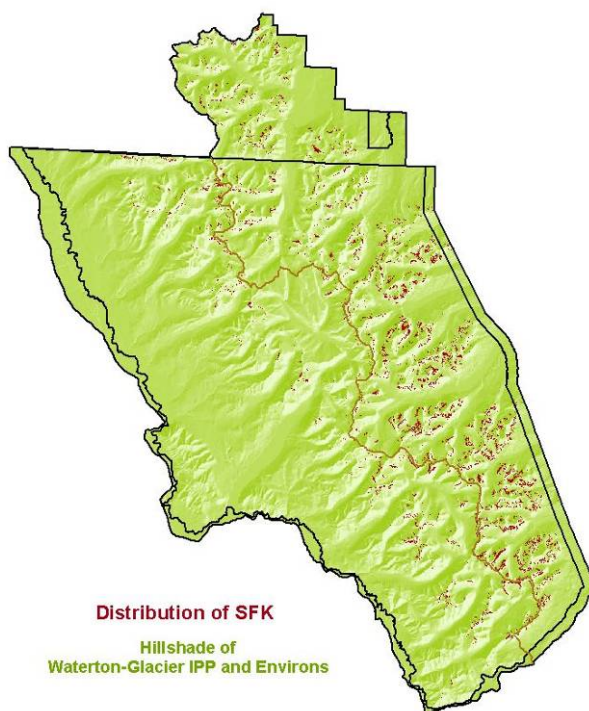
☺ Users' Accuracy: 83% with 90% confidence interval of 50–117% (n = 6)

☹ Producers' Accuracy: 63% with 90% confidence interval of 28–97% (n = 8)

Krummholz Shrubland (SFK)

Description of the Map Class

We used the Krummholz Shrubland (SFK) map class to map low-growing (<2 m), mat-like conifers (of any species), typically found in harsh environments of the mid- to high-subalpine (see the Distribution of SFK figure below). The SFK map class has a unique history. Originally, it was intended for woodlands of low-growing, mat-like spruce-fir communities, so we classified them in with the Subalpine Fir - Engelmann Spruce Woodland (WFS) map class. We applied, however, a special height modifier (the 5 height code) to distinguish them from other spruce-fir woodland stands >2 m in height (e.g., the 4 and 3 height codes). We used this special height modifier in case spruce-fir krummholz communities resulted from the vegetation analysis. Over half-way into our mapping of Waterton-Glacier IPP, the introduction of krummholz shrublands entered the scene. We were able to globally change all WFS having the 5 height code modifier (representing <2 m) to the SFK map class.



We often mapped SFK on aspects and slopes amid harsh environments throughout Waterton-Glacier IPP. Stands of SFK can have a closed or open canopy, even down to 10% total tree cover, most commonly with subalpine fir. The RD of deciduous shrubs is <25%. A full range of canopy closure is common for stands mapped with the SFK map class. When krummholz stands have a tightly closed canopy of 90-100% total cover, usually of subalpine fir, the shrubland almost resembles an extremely short forest with rich understory. Ranging to the other extreme, when krummholz stands are very sparse with conifers (10-25%), again usually of subalpine fir, the understory is often of those communities described and mapped with the Dwarf-shrub/Herbaceous Complex: Dry - Mesic (CSA) and the Cliff/Talus Sparse Vegetation (VCT) map classes. The SFK map class maps krummholz conifer shrublands from large and contiguous to small and isolated stands.

Like FFS and WFS map classes, when >10% RD of whitebark pine (pine being >2 m in height) occurs within the mat-like krummholz stands, the area would be mapped with the Whitebark Pine Woodland (WWB) map class. Those krummholz stands, however, with >10% RD whitebark pine, where pine <2 m in height would still be mapped with the SFK map class. This is because we found it problematic in discerning krummholz (size and shape) whitebark pine from other krummholz conifer species. For those instances, however, where we could depict some presence of emerging whitebark pine (not >10% RD), we modified the SFK map class with the Whitebark and Limber Pine Habitat Modifier accordingly. The same approach was applied for limber pine.

We can recall rare scenarios where krummholz shrubs are Douglas-fir dominant. We did not visit any of these stands during our field efforts, however, we do feel confident that these krummholz stands are dominated by Douglas-fir because they have a similar color signature to larger Douglas-fir trees, and they are in close proximity to lower elevation Douglas-fir woodlands and forests.

When krummholz subalpine conifers are mixed with >25% RD of deciduous shrubs, we mapped using the Mixed Conifer - Deciduous Shrubland: Avalanche/Snow Burial (SAM) map class. This scenario occurs quite infrequently.

It is worth noting, because of the late introduction of krummholz shrublands to the map classification, the SFK map class was not included in the random stratified sampling for accuracy assessment. (SFK sites included in the accuracy assessment were a result of the sites being randomly selected within the WFS map class.) Thus, the accuracy assessment results for SFK are shared with the Subalpine Fir - Engelmann Spruce Woodland (WFS) map class.

Relationship to the Vegetation Classification

The Krummholz Shrubland (SFK) map class represents 15 described associations*. Of these 15 associations, none are unique to this map class; all 15 associations are incorporated into other map classes. The 15 associations consist of 6 described alliances, again, none being unique to this map class; all 6 alliances are also included in other map classes. Of all 15 associations SFK captures, the stands are <2 m in height. When the stands are >2 m in height, they are mapped with their respective map classes. Refer to Table J-1 for association and alliance relationship to other map classes.

Although we believe a large majority of the plant communities captured by SFK are spruce-fir types, quite common are whitebark pine types and even occasionally limber pine and Douglas-fir types. However, we found during our fieldwork and mapping, because of the short, mat-like physiognomic structure of the tree-shrub, difficulty in discerning these conifer species from spruce-fir, particularly when we try to interpret >10% RD of whitebark pine or limber pine.

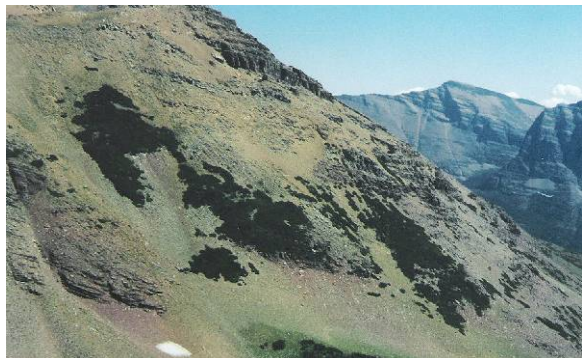
Of the spruce-fir types captured by the SFK map class, whether very common or rare, all occur both east and west of the CD (one uncommon type might be restricted to east of the CD, the *Abies lasiocarpa* - *Picea engelmannii* / *Valeriana sitchensis* Woodland). The most prominent community captured with SFK is *Abies lasiocarpa* - *Picea engelmannii* Krummholz Shrubland. This type occurs in high-subalpine on wind-impacted exposures. Other common types captured with SFK are *Abies lasiocarpa* - *Picea engelmannii* / *Luzula glabrata* var. *hitchcockii* Woodland, *Abies lasiocarpa* - *Picea engelmannii* / *Xerophyllum tenax* - *Luzula glabrata* var. *hitchcockii* Woodland, and *Pinus albicaulis* - *Abies lasiocarpa* / *Vaccinium scoparium* / *Xerophyllum tenax* Woodland. The remaining spruce-fir types are uncommon to rare.

Douglas-fir communities are rarely captured with the SFK map class. We expect that when Douglas-fir is mapped with SFK, it is in close proximity to the Douglas-fir Woodland (WDF) or the Douglas-fir Forest (FDF) map classes. Limber pine communities, as well, are uncommon or even rare to the SFK map class. When limber pine is mapped with SFK, it is only east of the CD and is anticipated in the lower subalpine and in close proximity to the Limber Pine Woodland (WLM) map class.

Perhaps still uncommon, yet more frequent than limber pine, are the krummholz-like whitebark pine communities that are mapped with SFK both east and west of the CD. Again, it is anticipated that when these whitebark pine are mapped as SFK, they are in close proximity to the Whitebark Pine Woodland (WWB) map class. We do suspect *Pinus albicaulis* - (*Picea engelmannii*) / *Dryas octopetala* Woodland might be more prevalent in WLNP, on very harsh, thin-soil sites of calcareous substrates.

Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures



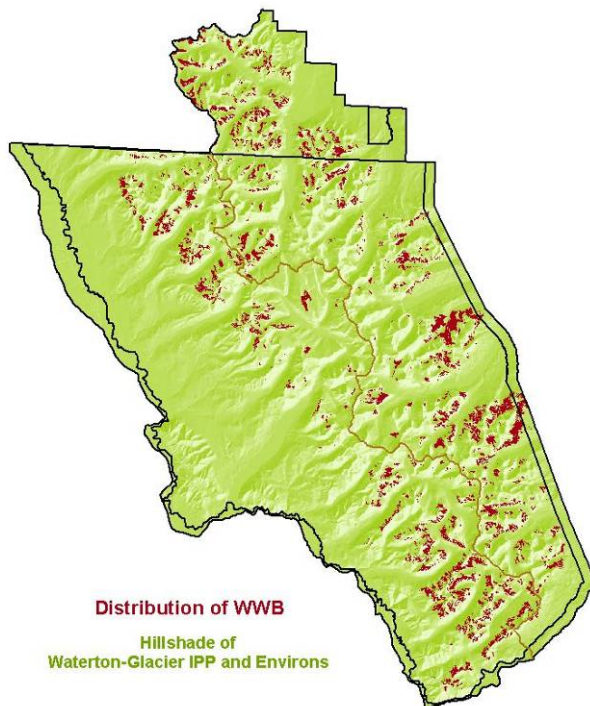
Accuracy Assessment Results

The SFK map class is included in the accuracy assessment for the Subalpine Fir - Engelmann Spruce Woodland (WFS) map class. The SFK map class was not a recognized map class at the time of accuracy assessment.

Whitebark Pine Woodland (WWB)

Description of the Map Class

We used the Whitebark Pine Woodland (WWB) map class to map whitebark pine woodland communities throughout Waterton-Glacier IPP on a wide range of aspects, slopes, and environments; from exposed rock talus to protected slopes of fir-spruce dominant stands with rich understories (see the Distribution of WWB figure below). Most stands of WWB we mapped have a significant amount of trees either dying or dead, due to white pine blister rust.



The whitebark pine woodlands mapped with WWB range from large and contiguous to small and isolated. Stands can have a fairly closed to extremely open canopy, even down to 10% total tree cover. Frequently, we mapped WWB stands quite similar to the way we mapped the Subalpine Fir - Engelmann Spruce Woodland (WFS) map class. When stands are more closed (>60% total cover) and are on gentle-protected slopes, they can resemble some of the forest communities like those described and mapped with the Subalpine Fir - Engelmann Spruce Forest (FFS) map class, having forest-like understory characteristics. When stands are very sparse (10-25% total cover), the understory is similar to those communities described and mapped with the Dwarf-shrub/Herbaceous Complex: Dry - Mesic (CSA) and the Cliff/Talus Sparse Vegetation (VCT) map classes.

In recognizing the importance of whitebark pine to resource management, our mapping of WWB included stands as low as 10% total tree cover, and with as little as 10% RD of whitebark pine to other tree species, rather than the typical cutoff of 25% RD. Even if deciduous trees of >25% RD were present, we would map the stand as WWB if whitebark pine was >10% RD to all other trees. In addition, for those stands with <10% RD of whitebark pine (thus mapped with a map class other than WWB), we tagged them with a Whitebark and Limber Pine Habitat Modifier to signify the presence of whitebark and/or limber pine. When whitebark pine woodlands become <2 m in height, we mapped them with the Krummholz Shrubland (SFK) map class, largely because of the difficulty in recognizing tree species at such short heights. In these instances, we also applied the Whitebark and Limber Pine Habitat Modifier to indicate any presence of whitebark pine that we could determine. We applied this same aggressive mapping to the Limber Pine Woodland (WLM) map class, and similar aggressive mapping to the Subalpine Larch Woodland (WSL) map class.

One of our main challenges in mapping WWB was mapping it down to the 10% total cover and down to 10% RD of whitebark pine to other tree species. When interpreting tree species at such low cover and density, physiognomic tree structures vary considerably, largely due to environmental impacts. In addition, discerning the amount of live whitebark pine trees, when many of the trees had dead tops with lower branches still alive, creates an even greater challenge to discerning RD of whitebark pine. Thus, distinguishing tree species became challenging. In addition, it became problematic to determine >10% RD of whitebark pine from large dying Douglas-fir trees or broad-branching subalpine larch trees in

stands of dense tree canopy cover (e.g., east of Upper Kintla Lake and north of Boulder Pass). However, of biggest concern was discerning between whitebark pine and limber pine. With these two pine species having similar shapes and overlapping ranges, we waited in anticipation for the accuracy assessment results of the relation between the WWB and WLM map classes.

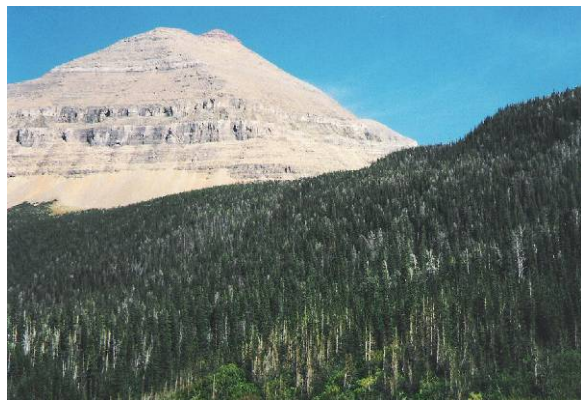
Some fine examples of mature whitebark pine stands exist within the Bighorn Basin just below Dawson Pass (Two Medicine Lake area).

Relationship to the Vegetation Classification

The Whitebark Pine Woodland (WWB) map class represents seven described associations*. Of these seven associations, all are also included in the Krummholz Shrubland (SFK) map class when those associations are krummholz. The seven associations consist of two described alliances, of which both are also included in the SFK map class when the alliances are krummholz. Refer to Table J-1 for relationship between association and alliance within the WWB map class.

Of all the whitebark pine types captured by the WWB map class, whether very common or rare, all occur both east and west of the CD. The most commonly captured community of the WWB map class is *Pinus albicaulis* - *Abies lasiocarpa* / *Vaccinium scoparium* / *Xerophyllum tenax* Woodland. We do suspect *Pinus albicaulis* - (*Picea engelmannii*) / *Dryas octopetala* Woodland might be common in WLNP, on very harsh, thin-soil sites of calcareous substrates, but not as common in GNP. The remaining communities we consider uncommon to WWB throughout Waterton-Glacier IPP. Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures





Accuracy Assessment Results

Glacier National Park

☹ Users' Accuracy: 70% with 90% confidence interval of 54–87% (n = 27)

☺ Producers' Accuracy: 90% with 90% confidence interval of 78–103% (n = 21)

Waterton Lakes National Park

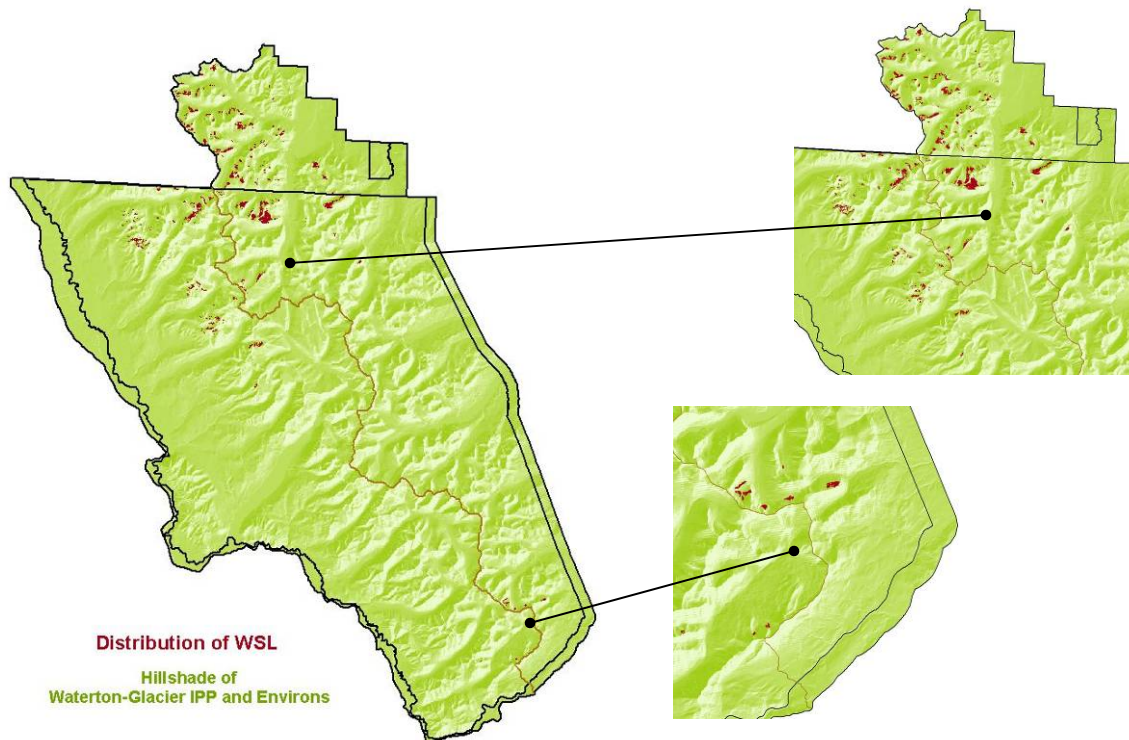
☹ Users' Accuracy: 70% with 90% confidence interval of 41–99% (n = 10)

☺ Producers' Accuracy: 100% with 90% confidence interval of 93–107% (n = 7)

Subalpine Larch Woodland (WSL)

Description of the Map Class

We used the Subalpine Larch Woodland (WSL) map class to map subalpine larch woodland communities of Waterton-Glacier IPP. The WSL map class is confined to the highest reaches of subalpine, and is seldom used in GNP, but more frequently used in WLNP (see the Distribution of WSL figure below). Most of the WSL mapped in GNP is in the northern portion of the park, near Canada.



Subalpine larch woodlands mapped with WSL are usually small stands and isolated to upper subalpine. Stands can have a fairly closed to very open canopy, even to 10% total tree cover. We mapped WSL when subalpine larch was >10% RD to subalpine fir, which is the most commonly associated tree. Technically, when 10% RD of whitebark pine occurs within a stand, regardless of the amount of subalpine larch present, we should map the stand using the Whitebark Pine Woodland (WWB) map class. We made an exception to this rule, however, and gave a bit more precedence to WSL when coexisting with whitebark pine. For these few instances, we applied the appropriate Whitebark and Limber Pine Habitat Modifier to the WSL map class, knowing that both whitebark pine and subalpine larch are important to Waterton-Glacier IPP. If WSL had not been mapped this aggressively, much of the WSL would have been lost to the WWB map class.

Because of the location and environment where subalpine larch exists, deciduous trees are typically not a factor when mapping WSL.

Some of the more magnificent stands of WSL are mapped east of Upper Kintla Lake just north of Boulder Pass. Here the subalpine larch are large and mature, with broad-branches resembling whitebark pine trees.

Relationship to the Vegetation Classification

The Subalpine Larch Woodland (WSL) map class represents one described association*, *Larix lyallii* / *Vaccinium membranaceum* / *Luzula glabrata* var. *hitchcockii* Woodland, and is unique to this map class.

The alliance of this association is also unique to this map class. Refer to Table J-1 for the association and alliance information linked to this map class.

Obviously, the *Larix lyallii* / *Vaccinium membranaceum* / *Luzula glabrata* var. *hitchcockii* Woodland is very common to the WSL map class. The understory species are indicative of a substantial snowload or long-persisting snow. This type occurs at the highest reaches of subalpine.

Representative Pictures



Accuracy Assessment Results

Glacier National Park

- ☺ Users' Accuracy: 100% with 90% confidence interval of 95–105% (n = 11)
- ☺ Producers' Accuracy: 100% with 90% confidence interval of 95–105% (n = 11)

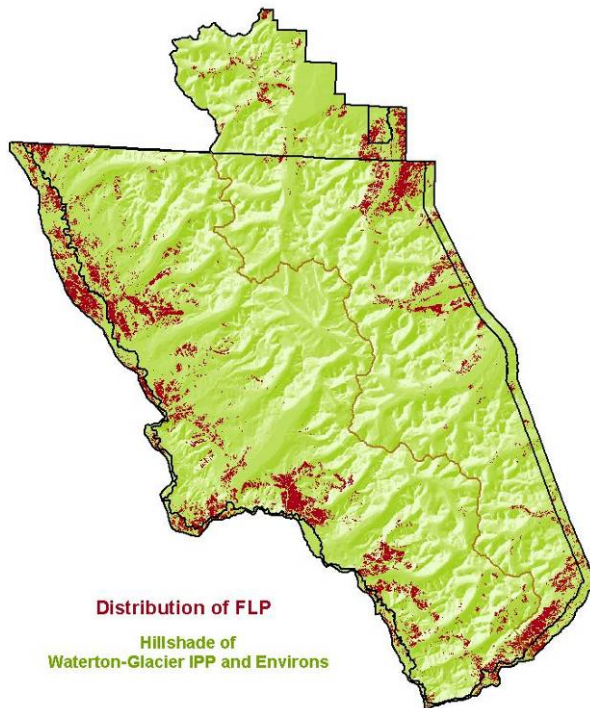
Waterton Lakes National Park

- ☹ Users' Accuracy: 78% with 90% confidence interval of 49–106% (n = 9)
- ☺ Producers' Accuracy: 88% with 90% confidence interval of 62–113% (n = 8)

Lodgepole Pine Forest (FLP)

Description of the Map Class

The Lodgepole Pine Forest (FLP) map class is widespread throughout the vegetation map (see the Distribution of FLP figure below). We mapped FLP on various aspects and slopes, often in montane, but not uncommon to subalpine (even high subalpine, along Lee Ridge in the northeast corner of GNP, for instance). Occurrence of FLP is usually indicative of fire legacy, regardless of low montane or high subalpine.



We mapped FLP when lodgepole pine was >75% RD to other trees in the stand, and total tree cover was >25%. When lodgepole pine coexists with seral western larch, the RD of lodgepole pine increases to >80% to map FLP (this became challenging to interpret). Stands of FLP can have open or closed canopies, which we differentiated with coverage density modifiers. Often, young stands of lodgepole pine have a tight, dense canopy (dog-hair), and older stands have a more open canopy with dead tops (from pine bark beetle or dying off from old age).

We mapped the successional tree layer when lodgepole pine reduced below 75% RD to other tree species, often due to lodgepole pine dying off in forest succession. Common forest layers succeeding the lodgepole pine were subalpine fir-Engelmann spruce and Douglas-fir, both with short tree heights and open canopies.

In forest regeneration areas from recent burn (e.g., Red Bench Fire of 1988 near Polebridge), we mapped FLP down to 10% total tree cover (again, lodgepole pine >75% RD to other trees, and >80% RD to seral western larch). In these instances, the understory was often characteristic of the Mixed Regenerate Shrubland (SMR) or Grassland Herbaceous (HGL) map classes. These sparse lodgepole pine stands are typically of short tree height (0.5–5 m). In areas not affected by recent burn, we mapped using the standard >25% total tree coverage.

Mapping FLP became difficult when lodgepole pines were short in height and had an open canopy. Often, in these instances, the tree shape becomes broader, resembling Douglas-fir on the aerial photos. Also, young dog-hair stands of lodgepole pine were easily confused with young dog-hair stands of Douglas-fir and subalpine fir/Engelmann spruce; the color distinctions on both the 1997 CIR and 1999 TC aerial photos were not always clear, particularly when components of both tree species were present. This led to the most difficult aspect in mapping FLP—the cutoff of 75% RD of lodgepole pine. Often, it was difficult to determine the uprising tree species in the canopy layer, particularly in ailing forests. First, based on the 75% RD cutoff, we would question if the lodgepole pine forest had turned over to the succeeding forest. If so, we would then determine the next succeeding forest type (e.g., Douglas-fir, subalpine fir-Engelmann spruce). In the far northwest corner of GNP, the succeeding forest was commonly Douglas-

fir, where in many other areas of Waterton-Glacier IPP, subalpine fir and Engelmann spruce were more prominent.

Also problematic, however, was determining if the succeeding tree layer was of the emergent tree layer, enough to question if we should classify the forest in succession, rather than the aged lodgepole pine. Particularly, when FLP reached the higher subalpine zone, it became difficult to assess relative density of lodgepole pine and whitebark pine, where we mapped as Whitebark Pine Woodland (WWB) when we interpreted whitebark pine to be >10% RD to other tree species.

Occasionally, an even mix of lodgepole pine and Douglas-fir exhibited a signature on the aerial photos similar to what we would map as the Subalpine Fir - Engelmann Spruce Forest (FFS) map class. This was due to the common mixture of conifer tree species usually associated with FFS. With only 25% RD subalpine fir and/or Engelmann spruce needed to use FFS, the even mix of lodgepole pine and Douglas-fir could bias the photointerpreter toward using the FFS map class.

When lodgepole pine stands were found within basin and riparian wetlands, we used the Engelmann Spruce Forest (FSP) map class—a map class that represents wet-mesic to wet Engelmann spruce—east of the CD. As we began mapping west of the CD, we added the Lodgepole Pine Wet Forest (FPW) map class to the map classification. Unfortunately, finding lodgepole pine wetlands originally mapped as FSP east of the CD would require surveying the aerial photos again in order to differentiate the wet lodgepole pine stands from the true Engelmann Spruce Forest types. Therefore, wet lodgepole pine stands east of the CD were not captured.

When lodgepole pine was mixed with >25% RD deciduous trees (aspen, cottonwood, birch), we mapped the stand with the Mixed Conifer - Deciduous Forest (FEP) map class, regardless of stand tree height (even <5 m). When lodgepole pine <5 m was mixed with >25% RD deciduous shrubs (not aspen, cottonwood, birch), we mapped using the Mixed Conifer - Deciduous Shrubland: Avalanche/Snow Burial (SAM) map class. Noteworthy, the SAM map class is host to numerous mixtures of conifer and deciduous tree and shrub species. In other words, all SAM map classes do not represent the lodgepole pine/deciduous shrub mixture. In hindsight, knowing what we know now about classification and distribution, we could have mapped these scenarios separately from other conifer-deciduous shrub mixes.

Relationship to the Vegetation Classification

The Lodgepole Pine Forest (FLP) map class represents 18 described associations*. There are also two undescribed associations, which we assigned with park-special names. Of these 20 associations (described and park-special), 8 are unique to this map class, whereas the other 12 associations are also incorporated into other map classes. The 20 associations comprise 3 described alliances, of which all 3 are also included in other map classes. Noteworthy, 15 of the 20 associations fall under the *Pinus contorta* Forest Alliance. Refer to Table J-1 for association and alliance relationship to other map classes.

It is our observation that the *Pinus contorta* / *Calamagrostis rubescens* Forest is common to the FLP map class as a post-fire seral expression, typically montane, yet reaching into subalpine. Also quite common to FLP in the montane and lower subalpine is *Pinus contorta* / *Clintonia uniflora* Forest. This type, however, is not common east of the CD below subalpine.

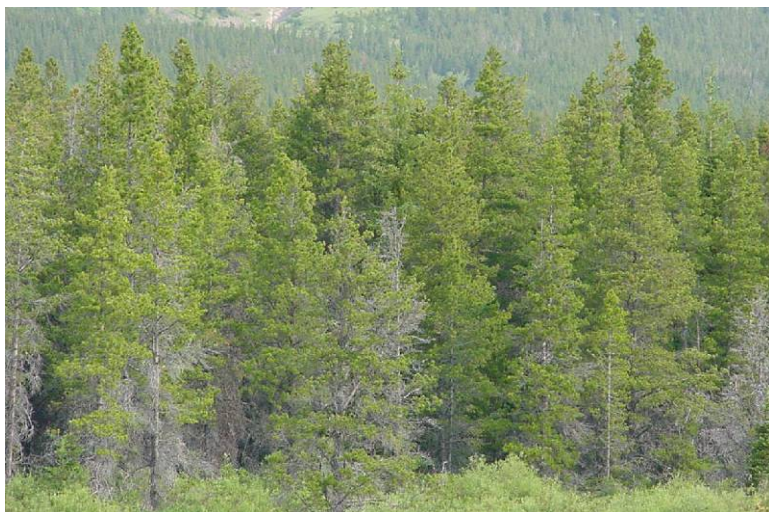
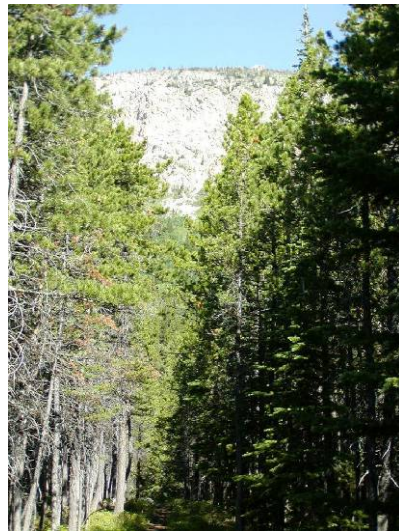
The three *Pinus contorta* forest communities associated with *Menziesia ferruginea* are very common to FLP when mapped at high subalpine. Also, common to FLP in subalpine are *Pinus contorta* / *Vaccinium scoparium* / *Xerophyllum tenax* Forest, *Pinus contorta* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest, *Pinus contorta* / *Vaccinium caespitosum* / *Clintonia uniflora* Forest, and *Pinus contorta* / *Vaccinium caespitosum* Forest associations, with the latter two associations more common west of the CD. Although uncommon, *Pinus contorta* / *Vaccinium scoparium* / *Calamagrostis rubescens* Forest can also be found in the upper subalpine.

Quite uncommon or even rare to FLP are *Pinus contorta* / *Acer glabrum* Forest, *Pinus contorta* / *Arnica cordifolia* Forest, *Pinus contorta* / *Linnaea borealis* Forest, *Pinus contorta* / *Vaccinium scoparium* Forest, *Pinus contorta* / *Calamagrostis canadensis* Forest, and *Pinus contorta* / *Cornus sericea* Woodland. When mapped, the latter two communities consist of small patches in subirrigated positions (e.g., swales, riparian) in montane to subalpine. These two types, however, are better captured with the Lodgepole Pine Wet Forest (FPW) and Engelmann Spruce Forest (FSP) map classes.

A few other lodgepole pine woodland communities are also mapped with the FLP map class, some of which are captured with the Lodgepole Pine Woodland (WLP) map class. We believe *Pinus contorta* / *Clintonia uniflora* - *Xerophyllum tenax* Woodland, *Pinus contorta* / *Heracleum maximum* Woodland, and *Pinus contorta* / *Juniperus communis* Woodland are all common to FLP in montane to subalpine, although the latter is only common to areas east of the CD.

Again, refer to Table J-1 for associations linked to this map class.

Representative Pictures





Accuracy Assessment Results

Glacier National Park

- ☺ Users' Accuracy: 95% with 90% confidence interval of 88–102% (n = 39)
- ☺ Producers' Accuracy: 82% with 90% confidence interval of 72–93% (n = 45)

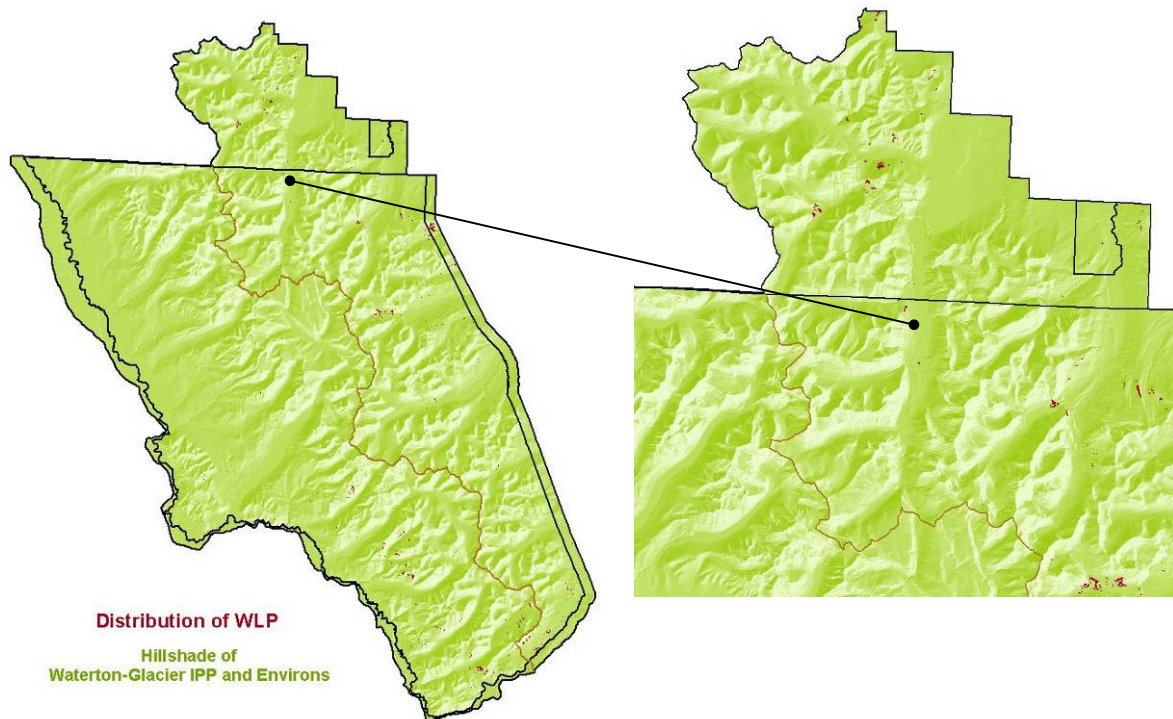
Waterton Lakes National Park

- ☺ Users' Accuracy: 86% with 90% confidence interval of 67–105% (n = 14)
- ☺ Producers' Accuracy: 86% with 90% confidence interval of 67–105% (n = 14)

Lodgepole Pine Woodland (WLP)

Description of the Map Class

The Lodgepole Pine Woodland (WLP) map class is quite sparse throughout the vegetation map, often in upper montane to lower subalpine (see the Distribution of WLP figure below).



We mapped WLP on dry sites with a sparse layer of dwarf-shrubs, forbs, and grasses, often on rocky outcrops. The WLP map class represents woodlands of lodgepole pine having >75% RD to other trees in the stand, and total tree cover >10%. Stands typically have a more open than closed canopy. We used the WLP map class conservatively, applying it to the more dry environments dominated by lodgepole pine. When understory vegetation became more established, we quickly reverted to using the Lodgepole Pine Forest (FLP) map class. Even with this approach, the WLP map class still overlaps with many of the lodgepole pine forest types, sharing them with the FLP map class.

Relationship to the Vegetation Classification

The Lodgepole Pine Woodland (WLP) map class represents nine described associations*. All nine of these associations are also incorporated into other map classes. The nine associations comprise two described alliances, of which both are also included in other map classes. Refer to Table J-1 for association and alliance relationship to other map classes.

We suspect the *Pinus contorta* / *Juniperus communis* Woodland to be most commonly captured by WLP in the driest environments. Less common is the *Pinus contorta* / *Heracleum maximum* Woodland, which has a tendency toward mesic sites. Several lodgepole pine forest types are also common to WLP when occurring in the driest sites. Of rare occurrence to the WLP map class, however, is *Pinus contorta* / *Vaccinium scoparium* Forest; rare to Waterton-Glacier IPP.

Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures



Accuracy Assessment Results

Glacier National Park

- ☺ Users' Accuracy: 96% with 90% confidence interval of 86–105% (n = 23)
- ☺ Producers' Accuracy: 85% with 90% confidence interval of 71–98% (n = 26)

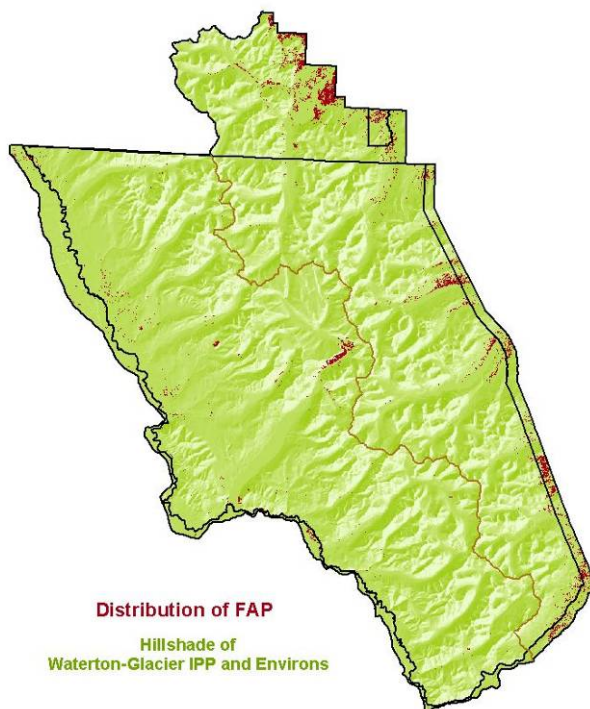
Waterton Lakes National Park

- ☺ Users' Accuracy: 100% with 90% confidence interval of 75–125% (n = 2)
- ☺ Producers' Accuracy: 50% with 90% confidence interval of -4–104% (n = 4)

Poplar - Birch Forest (FAP)

Description of the Map Class

The Poplar - Birch Forest (FAP) map class is typically mapped in the montane, yet occasionally reaches into the subalpine (see the Distribution of FAP figure below). The FAP map class usually depicts some degree of moisture in the mesic sub-hygic, subirrigated, and riparian locations. Topography is variable, from low-level riparian floodplains to steep slopes on various aspects.



The FAP map class represents poplar and/or birch forests having >75% RD to other trees within the forest stand, and having total tree cover >25%. The conifer component is <25% RD to the deciduous trees (this includes western larch trees). Poplar trees might be mature and tall (e.g., aspen >15 m in height on the west-facing slope east of the Belly River) or short statured and wind swept (e.g., aspen <2 m in height on the shores of Saint Mary Lake near Two Dog Flats).

When poplar and birch trees were short in height (<5 m), it became quite difficult to discern them from shrubs we typically mapped with the Deciduous Shrubland: Avalanche/Snow Burial (SAD) map class (e.g., willow, alder, maple). Thus, we mapped FAP conservatively, using the FAP map class when we could confidently discern poplar and birch from typical shrubland species, and used the SAD map class when less certain of species

composition. In many instances, SAD consisted of a mix or complex of shrubs and poplar species. This gives rise to the large occurrence of poplar communities linked to the SAD map class. The shrub communities, however, are not linked to the FAP map class because of our conservative approach in using the FAP map class.

The FAP map class easily transitions into the Black Cottonwood Forest (FCW) map class, which is located in wetter conditions. At times, it became an interpretive challenge to determine the hydrology of the site. In areas where it was difficult to discern between wetland and upland situations, we made our best judgment to map the FAP map class for drier, upland sites and the FCW map class for wetland sites. There was an overlap in plant communities between the FAP and FCW map classes.

Relationship to the Vegetation Classification

The Poplar - Birch Forest (FAP) map class represents 15 described associations*. Of these 15 associations, 1 is unique to this map class, whereas the other 14 are also incorporated into other map classes. The 15 associations comprise 6 described alliances, which are also included in other map classes. Refer to Table J-1 for association and alliance relationship to other map classes.

Both east and west of the CD, the FAP map class commonly captures *Populus tremuloides* / *Heracleum maximum* Forest, *Populus tremuloides* / *Calamagrostis canadensis* Forest, and *Populus balsamifera* ssp. *trichocarpa* - (*Populus tremuloides*) / *Heracleum maximum* Forest when in subirrigated or sub-hygic

sites. When in riparian locations, the FAP map class commonly captures *Populus tremuloides* / *Cornus sericea* Forest and *Populus balsamifera* ssp. *trichocarpa* / *Cornus sericea* Forest. The *Populus balsamifera* ssp. *trichocarpa* / *Cornus sericea* Forest can be in both subirrigated and riparian locations. Note, however, the Black Cottonwood Forest (FCW) map class also represents many of these types when in riparian locations, occurring more often in wetter scenarios of swale depressions and low riparian.

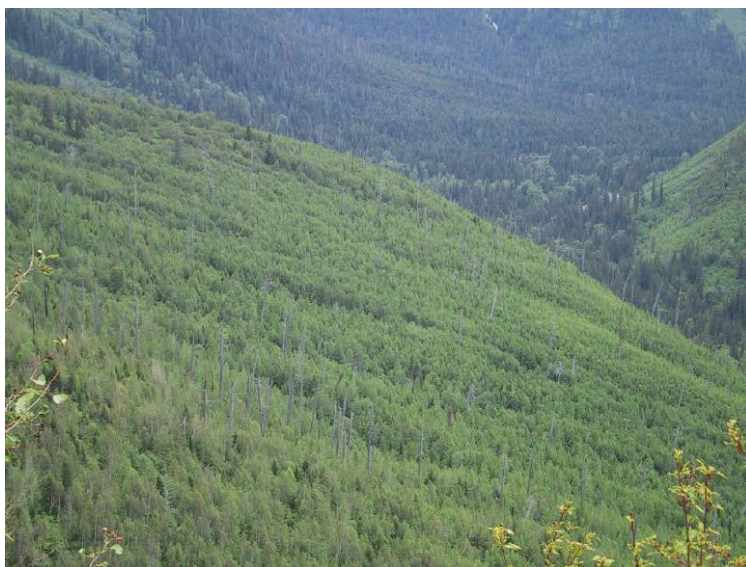
The *Populus tremuloides* / *Rubus parviflorus* Forest and *Populus tremuloides* / *Symphoricarpos albus* Forest are also common to the FAP map class, although occur more often east of the CD.

Uncommon and west of the CD, the FAP map class captures *Betula papyrifera* / *Acer glabrum* Woodland, indicating sites of secondary succession. These sites were probably at one time intensively burned, disrupting the soil mantle.

The remaining poplar forest communities represented with the FAP map class are uncommon to the area. These communities occur less than those communities previously mentioned, in large part due to their low occurrence at Waterton-Glacier IPP.

Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures





Accuracy Assessment Results

Glacier National Park

- ☺ Users' Accuracy: 89% with 90% confidence interval of 79–99% (n = 36)
- ☺ Producers' Accuracy: 97% with 90% confidence interval of 91–103% (n = 33)

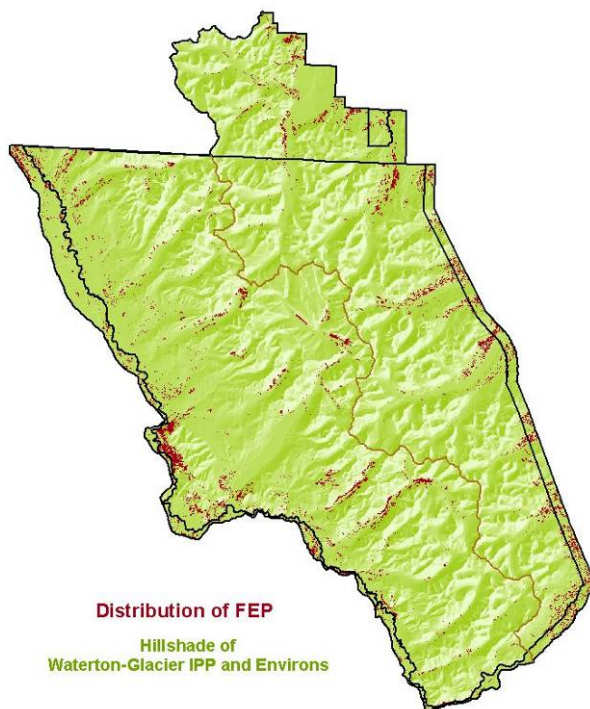
Waterton Lakes National Park

- ☺ Users' Accuracy: 92% with 90% confidence interval of 76–108% (n = 13)
- ☹ Producers' Accuracy: 75% with 90% confidence interval of 54–96% (n = 16)

Mixed Conifer - Deciduous Forest (FEP)

Description of the Map Class

Like the Poplar - Birch Forest (FAP) map class, the Mixed Conifer - Deciduous Forest (FEP) map class is typically mapped in the montane, yet occasionally reaches into the subalpine (see the Distribution of FEP figure below). Similar to FAP, the FEP map class usually depicts some degree of moisture in the mesic sub-hygic, subirrigated, and riparian locations. It also depicts stands well into the seral stage, succeeding toward conifer forest communities. Topography is variable, from low-level riparian floodplains to steep slopes on various aspects.



The FEP map class represents forests having mixed components of conifer and deciduous tree species. Both conifer and deciduous tree components are >25% RD to each other, with total tree cover >25%. We used FEP to map evenly mixed conifer-deciduous forests, as well as a mosaic of small (typically <MMU) conifer and deciduous forests (e.g., composite of lodgepole pine forest and aspen forest stands).

As with FAP, when poplar and birch trees were short in height (<5 m), it became rather difficult to discern them from shrub species (e.g., willow, alder, maple). Thus, we mapped FEP conservatively when the deciduous component was <5 m in height. If we could not discern the significant presence of poplar and/or birch species, we then used the Mixed Conifer - Deciduous Shrubland: Avalanche/Snow Burial (SAM) map class to represent areas where the conifers were shrub height (<5 m), or if the conifers were >5 m in height and >25% RD

we mapped the appropriate conifer map class (e.g., spruce-fir, Douglas-fir, lodgepole pine). Lastly, when we were confident that the deciduous component was poplar or birch (and not a shrub species), we mapped the area using the FEP map class. Again, this gives rise to the large occurrence of poplar communities linked to the SAD map class. The shrub communities, however, are not linked to the FEP map class, because of our conservative approach in using the FEP map class.

Although not represented in the vegetation classification, a mixed conifer and deciduous type comprised of western larch (conifer-bearing deciduous) and poplars (aspen and cottonwood) was observed in the field and during mapping. We proceeded to map these forests compositions with the FEP map class when each had >25% RD to each other. (Some examples of these forests are between the West Entrance to GNP and Apgar and at the base of Scalplock Mountain near the park-established trail.)

Relationship to the Vegetation Classification

The Mixed Conifer - Deciduous Forest (FEP) map class represents seven described associations*. Of these seven associations, one is unique to this map class, whereas the other six associations are also incorporated into other map classes. The seven associations comprise four described alliances, which are also included in other map classes. The FEP map class has one more described alliance, unique to this

map class, but with no described association. Refer to Table J-1 for association and alliance relationship to other map classes.

Perhaps the most common or most classic plant community captured by the FEP map class throughout Waterton-Glacier IPP is *Populus tremuloides* - *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Forest, representing a true mix of conifer and deciduous tree species. These scenarios are ultra-mesic to hygric, often associated with riparian sites. Also common to the FEP map class, on both sides of the CD, is *Populus balsamifera* ssp. *trichocarpa* - *Populus tremuloides* - Conifer / *Cornus sericea* Forest, again, linked to riparian sites. Of mesic forests moving in succession toward a spruce-fir forest community, the FEP map class commonly represents the *Populus balsamifera* ssp. *trichocarpa* - *Populus tremuloides* - Conifer / *Heracleum maximum* Forest. Another commonly captured community in the FEP map class, although more prevalent east of the CD, is *Populus balsamifera* ssp. *trichocarpa* - *Populus tremuloides* - Conifer / *Calamagrostis canadensis* Forest; these forests are typically associated with wetter sites. Prevalent west of the CD, the FEP map class captures *Populus balsamifera* ssp. *trichocarpa* - *Populus tremuloides* - Conifer / *Clintonia uniflora* Forest, a community linked to wet seral sites.

The remaining described communities are uncommon to the FEP map class, largely because they are uncommon to Waterton-Glacier IPP. The *Betula papyrifera* - Conifer / *Clintonia uniflora* Woodland is only found west of the CD, and the *Populus tremuloides* - Conifer / *Spiraea betulifolia* - *Symphoricarpos albus* Forest is most prevalent east of the CD.

Worth mentioning, although no plant community is described, is the *Pinus contorta* - *Populus tremuloides* Forest Alliance. These forests typically consist of a small block mosaic pattern of lodgepole pine forests and aspen and/or cottonwood forests, yet each of these forest blocks are too small to map, separately (<MMU) with the Lodgepole Pine Forest (FLP) and Poplar - Birch Forest (FAP) map classes.

Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures





Accuracy Assessment Results

Glacier National Park

☺ Users' Accuracy: 87% with 90% confidence interval of 78–96% (n = 46)

☺ Producers' Accuracy: 89% with 90% confidence interval of 80–98% (n = 45)

Waterton Lakes National Park

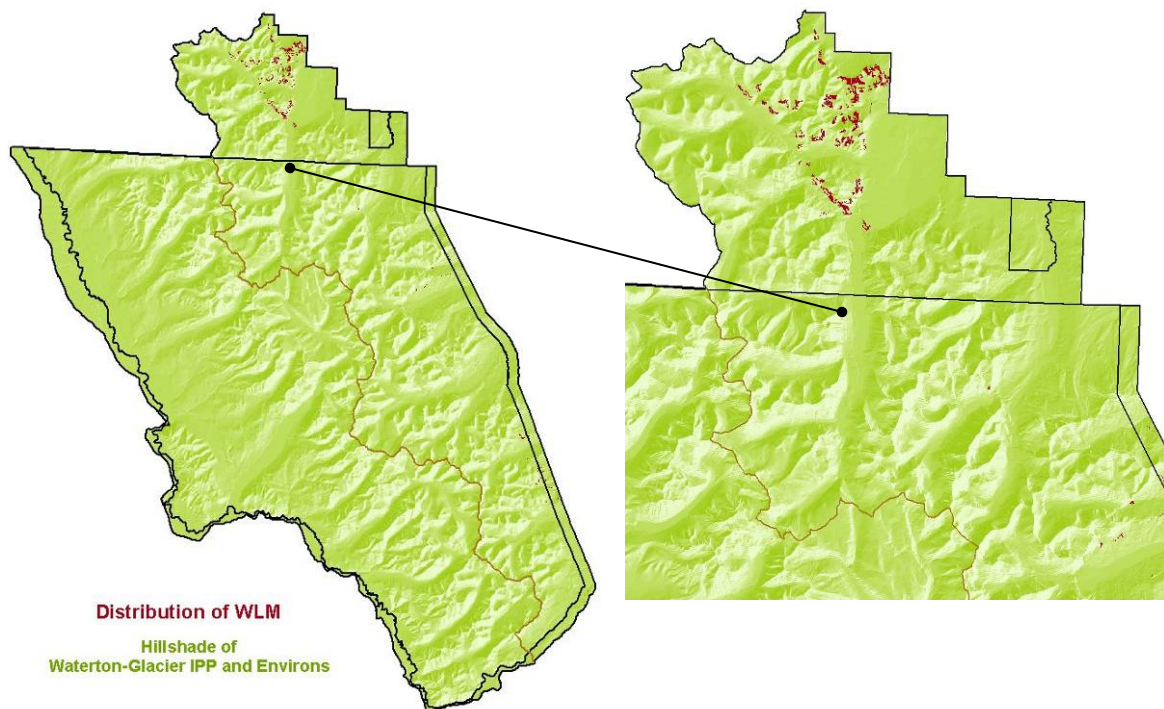
☺ Users' Accuracy: 93% with 90% confidence interval of 79–108% (n = 15)

☺ Producers' Accuracy: 61% with 90% confidence interval of 42–80% (n = 4)

Limber Pine Woodland (WLM)

Description of the Map Class

We used the Limber Pine Woodland (WLM) map class to map limber pine woodland communities of Waterton-Glacier IPP, which only occur east of the CD. We typically mapped WLM on ridgetops or on dry slopes with southern aspects (see the Distribution of WLM figure below). The WLM map class occurs most frequently in WLNP, and occurs less frequently in GNP.



The limber pine woodlands mapped with WLM are often small and isolated, common to the drier slopes in montane to lower subalpine. Stands typically have an open canopy, even down to 10% total tree cover. Most stands mapped with WLM have a significant amount of trees either dying or already dead, due to the white pine blister rust. When stands are very sparse (10-25% total cover), the understory in the subalpine and higher montane is similar to those communities described and mapped with the Dwarf-shrub/Herbaceous Complex: Dry - Mesic (CSA) and the Cliff/Talus Sparse Vegetation (VCT) map classes. When in the lower montane, the understory is similar to those communities described and mapped with the Grassland Herbaceous (HGL) map class.

In recognizing the importance of limber pine to resource management, our mapping of WLM included stands as low as 10% total tree cover and with as little as 10% RD of limber pine to other tree species, rather than the typical cutoff of 25% RD. Even if deciduous trees of >25% RD were present, we would map the stand as WLM if limber pine was >10% RD to all other trees. In addition, for those stands with <10% RD of limber pine (thus mapped with a map class other than WLM), we tagged them with a Whitebark and Limber Pine Habitat Modifier to signify the presence of limber and/or whitebark pine. When limber pine woodlands become <2 m in height, we mapped them with the Krummholz Shrubland (SFK) map class, largely because of the difficulty in recognizing tree species at such short heights. In these instances we also applied the Whitebark and Limber Pine Habitat Modifier to indicate any presence of limber pine that we could determine. We applied this same aggressive mapping to the Whitebark Pine

Woodland (WWB) map class and similar aggressive mapping to the Subalpine Larch Woodland (WSL) map class.

One of our main challenges in mapping WLM was mapping it down to the 10% total cover and down to 10% RD of limber pine to other tree species. When interpreting tree species at such low cover and density, physiognomic tree structures vary considerably, largely due to environmental impacts. In addition, discerning the amount of live limber pine trees, when many of the trees had dead tops with lower branches still alive, creates an even greater challenge to discerning RD of limber pine. Thus, distinguishing tree species became challenging. In addition, it became problematic to determine >10% RD of WLM with regards to the Douglas-fir Woodland (WDF) map class (and other component trees present). Of biggest concern, however, was discerning between whitebark pine and limber pine. With these two pine species having similar shapes and overlapping ranges, we waited in anticipation for the accuracy assessment results of the relationship between the WWB and WLM map classes.

Relationship to the Vegetation Classification

The Limber Pine Woodland (WLM) map class represents four described associations*. Of these four associations, two are unique to this map class, whereas the other two associations are also included in the Krummholz Shrubland (SFK) map class when those associations are krummholz. The four associations consist of one described alliance, of which is also included in the SFK map class when the alliance is krummholz. Refer to Table J-1 for association relationship to the SFK map class.

Of all the limber pine types captured by the WLM map class, whether very common or rare, all occur east of the CD. Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures





Accuracy Assessment Results

Glacier National Park

- ☺ Users' Accuracy: 82% with 90% confidence interval of 58–105% (n = 11)
- ☹ Producers' Accuracy: 56% with 90% confidence interval of 33–80% (n = 16)

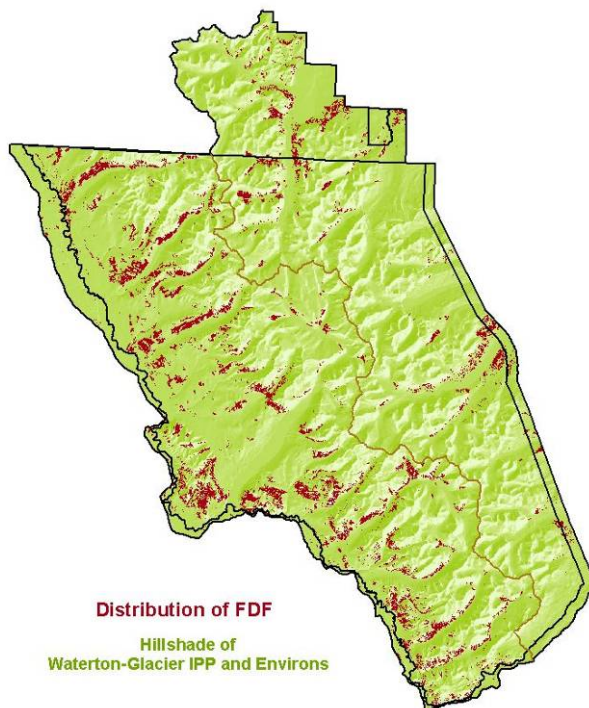
Waterton Lakes National Park

- ☺ Users' Accuracy: 80% with 90% confidence interval of 54–106% (n = 10)
- ☺ Producers' Accuracy: 100% with 90% confidence interval of 94–106% (n = 8)

Douglas-fir Forest (FDF)

Description of the Map Class

The Douglas-fir Forest (FDF) map class occurs throughout the vegetation map and is most prevalent west of the CD in montane to subalpine. However, FDF is not as prevalent east of the CD, yet noticeable pockets are evident in the subalpine from Waterton Lake to the CD, surrounding Saint Mary Lake and Lower Two Medicine Lake, and montane to subalpine of WLNP (see the Distribution of FDF figure below).



We often mapped FDF on aspects of drier inclination (e.g., west, south-west), and less frequently on aspects of northern exposures or mesic ravines at lower elevations. The FDF map class typically ranges from montane to subalpine, sometimes even reaching into the high subalpine on very warm slopes. Often, Douglas-fir forests grow on calcareous deposits (e.g., Rising Sun near Saint Mary Lake) and as a dominant seral tree in response to fire (e.g., near trailhead to Red Eagle Lake Trail). Forest stands can have an open or closed canopy with >25% total tree cover. The FDF map class represents stands that are largely monotypic Douglas-fir, or Douglas-fir mixed with considerable amounts of western larch and/or lodgepole pine, or Douglas-fir mixed with a fair amount of ponderosa pine, or Douglas-fir mixed with significantly less amounts of subalpine fir and/or Engelmann spruce, western hemlock and/or western red-cedar, or deciduous trees (aspen, cottonwood, birch).

We mapped FDF when Douglas-fir was >75% RD to western hemlock, western red-cedar, subalpine fir, and/or Engelmann spruce. We also mapped FDF when Douglas-fir was >25% RD to lodgepole pine and/or western larch trees (with the absence of cedar-hemlock and spruce-fir). At times, Douglas-fir coexisted with ponderosa pine. In these instances we used the 50% mark to determine which map class to use, either FDF if Douglas-fir >50% RD over ponderosa pine, or the Ponderosa Pine Woodland (WPP) map class if ponderosa pine >50% RD over Douglas-fir. In instances where Douglas-fir and ponderosa pine appeared to be a 50/50 mix, we gave precedence to ponderosa pine. This departed from the plant community descriptions for Douglas-fir forest types and ponderosa pine forest and woodland types. The vegetation community classification provides for only 25% RD of Douglas-fir over ponderosa pine. Our purpose in mapping at the 50% mark was to give GNP staff a better indication of ponderosa pine encroachment into grassland areas (e.g., Sullivan Meadow). Trumping all of this, was when the presence of limber pine and/or whitebark pine was >10% RD, giving either the Limber Pine Woodland (WLM) map class or Whitebark Pine (WWB) map class precedence.

On the aerial photos, mature open-growth Douglas-fir trees typically exhibit rounded tops and wide bases. Usually this physiognomic feature is a key signature for Douglas-fir. However, we occasionally encountered problems distinguishing lodgepole pines with short height and open canopies from Douglas-fir, because they appear to have stumpy tops and broader bases. Also, we found young, dense dog-hair

stands of early successional Douglas-fir difficult to discern from dog-hair stands of lodgepole pine. The 1997 CIR and 1999 TC aerial photos did not always provide discrete signature differences between these types. There are many prominent examples of this scenario around the lower end of Saint Mary Lake. It also became challenging to discern RD of Douglas-fir and lodgepole pine when they coexisted in a forest stand, since we continued to apply the FDF map class to forest stands with up to 75% RD of lodgepole pine. It became even more challenging to determine if the FDF map class should be applied to mature lodgepole pine stands beginning to give way to the next successional forest type, such as Douglas-fir or subalpine fir-Engelmann spruce. First, based on the 75% RD cutoff, we would question if the lodgepole pine forest had turned over to the succeeding forest. If so, we would then determine if the next succeeding forest type was Douglas-fir or another type, such as subalpine fir-Engelmann spruce. The next challenge was to determine if the succeeding tree layer was truly an emergent tree layer, enough to question if we should classify the stand with the FDF map class.

Occasionally, an even mix of Douglas-fir and lodgepole pine exhibited a signature on the aerial photos similar to what we would map as the Subalpine Fir - Engelmann Spruce Forest (FFS) map class. This was due to the common mixture of conifer tree species usually associated with FFS. With only 25% RD subalpine fir and/or Engelmann spruce needed to use FFS, the even mix of Douglas-fir and lodgepole pine could bias the photointerpreter toward using the FFS map class. Furthermore, with only 25% RD of subalpine fir and/or Engelmann spruce needed to map a forest stand with the FFS map class, we trained our interpretive eyes away from the more dominant Douglas-fir, and focused on the RD of spruce-fir, even though they were the lesser tree species in the stand.

Douglas-fir mixed with western larch posed an interpretive challenge when the larch tree shape was of similar size and shape as the Douglas-fir. Western larch expresses a distinctive branching pattern as a supracanopy tree in the forest. As a younger tree, however, western larch takes on a typical conical shape, and when growing in a tight pattern with Douglas-fir, the distinctions between the two trees were not always clear on either the CIR or TC aerial photos. This was more problematic when western larch approached 75% RD to Douglas-fir, where our standard was to classify the stand with the FDF map class. Some good examples of this scenario occur at the southern tip of GNP.

When Douglas-fir was mixed with >25% RD deciduous trees (aspen, cottonwood, birch), we mapped the stand with the Mixed Conifer - Deciduous Forest (FEP) map class, regardless of stand tree height (even <5 m). When Douglas-fir <5 m was mixed with >25% RD deciduous shrubs (not aspen, cottonwood, birch), we mapped using the Mixed Conifer - Deciduous Shrubland: Avalanche/Snow Burial (SAM) map class. Noteworthy, the SAM map class is host to numerous mixtures of conifer and deciduous tree and shrub species. In other words, all SAM map classes do not represent the Douglas-fir/deciduous shrub mixture. The best indicator to depict the SAM map class, when Douglas-fir is the primary component, is to look for dry sites having the FDF and Douglas-fir Woodland (WDF) map classes in close proximity. In hindsight, knowing what we know now about classification and distribution, we could have mapped these scenarios separately from other conifer-deciduous shrub mixes.

Relationship to the Vegetation Classification

The Douglas-fir Forest (FDF) map class represents 14 described associations. Of these 14 associations, 5 are unique to this map class, whereas the other 9 associations are also incorporated into other map classes. The 14 associations comprise 3 described alliances, of which all 3 are also included in other map classes. Refer to Table J-1 for association and alliance relationship to other map classes.

It is our experience the *Pseudotsuga menziesii* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest is the most common forest community captured by the FDF map class throughout the vegetation map. Also common are *Pseudotsuga menziesii* / *Clintonia uniflora* - *Xerophyllum tenax* Forest, *Pseudotsuga menziesii* / *Clintonia uniflora* Forest, and *Pseudotsuga menziesii* / *Vaccinium caespitosum* Forest, which occur in the montane and subalpine on both sides of the CD. These forest communities occur more frequently west of the CD, than they do east of the CD.

The remaining Douglas-fir communities represented with the FDF map class are uncommon to the area, due to their low occurrence at Waterton-Glacier IPP. Noteworthy, when captured with the FDF map class, the *Pseudotsuga menziesii* / *Arctostaphylos uva-ursi* Forest, is almost exclusively east of the CD on calcareous sites; this type is more commonly captured with the Douglas-fir Woodland (WDF) map class. Another mentionable community is the *Pseudotsuga menziesii* / *Cornus sericea* Woodland, which occurs at the wetter limits of Douglas-fir and is very uncommon. This community is most frequently mapped with the FDF map class when Douglas-fir stands are on subirrigated sites (riparian, swales).

Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures



Accuracy Assessment Results

Glacier National Park

☹ Users' Accuracy: 79% with 90% confidence interval of 67–91% (n = 38)

☹ Producers' Accuracy: 77% with 90% confidence interval of 65–89% (n = 39)

Waterton Lakes National Park

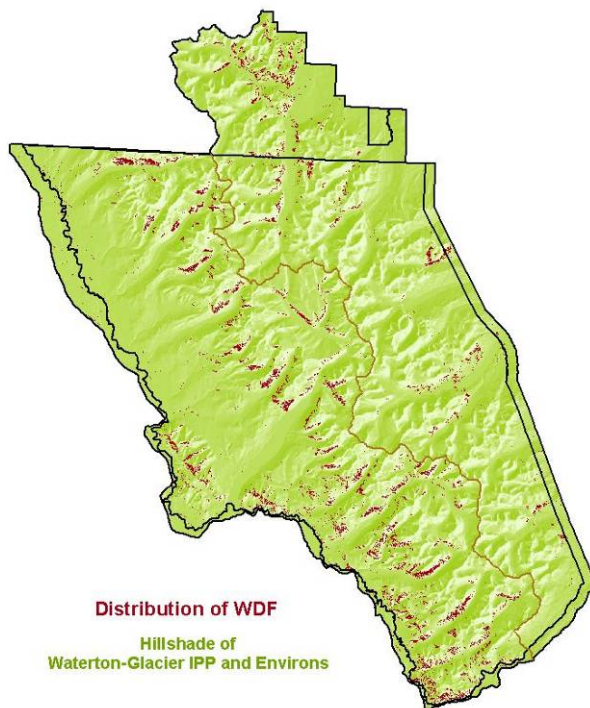
☹ Users' Accuracy: 36% with 90% confidence interval of 8–65% (n = 11)

☺ Producers' Accuracy: 100% with 90% confidence interval of 88–113% (n = 4)

Douglas-fir Woodland (WDF)

Description of the Map Class

The Douglas-fir Woodland (WDF) map class occurs throughout the vegetation map, and like the Douglas-fir Forest (FDF) map class is more prevalent west of the CD in the montane to subalpine. Similar to the FDF map class, the WDF map class is less prevalent east of the CD, yet noticeable pockets are evident in the subalpine from Waterton Lake to the CD, surrounding Saint Mary Lake and Lower Two Medicine Lake, and montane to subalpine of WLNP (see the Distribution of WDF figure below). The Douglas-fir woodlands represented by the WDF map class are commonly associated to, but not limited to, calcareous soils, often on ridgetops and steep slopes of drier inclinations (south and west aspects), and occasionally on more level landscapes of lower valley grasslands (e.g., grasslands near Saint Mary).



The WDF map class was used to map woodlands when Douglas-fir was >75% RD to cedar-hemlock or spruce-fir, or >25% RD to western larch and/or lodgepole pine. Although quite rare, the WDF map class would also be used if >50% RD to ponderosa pine. Also, the WDF map class needed the deciduous tree component <25% RD to conifer trees, and the total tree cover >10%. However, if limber pine and/or white bark pine was >10% RD to all other tree species of the stand, including Douglas-fir, then the Whitebark Pine Woodland (WWB) or the Limber Pine Woodland (WLM) map classes would be used.

Douglas-fir woodland types mapped with the WDF map class often had a moderate to sparse layer of herbaceous grassland and dwarf-shrubland throughout the understory. Therefore, the calcareous limestone soil was evident on the aerial photos, giving more credence to a site well suited for Douglas-fir.

East of the CD, limber pine is commonly associated with Douglas-fir woodlands, and whitebark pine is commonly found throughout Waterton-Glacier IPP. Occasionally, it became somewhat problematic determining when to map the WDF map class to the WLM and WWB map classes, largely due to the difficulty in determining the RD of limber pine or whitebark pine to Douglas-fir (and other component trees present). We mapped the WLM and WWB map classes with as little as 10% RD limber pine or whitebark pine, respectively to other tree species, including Douglas-fir. Particularly challenging was the interpretation of dying Douglas-fir trees, because the dying Douglas-fir trees can resemble dying five-needle pine trees on the aerial photographs.

Because the lower boughs of both Douglas-fir and lodgepole pine tend to broaden out when in open stands, Douglas-fir woodlands became a challenge to discern from the lodgepole pine woodlands. Likewise, another challenge was discerning Douglas-fir from ponderosa pine, particularly along woodland rims of the northwest corner of GNP.

In instances where Douglas-fir <5 m was mixed with dry shrub species commonly mapped with the Deciduous Shrubland: Dry - Mesic (SDS) map class, we continued to map these scenarios with WDF

rather than the Mixed Conifer - Deciduous Shrubland: Avalanche/Snow Burial (SAM) map class due to the dry woodland nature of the site.

Relationship to the Vegetation Classification

The Douglas-fir Woodland (WDF) map class represents eight described associations*. Of these eight associations, one is unique to this map class, whereas the other seven associations are also incorporated into other map classes. The eight associations comprise two described alliances, of which both are also included in other map classes. Refer to Table J-1 for association and alliance relationship to other map classes.

We determined that the *Pseudotsuga menziesii* / *Calamagrostis rubescens* Woodland is common to the WDF map class on warm and well-drained sites throughout Waterton-Glacier IPP. When Douglas-fir was in a seral stage, the WDF map class captured *Pseudotsuga menziesii* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest.

We also determined that the WDF map class commonly captured *Pseudotsuga menziesii* / *Arctostaphylos uva-ursi* Forest and *Pseudotsuga menziesii* / *Juniperus communis* Forest, east of the CD on well-drained calcareous and exposed sites in montane to mid-subalpine locations. In their most open form, both of these types can resemble and may transition to some of the limber pine woodland communities mapped and described within the Limber Pine Woodland (WLM) map class. The *Pseudotsuga menziesii* / *Spiraea betulifolia* Forest is also common to the WDF map class, east of the CD, mainly in the subalpine. West of the CD, common on low slopes and benches, is the *Pseudotsuga menziesii* / *Vaccinium caespitosum* Forest.

The *Pseudotsuga menziesii* / *Symphoricarpos albus* Forest is uncommon to the WDF map class, and is mainly mapped east of the CD. The *Pseudotsuga menziesii* / *Festuca idahoensis* Woodland is captured only by the WDF map class and occurs only east of the CD. This type, however, is quite rare, restricted to extremely well drained limestone sites of southern exposure.

Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures





Accuracy Assessment Results

Glacier National Park

- ☹ Users' Accuracy: 73% with 90% confidence interval of 58–87% (n = 33)
- ☺ Producers' Accuracy: 86% with 90% confidence interval of 73–98% (n = 28)

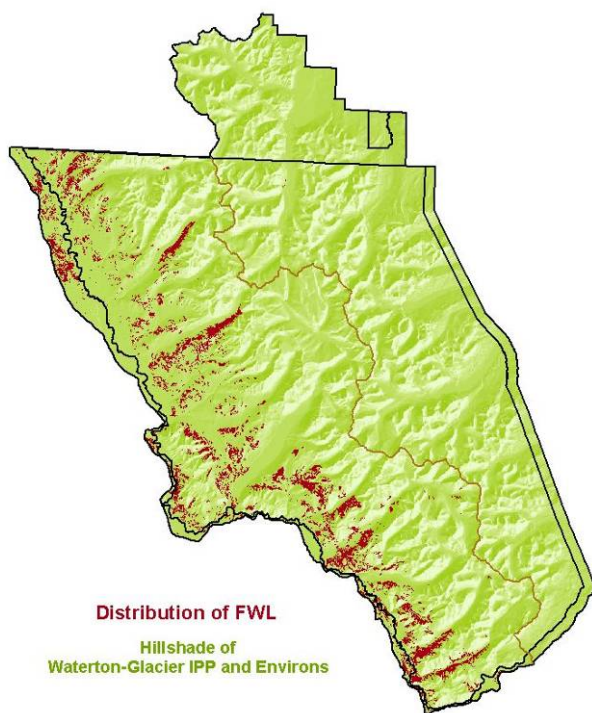
Waterton Lakes National Park

- ☹ Users' Accuracy: 46% with 90% confidence interval of 20–73% (n = 13)
- ☺ Producers' Accuracy: 67% with 90% confidence interval of 35–98% (n = 9)

Western Larch Forest (FWL)

Description of the Map Class

The Western Larch Forest (FWL) map class was used to map western larch forests, predominantly west of the CD in montane to low subalpine on various aspects and slopes (see the Distribution of FWL figure below). Occasionally, we mapped the FWL map class higher in the subalpine, but typically on elevations below 1,525 m. Although occasional western larch trees propagate east of the CD, they do not necessarily establish. We did map a few FWL communities observed during fieldwork east of the CD, just west of Waterton Lake within GNP. The field accuracy assessment, however, did not agree. The FWL map class was not used for mapping WLNP as western larch forest communities do not exist there.



The FWL map class can represent seral forests in response to fire, either in monotypic stands of western larch or coexisting with lodgepole pine. Forest stands can have an open or closed canopy with >25% total tree cover. The FWL map class represents large monotypic stands of western larch, or western larch mixed with considerable amounts of lodgepole pine, or western larch with significantly lesser amounts of deciduous trees (aspen, cottonwood, and birch).

We mapped the FWL map class when western larch was >75% RD to other conifer trees, such as western hemlock and/or western red-cedar, subalpine fir and/or Engelmann spruce, and/or Douglas-fir, and/or ponderosa pine. We also mapped the FWL map class when seral western larch was >20% RD to lodgepole pine (with the significant absence of other conifer trees), which became an interpretive challenge.

When western larch stands mixed with >25% RD deciduous tree species (aspen and cottonwood), we applied the Mixed Conifer - Deciduous Forest (FEP) map class to the forest stand. Some examples of this type exist between the west entrance of GNP and Apgar and at the base of Scalplock Mountain adjacent to the park-established trail.

In forest regeneration areas from recent burn (e.g., Red Bench Fire of 1988 near Pole Bridge), we mapped FWL down to 10% total tree cover. In these instances, the understory was often characteristic of the Mixed Regenerate Shrubland (SMR) map class, the Grassland Herbaceous (HGL) map class, or short-statured lodgepole pine (<80% RD to western larch). These sparse western larch stands were typically tall mature trees that were remnant survivors from a previous fire. In areas not affected by recent burn, we used the standard >25% total tree cover to consider mapping the FWL map class.

When conifer trees, other than lodgepole pine, are >25% RD to western larch, we needed to train our interpretive eyes away from the dominant western larch (up to 75% RD), and focus on the RD of the other conifer trees to determine proper map classification, even though the conifer trees were the lesser tree species in the stand (e.g., Douglas-fir, subalpine fir, Engelmann spruce, western cedar, western hemlock). In addition, dense supracanopy stands of western larch made it particularly difficult to interpret those map

classes requiring >25% RD to western larch; the canopy that determined the proper map class was obscured by the supracanopy. One example of this scenario is the viable cedar-hemlock forests with supracanopy western larch located between the shores of Lake McDonald and the road to Fish Creek Campground.

Even when western larch was not a supracanopy, but a younger seral tree taking on a typical conical shape and growing in a tight pattern with Douglas-fir, the distinctions between the two trees were not always clear on either CIR or TC aerial photos. This was more problematic when western larch approached <75% RD to Douglas-fir, where our standard was to classify the stand with the FDF map class. Some good examples of this scenario occur at the southern tip of GNP.

Often times, western larch was mixed with ponderosa pine in recently burned areas. Since we mapped both the FWL and the Ponderosa Pine Woodland (WPP) map classes down to 10% total tree cover in these areas, determining RD of tree species to each other became an interpretive challenge. We looked for >75% RD of western larch over ponderosa pine to map the FWL map class.

Relationship to the Vegetation Classification

The Western Larch Forest (FWL) map class represents four described western larch associations*. There is also one undescribed association, which we assigned with a park-special name. All five western larch associations fall within the same western larch alliance. We also recognize, however, an additional three described lodgepole pine associations, all falling within the same lodgepole pine alliance. The five western larch associations remain unique to this map class and are not shared by any other map classes. The three lodgepole pine associations, however, are also incorporated into other map classes. Refer to Table J-1 for association and alliance relationship to other map classes.

It is our observation that the most common and significant western larch community captured by the FWL map class is *Larix occidentalis* / *Clintonia uniflora* - *Xerophyllum tenax* Forest. The next most common community is the *Larix occidentalis* / *Clintonia uniflora* Forest. The remaining three western larch communities are notably common to the FWL map class, but are not as prevalent as the two already listed.

The three lodgepole pine associations are believed to be rare to uncommon in the FWL map class. We link them, however, to both the FWL and the Lodgepole Pine Forest (FLP) map classes because they exist in similar landscapes and are often interconnected to each other. For this mapping effort, however, only 20% RD of western larch over lodgepole pine is needed to map with the FWL map class; it is likely these lodgepole pine forest types may be captured with the FWL map class.

Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures



Accuracy Assessment Results

Glacier National Park

☹ Users' Accuracy: 76% with 90% confidence interval of 60–92% (n = 25)

☺ Producers' Accuracy: 86% with 90% confidence interval of 72–101% (n = 22)

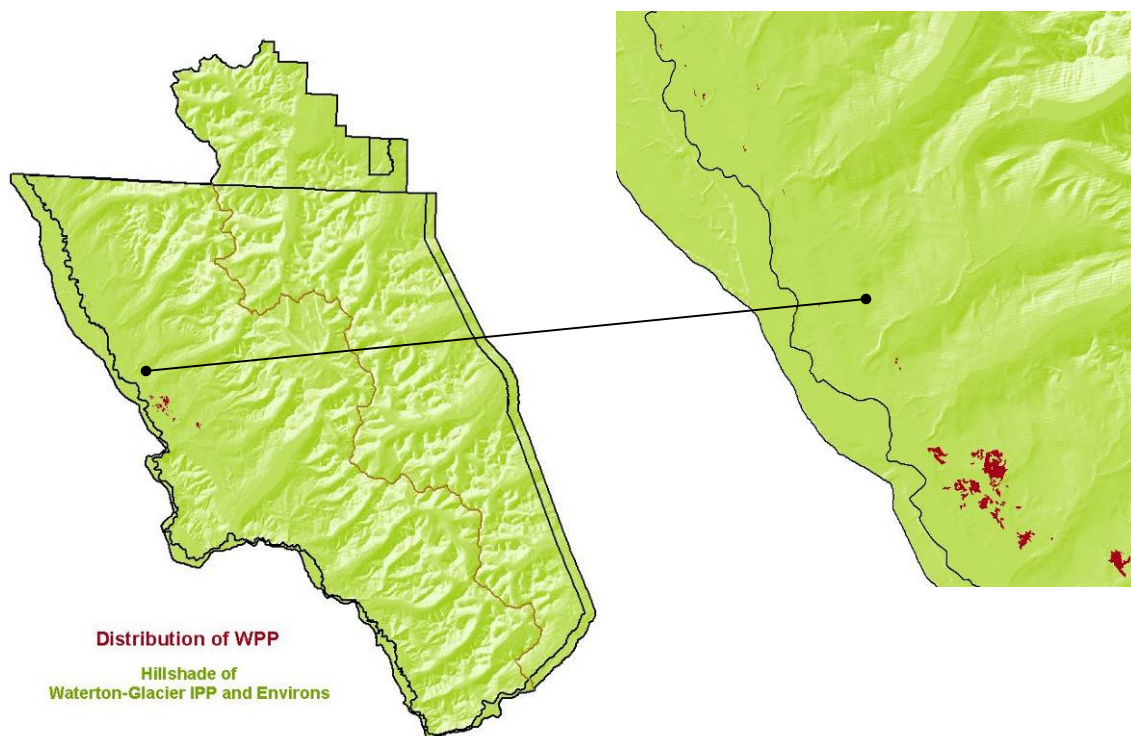
Waterton Lakes National Park

The FWL map class was not used in mapping WLNP.

Ponderosa Pine Woodland (WPP)

Description of the Map Class

The Ponderosa Pine Woodland (WPP) map class was used to map woodland and forest communities of ponderosa pine. The WPP map class is exclusive to west of the CD, and more specifically, predominantly to the northwest portion of GNP in montane to low subalpine, typically on southern and western aspects (see the Distribution of WPP figure below). The largest occurrence of the WPP map class is in the Sullivan Meadow area, where ponderosa pine coexists with Douglas-fir as it encroaches upon the grassland meadows. Other smaller isolated stands of the WPP map class were mapped north and south of the Sullivan Meadow area, such as in the Big Prairie area northwest of Polebridge. The WPP map class was not used for mapping WLNP, as ponderosa pine communities do not exist there.



With park management monitoring ponderosa pine distribution, particularly with its encroachment into grassland meadows—even after fire—we determined to map the WPP map class more aggressively than the vegetation classification describes. For ponderosa pine communities coexisting with Douglas-fir, the vegetation classification requires >75% RD of ponderosa pine over Douglas-fir. We, however, mapped the WPP map class if ponderosa pine was >50% RD to Douglas-fir. In instances where ponderosa pine and Douglas-fir appeared to be a 50/50 mix, we gave precedence to ponderosa pine.

We mapped the WPP map class down to 10% total tree cover. Because of ponderosa pine's resistance to fire, it often coexists with the fire-resistant western larch. Often times, we mapped the WPP map class in stands that were very open and recently burned (within the past 20 years or so). With our decision to also map the Western Larch Forest (FWL) map class down to 10% total tree cover (see FWL map class description for further explanation), the interpretive challenge was to determine the RD between ponderosa pine and western larch, given the sparse layer of trees to interpret. Our determination strived for 25% RD of ponderosa pine over western larch to map the WPP map class. When ponderosa pine coexists with spruce-fir, we looked for >75% RD of ponderosa pine, which was essentially rare.

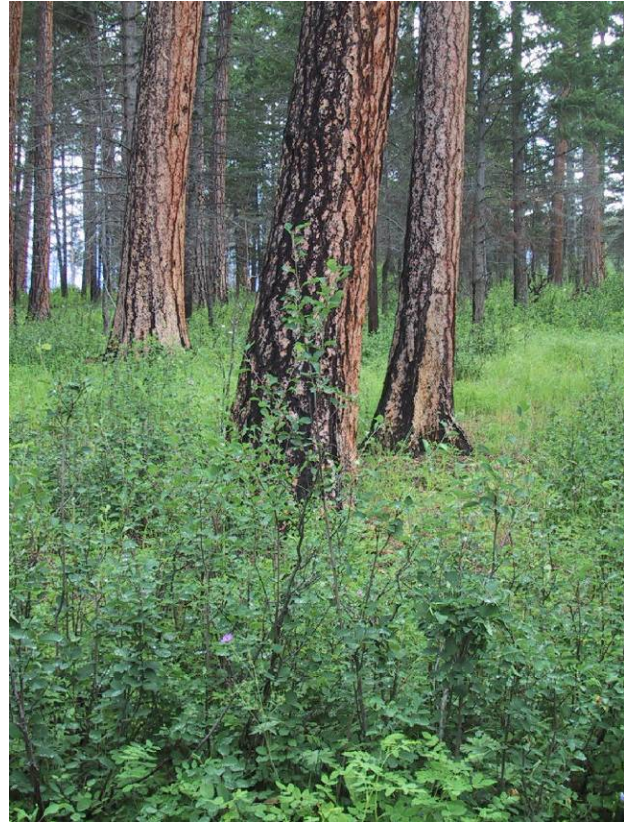
Relationship to the Vegetation Classification

The Ponderosa Pine Woodland (WPP) map class represents four described associations*. All four of these associations are unique to this map class; none are shared with any other map classes. The four associations comprise two described alliances, of which both are also unique to this map class. Refer to Table J-1 for relationship of these associations to the alliances.

All ponderosa pine communities are in warm settings of the montane, restricted west of the CD. The WPP map class commonly captures *Pinus ponderosa* / *Calamagrostis rubescens* Forest, *Pinus ponderosa* / *Symphoricarpos albus* Forest and *Pinus ponderosa* / *Vaccinium caespitosum* Woodland. The latter community typically shares canopy dominance with lodgepole pine and/or western larch. Rare to this map class, as well as the park, is *Pinus ponderosa* / *Festuca campestris* Woodland, which signifies an early seral stage of ponderosa pine.

Representative Pictures





Accuracy Assessment Results

Glacier National Park

😊 Users' Accuracy: 100% with 90% confidence interval of 94–106% (n = 8)

😊 Producers' Accuracy: 89% with 90% confidence interval of 66–112% (n = 9)

Waterton Lakes National Park

The WPP map class was not used for mapping WLNP.

Cedar - Hemlock Forest (FCH and FCS)

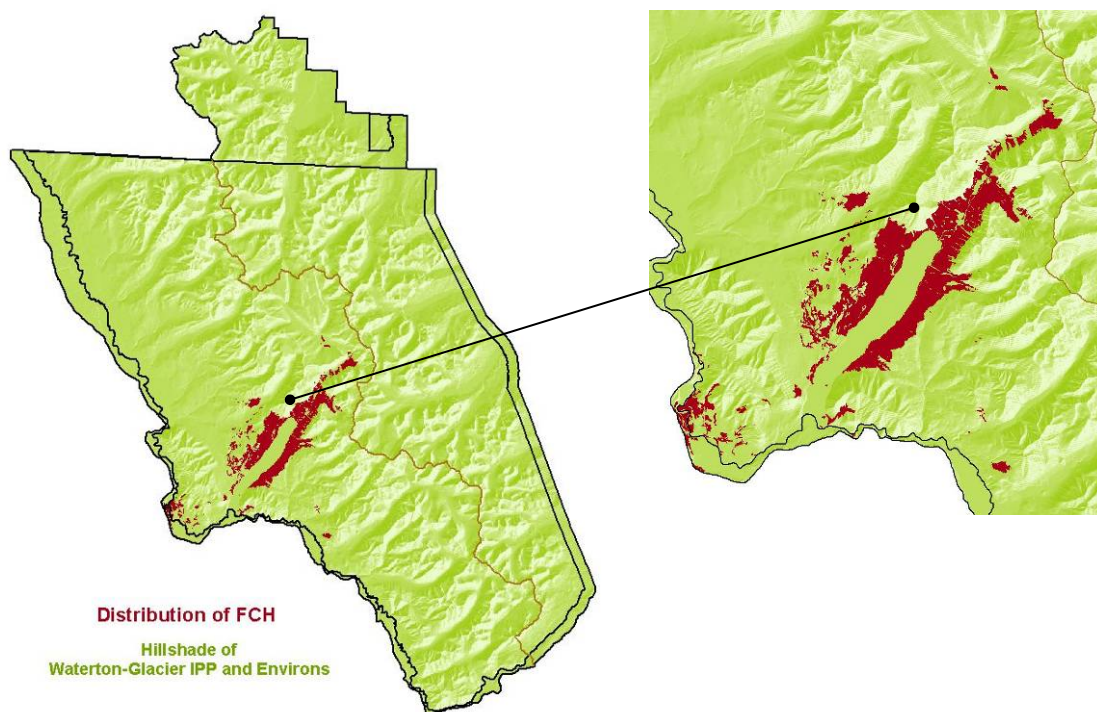
The Cedar - Hemlock Forest map class is separated into two map class phases: the mesic phase (FCH) and the wet phase (FCS). Although each map class phase has a close relationship to each other and to the vegetation classification, there are some unique characteristics to each as well. We added the FCS wet phase after the mapping of cedar-hemlock began, hoping to capture the more wetland settings separate from the more upland settings.

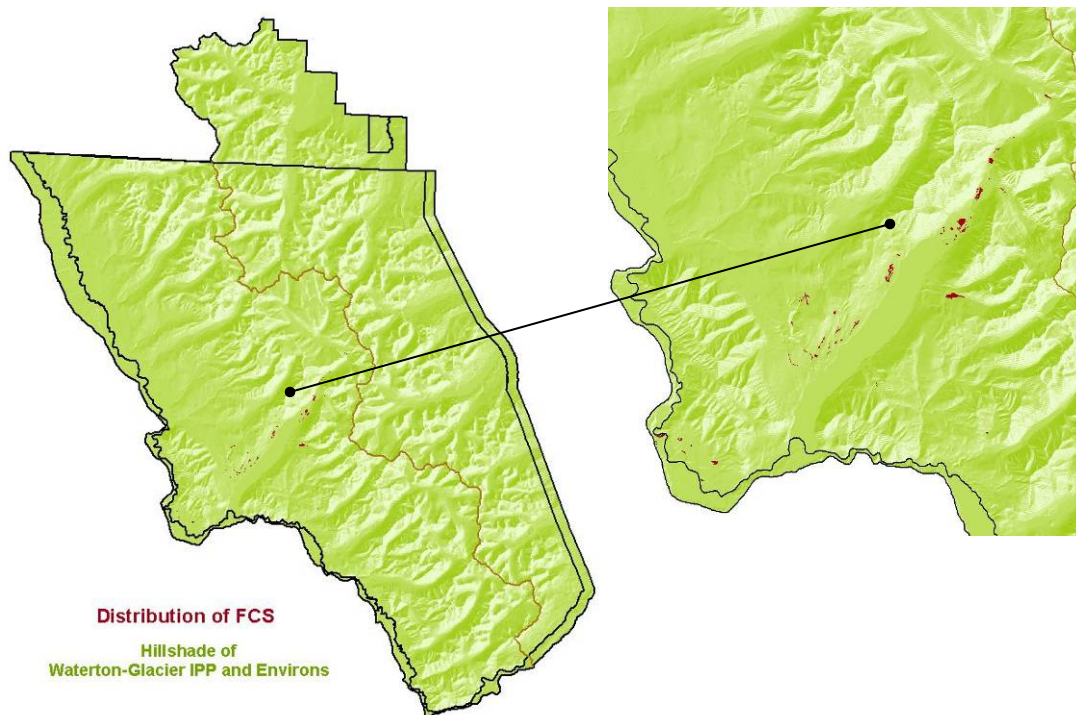
Description of the Map Class

We mapped both map class phases (FCH and FCS) of the Cedar - Hemlock Forest most frequently within the Lake McDonald basin (see the Distribution of FCH and FCS figures below). We also mapped FCH in close proximity to the North Fork Flathead River, at the base of the Apgar Mountains, before the confluence of the Middle Fork Flathead River. Very few FCH/FCS communities were mapped elsewhere.

We mapped FCH and FCS when western hemlock and/or western red-cedar were >25% RD to other conifer trees, and the deciduous component was <25% RD to all conifer trees. Although the FCH map class (mesic phase) captured mesic to wet mesic zones, we purposely used the FCS map class (wet phase) to map the wettest zones. When we mapped FCS, the area characteristics resembled that of the Engelmann Spruce Forest (FSP) map class. Typically, these areas consisted of western red-cedar (usually) and/or hemlock (more rarely) >25% RD to other tree species, along with some spruce and an occasional cottonwood.

Interpretation became challenging when western cedar and/or western hemlock approached 25% RD to other conifers (typically subalpine fir, Engelmann spruce, Douglas-fir, and western larch). In addition, interpretation was further complicated when dense supracanopy stands of western larch obscured viable cedar-hemlock stands. The road to Fish Creek Campground adjacent to Lake McDonald is a good example of this.





Relationship to the Vegetation Classification

The Cedar - Hemlock Forest map class (including both phases) represents 11 described associations, of which all 11 are unique to this map class. The 11 associations consist of 4 described alliances, of which all 4 are unique to this map class.

The FCH (mesic) map class phase represents all 11 associations (and therefore all 4 alliances). The FCS (wet) map class phase represents 7 of the 11 associations, leaving 4 associations unique to the FCH map class phase. All four alliances are shared by both map class phases. Refer to Table J-1 for association and alliance relationship between these two map class phases.

It is our observation that *Thuja plicata* / *Clintonia uniflora* Forest and *Tsuga heterophylla* / *Clintonia uniflora* Forest are the most common western cedar and western hemlock communities captured by the FCH map class phase (mesic), often growing in close juxtaposition or in a mosaic pattern with each other. Also common to the FCH map class phase is *Thuja plicata* / *Clintonia uniflora* - *Xerophyllum tenax* Forest and *Thuja plicata* / *Gymnocarpium dryopteris* Forest. The remaining five communities linked to the FCH map class phase are considered uncommon to rare.

We believe the majority of the wetland communities are best captured by the wet phase (FCS), although the mesic phase (FCH) may also capture wetland cedar and hemlock communities. The *Thuja plicata* / *Athyrium filix-femina* Forest, *Tsuga heterophylla* / *Gymnocarpium dryopteris* Forest, and *Tsuga heterophylla* / *Athyrium filix-femina* Forest are captured by both FCH and FCS map class phases, however, they are most captured by the wet phase (FCS), and uncommon to the mesic phase (FCH). The *Thuja plicata* / *Gymnocarpium dryopteris* Forest is also commonly captured by both map class phases. The remaining three communities linked to FCS are considered uncommon to rare in the FCS map class phase.

Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures

Mesic Phase (FCH)





Wet Phase (FCS)



Accuracy Assessment Results

The FCH and FCS map class phases comprise the same map class, Cedar - Hemlock Forest. Therefore, they were combined for accuracy assessment.

Glacier National Park

☺ Users' Accuracy: 88% with 90% confidence interval of 72–104% (n = 17)

☹ Producers' Accuracy: 83% with 90% confidence interval of 66–101% (n = 18)

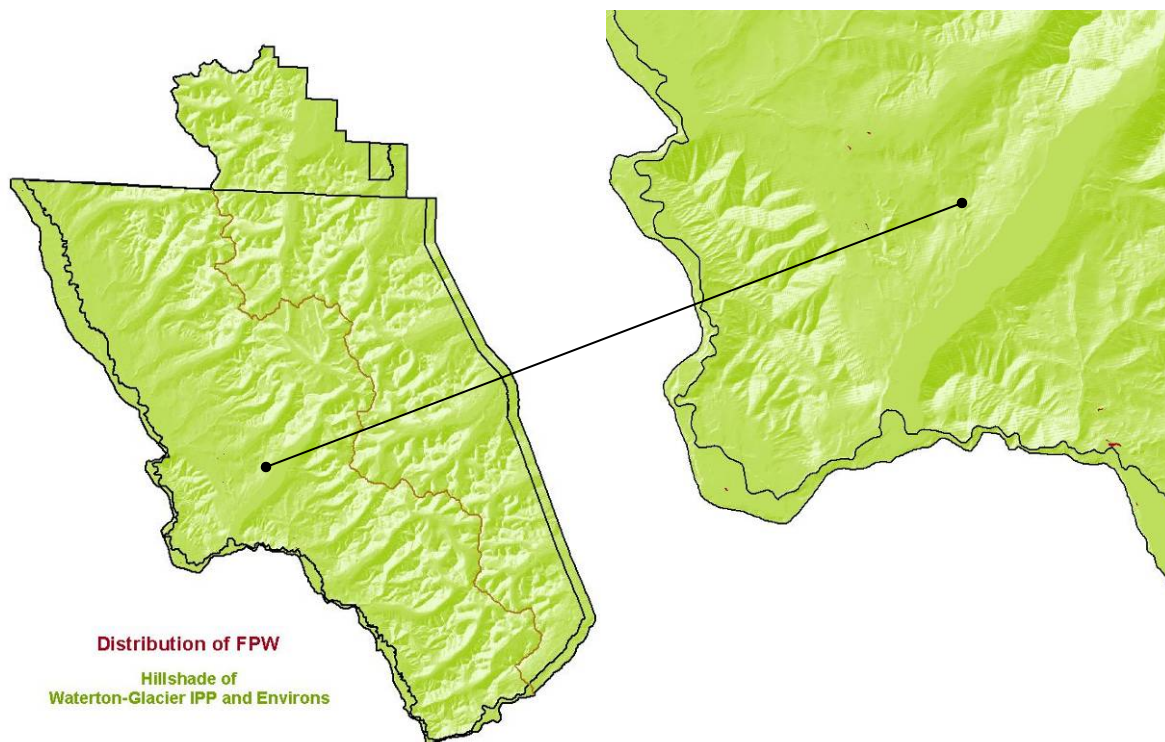
Waterton Lakes National Park

The FCH and FCS map class phases were not used in mapping WLNP.

Lodgepole Pine Wet Forest (FPW)

Description of the Map Class

The Lodgepole Pine Wet Forest (FPW) map class is quite rare to the vegetation map and is typically found within montane to low-subalpine (see the Distribution of FPW figure below). We used FPW to map lodgepole pine stands in basin and riparian wetlands—on occasion with open water inundating the understory (even on August-dated aerial photos). Unfortunately, the full recognition of these wetland lodgepole pine communities and the inception of the FPW map class did not occur until mapping east of the CD was complete, and mapping west of the CD was in progress. Basin and riparian lodgepole pine wetlands are mostly captured within the Engelmann Spruce Forest (FSP) map class—a map class that represents wet-mesic to wet Engelmann spruce—and due to a lack of understanding early in the mapping process, may also be captured within the Lodgepole Pine Forest (FLP) map class. Unfortunately, finding lodgepole pine wetlands originally mapped as FSP east of the CD would require surveying the aerial photos again in order to differentiate from true Engelmann spruce forest types. Therefore, wet lodgepole pine stands east of the CD were not captured.



We used the FPW map class very conservatively to map lodgepole pine stands undoubtedly in the wetland zone. Like the Lodgepole Pine Forest (FLP) map class, we mapped FPW when lodgepole pine was >75% RD to other trees in the stand, and total tree cover was >25%. When the deciduous (typically black cottonwood) component was >25% RD to conifer trees, we then applied the Mixed Conifer - Deciduous Wet Forest (FWM) map class.

The area near Many Glacier between Swiftcurrent Lake and the Swiftcurrent Ranger Station provides an example of lodgepole pine wetlands mapped as FSP and perhaps FLP. The area along the Middle Fork Flathead River, midway between Lincoln Creek and Harrison Creek, provides a prevalent example of area mapped as FPW.

The FPW map class was not applied to WLNP mapping. It is possible it occurs in WLNP, as we remember viewing wet lodgepole pine in the field and on aerial photos in GNP near the Canada border

(Belly River). One can assume if wet lodgepole pine occurs in WLNP, it is captured with the FSP map class.

Relationship to the Vegetation Classification

The Lodgepole Pine Wet Forest (FPW) map class represents two described associations, each within their own described alliance. Neither of the two associations nor the two alliances are unique to the FPW map class; they are also included in the Lodgepole Pine Forest (FLP) map class. Refer to Table J-1 for association and alliance relationship to other map classes.

It is our observation the *Pinus contorta* / *Calamagrostis canadensis* Forest and *Pinus contorta* / *Cornus sericea* Woodland are both very common to the FPW map class, and more prevalent east of the CD. It is an unfortunate event that the FPW map class came after the east side mapping was already complete; recall that these two types are mapped with the Engelmann Spruce Forest (FSP) map class, or possibly the Lodgepole Pine Forest (FLP) map class east of the CD. The first community listed is more conducive of lodgepole pine mapped in sub-hygic to hydric soils, often of small patch swales. The latter community is more representative of lodgepole pine mapped within riparian zones.

Representative Pictures

No representative pictures available.

Accuracy Assessment Results

Glacier National Park

Due to remote locations, the FPW map class was not assessed for accuracy in GNP.

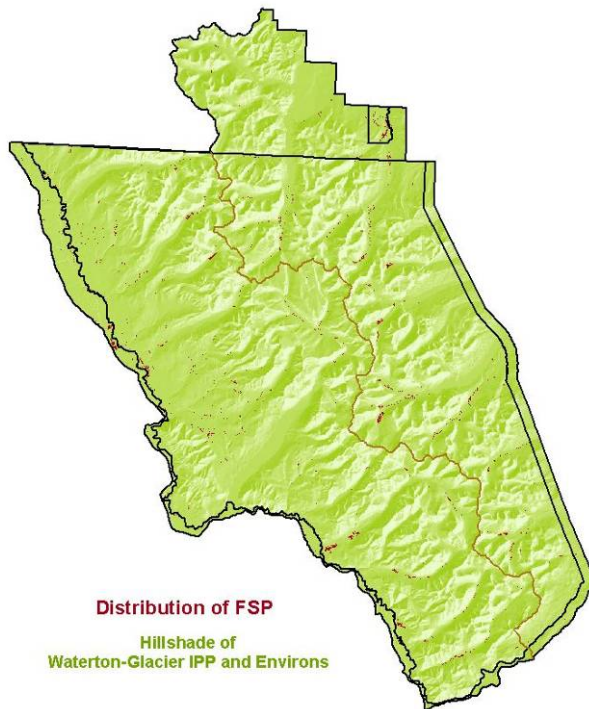
Waterton Lakes National Park

The FPW map class was not used in mapping WLNP.

Engelmann Spruce Forest (FSP)

Description of the Map Class

The Engelmann Spruce Forest (FSP) map class is somewhat common throughout the vegetation map, distributed from montane to subalpine (see the Distribution of FSP figure below). We used FSP to map Engelmann spruce stands in mesic and wet-mesic sites on perched basins, subirrigated toeslopes, and low terrace riparian benches. On occasion, east of the CD, we used the FSP map class to capture lodgepole pine stands within these same wetland environments (see the FPW map class description for further explanation).



We applied the FSP map class to mesic and wet-mesic sites having >25% total tree cover, and an exceedingly high RD (>80%) of Engelmann spruce over other tree species (with the exception of mapping wet lodgepole pine east of the CD, as previously mentioned). Applying the FSP map class to toeslope and riparian benches required a low RD of subalpine fir (<10–15%) and when the subalpine fir exceeded this low RD, we then used the Subalpine Fir - Engelmann Spruce Forest (FFS) map class. At times, it became difficult to discern FSP from FFS on the aerial photos, and we recognized an overlap in plant communities between these two map classes.

Often, the sparse presence of black cottonwood would be indicative of FSP in riparian bench sites, and helped in mapping FSP. When the deciduous component (typically black cottonwood) was >25% RD to conifer trees, we then applied the Mixed Conifer - Deciduous Wet Forest (FWM)

map class. When the western red-cedar (usually) and/or hemlock (more rarely) was >25% RD over the Engelmann spruce and other tree species, we applied the wet phase of the Cedar - Hemlock Forest (FCS). This was common within the Lake McDonald basin. At times, this interpretive call was challenging.

The FSP map class is commonly thought to have a closed tree canopy, however, it is occasionally found to have an open canopy. The understory of FSP is typically herb rich with an element of shrub species other than willow (e.g., dogwood). Willow shrubs, however, are often along the forest margins, especially of braided streams and islands, but are not typically found within the forest. The FSP map class easily transitions into the Engelmann Spruce - Wet Shrub Forest (FSW) map class, which exists in wetter conditions, typically has a more open canopy, and has a dense shrub undergrowth of willow species. Lastly, the spruce trees mapped with the FSP map class are typically taller than the spruce trees mapped with the FSW map class because of their slightly drier position in the landscape.

Relationship to the Vegetation Classification

The Engelmann Spruce Forest (FSP) map class represents six described associations*. Of these six associations, one is unique to this map class, whereas the other five associations are also incorporated into other map classes. The six associations comprise 4 described alliances, of which three are also included in other map classes (the other one association is unique to the FSP map class). The FSP map class has one

additional described alliance, with no described association. Refer to Table J-1 for association and alliance relationship to other map classes.

On riparian benches, the FSP map class most commonly captures *Picea engelmannii* / *Equisetum arvense* Forest and *Picea engelmannii* / *Cornus sericea* Woodland. The former community is perhaps the more mesic of the two, and both communities have a water table close to the surface. Also on benches, the FSP map class commonly captures *Abies lasiocarpa* - *Picea engelmannii* / *Calamagrostis canadensis* Forest, often in small patches. On subirrigated slopes, particularly on toeslopes, *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Streptopus amplexifolius* Woodland is common to the FSP map class.

Uncommon to FSP, particularly because it is at its eastern range of distribution and is rare in GNP, is *Abies lasiocarpa* - *Picea engelmannii* / *Oplomanax horridus* Forest. This community is restricted to west of the CD.

Not officially shown in the classification crosswalk table (Table J-1), but worth noting, is the inclusion of *Pinus contorta* / *Calamagrostis canadensis* Forest and *Pinus contorta* / *Cornus sericea* Woodland communities within the FSP map class in areas east of the CD. These two lodgepole pine wetland communities are linked to the Lodgepole Pine Wet Forest (FPW) map class. Unfortunately, these two types were not recognized as plant communities until mapping was complete east of the CD—a casualty of mapping prior to the complete development of the vegetation classification. For further discussion regarding this situation, see the FPW map class description.

Again, refer to Table J-1 for all associations linked to this map class, but note the two lodgepole pine wetland communities are listed with the FPW map class, not the FSP map class.

Representative Pictures



Accuracy Assessment Results

Glacier National Park

☺ Users' Accuracy: 78% with 90% confidence interval of 63–93% (n = 27)

☺ Producers' Accuracy: 88% with 90% confidence interval of 74–101% (n = 24)

Waterton Lakes National Park

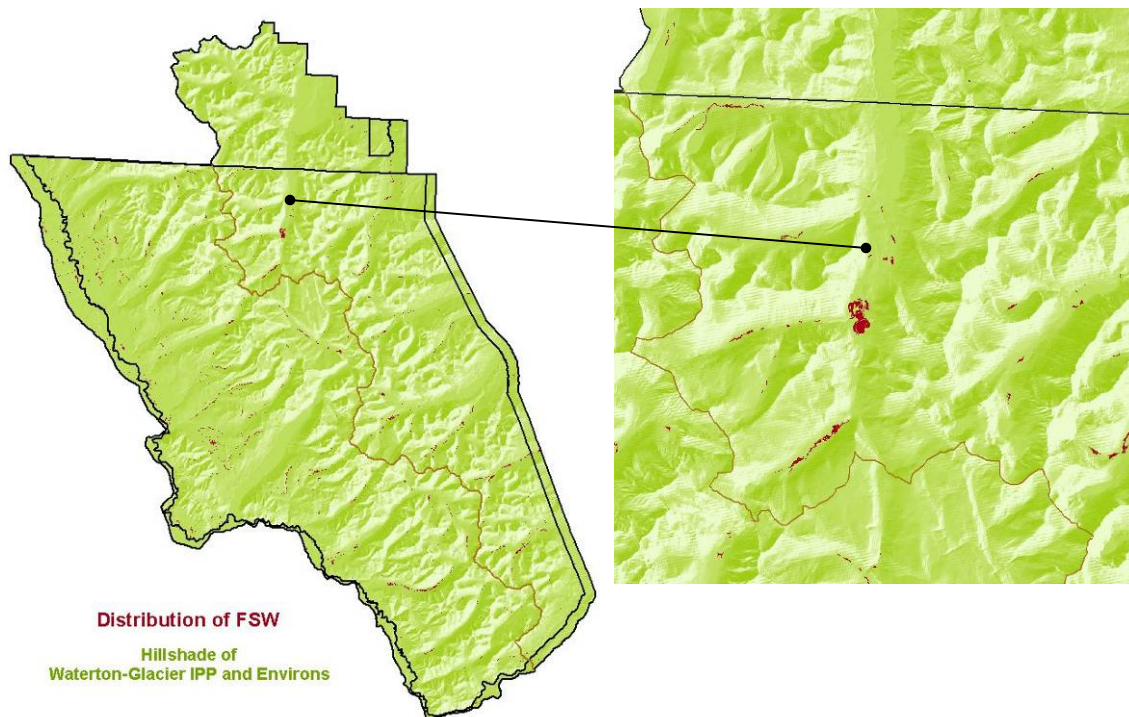
☹ Users' Accuracy: 33% with 90% confidence interval of -7–73% (n = 6)

☹ Producers' Accuracy: 67% with 90% confidence interval of 5–128% (n = 3)

Engelmann Spruce - Wet Shrub Forest (FSW)

Description of the Map Class

The Engelmann Spruce - Wet Shrub Forest (FSW) map class is more common throughout the GNP vegetation map than the WLNP vegetation map and is distributed from montane to subalpine (see the Distribution of FSW figure below). We used the FSW map class to map Engelmann spruce stands with a rich understory of shrub species in wetlands of riparian and perched basins.



We applied the FSW map class to wetland sites having >25% total tree cover of Engelmann spruce, usually with a rich undergrowth of shrub species, most commonly willow, yet on occasion bog birch or alder. Occasionally, the undergrowth of the FSW map class is of wetland herbaceous species (e.g., sedge), perhaps more common in cirque locations in the subalpine. The FSW map class has an open tree canopy due to its wetter location, yet occasionally has a more closed tree canopy. Also, the spruce trees are often shorter in height than those found in the Engelmann Spruce Forest (FSP) map class due to its wetter position on the landscape. The FSW map class, however, easily transitions into the FSP map class, which is of drier riparian bench sites and typically has a more closed tree canopy with a less developed shrub layer (lacking significant willow species, yet rich in herbaceous species).

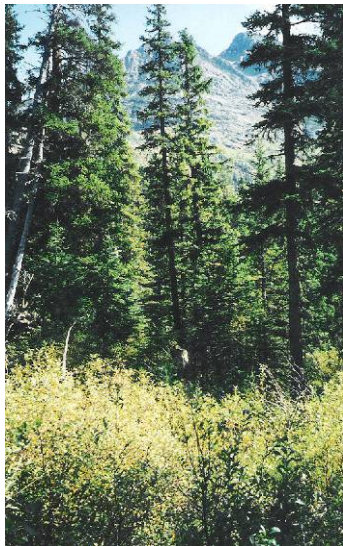
When the deciduous (typically black cottonwood) component is >25% RD to conifer trees, we then applied the Mixed Conifer - Deciduous Wet Forest (FWM) map class. When the total tree canopy cover became <20–25%, we then applied the Deciduous Wet Shrubland (SWL) map class, and perhaps less commonly the Wet Meadow Herbaceous (HWM) map class. When the western red-cedar (usually) and/or hemlock (more rarely) is >25% RD over the Engelmann spruce and other tree species, we then applied the wet phase of the Cedar - Hemlock Forest (FCS). This is common within the Lake McDonald basin.

Relationship to the Vegetation Classification

The Engelmann Spruce - Wet Shrub Forest (FSW) map class represents two described associations. Of these two associations, one is unique to this map class, whereas the other is also included in the Engelmann Spruce Forest (FSP) map class. The two associations comprise two described alliances, of which one alliance is unique to the FSW map class, and the other is also included in the FSP map class. Refer to Table J-1 for association and alliance relationship to other map classes.

The FSW map class essentially captures the *Picea engelmannii* / *Salix drummondiana* Woodland. Less commonly, the *Picea engelmannii* / *Cornus sericea* Woodland is captured in slightly drier sites, however, this type is more commonly mapped with the Engelmann Spruce Forest (FSP) map class.

Representative Pictures



Accuracy Assessment Results

Glacier National Park

- ☺ Users' Accuracy: 100% with 90% confidence interval of 98–102% (n = 24)
- ☺ Producers' Accuracy: 100% with 90% confidence interval of 98–102% (n = 24)

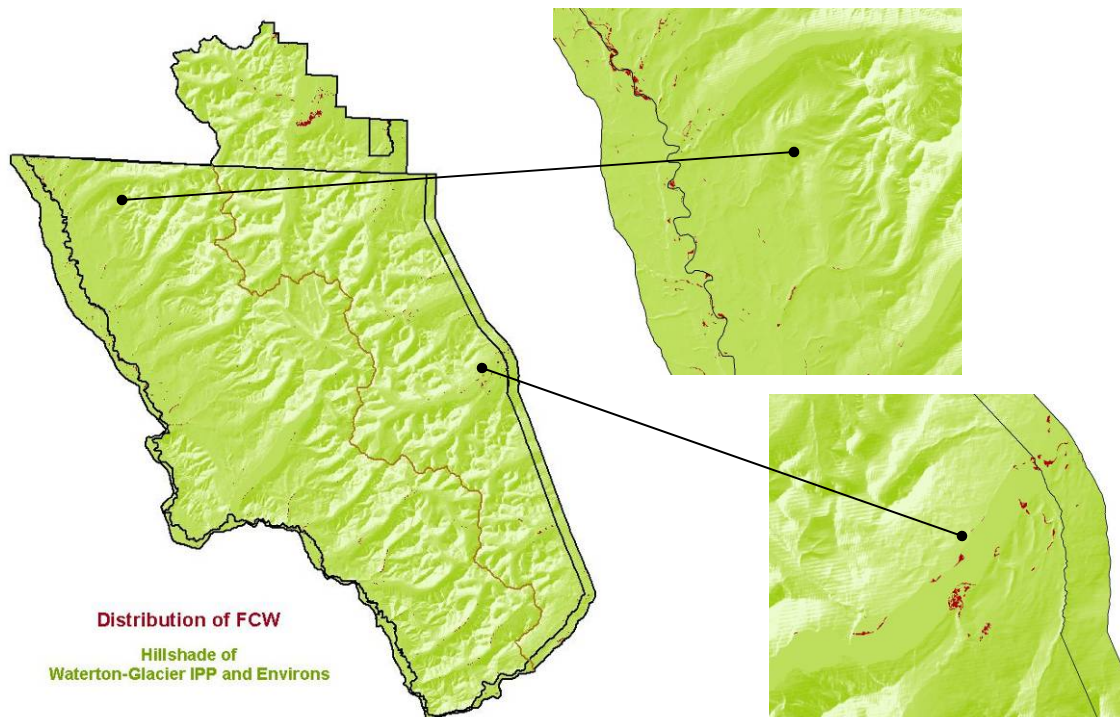
Waterton Lakes National Park

- ☹ Users' Accuracy: 67% with 90% confidence interval of 5–128% (n = 3)
- ☺ Producers' Accuracy: 100% with 90% confidence interval of 75–125% (n = 2)

Black Cottonwood Forest (FCW)

Description of the Map Class

The Black Cottonwood Forest (FCW) map class was used to map wetland poplar stands, typically consisting of black cottonwood, but occasionally aspen. Forest stands are generally small, occur in close proximity to riparian corridors and lakeshores, are occasionally found in perched basins settings, and are typically located in the montane to lower subalpine (see the Distribution of FCW figure below).



The FCW map class often included a small component of conifer trees. However, when the conifer species (usually Engelmann spruce) became >25% RD to poplar trees, we resorted to the Mixed Conifer - Deciduous Wet Forest (FWM) map class to describe the forest stand.

Black cottonwood trees were easily identifiable on the aerial photos. The interpretive challenge, however, came in determining the hydrology of the site. In areas where it was difficult to discern between wetland and upland situations, we made our best judgment to map with the FCW map class for wetland sites, and the Poplar - Birch Forest (FAP) map class for drier, upland sites. There was an overlap in plant communities between the FCW and FAP map classes.

Relationship to the Vegetation Classification

The Black Cottonwood Forest (FCW) map class represents six described associations*. Of these six associations, one is unique to this map class, whereas the other five are also incorporated into other map classes. The six associations comprise four described alliances, of which all four are also included in other map classes. Refer to Table J-1 for association and alliance relationship to other map classes.

All of the black cottonwood forest communities occur both east and west of the CD. We believe the most common community to the FCW map class, when mapping black cottonwood stands within wetland swales and subirrigated benches, is *Populus balsamifera* ssp. *trichocarpa* / *Calamagrostis canadensis* Forest [Provisional], and when the stand is more dominant with aspen, the most common community is *Populus tremuloides* / *Calamagrostis canadensis* Forest. Likewise, when mapping black cottonwood

stands within more extensive riparian habitats, the most common community to FCW is *Populus balsamifera* ssp. *trichocarpa* / *Cornus sericea* Forest, and when the stand is more dominant with aspen, the most common community is *Populus tremuloides* / *Cornus sericea* Forest.

Less common to the FCW map class is *Populus balsamifera* ssp. *trichocarpa* - (*Populus tremuloides*) / *Heracleum maximum* Forest and *Populus tremuloides* / *Heracleum maximum* Forest. These forest types are better captured with the Poplar - Birch Forest (FAP) map class, since they are in drier habitats.

Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures



Accuracy Assessment Results

Glacier National Park

- 😊 Users' Accuracy: 97% with 90% confidence interval of 89–104% (n = 29)
- 😊 Producers' Accuracy: 85% with 90% confidence interval of 73–97% (n = 33)

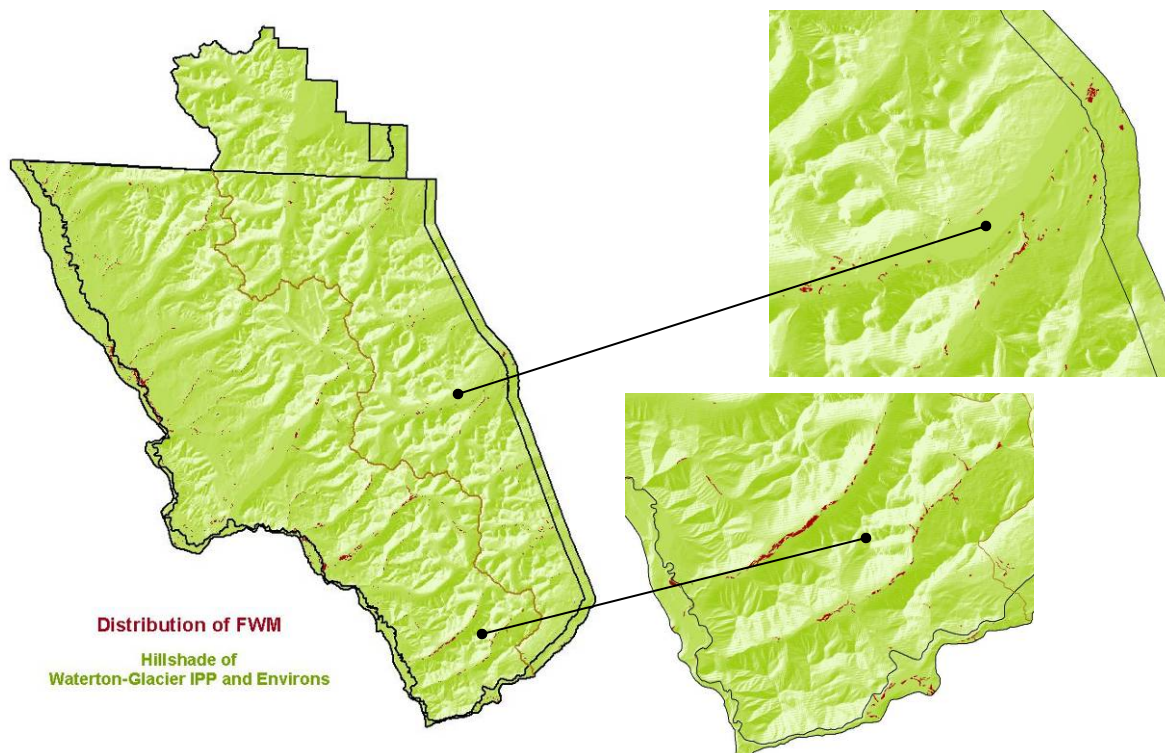
Waterton Lakes National Park

- 😊 Users' Accuracy: 100% with 90% confidence interval of 92–108% (n = 6)
- 😊 Producers' Accuracy: 86% with 90% confidence interval of 57–115% (n = 7)

Mixed Conifer - Poplar Wet Forest (FWM)

Description of the Map Class

The Mixed Conifer - Poplar Wet Forest (FWM) map class was used to map wetland forest stands of mixed conifer and deciduous trees, most typically with Engelmann spruce and black cottonwood, yet sites with other tree species (e.g., lodgepole pine, subalpine fir, trembling aspen) occurred as well. Forest stands were typically small, in close proximity to riparian corridors, occasionally perched in basins settings, and typically located in the montane to mid-subalpine. (see the Distribution of FWM figure below).



The FWM map class is very similar to the Black Cottonwood Forest (FCW) and Engelmann Spruce Forest (FSP) map classes, however, the FWM map class needs to have both the conifer and deciduous components >25% RD to each other. When one component exceeds >75% RD to the other, either the FCW or the FSP map classes were applied.

The forest stands can have a closed or open canopy, ranging from a scoured understory from high energy streams to a rich herbaceous undergrowth on soil development of swales and basins. When the total canopy cover became <25%, we then applied the wetland shrub or herbaceous map classes accordingly, perhaps most commonly was the Deciduous Wet Shrubland (SWL) map class.

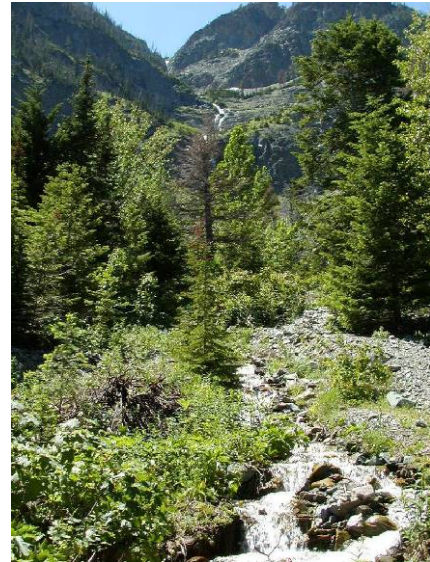
Relationship to the Vegetation Classification

The Mixed Conifer - Poplar Wet Forest (FWM) map class represents four described associations*. Of these four associations, one is unique to this map class, whereas the other three associations are also incorporated into other map classes. The four associations comprise two described alliances, of which both are also included in other map classes. Refer to Table J-1 for association and alliance relationship to other map classes.

All of the mixed conifer - poplar wet forest communities occur both east and west of the CD. We determined *Populus balsamifera* ssp. *trichocarpa* - *Populus tremuloides* - Conifer / *Calamagrostis canadensis* Forest and *Populus balsamifera* ssp. *trichocarpa* - *Populus tremuloides* - Conifer / *Cornus sericea* Forest to be most commonly captured by the FWM map class, often within riparian habitats. Also common to both sides of the CD, but perhaps more prevalent east of the CD, was *Populus balsamifera* ssp. *trichocarpa* - *Picea engelmannii* / *Equisetum arvense* Forest along riparian passageways. Perhaps less common and occurring on subirrigated sites was the *Populus tremuloides* - *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Forest. This type was also represented by the FCW map class, although perhaps better captured with the Mixed Conifer - Deciduous Forest (FEP) map class.

Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures



Accuracy Assessment Results

Glacier National Park

- ☺ Users' Accuracy: 86% with 90% confidence interval of 74–98% (n = 29)
- ☺ Producers' Accuracy: 100% with 90% confidence interval of 98–102% (n = 25)

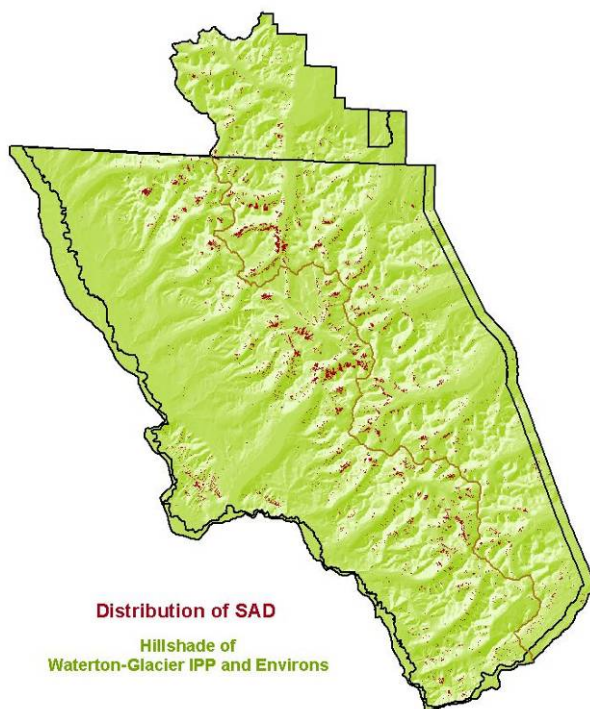
Waterton Lakes National Park

- ☺ Users' Accuracy: 50% with 90% confidence interval of -33–133% (n = 2)
- ☺ Producers' Accuracy: 100% with 90% confidence interval of 50–150% (n = 1)

Deciduous Shrubland: Avalanche/Snow Burial (SAD)

Description of the Map Class

The Deciduous Shrubland: Avalanche/Snow Burial (SAD) map class was used to map deciduous shrublands of avalanche chutes and snow burial fields. These communities typically occurred in the subalpine and range from large shrub fields on slopes extending from the tree line to the valley below (avalanche chutes and their runouts, broad mountain slopes) to small isolated pockets nestled within dense forests (snow-packed fields and cornices). (See the Distribution of SAD figure below.) These shrublands tend to occur more often on moist sites, yet occasionally are located on sites that are quickly drying out due to moisture absorbing into the loose rocky sites of colluvial and scree.



We applied the SAD map class when shrubs were >25% total cover and the deciduous shrub component was >75% RD over its conifer counterpart, regardless of conifer height. When conifers were >25% RD to the deciduous shrubs and were <5 m in height, we then used the Mixed Conifer - Deciduous Shrubland: Avalanche/Snow Burial (SAM) map class. If the conifers were >5 m in height and >25% total cover, the appropriate forest or woodland map class was applied (e.g., fir-spruce, Douglas-fir, lodgepole pine).

A particular challenge in mapping SAD was making the proper interpretive decision in RD of conifer shrubs. Often times, only the very tops of conifer shrubs poked through the broad-shaped deciduous shrubs, leaving an impression of fewer conifers. This resulted in mistakenly mapping the shrubland with the SAD map class, when in actuality the shrubland was better represented with the SAM map class. To

avoid this, we tended to map more aggressively with the SAM map class, recognizing that more conifer shrubs exist than meets the eye.

When a shrub field or avalanche chute primarily consisted of trembling aspen, we mapped the Poplar - Birch Forest (FAP) map class, regardless of the short tree height. When we were unable to determine if the community was comprised of shrubs or short aspen, we used the SAD map class to describe the shrub field.

Shrublands in early successional response to forest and woodland disturbance (e.g., fire, disease, insect) were captured with the Mixed Regenerate Shrubland (SMR) map class.

Relationship to the Vegetation Classification

The Deciduous Shrubland: Avalanche/Snow Burial (SAD) map class represents 28 described associations*. Among the undescribed associations, we assigned two of them with park-special names. Of these 30 associations (described and park-special), 1 of the park-special types is unique to this map class, whereas the remaining 29 associations are also incorporated into other map classes. The 30 associations

comprise 16 described alliances, plus another 2 undescribed alliances for each of the park-special types. Refer to Table J-1 for association and alliance relationship to other map classes.

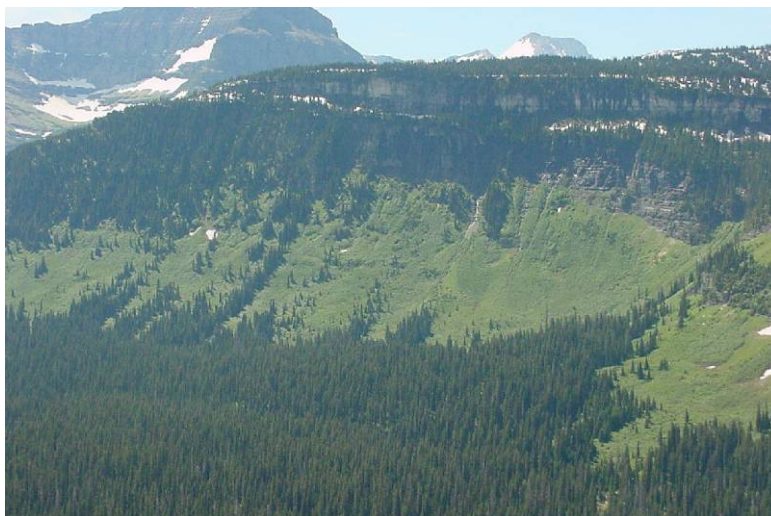
The SAD map class captured numerous shrubland communities, however, most are rare or uncommon to the map class; we determined 22 of the 30 associations to be rare or uncommon, with many being restricted to one side of the CD.

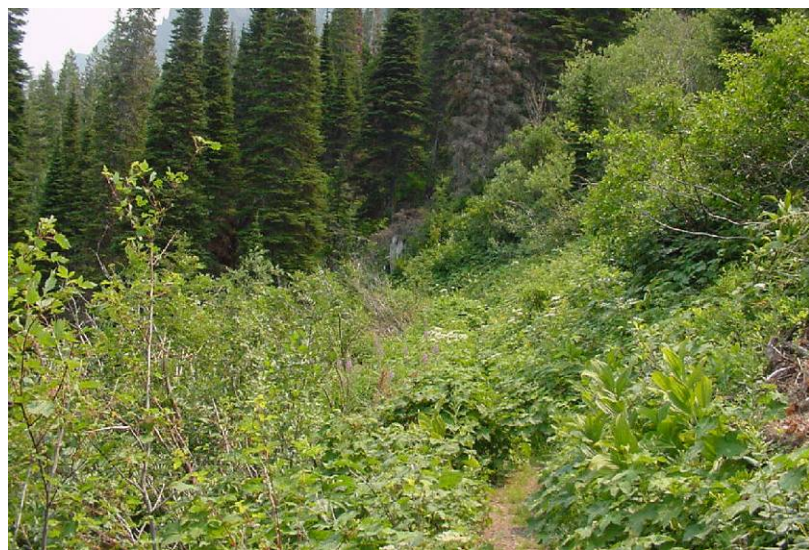
The shrubland communities most common to the SAD map class throughout the Waterton-Glacier IPP are *Acer glabrum* Avalanche Chute Shrubland and *Alnus viridis* ssp. *sinuata* / Mesic Forbs Shrubland. Another common community west of the CD is *Alnus viridis* ssp. *sinuata* / *Athyrium filix-femina* - *Cinna latifolia* Shrubland. Also common to the SAD map class throughout the park, characterizing the wettest portions of avalanche chutes, is *Alnus incana* / *Calamagrostis canadensis* Shrubland. *Alnus incana* Shrubland is common to the SAD map class, as well. Additional communities represented by the SAD map class, typically east of the CD, are *Populus tremuloides* / *Amelanchier alnifolia* Avalanche Chute Shrubland, *Rubus parviflorus* / *Chamerion angustifolium* - *Heracleum maximum* Shrubland, and *Salix commutata* / Mesic Graminoid Shrubland.

Of these shrubland associations common to the SAD map class, some are more common to avalanche chutes, whereas others are more apt toward snow burial fields and cornices.

Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures





Accuracy Assessment Results

Glacier National Park

- 😊 Users' Accuracy: 95% with 90% confidence interval of 88–102% (n = 41)
- 😊 Producers' Accuracy: 89% with 90% confidence interval of 80–98% (n = 44)

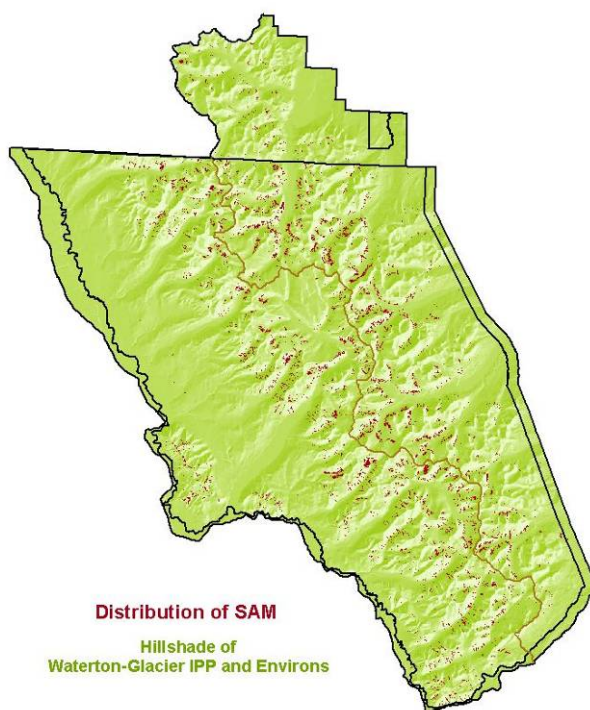
Waterton Lakes National Park

- 😊 Users' Accuracy: 100% with 90% confidence interval of 83–117% (n = 3)
- 😞 Producers' Accuracy: 60% with 90% confidence interval of 14–106% (n = 5)

Mixed Conifer - Deciduous Shrubland: Avalanche/Snow Burial (SAM)

Description of the Map Class

The Mixed Conifer - Deciduous Shrubland: Avalanche/Snow Burial (SAM) map class was used similarly to the Deciduous Shrubland: Avalanche/Snow Burial (SAD) map class. The SAM map class was used to map mix conifer and deciduous shrublands of avalanche chutes and snow burial fields. Similar to the SAD map class, these communities tend to be in the subalpine, and range from large shrub fields on slopes extending from the tree line to the valley bottoms (avalanche chutes and their runouts, broad mountain slopes) to small isolated pockets nestled within dense forests (snow-packed fields and cornices). (See the Distribution of SAM figure below.) Similar to SAD, these shrublands tend to occur more often on moist sites, yet occasionally are located on sites that are quickly drying out due to moisture absorbing into the loose rocky sites of colluvial and scree.



We applied the SAM map class when shrubs were >25% total cover and both the deciduous and conifer shrub components were >25% RD to each other. However, if the conifer trees were >5 m in height and >25% total cover, the appropriate forest or woodland map class was applied. (e.g., fir-spruce, Douglas-fir, lodgepole pine). We also applied a forest or woodland map class when the shrub-height conifers were >75 RD to the deciduous shrubs. When the conifers were <25% RD to the deciduous shrubs (regardless of height), we then used the Deciduous Shrubland: Avalanche/Snow Burial (SAD) map class to describe the area.

A particular challenge in mapping SAM was making the proper interpretive decision in RD of conifer shrubs. Often times, only the tops of conifer shrubs poked through the broad-shaped deciduous shrubs, leaving an impression of fewer conifers. This resulted in mistakenly mapping the shrubland with the SAD map class, when in actuality the

shrubland was better represented with the SAM map class. Thus, we aggressively mapped using the SAM map class when we recognized presence of conifer shrubs, understanding that more conifer shrubs are present than meets the eye.

Technically, shrub-height conifers mixed with poplars and/or birch constitute using the (FEP) map class, along with a short-height physiognomic modifier. However, when we were unable to determine if the deciduous component was comprised of shrubs or short poplars and/or birch, we used the SAM map class to describe the mixed shrub field.

Shrublands in early successional response to forest and woodland disturbance (e.g., fire, disease, insect) were captured with the Mixed Regenerate Shrubland (SMR) map class.

In hindsight, we could have mapped areas mapped as SAM into more detail based on the conifer species. For instance, spruce-fir mixes and Douglas-fir mixes could have been mapped separate, instead of mapping both types in the SAM map class. Of these two scenarios, the spruce-fir mixed deciduous shrub is more frequently captured with the SAM map class. However, if one wanted to extrapolate areas of

Douglas-fir mixed deciduous shrub, sifting the vegetation map coverage for the SAM map class in juxtaposition to dry locations having significant amounts of Douglas-fir Forest (FDF) and Douglas-fir Woodland (WDF) map classes would be an excellent place to begin. Also, the Deciduous Shrubland: Dry - Mesic (SDS) map class is another prompting indicator, since this deciduous shrub type is similar to the deciduous shrubs found in the Douglas-fir version of the SAM map class.

Relationship to the Vegetation Classification

The Mixed Conifer - Deciduous Shrubland: Avalanche/Snow Burial (SAM) map class represents 15 described associations. All 15 of these associations are also incorporated into other map classes; none are unique to this map class. The 15 associations comprise 8 alliances, in which all 8 of the alliances are also included in other map classes. Refer to Table J-1 for association and alliance relationship to other map classes.

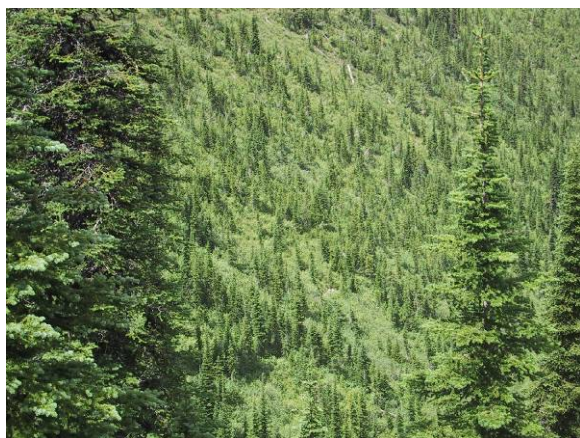
We consider over half of the 15 communities rare or uncommon to the SAM map class. Some of these communities are better captured by other map classes, whereas others are essentially uncommon to Waterton-Glacier IPP.

Most commonly captured by the SAM map class throughout Waterton-Glacier IPP is *Abies lasiocarpa* - *Picea engelmannii* / *Vaccinium membranaceum* / *Xerophyllum tenax* Forest when it is <5 m in height and mixed with >25% RD of deciduous shrubs. Likewise, *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Streptopus amplexifolius* Woodland and *Pseudotsuga menziesii* / *Acer glabrum* Forest are also captured by the SAM map class in instances where Douglas-fir and associated conifers are <5 m in height and mixed with >25% RD of deciduous shrubs.

Also common to the SAM map class, typically west of the CD, are *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Clintonia uniflora* Forest, *Abies lasiocarpa* - *Picea engelmannii* / *Menziesia ferruginea* / *Xerophyllum tenax* Forest (particularly of slopes with north and east aspects), and *Populus balsamifera* ssp. *trichocarpa* - *Populus tremuloides* - Conifer / *Heracleum maximum* Forest. More common to the SAM map class east of the CD is *Menziesia ferruginea* / *Xerophyllum tenax* Shrubland with a component mix of conifers.

Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures





Accuracy Assessment Results

Glacier National Park

☺ Users' Accuracy: 85% with 90% confidence interval of 74–97% (n = 34)

☺ Producers' Accuracy: 91% with 90% confidence interval of 81–101% (n = 32)

Waterton Lakes National Park

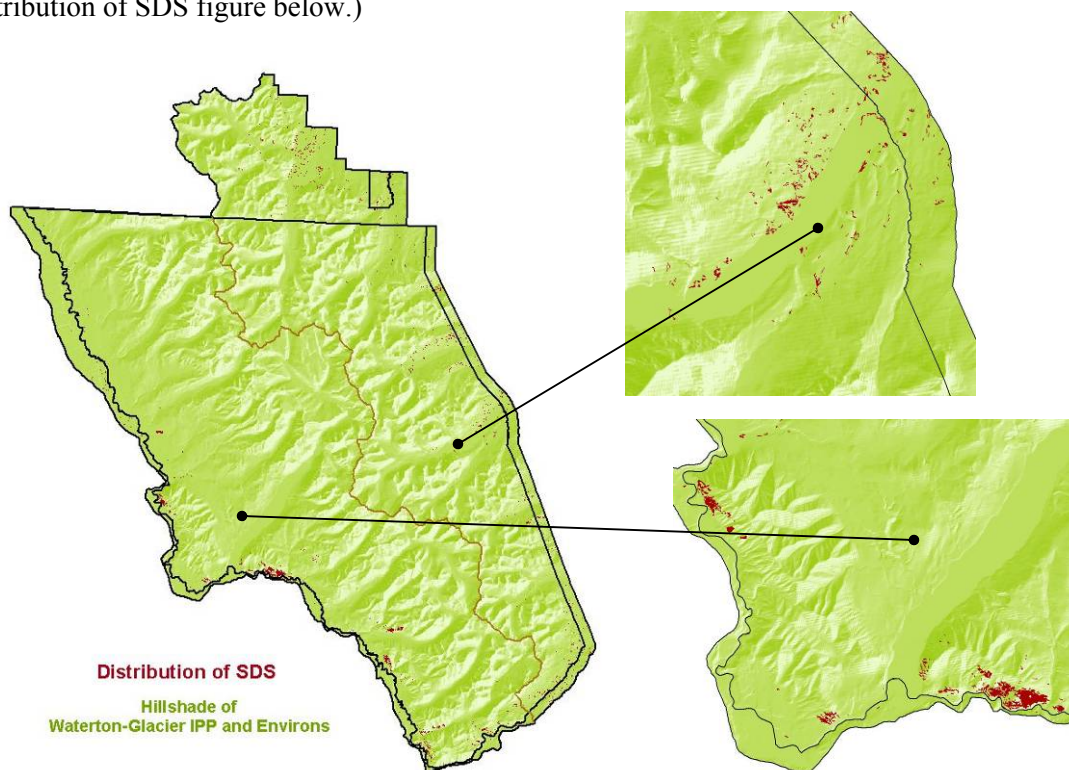
☹ Users' Accuracy: 75% with 90% confidence interval of 58–105% (n = 4)

☹ Producers' Accuracy: 43% with 90% confidence interval of 5–81% (n = 7)

Deciduous Shrubland: Dry - Mesic (SDS)

Description of the Map Class

The Deciduous Shrubland: Dry - Mesic (SDS) map class was used to map dry deciduous shrublands throughout the foothill and montane regions of Waterton-Glacier IPP. Occasionally, it was found in the lower subalpine region, but well within the forest tree line and often closely associated with grassland meadows (e.g., Two Dog Flats). The SDS map class was also used to map montane dry shrublands that were remnant from very severe and historic burns (e.g., 80–100 years) on very warm and dry slopes, where soil had not readily developed. (e.g., the south-aspect slope of Belton Hills just east of West Glacier). We mapped SDS predominantly in montane, and much less frequently in subalpine; they were often on dry alluvial or riparian benches in valley bottoms and located below the tree line. (See the Distribution of SDS figure below.)



We applied the SDS map class when shrubs were >25% total cover and the deciduous dry-shrub component was >75% RD over its conifer counterpart, regardless of conifer height. When conifers were >25% RD to the deciduous shrubs and <5 m in height, we then used the Mixed Conifer - Deciduous Shrubland: Avalanche/Snow Burial (SAM) map class. (This is plausible since the conifer presence indicates a higher moisture regime.) If the conifers were >5 m in height, then we used the appropriate forest or woodland map class (e.g., spruce-fir, Douglas-fir, lodgepole pine). When shrubs were <25% total cover, we reverted our classification to describe the herbaceous layer with the Grassland Herbaceous (HGL) map class.

The dry shrub species of the SDS map class naturally have low-growth stature. Deer and elk frequently browse the shrubs making them even shorter in height. In addition, these dry deciduous shrub communities are open and patchy, rarely growing as a dense shrub field. Thus, they can appear quite nominal on the aerial photos, and some of the dry shrub communities might have actually been mapped (without intention) with the HGL map class, particularly when in close proximity to grassland meadows. Often times, these dry deciduous shrub communities are along the margins of grassland meadows in

transition to the adjacent forest lands. Some of these transitions are too narrow to map and are mere inclusions to the HGL map class (with intention).

Occasionally, we used the SDS map class to map small dry deciduous shrub openings within forests of the montane. These sites, however, are dry and unaffected by snow avalanche or snowpack. The SDS map class was not applied above the forest zone and into the woodlands of the subalpine. When in upper montane to lower subalpine, the upper extent of the forest zone was used as the upper threshold for the SDS map class. These scenarios, however, are quite infrequent in the mapping. Above this upper threshold for the SDS map class and clearly into the subalpine, we readily applied the Dwarf-shrub/Herbaceous Complex: Dry - Mesic (CSA) map class for describing shrub-herbaceous meadows. We continued to apply the SDS map class to dry deciduous shrublands when clearly in montane areas, even when forest zones were not as apparent and the area was predominantly woodland.

We continued to apply the HGL map class to grassland meadows within montane woodland areas, even when the forest/woodland transition lines were not apparent. Even with this mapping convention, however, determining the use of either the HGL or the CSA map classes was not always obvious. In the lower montane to upper subalpine region, there is definitely an overlap of plant community types between the HGL and CSA map classes.

Likewise, there were slight distinctions on the aerial photos between communities of the SDS map class and the Dwarf-shrub/Herbaceous Complex: Mesic - Wet (CSW) map class. Shrub species typically found in dry grassland meadows sometimes appeared in areas with a higher moisture regime. Also, the short-growth and heavily browsed shrubs of the SDS map class appeared similar to the tall forb herbaceous layer of the CSW map class. Where these deciduous shrublands and mesic dwarf-shrub/forb meadows coexist, studying the landscape position helped to determine what map class to apply.

Relationship to the Vegetation Classification

The Deciduous Shrubland: Dry - Mesic (SDS) map class represents 11 described associations*. All 11 associations are also incorporated into other map classes; none are unique to this map class. Almost all of the 11 described associations are distinct to their own alliance; consisting of 10 described alliances, in which all 10 alliances are also included in other map classes. The SDS map class has two more described alliances, but with no described associations. Refer to Table J-1 for association and alliance relationship to other map classes.

We believe most commonly captured by the SDS map class throughout Waterton-Glacier IPP are *Amelanchier alnifolia* / (Mixed Grass, Forb) Shrubland, *Amelanchier alnifolia* / *Pseudoroegneria spicata* - Bunchgrass Shrubland, and *Prunus virginiana* - (*Prunus americana*) Shrubland. On the mesic spectrum, the SDS map class captures a portion of *Acer glabrum* Avalanche Chute Shrubland, yet this type is most likely captured by the Deciduous Shrubland: Avalanche/Snow Burial (SAD) map class.

Several other deciduous shrub communities are common to the SDS map class, although more abundant east of the CD. These shrub communities are *Rosa woodsii* Shrubland, *Rubus parviflorus* / *Chamerion angustifolium* - *Heracleum maximum* Shrubland, *Spiraea betulifolia* Shrubland, and *Symphoricarpos albus* Shrubland.

The remaining deciduous shrub communities are uncommon or rare to the SDS map class, mostly because they are uncommon to Waterton-Glacier IPP. In addition, most of these uncommon or rare communities occur west of the CD, however, one is exclusive east of the CD (*Elaeagnus commutata* Shrubland).

Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures



Accuracy Assessment Results

Glacier National Park

- ☺ Users' Accuracy: 93% with 90% confidence interval of 84–103% (n = 29)
- ☺ Producers' Accuracy: 93% with 90% confidence interval of 84–103% (n = 29)

Waterton Lakes National Park

- ☺ Users' Accuracy: 82% with 90% confidence interval of 58–105% (n = 11)
- ☹ Producers' Accuracy: 69% with 90% confidence interval of 44–94% (n = 13)

Grassland Herbaceous (HGL)

Description of the Map Class

The Grassland Herbaceous (HGL) map class was used to map dry to mesic grassland meadows throughout the foothill and montane regions of Waterton-Glacier IPP, and occasionally within the lower subalpine region, well within the forest zone. (See the Distribution of HGL figure below.)



We applied the HGL map class to grassland meadows having a tree layer <25% total cover (when considering forest types not in recent burn areas) or <10% total cover (when considering woodland types), and having a shrub layer <25% total cover, with the exception of sagebrush, in which the shrub layer needed to be <10% total cover. In recent burn areas (e.g., Red Bench fire of 1988), we applied the HGL map class to grassland meadows having a tree layer <10% total cover, otherwise the appropriate forest or woodland map class was applied. An example of this is the short stature (and very sparse) lodgepole pine stands of Big Prairie just northwest of Polebridge.

There was not a discernable signature on the aerial photos apparent between types within the HGL and the Dwarf-shrub/Herbaceous Complex: Dry - Mesic (CSA) map classes. To a large extent, numerous vegetation types of these two map classes overlap when in the upper montane and lower subalpine.

To promote consistency in our mapping, we derived a mapping convention to apply to the HGL and CSA map classes within this transitional zone. The upper extent of the forest zone (toward montane forests) was mapped with the HGL map class, and above the forest zone (toward subalpine woodlands) the CSA map class was applied. We continued to apply the HGL map class to grassland meadows clearly within montane areas, even when the forest zones were not apparent and the areas were predominantly woodland.

Even with this mapping convention, however, determining the use of either the HGL or the CSA map classes was not always obvious. In the lower montane to upper subalpine region, there is definitely an overlap of plant community types between the HGL and CSA map classes.

As explained in the Deciduous Shrubland: Dry - Mesic (SDS) map class, the shrubs of this map class have low-growth stature, are often heavily browsed, and are typically open and patchy. Thus, they are difficult to locate on the aerial photos. It is reasonable to conclude that dry deciduous shrub communities of the SDS map class might actually be mapped (not purposefully) within the HGL map class, particularly when in closely proximity with each other. Often times, these dry deciduous shrub communities of the SDS map class are along the margins of grassland meadows in transition to the adjacent forest lands. Some of these transitions are too narrow to map and are mere inclusions to the HGL map class.

Likewise, there were slight distinctions on the aerial photos between communities of the HGL map class and the Dwarf-shrub/Herbaceous Complex: Mesic - Wet (CSW) map class. Where mesic grassland and

mesic dwarf-shrub/forb meadows coexist, we studied their position in the landscape to determine what map class to use.

Relationship to the Vegetation Classification

The Grassland Herbaceous (HGL) map class represents 22 described associations*. Of these 22 associations, 11 of them (half) are unique to this map class, whereas the other 11 associations are also incorporated into other map classes. The 22 associations comprise 14 alliances, of which 5 alliances are unique to the map class, while the other 9 alliances are also included in other map classes. Refer to Table J-1 for association and alliance relationship to other map classes.

Perhaps one of the most common and widely distributed grassland communities captured by the HGL map class throughout Waterton-Glacier IPP is *Festuca campestris* - *Festuca idahoensis* Herbaceous Vegetation. Exclusive to east of the CD and in more mesic sites, the HGL map class commonly captures *Festuca campestris* - *Festuca idahoensis* - *Geranium viscosissimum* Herbaceous Vegetation.

There are some communities the HGL map class captures, east of the CD and occasionally west of the CD, which are typical of exposed slopes with thin soils. These communities are *Festuca idahoensis* - *Pseudoroegneria spicata* Herbaceous Vegetation, *Dasiphora fruticosa* ssp. *floribunda* / *Festuca campestris* Shrub Herbaceous Vegetation, and *Dasiphora fruticosa* ssp. *floribunda* / *Festuca idahoensis* Shrub Herbaceous Vegetation. Also commonly mapped with the HGL map class, east of the CD, when on more calcareous substrates is *Arctostaphylos uva-ursi* / *Festuca campestris* - *Festuca idahoensis* Dwarf-shrubland.

Again, more common east, than west, of the CD, the HGL map class captures *Calamagrostis rubescens* Herbaceous Vegetation and *Carex geyeri* Herbaceous Vegetation to map grassland meadows within long-persisting seral landscapes. One of the primary communities in the HGL map class is *Chamerion angustifolium* Rocky Mountain Herbaceous Vegetation [Provisional] captured on mesic sites within post-fire locations throughout Waterton-Glacier IPP.

Although uncommon, yet worth noting, the HGL map class captured *Phleum pratense* - *Poa pratensis* - *Bromus inermis* Semi-natural Herbaceous Vegetation when mapping grasslands influenced by various current or historic disturbance activities (e.g., along roadsides, horse/mule trails and corals, old fields).

Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures







Accuracy Assessment Results

Glacier National Park

- ☺ Users' Accuracy: 97% with 90% confidence interval of 91–103% (n = 33)
- ☺ Producers' Accuracy: 97% with 90% confidence interval of 91–103% (n = 33)

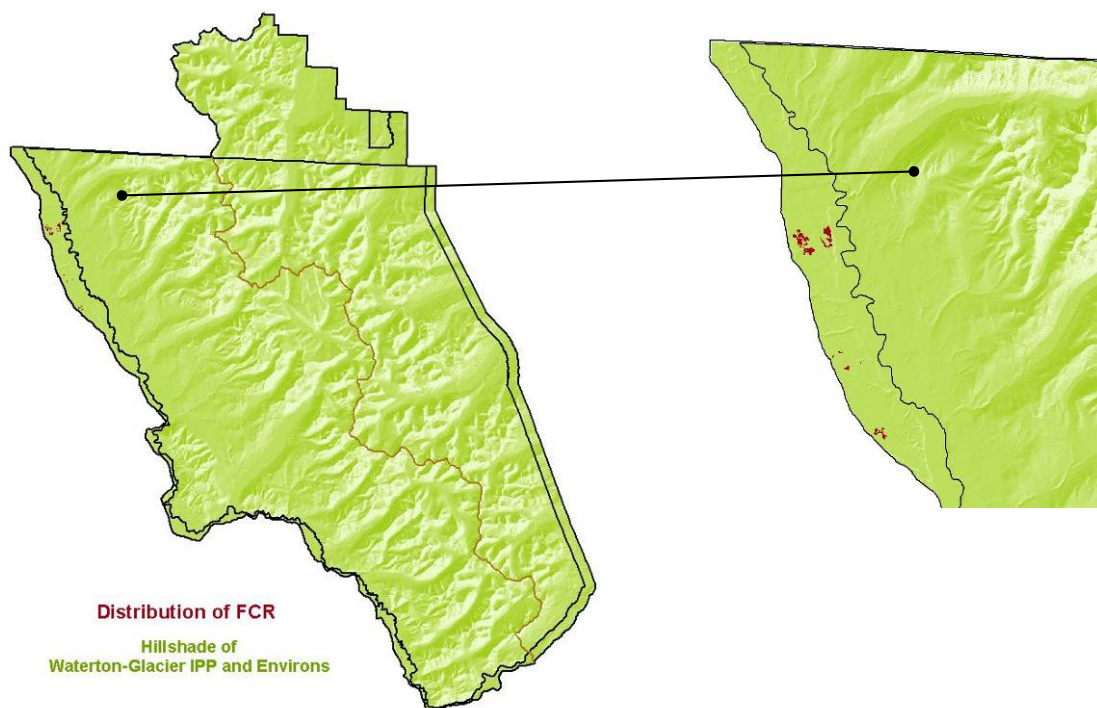
Waterton Lakes National Park

- ☺ Users' Accuracy: 89% with 90% confidence interval of 74–104% (n = 18)
- ☺ Producers' Accuracy: 80% with 90% confidence interval of 63–97% (n = 20)

Mixed Conifer Regenerate Forest (FCR)

Description of the Map Class

The Mixed Conifer Regenerate Forest (FCR) map class was developed late in the mapping effort to capture young seral conifer forests in succession from previous logging activities. It was too difficult to discern from the aerial photos what standard forest map class would be most appropriate. To clarify, however, when we could determine a standard forest map class to describe forests in succession from previous logging events, we applied the appropriate forest map class. The FCR map class was only used in instances where we were unable to make an adequate assessment of the forest in succession from post-logging. The FCR map class was also only used in the environs west of GNP. (See the Distribution of FCR figure below.)



The FCR map class has a total tree canopy cover >25%. When the total tree canopy cover was <25%, the map class best representing the understory type would be applied. Usually, this understory type was the Mixed Regenerate Shrubland (SMR) map class, which is essentially a shrub version of the FCR. Some deciduous trees could be present, but when the deciduous tree component was >25% RD to conifers, the Mixed Conifer - Deciduous Forest (FEP) map class was applied to classify the mixed forest.

Relationship to the Vegetation Classification

There were no NVC associations or alliances specifically identified for the Mixed Conifer Regenerate Forest (FCR) map class. Common to FCR was a mixture of lodgepole pine, western larch, and Douglas-fir, along with lesser amounts of Engelmann spruce, subalpine fir, and trembling aspen.

Representative Pictures

No representative pictures available.

Accuracy Assessment Results

Glacier National Park

The FCR map class was not assessed for accuracy for GNP.

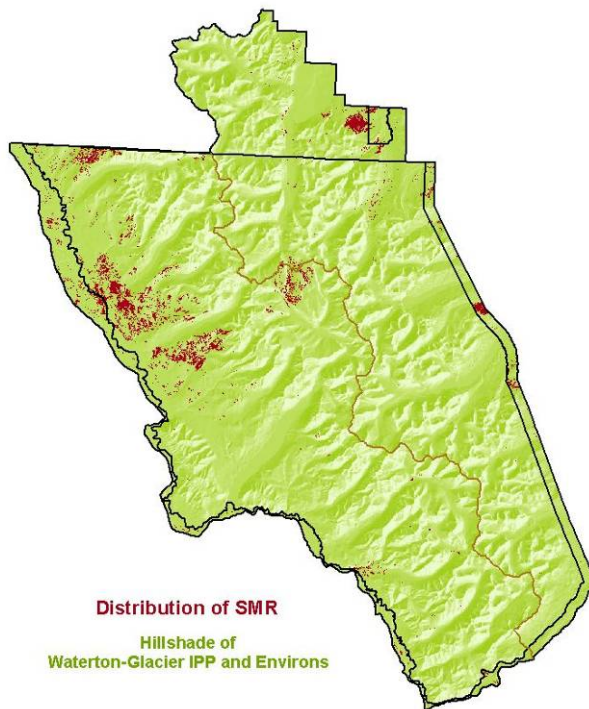
Waterton Lakes National Park

The FCR map class was not used in mapping WLNP.

Mixed Regenerate Shrubland (SMR)

Description of the Map Class

The Mixed Regenerate Shrubland (SMR) map class characterizes shrub and herbaceous fields that are in direct result from forest degeneration. Location is dependent upon areas of recent fire, bug kill, blowdown, and even mechanical harvest, which is occasional external to Waterton-Glacier IPP. (See the Distribution of SMR figure below.)



Typical stands of the SMR map class consist of a broad mix of herbaceous and dwarf-shrub vegetation, with a significant amount of deciduous shrubs and <75% total cover of short (<5 m height) conifer trees present. It is quite common for the deciduous shrubs to be heavily browsed low to the ground.

When the short-height conifer trees became >75% of the total cover, then the appropriate forest map class was applied. Likewise, when trees >5 m in height were >25% of the total cover, the appropriate forest map class was used. The exception to this rule, however, was when lodgepole pine or western larch were the dominant tree (needing >75% RD to other trees), where the Lodgepole Pine Forest (FLP) or the Western Larch Forest (FWL) map classes were used to map the area with as little as 10% total tree cover. These FLP and FWL map classes are typical in early succession locations that are post-fire (e.g., Red Bench Fire area), resulting in the decision to map

them down to 10% total tree cover. In contrast, other conifer forest map classes that represent spruce-fir and Douglas-fir are more typical of later forest succession, often from bug kill and blowdown of lodgepole pine (e.g., Belly River area), thus the mapping convention was >25% total tree cover for those tree types.

Relationship to the Vegetation Classification

The Mixed Regenerate Shrubland (SMR) map class represents 10 described associations*. All 10 associations are also incorporated into other map classes. The 10 associations comprise 9 alliances, of which all 9 alliances are also included in other map classes. Refer to Table J-1 for association and alliance relationship to other map classes.

Throughout Waterton-Glacier IPP, the SMR map class commonly captures the majority of the communities linked to in Table J-1. The *Symphoricarpos occidentalis* Shrubland is an exception, as it is uncommon to the area and may exist only east of the CD. Also, more common east of the CD than west, is *Rosa woodsii* Shrubland and *Spiraea betulifolia* Shrubland. Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures





Accuracy Assessment Results

Glacier National Park

The SMR map class was not assessed for accuracy for GNP.

Waterton Lakes National Park

The SMR map class was not assessed for accuracy for WLNP.

Burned Vegetation: Bare Soil (VBA)

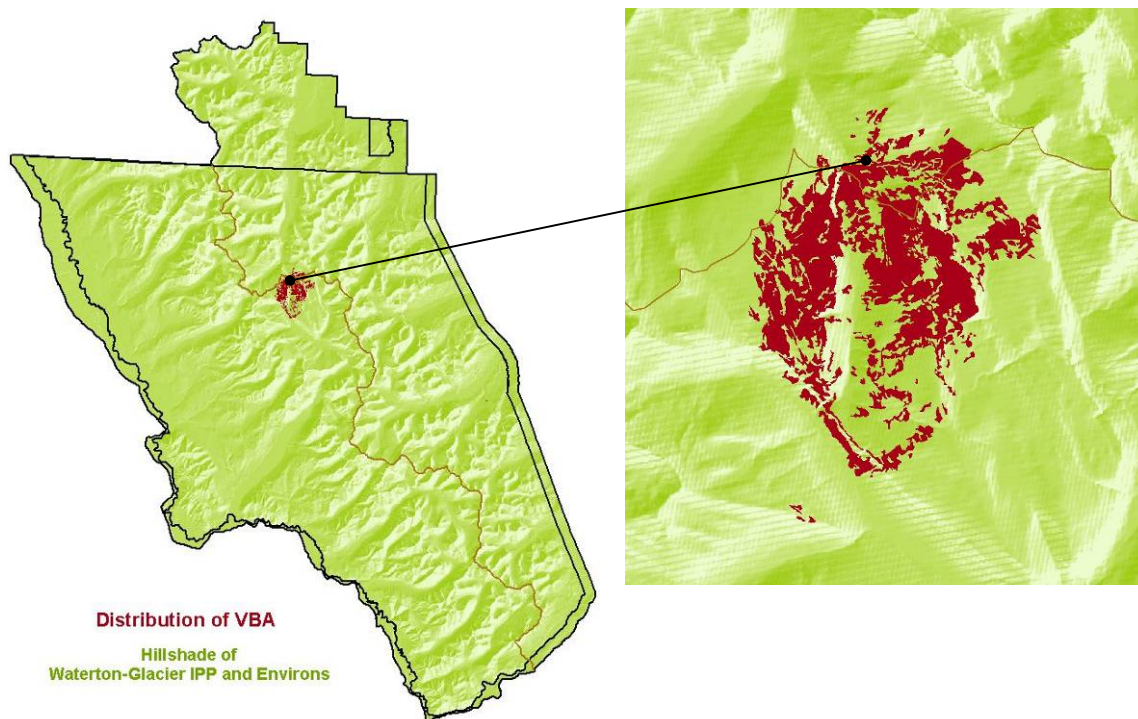
Description of the Map Class

We developed the Burned Vegetation: Bare Soil (VBA) map class to classify areas of high severity burns occurring just prior to aerial photography collection. Of these areas, <10% of live vegetation (often times no vegetation at all) could be seen on the aerial photos.

The VBA map class was uniquely and infrequently used (see the Distribution of VBA figure below). The most obvious use of the VBA map class was on Flattop Mountain with a fire, known as the Kootenai Complex Fire, occurring just prior to the collection of the August 1999 TC aerial photos. Presence of vegetation in these areas would soon appear and would typically be captured with the Mixed Regenerate Shrubland (SMR) map class. In fact, a quick study of the SMR figure in the SMR map class description shows an interwoven occurrence of the SMR map class within the VBA map class, indicating perhaps areas of low burn intensities in the Kootenai Complex Fire.

To simplify mapping of these high change areas, we generally applied a 2 ha MMU to the VBA map class. Areas of severe burn of <2 ha were typically included in the SMR map class.

The VBA map class was not used in mapping WLNP, instead, the SMR map class was used to map these recent and severely burned areas. It was not until after the WLNP photointerpretation was complete that the VBA map class was developed.



Relationship to the Vegetation Classification

There are no NVC associations or alliances specifically identified for the Burned Vegetation: Bare Soil (VBA) map class. Areas mapped with the VBA map class are essentially without or with very little vegetation at the date of photography. These areas are dynamically changing and would soon resemble an early version of plant communities described with the Mixed Regenerate Shrubland (SMR) map class. Therefore, to logistically sample these sites, or properly analyze and classify them, was hardly feasible.

Representative Pictures



Accuracy Assessment Results

Glacier National Park

The VBA map class was not assessed for accuracy for GNP.

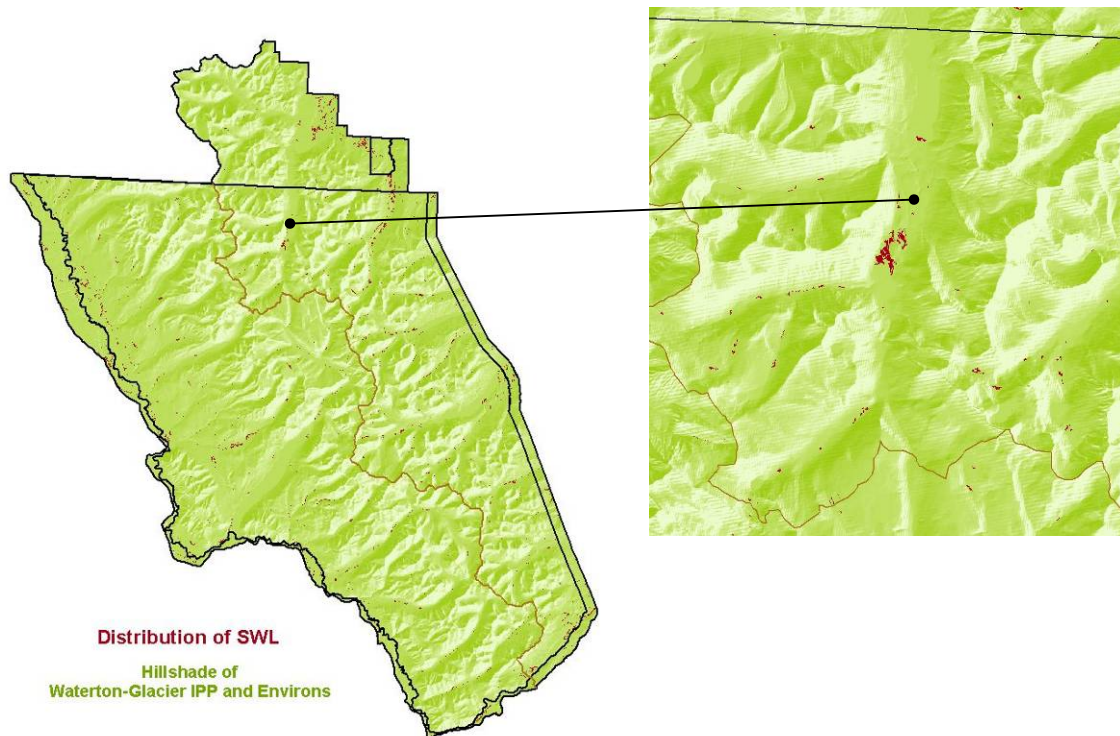
Waterton Lakes National Park

The VBA map class was not used in mapping WLNP.

Deciduous Wet Shrubland (SWL)

Description of the Map Class

The Deciduous Wet Shrubland (SWL) map class is common throughout the Waterton-Glacier IPP vegetation maps, often located in small pockets following riparian corridors and within perched basins. (See the Distribution of SWL figure below.)



We applied the SWL map class to wetland sites having >25% total shrub cover, most commonly willow, often alder, and occasionally bog birch. A sparse layer of trees with <25% canopy cover was also common; the tree layer was typically Engelmann spruce.

When Engelmann spruce had a total tree cover of >25% over the wetland shrubs, the Engelmann Spruce - Wet Shrub Forest (FSW) map class was used to map the wetland. When shrubs became <25% total cover, the herbaceous layer was mapped, often with one of the following map classes: Wet Meadow Herbaceous (HWM), Exposed Shoreline Herbaceous: Pioneering Vegetation (HES), and Exposed Shoreline Sparse Vegetation (wet riparian/basin phase) (VSL).

Relationship to the Vegetation Classification

The Deciduous Wet Shrubland (SWL) map class represents 24 described associations*. There is also one undescribed association we assigned with a park-special name. The other four undescribed associations fall under known alliances. Of the 25 associations (described and undescribed), 14 are unique to this map class, whereas the other 11 associations are also incorporated into other map classes, usually of the Deciduous Shrubland: Avalanche/Snow Burial (SAD) map class. The 25 associations comprise 18 described alliances and 1 undescribed alliance, of which 8 are also included in other map classes, and 10 are unique to the SWL map class. There are three additional alliances with undescribed associations that SWL represents. All three alliances are unique to the SWL map class. Refer to Table J-1 for association and alliance relationship to other map classes.

Perhaps the most common association captured by the SWL map class throughout the entire Waterton-Glacier IPP project extent is *Salix drummondiana* / *Carex utriculata* Shrubland; as it is the most common willow species of the area. Also, quite common in higher subalpine locations are the three associations of the *Alnus incana* Temporarily Flooded Shrubland Alliance: *Alnus viridis* ssp. *sinuata* / Mesic Forbs Shrubland, *Cornus sericea* Shrubland, *Salix boothii* / *Calamagrostis canadensis* Shrubland, *Salix boothii* / *Carex utriculata* Shrubland, *Salix drummondiana* / *Calamagrostis canadensis* Shrubland, *Salix drummondiana* / Mesic Forbs Shrubland, and *Salix geyeriana* / Mesic Forbs Shrubland. Also common both east and west of the CD and indicative of SWL in seral or successional scenarios are *Salix bebbiana* Shrubland and *Salix boothii* / Mesic Forbs Shrubland.

Common to the SWL map class, primarily east of the CD, in the subalpine is *Salix commutata* / Mesic Graminoid Shrubland. Contrary, more common west of the CD, the SWL map class presents *Alnus viridis* ssp. *sinuata* / *Athyrium filix-femina* - *Cinna latifolia* Shrubland. In fen sites, the SWL map class captures *Betula nana* / *Carex* spp. Shrubland and *Betula nana* / *Carex utriculata* Shrubland.

Although the remaining associations may be more prevalent on one side of the CD than the other, they are much less common to the SWL map class, in large part because of their uncommon occurrence at Waterton-Glacier IPP.

Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures







Accuracy Assessment Results

Glacier National Park

- ☺ Users' Accuracy: 84% with 90% confidence interval of 72–95% (n = 37)
- ☺ Producers' Accuracy: 89% with 90% confidence interval of 78–99% (n = 35)

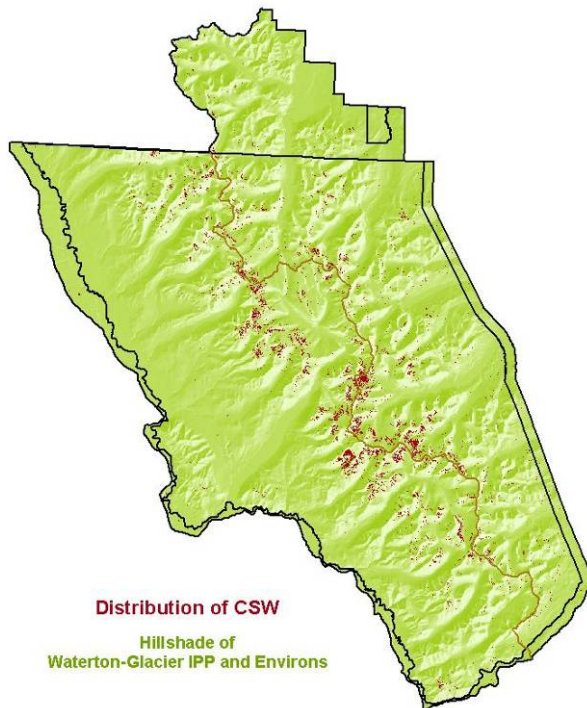
Waterton Lakes National Park

- ☺ Users' Accuracy: 82% with 90% confidence interval of 58–105% (n = 11)
- ☺ Producers' Accuracy: 90% with 90% confidence interval of 69–111% (n = 10)

Dwarf-shrub/Herbaceous Wet Complex: Mesic - Wet (CSW)

Description of the Map Class

The Dwarf-shrub/Herbaceous Wet Complex: Mesic - Wet (CSW) map class captures dwarf-shrub and/or herbaceous vegetation on slopes or in slight depressions where adequate moisture is available for much of the season. Although it ranges from low montane to high alpine, it is most prevalent in subalpine and alpine (see the Distribution of CSW figure below). The wide range in elevation is due to the widespread ecology of many species that overlap across elevation zones.



The mapping of CSW captures mesic to wet vegetation types having >10% total cover of dwarf-shrubs and/or herbaceous vegetation, barring the presence of shrubs or trees to consider a shrub, woodland, or forest map class.

The CSW map class is a complex unit where, from the mapping perspective, a confident separation between dwarf-shrubland types and herbaceous types could not be made. Normally, if we could determine dwarf-shrubland types with confidence, they would be mapped separately from the herbaceous types (herbaceous types having <25% RD to the dwarf-shrub component).

There are similarities in plant communities and landscape position between the CSW map class and the Dwarf-shrub/Herbaceous Wet Complex: Dry - Mesic (CSA) map class. Yet, the CSW map class represents sites that are more favorably moist. A common site for the CSW map class is

moist meadows in the alpine and subalpine retaining significant snow accumulation well into the summer months, particularly in slight striated depressions (e.g., the area along the Logan Pass boardwalk trail). Other common locations for the CSW map class are on mountain slopes, particularly of east and north aspects, retaining snow accumulations into the growing season. The CSW map class, although sparser in vegetation (10-25% total cover), was often used to map areas of receding glaciers with the newly exposed rock continually wet from glacial melt throughout the growing season. When these areas of exposed rock are <10% vegetated, the Cliff/Talus Sparse Vegetation (VCT) map class was used. The CSW map class was also used for west and south aspects where protection is provided from the surrounding topography, such as in a cornice position. In the subalpine and montane, the CSW map class depicts areas receiving significant moisture to support mesic to wet dwarf-shrub and herbaceous vegetation. These include seepage meadows on shallow slopes and snowpack pockets within forest openings.

Often times, the alpine meadows could be described as a mosaic of the CSW and CSA map classes, with slight micro-topographic changes from mesic depressions (CSW) to drier bedrock exposures (CSA). The meadow along the Logan Pass boardwalk trail offers a good example of this. In these instances, the dominant scenario was used to determine which map class to apply. Also, within the high subalpine to alpine, the CSW map class captures dwarf-shrub willows carpeting the basin or cirque walls and follows the drainage corridor downslope; an excellent example of this occurs high up on Lee Ridge.

Perhaps the most difficult aspect of mapping CSW was distinguishing it from the CSA map class. For the CSW map class, special attention was given during mapping to positions within the landscape lending toward moist environments. The vegetation was generally more rich and dense than those of the CSA map class. However, there were some plant communities and species that also lent themselves to mesic-wet and mesic-dry environments; beargrass is a prime example of this. Another challenge was making the distinction between the CSW map class and the VCT map class, where separation was based on density of the dwarf-shrub/herbaceous components (the CSW map class having >10% total cover and the VCT map class having <10% total cover).

Likewise, there were slight distinctions on the aerial photos between communities of the CSW map class and the Grassland Herbaceous (HGL) map class. Where mesic to wet forb meadows and mesic grasslands coexist, their position in the landscape was used to determine what map class to use.

Relationship to the Vegetation Classification

The Dwarf-shrub/Herbaceous Wet Complex: Mesic - Wet (CSW) map class represents 23 described associations, plus one other undescribed association we assigned with a park-special name. Of the 24 associations (described and undescribed), 8 are unique to the CSW map class, whereas the other 16 associations are also incorporated into other map classes. The 23 described associations are of 22 described alliances, of which 7 alliances are unique to the CSW map class and the other 15 alliances are also included in other map classes. Refer to Table J-1 for association and alliance relationship to other map classes.

One of the more common associations captured by the CSW map class in the alpine throughout the entire Waterton-Glacier IPP project is *Carex nigricans* - *Sibbaldia procumbens* Herbaceous Vegetation, which often exists in small patches associated with long-persisting snowbeds. Also common in the alpine, both east and west of the CD, is *Juncus parryi* / *Sibbaldia procumbens* Herbaceous Vegetation, where snow deposition occurs and melt-off is relatively late in the season. Likewise, common in the alpine are *Salix arctica* - (*Salix petrophila*, *Salix nivalis*) / *Polygonum bistortoides* Dwarf-shrubland, *Salix arctica* / *Carex nigricans* Dwarf-shrubland, *Carex paysonis* - *Sibbaldia procumbens* Herbaceous Vegetation, *Carex scirpoidea* - *Zigadenus elegans* Herbaceous Vegetation, and *Arenaria capillaris* / *Polytrichum piliferum* Herbaceous Vegetation, with the latter occurring in the drier alpine.

Perhaps most common to the CSW map class in the subalpine, both east and west of the CD, is *Xerophyllum tenax* Herbaceous Vegetation, which is also common to the CSA map class in drier conditions. Also very common in the subalpine, is *Vaccinium membranaceum* / *Xerophyllum tenax* Shrubland. Common in small patches, in the high subalpine and alpine, are *Luzula glabrata* var. *hitchcockii* - *Erythronium grandiflorum* Herbaceous Vegetation and *Phyllodoce glanduliflora* / *Sibbaldia procumbens* Dwarf-shrubland, with the former typically in late-persisting snowpack sites. Common throughout in the subalpine in subirrigated cold sites is *Valeriana sitchensis* - *Veratrum viride* Herbaceous Vegetation.

Covering a broad elevation spectrum from montane to alpine the *Senecio triangularis* Herbaceous Vegetation is common throughout Waterton-Glacier IPP in small patch swales, melting pools, and riparian stringers. Similar in landscape position, although only in the higher subalpine and alpine, is *Trollius laxus* - *Parnassia fimbriata* Herbaceous Vegetation. Perhaps more common east, than west, of the CD, is *Heracleum maximum* Herbaceous Vegetation, which is captured by the CSW map class in subirrigated positions in the montane to mid-subalpine.

The remaining associations are less frequently captured by the CSW map class, either because they are less common or rare to the Waterton-Glacier IPP, or because they are better captured by other map classes. However, we do recognize that they have some element of overlap into the CSW map class. Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures





Accuracy Assessment Results

Glacier National Park

☺ Users' Accuracy: 91% with 90% confidence interval of 82–101% (n = 32)

☺ Producers' Accuracy: 85% with 90% confidence interval of 73–97% (n = 33)

Waterton Lakes National Park

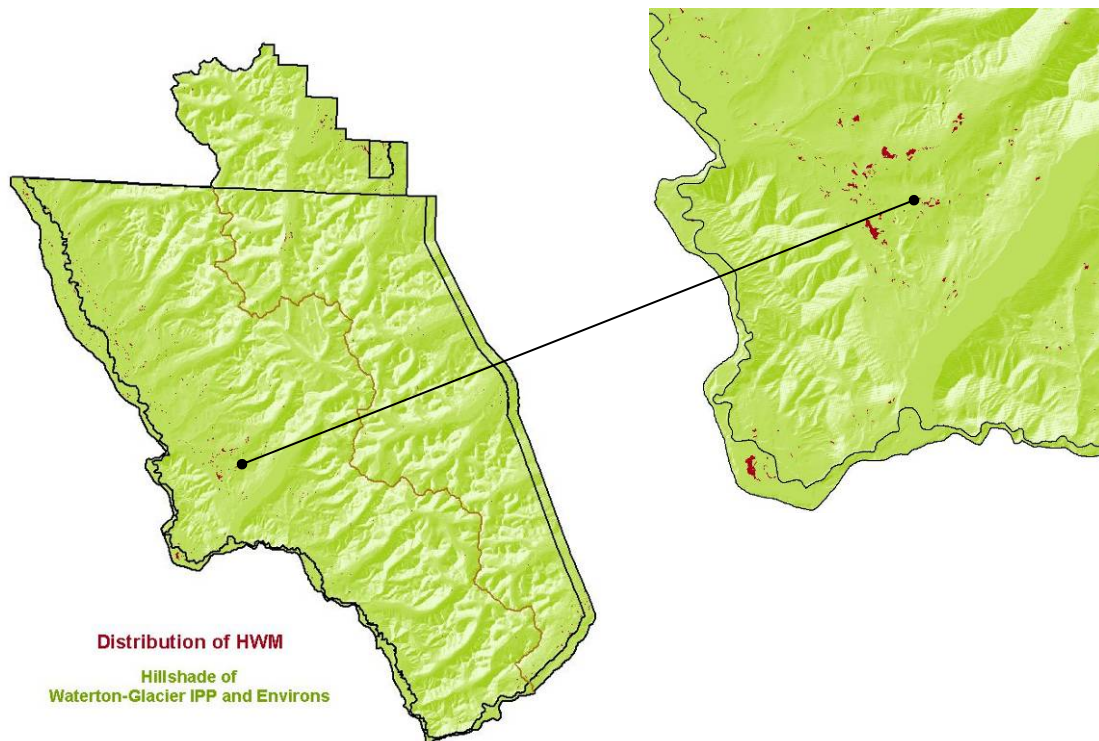
☹ Users' Accuracy: 67% with 90% confidence interval of 27–107% (n = 6)

☺ Producers' Accuracy: 100% with 90% confidence interval of 88–113% (n = 4)

Wet Meadow Herbaceous (HWM)

Description of the Map Class

The Wet Meadow Herbaceous (HWM) map class is quite common throughout the Waterton-Glacier IPP vegetation layers within the montane and subalpine, and is typically located in small pockets within perched basin wetlands, along lakeshore margins, and along riparian corridors. (See the Distribution of HWM figure below.)



We applied the HWM map class to basin and riparian wetland sites having >10% wet meadow vegetation, most commonly dominated with sedge species and Canada bluejoint. When the total vegetation cover was <10%, the Exposed Shoreline Herbaceous (wet riparian/basin phase) (VSL) map class was used; common in riparian locations. When the vegetation consisted of pioneering species, the Exposed Shoreline Herbaceous: Pioneering Vegetation (HES) map class was used; again, common in riparian locations. Wetland meadows on slopes were typically mapped using the Dwarf-shrub/Herbaceous Wet Complex: Mesic - Wet (CSW) map class. The HWM map class was reserved for basin and riparian locations. When deep-water emergent vegetation, typically bulrush and/or cattail, became >25% RD to wet meadow vegetation, the Semi-permanently Flooded Herbaceous (HSF) map class was used to map the wetland. When the total cover of shrubs, often willow, alder, and dogwood, became >25% then the Deciduous Wet Shrubland (SWL) map class was used to map the area as a wet shrubland. When the area contained >25% total tree cover, then the appropriate wetland forest map class was applied to the mapping.

When the HSF map class was isolated within upland surroundings, it was typically mapped <MMU to capture the unique expression of this type within the landscape. These types of occurrences are uncommon throughout the map.

Relationship to the Vegetation Classification

The Wet Meadow Herbaceous (HWM) map class represents 22 described associations, including one undescribed association we assigned with a park-special name. Of these 22 associations, 3 are unique to this map class, whereas the other 19 associations are also incorporated into other map classes. The 21 described associations each have their own alliance (21 alliances), and the park-special type assimilates to an unknown alliance. Thus, 3 described alliances are unique to this map class, and the other 18 described alliances are also included in other map classes. Refer to Table J-1 for association and alliance relationship to other map classes.

Some of the vegetation associations represented by the HWM map class are commonly part of the Dwarf-shrub/Herbaceous Wet Complex: Mesic - Wet (CSW) map class, particularly in basin locations where the slope is very subtle. Other vegetation associations represented by the HWM map class are commonly part of the Semi-permanently Flooded Herbaceous (HSF) map class when in deeper marsh basin settings. This scenario often occurs as inclusions along the margin of wet marshes (a scale issue).

Throughout the Waterton-Glacier IPP project extent, the most common type to the HWM map class is *Calamagrostis canadensis* Western Herbaceous Vegetation, which occurs in relatively small patches. Of the sedge types, the most common associations captured by HWM are *Carex microptera* Herbaceous Vegetation and *Carex utriculata* Herbaceous Vegetation (in wetter meadows). Sedge types common to the subalpine and alpine are *Carex nigricans* - *Sibbaldia procumbens* Herbaceous Vegetation, *Carex scirpoidea* - *Zigadenus elegans* Herbaceous Vegetation, and *Carex spectabilis* - *Arnica X diversifolia* Herbaceous Vegetation. In addition, only two other associations were common to the subalpine and alpine: *Senecio triangularis* Herbaceous Vegetation (in small patches) and *Trollius laxus* - *Parnassia fimbriata* Herbaceous Vegetation (as riparian stringers). Also frequent to HWM, when mapping areas of post-burn, is *Chamerion angustifolium* Rocky Mountain Herbaceous Vegetation [Provisional]. Although the *Juncus balticus* Herbaceous Vegetation is very common outside the Waterton-Glacier IPP area, we are uncertain of its occurrence to HWM within the map extent.

At Waterton-Glacier IPP, the remaining communities associated with the HWM map class are rare to uncommon.

Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures





Accuracy Assessment Results

Glacier National Park

☺ Users' Accuracy: 83% with 90% confidence interval of 69–98% (n = 24)

☺ Producers' Accuracy: 87% with 90% confidence interval of 73–101% (n = 23)

Waterton Lakes National Park

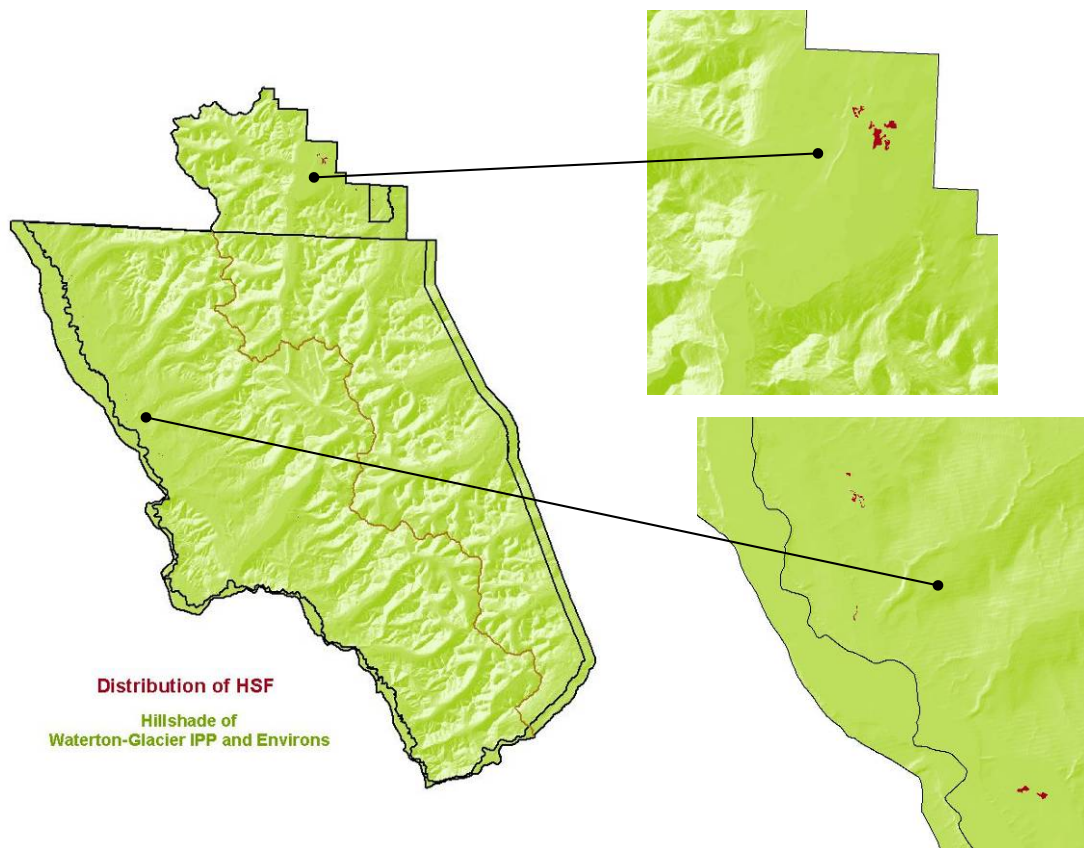
☺ Users' Accuracy: 100% with 90% confidence interval of 92–108% (n = 6)

☺ Producers' Accuracy: 86% with 90% confidence interval of 57–115% (n = 7)

Semi-permanently Flooded Herbaceous (HSF)

Description of the Map Class

The Semi-permanently Flooded Herbaceous (HSF) map class is relatively uncommon throughout the Waterton-Glacier IPP vegetation layers, but is typically located in small pockets along lakeshore margins and within deep basin wetlands of the montane to lower subalpine (see the Distribution of HSF figure below).



We applied the HSF map class to wetland sites having >10% deep-water emergent vegetation, most commonly bulrush and cattail. Open water wetlands having <10% of any vegetation, including the emergent vegetation, were mapped with the Natural/Artificial Lake/Pond (NLP) map class. A presence of floating-leaved and/or submersed aquatic vegetation, including water lily, pondweed, and water milfoil, often accompanied these areas, particularly in margins near deeper water. When floating-leaved and submersed aquatic vegetation became >75% RD to deep-water emergent vegetation, the Permanently Flooded Herbaceous (HPF) map class was used to map the deep marsh wetland. Likewise, when shallow marsh vegetation became >25% RD to deep-water emergent vegetation, the Wet Meadow Herbaceous (HWM) map class was used to map the wetland.

When the HSF map class was isolated within upland surroundings, it was typically mapped <MMU to capture the unique expression of this type within the landscape. These types of occurrences are uncommon throughout the map.

Relationship to the Vegetation Classification

The Semi-permanently Flooded Herbaceous (HSF) map class represents primarily three described associations; *Schoenoplectus tabernaemontani* Temperate Herbaceous Vegetation, *Typha (latifolia)*,

angustifolia) Western Herbaceous Vegetation, and *Equisetum fluviatile* Herbaceous Vegetation. These three semi-permanently flooded associations are also incorporated into other map classes, and each have their own alliance, of which all three alliances are also included in other map classes. In addition to these three types, 11 other seasonally flooded communities are either closely interlocking with the semi-permanently flooded types, or are commonly captured as inclusions within wetland margins (a scale issue) of these semi-permanently flooded types. All 11 seasonally flooded associations are also incorporated into other map classes, and consist of 10 alliances.

Refer to Table J-1 for association and alliance relationship to other map classes.

Representative Picture



Accuracy Assessment Results

Glacier National Park

- 😊 Users' Accuracy: 100% with 90% confidence interval of 92–108% (n = 6)
- 😊 Producers' Accuracy: 86% with 90% confidence interval of 57–115% (n = 7)

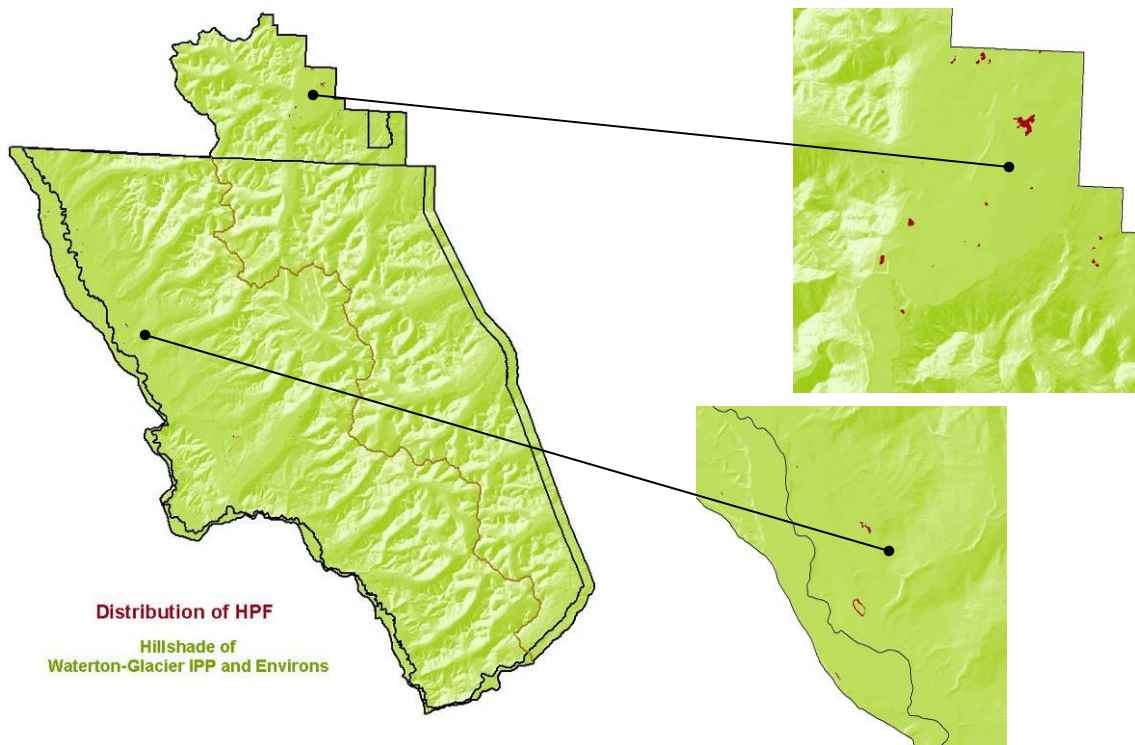
Waterton Lakes National Park

- 😊 Users' Accuracy: 100% with 90% confidence interval of 75–125% (n = 2)
- 😊 Producers' Accuracy: 100% with 90% confidence interval of 75–125% (n = 2)

Permanently Flooded Herbaceous (HPF)

Description of the Map Class

The Permanently Flooded Herbaceous (HPF) map class is relatively uncommon throughout the Waterton-Glacier IPP vegetation layers, but is typically located in small pockets along lakeshore margins and within deep basin wetlands of the montane to lower subalpine (see the Distribution of HPF figure below).



We applied the HPF map class to wetland sites having >10% floating-leaved and submersed aquatic vegetation, most commonly consisting of waterlily, pondweed, and water milfoil. Wetlands having <10% of any vegetation, including floating-leaved and submersed aquatic vegetation, were mapped with the Natural/Artificial Lake/Pond (NLP) map class (open water). A presence of deep water emergent vegetation, such as bulrush and cattail, often accompanied these areas, particularly in the lakeshore margins. When emergent vegetation became >25% RD to floating-leaved and submersed aquatics, the Semi-permanently Flooded Herbaceous (HSF) map class was used to map the deep marsh wetland.

When the HSF map class was isolated within upland surroundings, it was typically mapped <MMU to capture the unique expression of this type within the landscape. These types of occurrences are uncommon throughout the map.

Relationship to the Vegetation Classification

The Permanently Flooded Herbaceous (HPF) map class represents primarily three described associations; *Myriophyllum sibiricum* Herbaceous Vegetation, *Nuphar lutea* ssp. *polysepala* Herbaceous Vegetation, and *Stuckenia pectinata* - *Myriophyllum* (*sibiricum*, *spicatum*) Herbaceous Vegetation. These three permanently flooded associations are unique to this map class, and are not included within any other map class. These three associations each have their own alliance and all three of these alliances are unique to the HPF map class. In addition to these three types, 11 other semi-permanently and seasonally flooded communities are either closely interlocking with the permanently flooded types, or are commonly captured as inclusions within lakeshore margins of these permanently flooded types. Of these 11

communities, 9 are seasonally flooded associations (all incorporated into other map classes, which comprise 8 alliances) and 3 are semi-permanently flooded associations (all incorporated into other map classes, which comprise 3 alliances).

Refer to Table J-1 for association and alliance relationship to other map classes.

Representative Picture



Accuracy Assessment Results

Glacier National Park

- ☺ Users' Accuracy: 100% with 90% confidence interval of 83–117% (n = 3)
- ☺ Producers' Accuracy: 100% with 90% confidence interval of 83–117% (n = 3)

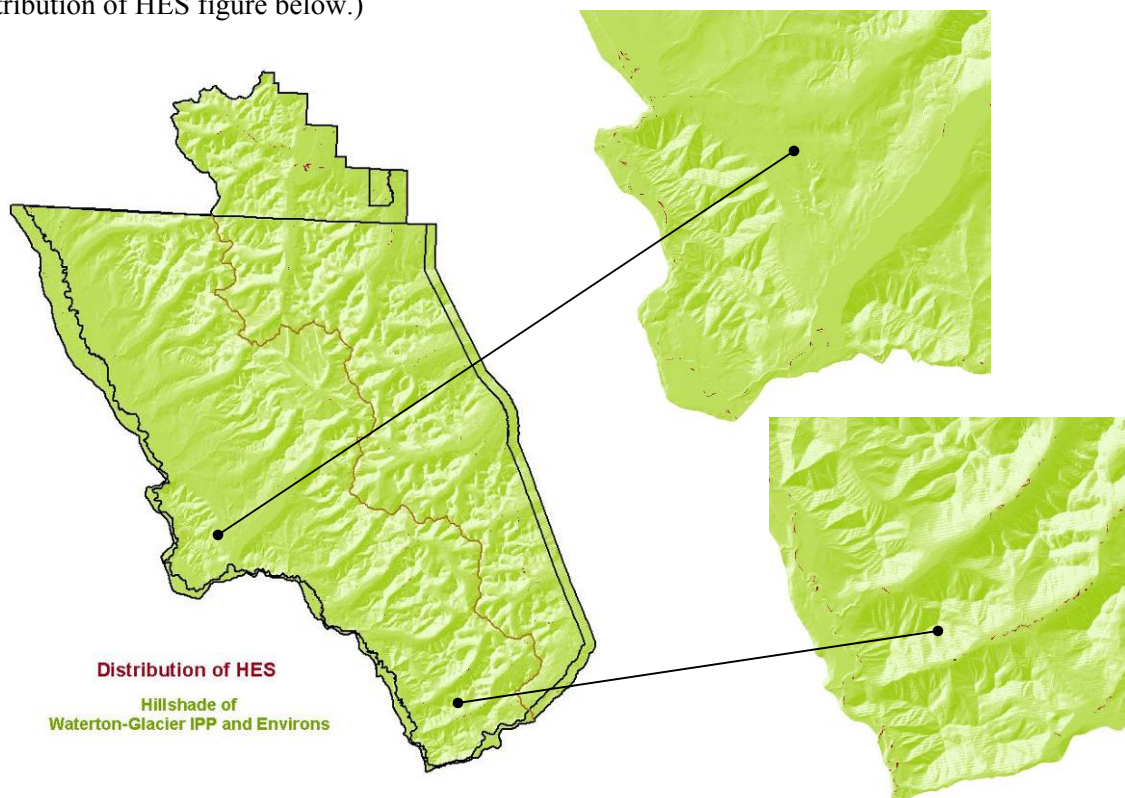
Waterton Lakes National Park

- ☺ Users' Accuracy: 100% with 90% confidence interval of 50–1505% (n = 1)
- ☺ Producers' Accuracy: 100% with 90% confidence interval of 50–1505% (n = 1)

Exposed Shoreline Herbaceous: Pioneering Vegetation (HES)

Description of the Map Class

The Exposed Shoreline Herbaceous: Pioneering Vegetation (HES) map class is common to the montane throughout the Waterton-Glacier IPP vegetation layers within riparian corridors, on alluvial streambeds of rock boulders and cobble substrates, and on recently exposed shorelines of lakes and ponds. (See the Distribution of HES figure below.)



We applied the HES map class to exposed riparian and lakeshore sites having >10% total cover of pioneering vegetation, typically on sand, cobble, and rocky substrates. Pioneering vegetation includes colonizing herbaceous, shrubs, and/or tree saplings. When <10% total vegetation cover, the Exposed Shoreline Herbaceous (wet riparian/basin phase) (VSL) map class was used; common in riparian locations. When the perennial herbaceous layer—often of sedge species and Canada bluejoint—was >25% RD to pioneering vegetation, the Wet Meadow Herbaceous (HWM) map class was used to map the wetland. If the shrub layer—often of willow species—was >25% total cover, then the area was mapped with the Deciduous Wet Shrubland (SWL) map class. Likewise, when the area contained >25% total tree cover, then the appropriate wetland forest map class was applied to the mapping.

Somewhat difficult to discern from the aerial photographs were lower percentages of the vegetation (e.g., 0–20%), as rock reflectance overexposed the surface, making the vegetation on the aerial photo less viewable. This made it challenging, at times, to make a distinction between the HES map class and the VSL map class based on percent composition of vegetation.

Relationship to the Vegetation Classification

The Exposed Shoreline Herbaceous: Pioneering Vegetation (HES) map class represents four described associations. There is also one undescribed association we assigned with a park-special name and another undescribed association falling under a known alliance. All six associations (described and undescribed), are also incorporated into other map classes. The six associations comprise five described alliances and

one undescribed alliance, of which all are included in other map classes. Refer to Table J-1 for association and alliance relationship to other map classes.

Of all the types, the Gravel Bar Early Successional Vegetation—the park-special type—is most common to the HES map class in riparian locations throughout Waterton-Glacier IPP. Also common along riparian and lakeshore scenarios is *Elymus repens* Semi-natural Herbaceous Vegetation. East of the CD, *Dryas drummondii* / *Chamerion latifolium* Dwarf-shrubland and *Eleocharis palustris* Herbaceous Vegetation are regularly found representing HES. The other two types linked to the HES map class are uncommon, but typically occur east of the CD.

Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures



Accuracy Assessment Results

Glacier National Park

- ☺ Users' Accuracy: 95% with 90% confidence interval of 84–106% (n = 20)
- ☺ Producers' Accuracy: 95% with 90% confidence interval of 84–106% (n = 20)

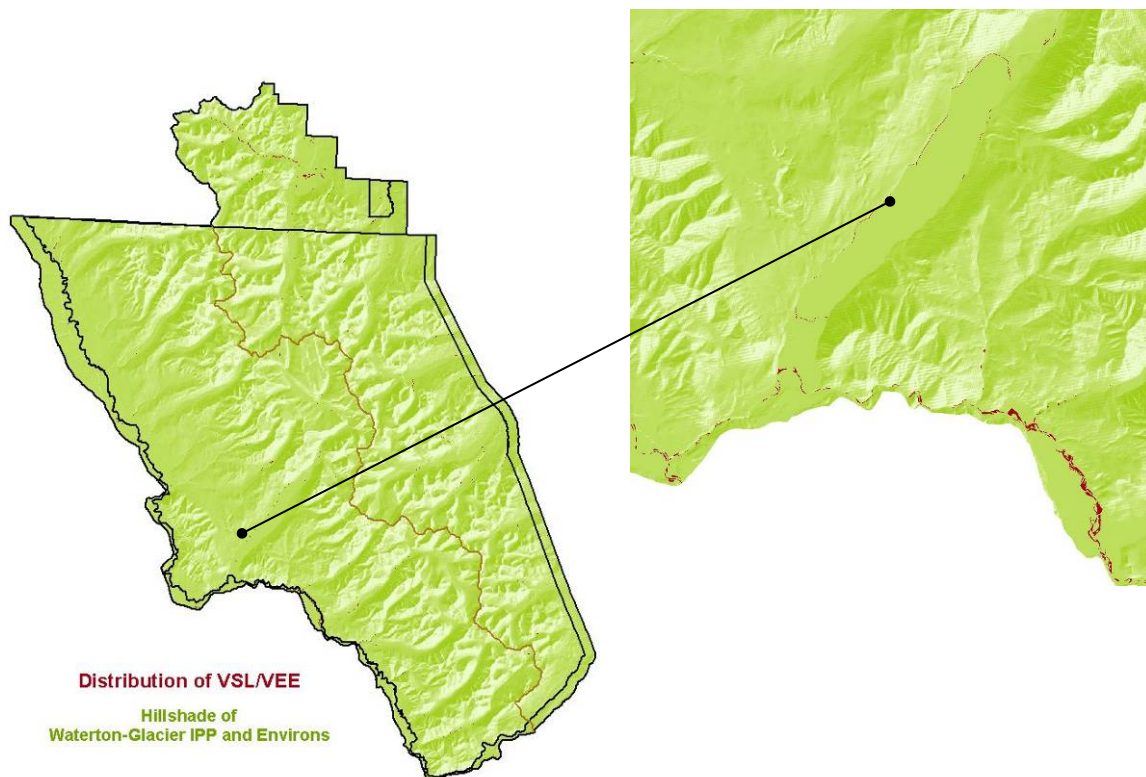
Waterton Lakes National Park

- ☹ Users' Accuracy: 40% with 90% confidence interval of -6–86% (n = 5)
- ☺ Producers' Accuracy: 100% with 90% confidence interval of 75–125% (n = 2)

Exposed Shoreline Sparse Vegetation (VSL and VEE)

Description of the Map Class

The Exposed Shoreline Sparse Vegetation map class is split into two map class phases, the wet riparian/basin phase (VSL) and the highly erodable embankment phase (VEE), typically in riparian locations, but occasionally in exposed shorelines of lakes and ponds. (See the Distribution of VSL/VEE figure below.) Both map class phases are common to montane and lower subalpine. The VEE map class phase is perhaps restricted to lower regions where stream development is more advanced. The VSL map class phase infrequently reaches into the higher subalpine.



We used the VSL and VEE map class phases to map wetland areas having <10% total cover of vegetation, typically pioneering vegetation consisting of herbaceous, shrubs, and/or tree samplings on alluvial sand, gravel, and cobble substrates. The most typical locations for VSL and VEE map class phases are in riparian locations. They are less commonly found within basin settings.

The VSL map class phase represents areas where the substrate is exposed. In riparian situations, they are generally flat and remain low within the riparian floodplain, where they receive repetitive flooding, thus preventing further establishment of perennial vegetation. In lake or pond drawdown situations, they are located within the freshly exposed substrate.

The VEE map class phase represents embankments on the sides of the riparian floodplain. These highly erodable embankments usually receive annual flooding, however, they receive less reoccurring floods throughout the season compared to the VSL map class. Even though less flooding occurs on these higher embankments, vegetation is still prevented from fully establishing because of continual erosion.

If the pioneering vegetation became >10% cover, the Exposed Shoreline Herbaceous: Pioneering Vegetation (HES) map class was used to map the area. When there were >25% RD of shrubs or trees, the appropriate shrub or tree map class was applied. These areas are rapidly changing as the heterogeneous ephemeral vegetation varies from year to year.

As with HES, it became difficult to discern from the aerial photographs lower percentages of vegetation (e.g., 0–20%), as rock reflectance overexposed the surface, making the vegetation on the aerial photo less viewable. This made it challenging, at times, to make a distinction between the VSL map class and the HES map class based on percent composition of vegetation.

Relationship to the Vegetation Classification

The Exposed Shoreline Sparse Vegetation (VSL and VEE) map class represents one described associations and one undescribed association we assigned with a park-special name. Of the two associations (described and undescribed), both are also incorporated into other map classes. The described association is of a described alliance, whereas the undescribed association is of an undescribed alliance. Because of the random, heterogeneous, and ephemeral nature of this vegetation, identifying and describing vegetation types was not plausible. Refer to Table J-1 for association and alliance relationship to other map classes.

Similar to the HES map class, but with a total vegetation cover <10%, the Gravel Bar Early Successional Vegetation—the park-special type—is most common to the VSL and VEE map class phases in riparian locations throughout Waterton-Glacier IPP. The *Dryas drummondii* / *Chamerion latifolium* Dwarf-shrubland is less common to the VSL and VEE map class phases than to the HES map class, since the community has little time to establish before large flood events reset the vegetation. It is logical to presume, however, that the VEE map class phase is more likely than the VSL map class phase to capture this community since it is less likely to flood.

Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures

Eroded Embankment Phase (VEE)



Wet Riparian/Basin Phase (VSL)



Accuracy Assessment Results

Glacier National Park

- ☺ Users' Accuracy: 96% with 90% confidence interval of 86–105% (n = 23)
- ☺ Producers' Accuracy: 100% with 90% confidence interval of 98–102% (n = 22)

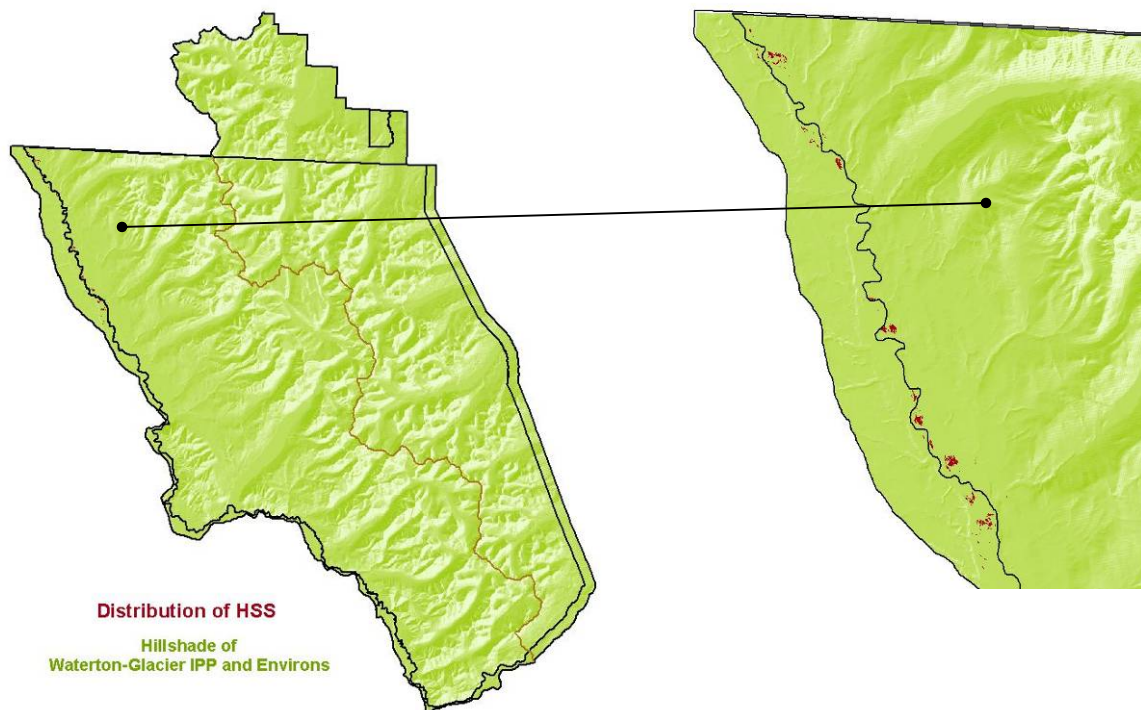
Waterton Lakes National Park

- ☺ Users' Accuracy: 100% with 90% confidence interval of 92–108% (n = 6)
- ☺ Producers' Accuracy: 100% with 90% confidence interval of 92–108% (n = 6)

Sagebrush - Fescue Shrub Herbaceous (HSS)

Description of the Map Class

The Sagebrush - Fescue Shrub Herbaceous (HSS) map class is restricted to locations west of the CD in the northwest corner of GNP, closely following the prairie lands along the North Fork Flathead River corridor, essentially from the United States-Canada International border to the Polebridge area. (See the Distribution of HSS figure below.) The HSS map class is common to Big Prairie, Round Prairie, Abotts Flats, and associated areas.



We used the HSS map class to map shrub herbaceous lands having >10% cover of sagebrush. When there was <10% sagebrush, the Grassland Herbaceous (HGL) map class was used to map the herbaceous grassland. When >25% total tree cover existed, the appropriate woodland (or forest) map class was applied.

Relationship to the Vegetation Classification

The Sagebrush - Fescue Shrub Herbaceous (HSS) map class represents two described associations: *Artemisia tridentata* ssp. *vaseyana* / *Festuca campestris* Shrub Herbaceous Vegetation and *Artemisia tridentata* ssp. *vaseyana* / *Festuca idahoensis* Shrub Herbaceous Vegetation. They are both in the same alliance, unique to this map class, and not part of any other map class. Refer to Table J-1 for association and alliance information.

The HSS map class most commonly captures *Artemisia tridentata* ssp. *vaseyana* / *Festuca campestris* Shrub Herbaceous Vegetation as the most common community in the area. Of areas of heavy grazing, the HSS map class may capture *Artemisia tridentata* ssp. *vaseyana* / *Festuca idahoensis*.

Representative Pictures



Accuracy Assessment Results

Glacier National Park

☺ Users' Accuracy: 86% with 90% confidence interval of 57–115% (n = 7)

☹ Producers' Accuracy: 75% with 90% confidence interval of 44–106% (n = 8)

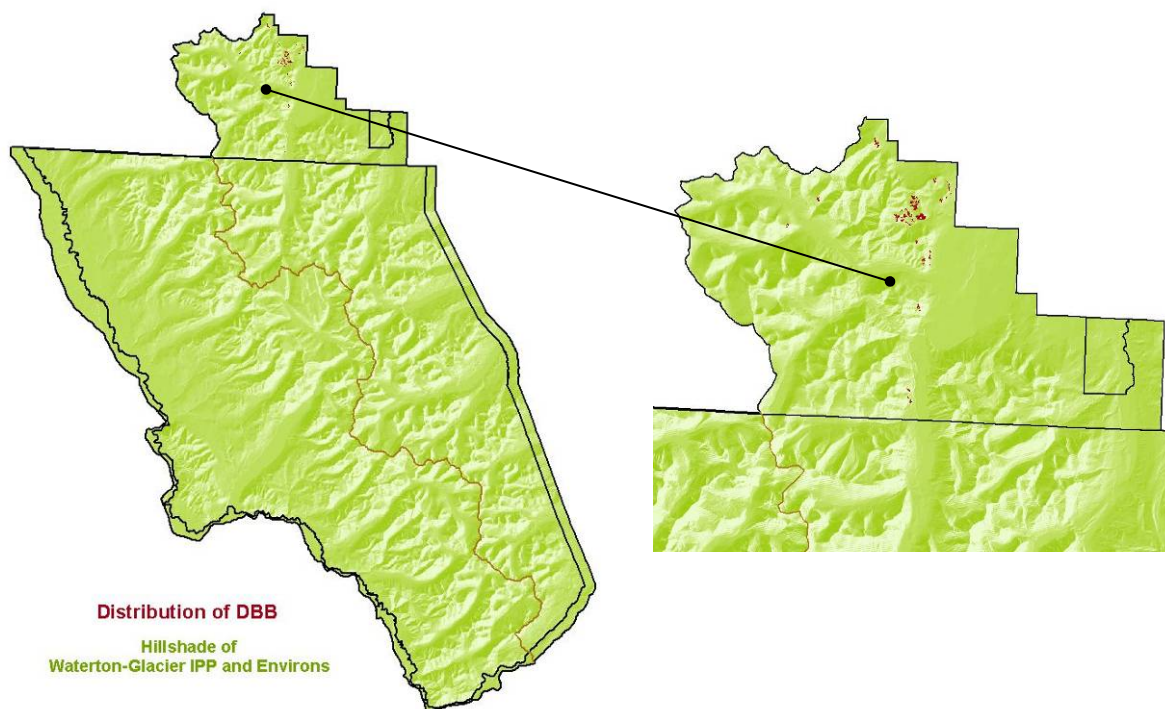
Waterton Lakes National Park

The HSS map class was not used for mapping WLNP.

Bearberry Dwarf-shrubland (DBB)

Description of the Map Class

The Bearberry Dwarf-shrubland (DBB) map class was specifically used for mapping the WLNP layer; it is the only map class not used for the GNP layer. (See the Distribution of DBB figure below.) The DBB map class was used to map bearberry dwarf-shrublands on moderately steep south and southwest exposed slopes of the montane.



The typical vegetation pattern of DBB appeared as a vertical streaking pattern across the landscape, often with a sparse layer of limber pine. When the total cover of limber pine was >10% , the Limber Pine Woodland (WLM) map class was applied.

Relationship to the Vegetation Classification

The Bearberry Dwarf-shrubland (DBB) map class represents three described associations: *Arctostaphylos uva-ursi* / *Festuca campestris* - *Festuca idahoensis* Dwarf-shrubland, *Arctostaphylos uva-ursi* / *Pseudoroegneria spicata* Dwarf-shrubland, and *Arctostaphylos uva-ursi* / *Solidago multiradiata* Dwarf-shrubland. All three of these communities are incorporated into other map classes, and consist of one alliance. Refer to Table J-1 for association and alliance relationship to other map classes.

Representative Picture



Accuracy Assessment Results

Glacier National Park

The DBB map class was not used for mapping GNP.

Waterton Lakes National Park

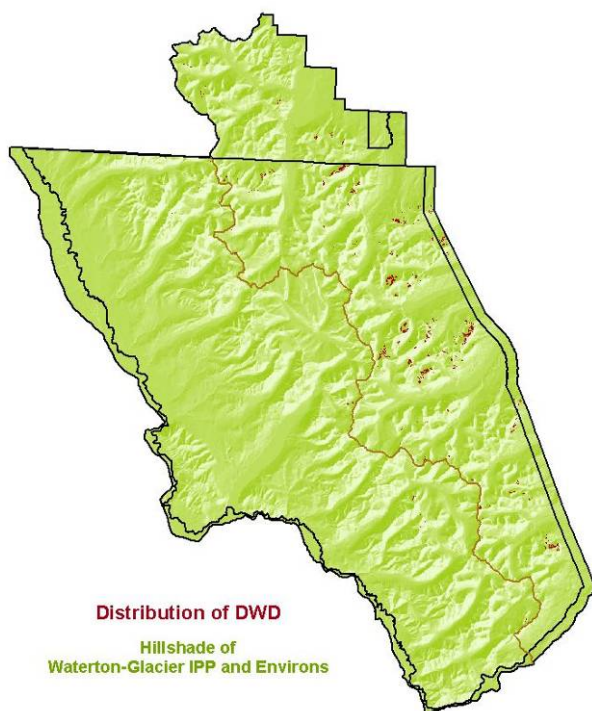
☺ Users' Accuracy: 100% with 90% confidence interval of 75–125% (n = 2)

☹ Producers' Accuracy: 67% with 90% confidence interval of 5–128% (n = 3)

White Dryad Dwarf-shrubland (DWD)

Description of the Map Class

The White Dryad Dwarf-shrubland (DWD) map class is prominent to high-subalpine and alpine east of the CD and is less prominent west of the CD. (See the Distribution of DWD figure below.) It is typically positioned in the landscape on calcareous substrates in wind-swept locations, giving the characteristic of alternating patterns between dwarf-shrub and exposed rock.



We used the DWD map class to identify areas of white dryad dwarf-shrublands having >10% total cover. Its wind-swept and alternating pattern were very distinctive on the aerial photos. When white dryad dwarf-shrubland communities did not appear in this distinctive pattern, we mapped with the Dwarf-shrub/Herbaceous Complex: Dry - Mesic (CSA) map class. The only distinguishable difference between the DWD map class and CSA map class was the physiognomic growth pattern on the landscape.

It was often difficult to discern from the aerial photographs lower percentages of the dwarf-shrub vegetation (e.g., 0–20%), as rock reflectance overexposed the surface, making the vegetation on the aerial photo less viewable. This made it challenging, at times, to make a distinction between the DWD map class and the VCT map class based on percent composition of vegetation.

In addition, white dryad dwarf-shrublands that were too small to map (<MMU size), even though the characteristic alternating pattern was evident, were most likely mapped as part of the CSA map class.

Relationship to the Vegetation Classification

The White Dryad Dwarf-shrubland (DWD) map class represents two described associations: *Dryas octopetala* - *Carex rupestris* Dwarf-shrub Herbaceous Vegetation and *Dryas octopetala* - *Polygonum viviparum* Dwarf-shrub Herbaceous Vegetation. Both communities consist of one alliance, and are also included in the CSA map class. Refer to Table J-1 for association and alliance information.

The *Dryas octopetala* - *Carex rupestris* Dwarf-shrub Herbaceous Vegetation is most common to the DWD map class, largely because it is most common to the Waterton-Glacier IPP area. This vegetation community is often captured by the DWD map class in the most dry, wind-swept locations. When areas are moister, perhaps due to snow accumulation, the *Dryas octopetala* - *Polygonum viviparum* Dwarf-shrub Herbaceous Vegetation is most likely be captured by the DWD map class.

Representative Pictures



Accuracy Assessment Results

Glacier National Park

- ☺ Users' Accuracy: 92% with 90% confidence interval of 82–103% (n = 26)
- ☺ Producers' Accuracy: 100% with 90% confidence interval of 98–102% (n = 24)

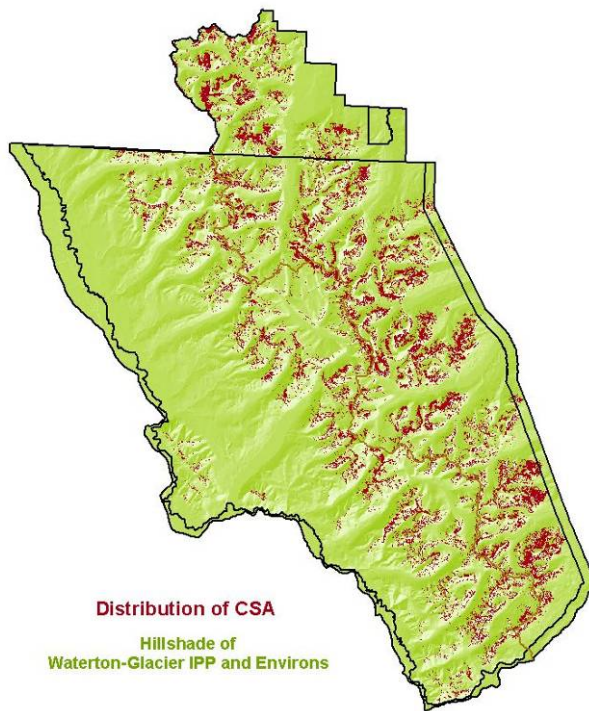
Waterton Lakes National Park

- ☹ Users' Accuracy: 0% with 90% confidence interval of -25–25% (n = 2)
- ☹ Producers' Accuracy: 0% with 90% confidence interval of 0–0% (n = 0)

Dwarf-shrub/Herbaceous Complex: Dry - Mesic (CSA)

Description of the Map Class

The Dwarf-shrub/Herbaceous Complex: Dry - Mesic (CSA) map class captures dwarf-shrub and/or herbaceous vegetation in mesic to dry conditions and is abundant throughout the alpine and subalpine, occasionally in the upper montane (see the Distribution of CSA figure below).



The CSA map class was applied to dwarf-shrub and/or herbaceous vegetation having >10% total cover, barring significant presence of shrubs or trees to consider a shrub, woodland, or forest map class. Areas mapped with CSA tend to dry out by mid-summer; desiccating winds and warm exposures contribute to drought-like conditions. Wind exposure can prevent little winter snow cover and result in a short and temporary supply of meltwater in summer months. Although vegetation can be of high cover, it was typically of lower density due to its dryness.

The CSA map class is a complex unit where, from the mapping perspective, a confident separation between dwarf-shrubland types and herbaceous types could not be made. Normally, if we could determine dwarf-shrubland types with confidence, they would be mapped separately from the herbaceous types (herbaceous types having <25% RD to the

dwarf-shrub component).

There are similarities in plant communities and landscape position between the CSA map class and the Dwarf-shrub/Herbaceous Wet Complex: Mesic - Wet (CSW) map class. Yet, the CSA map class represents sites that are more favorably dry, often of warm exposures, and wind driven.

Perhaps the most difficult aspect in mapping CSA was distinguishing it from the CSW map class. For the CSA map class, special attention was given during mapping to positions within the landscape lending toward drier environments. The vegetation was generally less rich and dense than those of the CSW map class. However, there were some plant communities and species that also lent themselves to mesic-wet and mesic-dry environments; beargrass is a prime example of this. Often times, alpine meadows could actually be described as a mosaic of the CSA and CSW map classes, with slight micro-topographic changes from mesic depressions (CSW) to drier bedrock exposures (CSA). In these instances, the dominant scenario was used to determine which map class to apply.

Another challenge was making the distinction between the CSA map class and the Cliff/Talus Sparse Vegetation (VCT) map class, where separation was based on density of the dwarf-shrub/herbaceous components (the CSA map class having >10% total cover and the VCT map class having <10% total cover). In addition, bare rock exposures often diffused the appearance of vegetation on the aerial photographs; from field experience, viewing even hints of vegetation on the aerial photographs gave indication there was >10% vegetation present and the CSA map class was applied (using the 10–25% density modifier). The CIR aerial photos were used to help clarify rock substrate from vegetation.

Determining the break between the CSA and Grassland Herbaceous (HGL) map classes was also a challenge. There was not a discernable signature on the aerial photos apparent between the CSA and the HGL map classes. To a large extent, numerous vegetation types of these two map classes overlap when in the upper montane and lower subalpine. To promote consistency in our mapping, we derived a mapping convention to apply to the CSA and HGL map classes within this transitional zone. The upper extent of the forest zone (toward subalpine woodlands) was mapped with the CSA map class, and within the forest zone (toward montane forests) the HGL map class was applied. We continued to apply the HGL map class to grassland meadows clearly within montane areas, even when the forest zones were not apparent and the areas were predominantly of woodland. Even with this mapping convention, however, determining the use of either the CSA or HGL map classes was not always obvious. There is definitely an overlap of plant community types between the CSA and HGL map classes in the lower montane to upper subalpine region.

Relationship to the Vegetation Classification

The Dwarf-shrub/Herbaceous Complex: Dry - Mesic (CSA) map class represents 22 described associations*. There are also two undescribed associations we assigned with park-special names. Of the 24 associations (described and park-special), 2 are unique to this map class, whereas the other 22 are also incorporated into other map classes. The 24 associations comprise 15 described alliances, of which 2 alliances are unique to the CSA map class and the other 13 alliances are also included in other map classes. There is one additional undescribed alliance that encompasses one park-special association; this alliance is unique to the CSA map class and is not included in any other map class. Refer to Table J-1 for association and alliance relationship to other map classes.

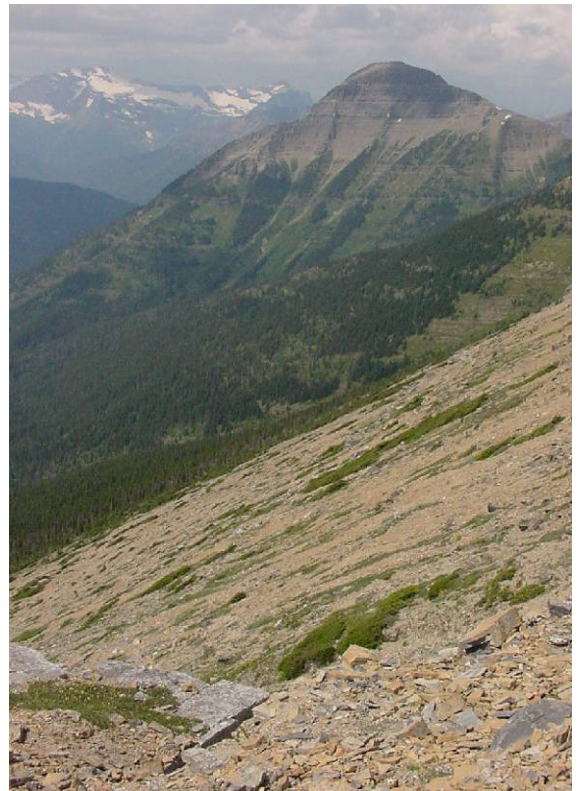
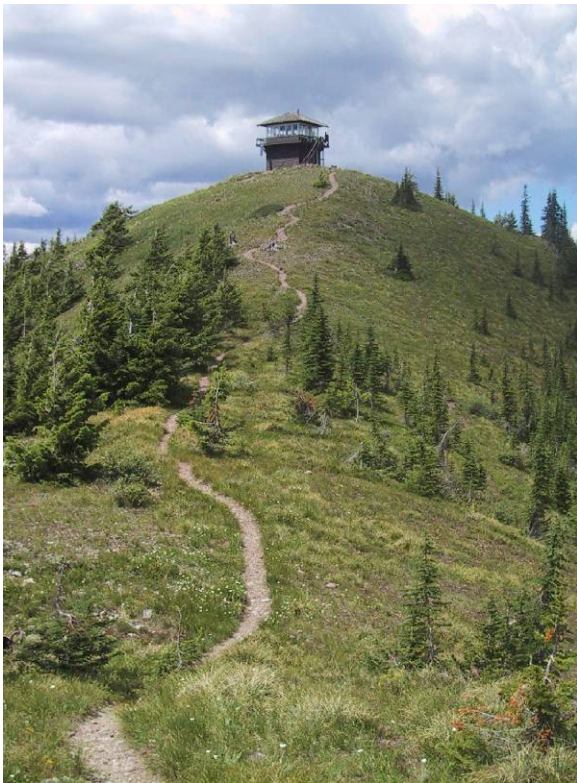
Quite common to the CSA map class in the subalpine, both east and west of the CD, are *Xerophyllum tenax* Herbaceous Vegetation and *Vaccinium membranaceum* / *Xerophyllum tenax* Shrubland, which are also common to the CSW map class in wetter conditions. Very common to the CSA map class, in the alpine on wind-swept calcareous areas, are *Dryas octopetala* - *Carex rupestris* Dwarf-shrub Herbaceous Vegetation and *Dryas octopetala* - *Polygonum viviparum* Dwarf-shrub Herbaceous Vegetation, although the latter is not as common as the former. Also, commonly captured by the CSA map class in the alpine are two sedge communities, *Carex albonigra* - *Myosotis asiatica* Herbaceous Vegetation and *Carex paysonis* - *Sibbaldia procumbens* Herbaceous Vegetation.

Several additional communities are commonly captured by the CSA map class, more often east of the CD than west, merely because of their distribution. The *Salix glauca* Shrubland is common to the CSA map class in subirrigated locations with significant wind impact. Also common to the CSA map class, on exposed wind-scoured slopes, is *Dasiphora fruticosa* ssp. *floribunda* / *Artemisia michauxiana* Shrub Herbaceous Vegetation [Provisional]. Perhaps more protected from wind than the previous communities and on calcareous substrates are two additional *Dasiphora* communities, *Dasiphora fruticosa* ssp. *floribunda* / *Festuca campestris* Shrub Herbaceous Vegetation and *Dasiphora fruticosa* ssp. *floribunda* / *Festuca idahoensis* Shrub Herbaceous Vegetation. Three *Arctostaphylos* communities, *Arctostaphylos uva-ursi* / *Festuca campestris* - *Festuca idahoensis* Dwarf-shrubland, *Arctostaphylos uva-ursi* / *Pseudoroegneria spicata* Dwarf-shrubland, and *Arctostaphylos uva-ursi* / *Solidago multiradiata* Dwarf-shrubland, are also commonly captured by the CSA map class. Two other communities common to the CSA map class in the alpine and high subalpine are *Carex geyeri* Herbaceous Vegetation and *Phacelia hastata* - (*Penstemon ellipticus*) Sparse Vegetation.

The remaining associations were less commonly captured by the CSA map class. Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures





Accuracy Assessment Results

Glacier National Park

- 😊 Users' Accuracy: 91% with 90% confidence interval of 82–101% (n = 35)
- 😊 Producers' Accuracy: 89% with 90% confidence interval of 79–99% (n = 36)

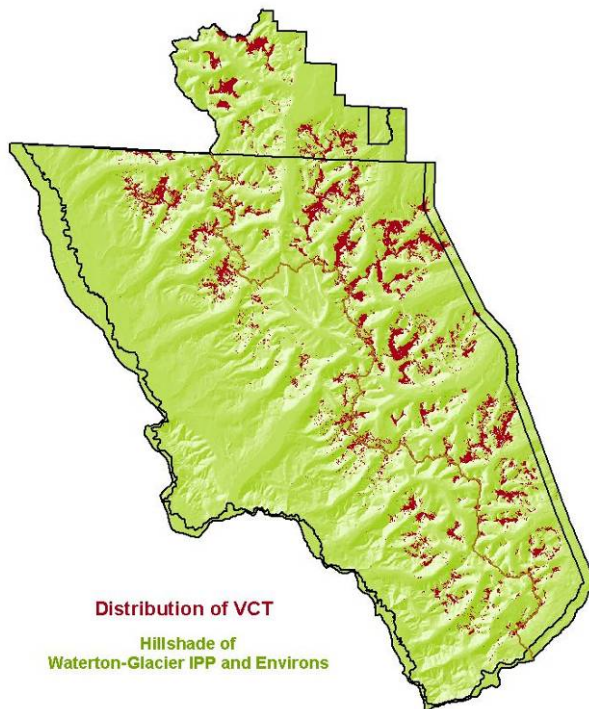
Waterton Lakes National Park

- 😊 Users' Accuracy: 85% with 90% confidence interval of 64–105% (n = 13)
- 😊 Producers' Accuracy: 92% with 90% confidence interval of 74–109% (n = 12)

Cliff/Talus Sparse Vegetation (VCT)

Description of the Map Class

The Cliff/Talus Sparse Vegetation (VCT) map class is quite common to the map, with occurrence concentrated to the subalpine and alpine (see the Distribution of VCT figure below). It is common above the tree line on steep rocky slopes and talus scree.



The VCT map class was used to map areas in the alpine and subalpine—occasionally within the montane—having <10% total vegetation cover. Herbaceous, dwarf-shrub, shrub, tree, and nonvascular vegetation grow in rock fixtures or on the rock surfaces. The VCT map class was also used to map areas of receding glaciers, with the newly exposed rock continually wet from glacial melt throughout the growing season, yet with <10% dwarf-shrub and herbaceous vegetation. When these areas were >10% vegetated, the Dwarf-shrub/Herbaceous Complex: Mesic - Wet (CSW) map class was used.

A particular challenge in interpreting was distinguishing the VCT map class from the Dwarf-shrub/Herbaceous Complex: Dry - Mesic (CSA) map class based on density of the dwarf-shrub/herbaceous components (VCT having <10% total cover and CSA having >10% total cover). In addition, bare rock exposures often diffused the

appearance of vegetation on the aerial photographs; from field experience, viewing even hints of vegetation on the aerial photographs gave indication that there was >10% vegetation present. Extra care was needed, however, not to confuse rock appearances with sparse vegetation. The CIR aerial photographs were used to help clarify rock substrate from sparse vegetation. Essentially, the VCT map class was used where no signature of vegetation was evident.

Relationship to the Vegetation Classification

The Cliff/Talus Sparse Vegetation (VCT) map class represents eight described associations*. There are also two undescribed associations we assigned with park-special names. Of the 10 associations (described and park-special), 2 are unique to this map class, whereas the other 8 associations are also incorporated into other map classes. The eight described associations comprise eight described alliances, of which two alliances are unique to the VCT map class, and the other six alliances are also included in other map classes. There is one additional undescribed alliance that encompasses one park-special association. Refer to Table J-1 for association and alliance relationship to other map classes.

Because of the extreme locations these communities persist in, little is known of their commonality to the VCT map class. Yet, we venture that the most common association mapped with VCT is *Saxifraga bronchialis* Scree Slope Sparse Vegetation, occurring over a broad elevation range. Also broadly distributed and commonly captured in the VCT map class is *Penstemon ellipticus* Dwarf-shrubland on slopes of thin soils in warm exposure settings. Also common to the VCT map class is *Arenaria capillaris* / *Polytrichum piliferum* Herbaceous Vegetation, occurring in the alpine and high subalpine.

Less is known about the remaining communities and their occurrence to the VCT map class. We do determine, however, *Carex albonigra* - *Myosotis asiatica* Herbaceous Vegetation and *Saxifraga mertensiana* Cliff Crevice Sparse Vegetation are exclusively alpine. Again, refer to Table J-1 for all associations linked to this map class.

Representative Pictures



Accuracy Assessment Results

Glacier National Park

- 😊 Users' Accuracy: 100% with 90% confidence interval of 98–102% (n = 25)
- 😊 Producers' Accuracy: 100% with 90% confidence interval of 98–102% (n = 25)

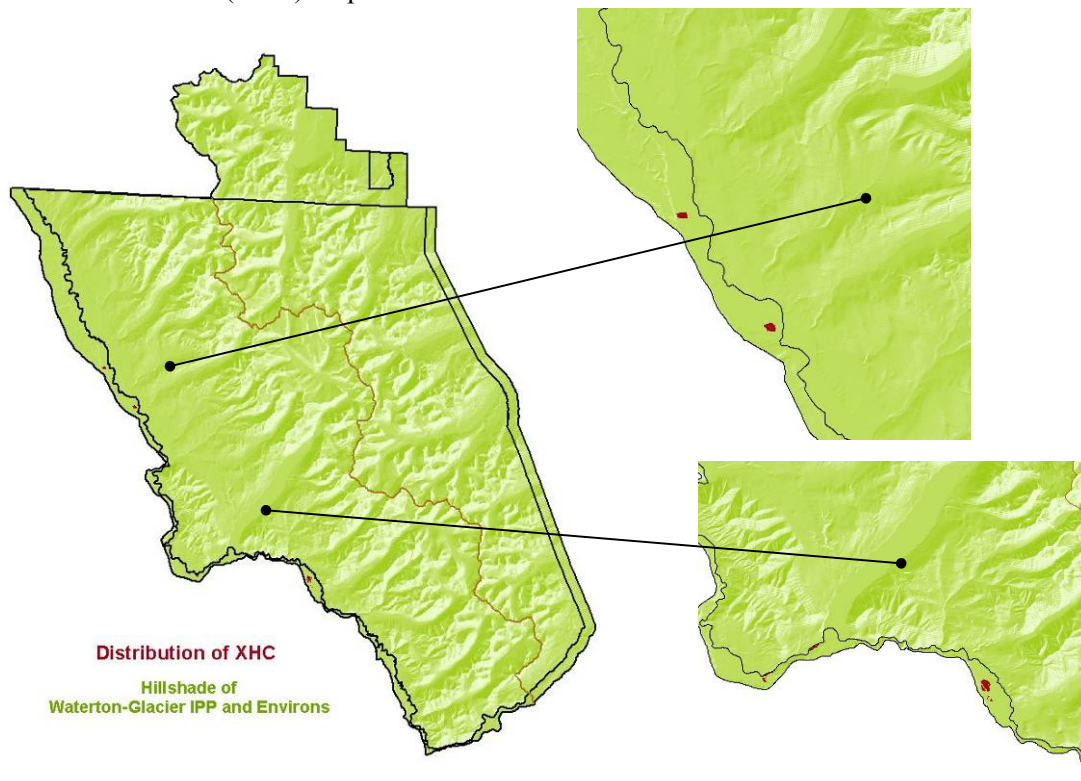
Waterton Lakes National Park

- 😊 Users' Accuracy: 100% with 90% confidence interval of 92–108% (n = 6)
- 😊 Producers' Accuracy: 100% with 90% confidence interval of 92–108% (n = 6)

Hayfield/Cropland (XHC)

Description of the Map Class

The Hayfield/Cropland (XHC) map class represents lands cultivated either for row crops or for improved pasture of monotypic annual or biennial herbaceous vegetation. All XHC are located outside of Waterton-Glacier IPP in the environs (see the Distribution of XHC figure below). Lands of perennial grasses and forbs growing naturally and used primarily for pastureland, perhaps cut for hay periodically, remain in the Grassland Herbaceous (HGL) map class.



Relationship to the Vegetation Classification

The NVC does not classify vegetation of the XHC map class to either alliance or association levels. We provide a tentative MacroGroup (Level 6) name in the NVCvr2, which is most likely a combination of two MacroGroups: Temperate Row Crop/Close Grown Crop. They are, however, classified with two planted/cultivated Formations in the 1997 version of the NVC; the Annual Close-grown Forbs and Grasses (V.D.2.C.a) and the Annual Row-crop Forbs and Grasses (V.D.2.C.b).

Representative Pictures

No representative pictures available.

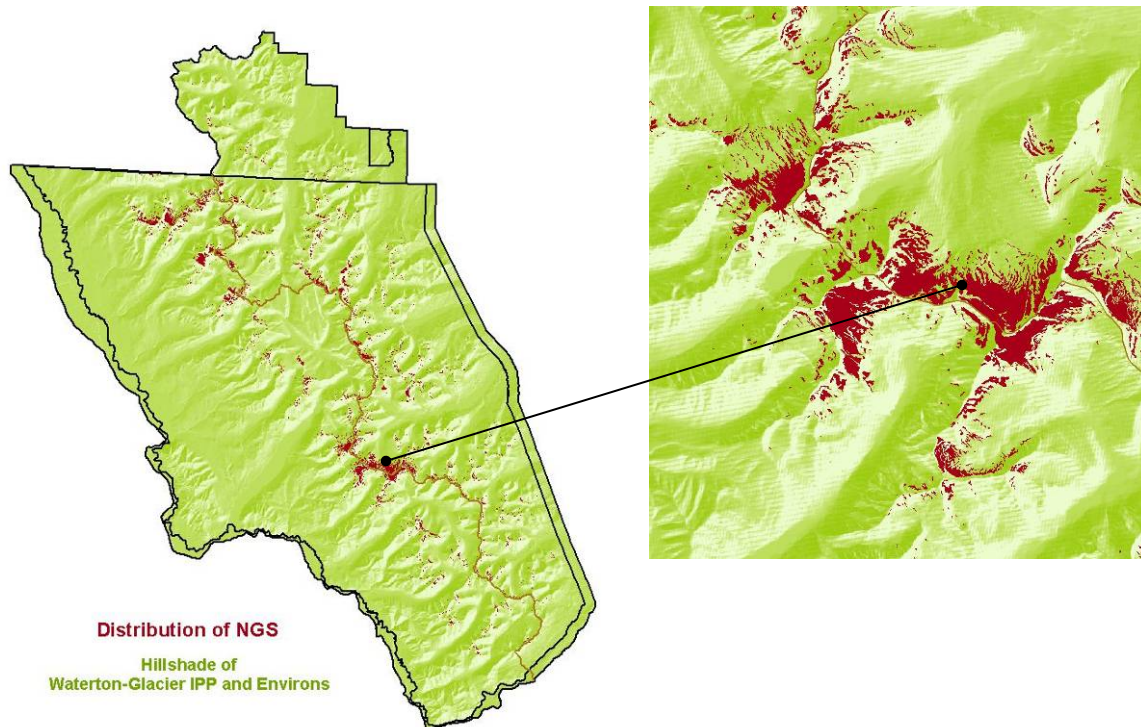
Accuracy Assessment Results

The XHC map class does not represent alliance or association level vegetation types, and therefore was not assessed for accuracy for either GNP or WLNP.

Glacier/Snow Fields (NGS)

Description of the Map Class

The Glacier/Snow Field (NGS) map class represents perennial glaciers and snow fields visible at the date of photography (August 1999), and is typically within the alpine and higher subalpine regions (see the Distribution of NGS figure below). With park staff and researchers closely monitoring the glaciers and snow fields of Waterton-Glacier IPP, we applied a smaller MMU of 0.25 ha when mapping NGS. Exposed rock and vegetation within glaciers and snow fields were mapped separate from NGS. However, some small areas, below MMU, of exposed rock and vegetation, may be inclusive to the NGS map class. In contrast, small snow fields below MMU are inherently inclusive within other map classes.



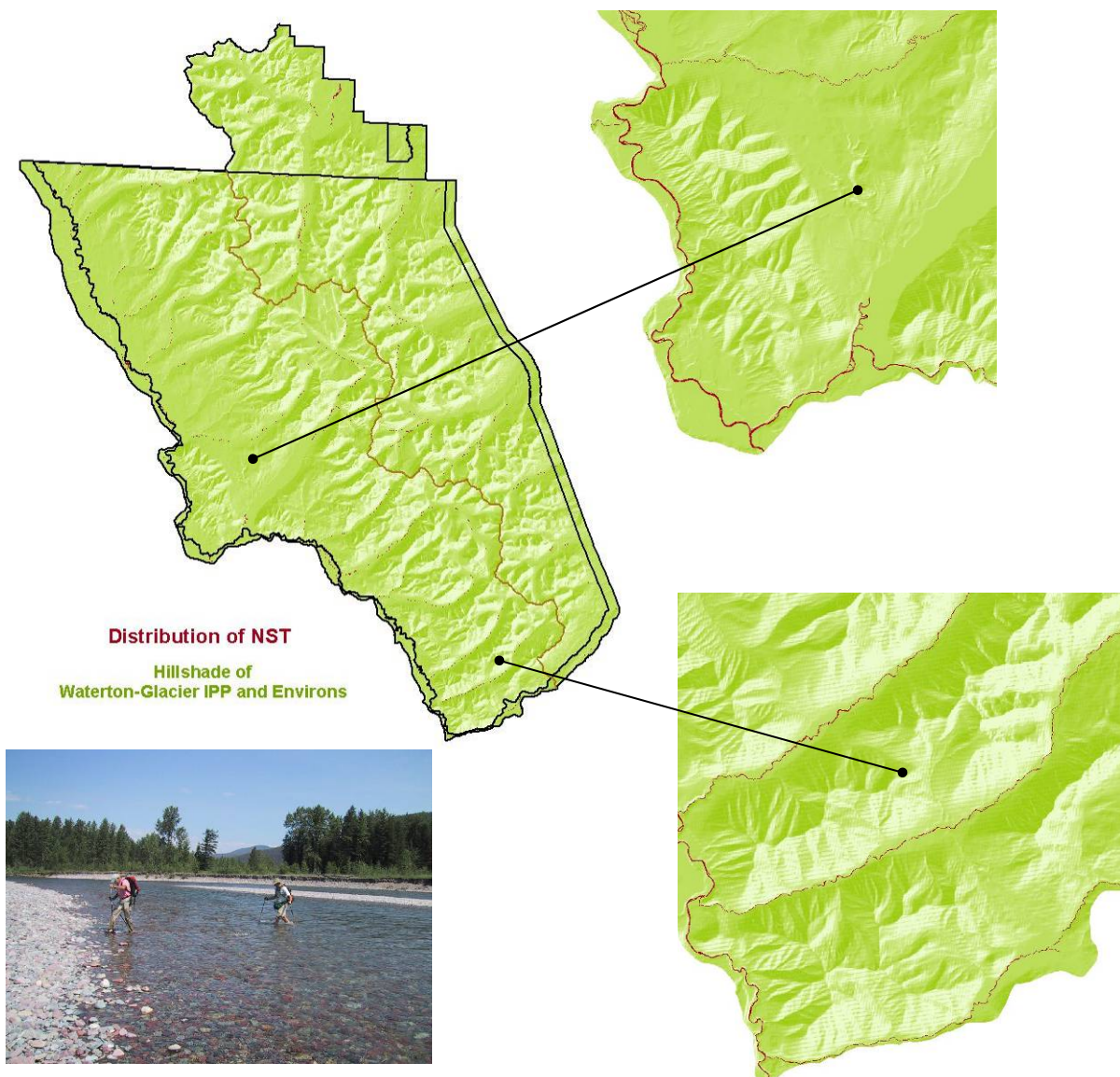
Representative Pictures



Stream/River (NST)

Description of the Map Class

The Stream/River (NST) map class represents streams and rivers—perennial or intermittent—having a width on the aerial photographs that could be delineated into polygon form (August 1999 TC photos at a scale of 1:15,840, although the scale varies with ground elevation changes). Mapping of NST required the stream or river to have water at the date of photography, and is distributed throughout the map extent (see the Distribution of NST figure below). Inherently, inclusive to NST are numerous small riparian rock bars of extremely sparse vegetation (0–10%), too small to map separately as the Exposed Shoreline Sparse Vegetation (wet riparian/basin phase) (VSL) map class. When these rock bars became sizable, we applied the VSL map class to capture them; in many instances VSL was mapped below the 0.5 ha MMU in order to capture these river and stream habitats. Likewise, similar scenarios occurred for the Exposed Shoreline Herbaceous: Pioneering Vegetation (HES) map class (when >10% of pioneering vegetation) and the Deciduous Wet Shrubland (SWL) map class. Although each of these map classes may exist below MMU in the NST map class, the most frequent scenario is of small rock bars too small to map with the VSL map class.



Representative Pictures

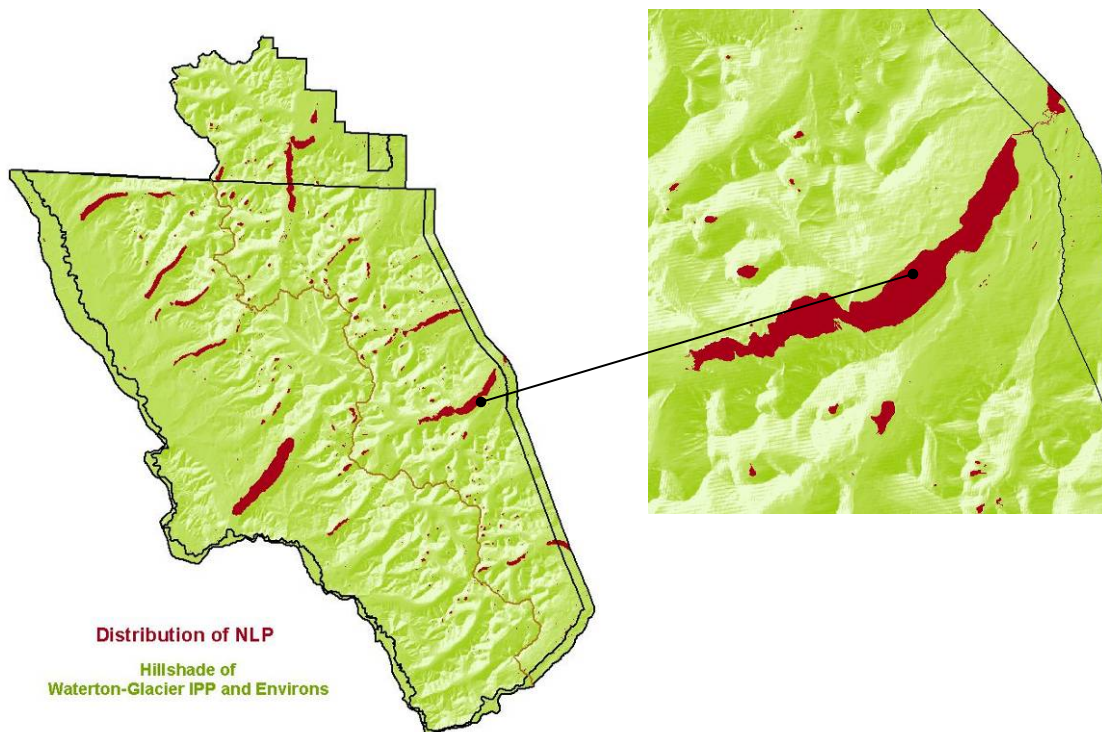


Natural and Artificial Lake/Pond (NLP)

Description of the Map Class

The Natural and Artificial Lake/Pond (NLP) map class represents lakes and ponds of either natural or artificial origin (artificial being either human-made or human-maintained with a control structure), and have <10% total vegetation present. The NLP map class is distributed throughout the map extent (see the Distribution of NLP figure below).

Natural lakes and ponds consist of large, deep glacial carved lakes in the lower valleys (e.g., Lake McDonald, Kintla Lake) to small, shallow cirque or rock-striated ponds in the high mountains. Artificial lakes and ponds consist of large, deep-cut valley lakes maintained by control structures (e.g. Lake Sherburne) to the small impoundments used for watering livestock (e.g., environs of GNP). When small ponds were positioned within upland surroundings, we easily mapped them using 0.25 ha MMU. When the lakes and ponds occurred within a wetland system (e.g., herbaceous-shrub marsh), we typically mapped to the standard 0.5 ha MMU, incorporating the open water areas within the map classes representing the wetland system.



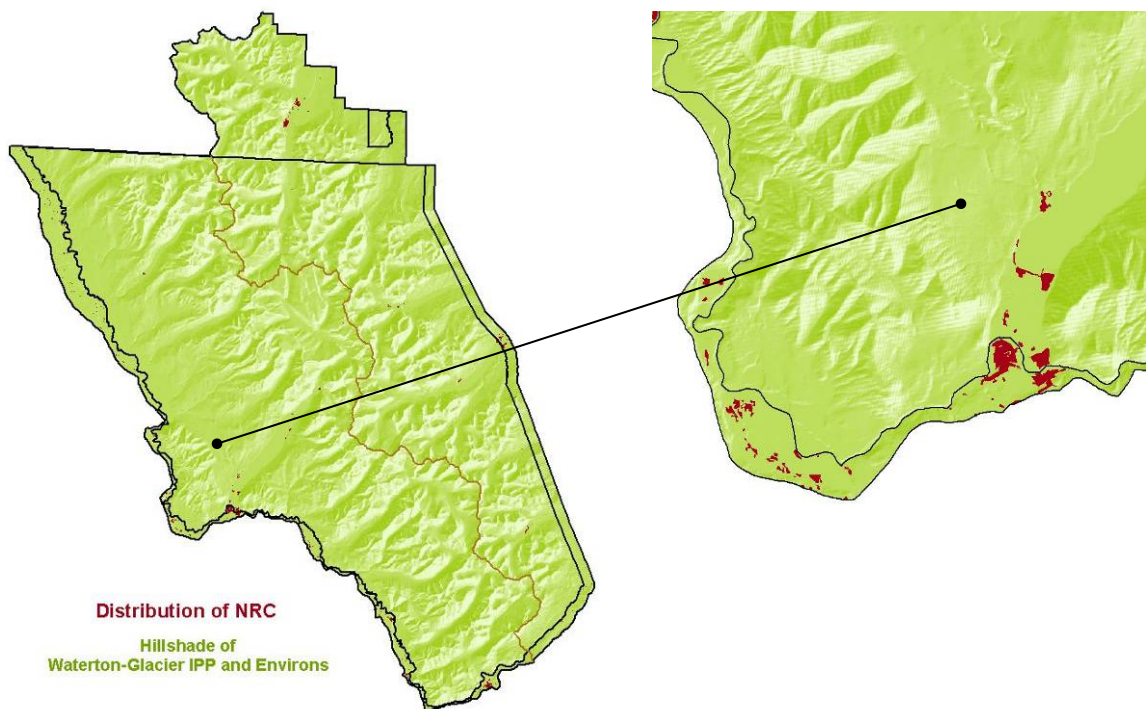
Representative Pictures



Residential/Commercial Area (NRC)

Description of the Map Class

The Residential/Commercial Area (NRC) map class represents towns, villages, farmsteads, golf courses, concessions, residential easements within the Waterton-Glacier IPP, campgrounds, ranger stations, visitor centers and their parking lots, and park headquarters. The NRC map class is perhaps more common external to Waterton-Glacier IPP boundaries, yet is occasional found within the park (see the Distribution of NRC figure below). The NRC map class also includes roads and railroads encompassed by residential and commercial areas. Outside of the NRC map class, these roads and railroads would be mapped using the Road/Railroad (NRR) map class.



Representative Pictures

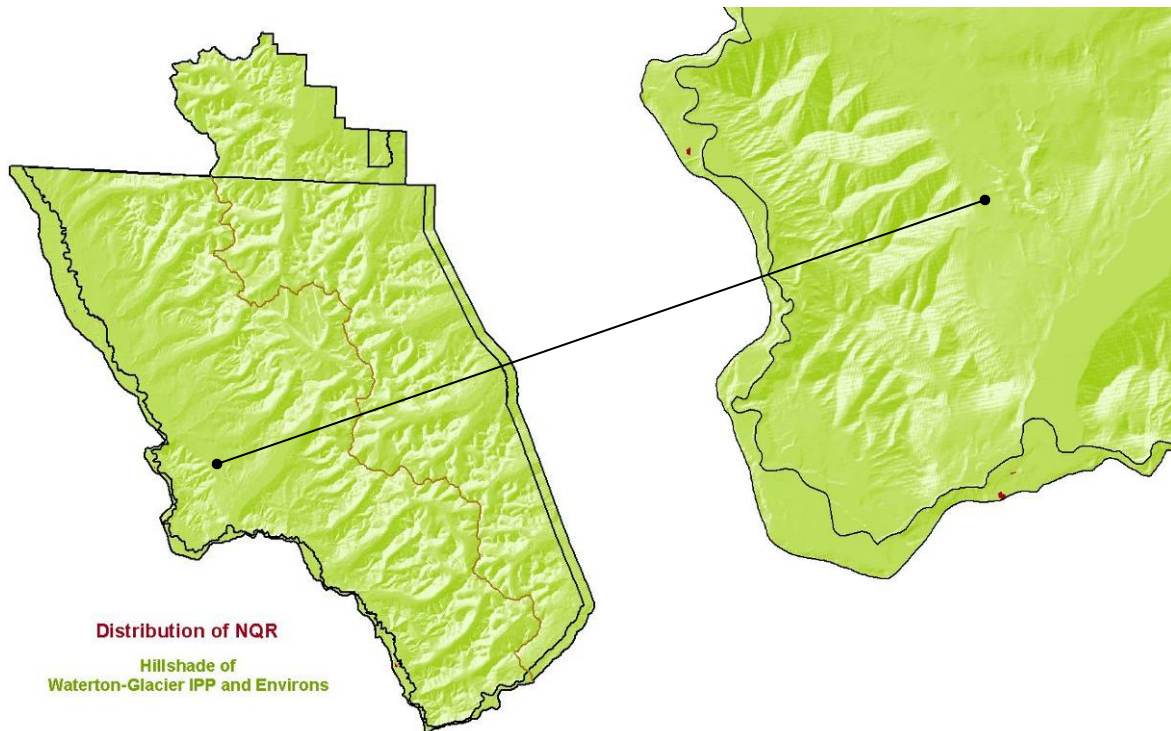




Quarry (NQR)

Description of the Map Class

The Quarry (NQR) map class represents lands used for extractive mining purposes, whether active or non-active. (See the Distribution of NQR figure below.) We did not, however, use the NQR map class to capture river rock harvesting from rivers and streams (e.g., Divide Creek near Saint Mary). In such instances, we continued using the typical map classes to capture such riparian sites; e.g., the Exposed Shoreline Sparse Vegetation (wet riparian/basin phase) (VSL) and the Exposed Shoreline Herbaceous: Pioneering Vegetation (HES) map classes.



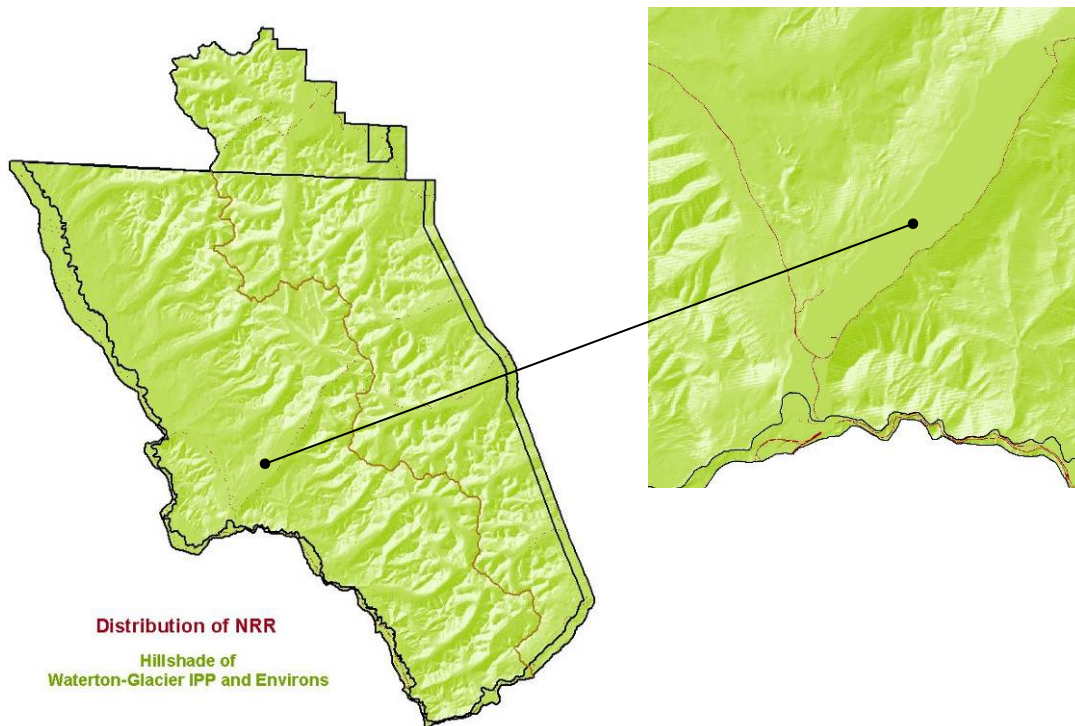
Representative Pictures

No representative pictures available.

Road/Railroad (NRR)

Description of the Map Class

The Road/Railroad (NRR) map class represents lands used primarily for transportation and includes roads and their right-of-ways, railroads and their right-of-ways, and roadside parking (not commercial site parking, however). (See the Distribution of NRR figure below.) We mapped roads and railroads along with their right-of-ways when they were wide enough on the aerial photographs to delineate into polygon form (August 1999 TC photos at a scale of 1:15,840, although the scale varies with ground elevation changes). When trees overtook right-of-ways, we applied the appropriate map class(es) best representing the trees. Herbaceous and low-growing shrubs on the right-of-ways were included in the NNR map class. Roads and railroads occurring within residential or commercial areas were not mapped in the NNR map class, but rather included in the mapping of the Residential/Commercial Area (NRC) map class.



Representative Pictures



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Appendix K

Accuracy Assessment Observation Plot Field Form

USGS-NPS VEGETATION MAPPING PROGRAM				
ACCURACY ASSESSMENT FORM GLACIER NATIONAL PARK				
POINT NO:	DATE:(MM/DD/YY)	PARK CODE: GLAC	UTM ZONE 12	OBSERVERS:
UTM EASTING _____ UTM NORTHING _____				
ACCURACY (EPE): _____ DOP: _____		PLOT REPRESENTATIVENESS: _____ (MMU) _____ (POLYGON)		

SETTING		LANDFORM:	
LOCATION:		TOPOGRAPHIC POSITION:	
ASPECT:		% SLOPE:	
ELEVATION:		SURFICIAL GEOLOGY:	
COWARDIN SYSTEM:		PICTURE NO(S)	
UPLAND	RIVERINE	PALUSTRINE	LACUSTRINE

STRUCTURE			VEG CODE:	
% CONIFEROUS : DECIDUOUS _____:_____			TOTAL CVR.	
	TOTAL CVR	TALL WOODY (2-5M)		ALTERNATE VEG CODE:
EMERGENT TREES		MEDIUM WOODY (0.5 -2M)		
TREE CANOPY		SHORT WOODY (<0.5M)		
SUBCANOPY		HERBACEOUS		
Ground Cover: _____ soil+ _____ gravel+ _____ rock+ _____ litter+ _____ wood+ _____ moss+ _____ basal veg+ _____ other=100%			OTHER VEG TYPES WITHIN MMU:	

COMMENTS	
Classification Comments:	
Environmental:	
Landscape:	
Animal Use/Disturbance:	

SPECIES									
TREES (Maturity Classes)	TOTAL CVR	OM	M	P	SP	SD	SHRUBS: > 0.5 m Ht.	Cvr.	
		C : H	C : H	C : H	C : H	C : H			
Abies lasiocarpa		:	:	:	:	:	Acer glabrum		
Betula papyrifera		:	:	:	:	:	Alnus incana		
Larix lyallii		:	:	:	:	:	Alnus viridis ssp. sinuata		
Larix occidentalis		:	:	:	:	:	Amelanchier alnifolia		
Picea engelmannii		:	:	:	:	:	Artemisia tridentata ssp. vaseyana		
Picea engelmannii x P. glauca		:	:	:	:	:	Betula nana (= B. glandulosa)		
Pinus albicaulis		:	:	:	:	:	Betula occidentalis		
Pinus contorta		:	:	:	:	:	Cornus sericea		
Pinus flexilis		:	:	:	:	:	Crataegus douglasii		
Pinus monticola		:	:	:	:	:	Dasiphora floribunda		
Pinus ponderosa		:	:	:	:	:	Elaeagnus commutata		
Populus balsamifera ssp. trichocarpa		:	:	:	:	:	Lonicera involucrata		
Populus tremuloides		:	:	:	:	:	Menziesia ferruginea		
Pseudotsuga menziesii		:	:	:	:	:	Rhamnus alnifolia		
Thuja plicata		:	:	:	:	:	Oplopanax horridus		
Tsuga heterophylla		:	:	:	:	:	Penstemon ellipticus		
COVER CLASSES (%):		HEIGHT CLASSES:				MATURITY CLASSES:		Prunus emarginata	
T=<1%	2=10-15%	5=50-75%	01= <.5m	04=2-5m	07=15-25m	10=>50m	SD=<1m tall	MA=9-21"	Prunus pensylvanica
P=1-5%	3=15-25%	6=>75%	02=0.5-1m	05=5-10m	08=20-35m		SA=>1m tall-5" dbh		Prunus virginiana
1=5-10%	4=25-50%		03=1-2m	06=10-15m	09=35-50m		PO=5-9" dbh	OM=>21"dbh	Rhamnus alnifolia
WILLOWS		Cvr.							Ribes hudsonianum
Salix bebbiana			Salix glauca						Ribes lacustre
Salix boothii			Salix lutea						Rosa acicularis
Salix candida			Salix pseudomonticola						Rosa woodsii
Salix commutata			Salix scouleriana						Rubus parviflorus
Salix drummondiana			Salix sitchensis						Sorbus scopulina
Salix geyeriana									Symphoricarpos albus
									Symphoricarpos occidentalis
									Vaccinium membranaceum

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Appendix L

Accuracy Assessment Contingency Tables

Explanation of the Contingency Matrix

We provide an accuracy assessment contingency matrix for both the Glacier National Park and the Waterton Lakes National Park vegetation map layers. The contingency tables are arrays of numbers set out in rows and columns to reveal the number of polygons assigned to a particular plant community relative to the actual plant community as verified on the ground.

The columns represent National Vegetation Classification (NVC) associations (plant communities). Because of the high ratio of many plant communities described by few map classes (>200 vegetation types described by about 40 vegetation map class; a 5:1 ratio), we used the map class codes to label those groupings of vegetation associations for ease of comparison during the analysis and discerning results. The map class codes at the top of the table columns represent groupings of plant communities linked to the respective map class. The rows represent the map classes listed by their respective map class codes. The accuracies of each map class are described as both producers' accuracy with errors of inclusion (omission errors), and users' accuracy with error of exclusion (commission errors) present in the mapping.

A crosswalk between map classes and vegetation types is provided in Appendix J: Map Classification Descriptions and Visual Guide. Essentially, this crosswalk reveals the various plant communities that are assigned to the map class codes we used to define aggregates of vegetation types.

The following pages are formatted to legal-size page (8.5" x 14") in landscape position.

Accuracy Assessment Contingency Table
 Glacier National Park of the Waterton-Glacier International Peace Park Vegetation Mapping Project

		FIELD SAMPLES - REFERENCE DATA																												COMISSION							
VEGETATION MAP CODES	FLP	FDf	FFS	FSP	FSW	FWL	FAP	FCW	FEP	FWM	FCH/FCS	WLP	WLM	WWB	WDF	WFS	WSL	WPP	SAD	SDS	SWL	SAM	DWD	HGL	HSS	HES	HWM	HSF	HPF	VCT	VSL/VEE	CSA	CSW	TOTAL	USERS' ACCURACY	90% Confidence Intervals	
																																				-	+
FLP	37		1			1																												39	95%	88%	102%
FDf	2	30	4			1												1																38	79%	67%	91%
FFS	2	2	38			1																												43	88%	79%	98%
FSP			5	21																		1												27	78%	63%	93%
FSW					24																												24	100%	98%	102%	
FWL	1	3	2			19																											25	76%	60%	92%	
FAP							32		2										1		1												36	89%	79%	99%	
FCW							1	28																									29	97%	89%	104%	
FEP	1		1	1				1	40		1																						46	87%	78%	96%	
FWM				2					1	25	1																						29	86%	74%	98%	
FCH/FCS		1							1		15																						17	88%	72%	104%	
WLP												22			1																		23	96%	86%	105%	
WLM			1									1	9																			11	82%	58%	105%		
WWB	1	1	1									1	3	19		1																27	70%	54%	87%		
WDF		1							1		1	2	3		24	1																	33	73%	58%	87%	
WFS		1	2										1	2	3	30			1													41	73%	61%	86%		
WSL																11																	11	100%	95%	105%	
WPP																		8															8	100%	94%	106%	
SAD																			39			1											41	95%	88%	102%	
SDS																				27											1	1	29	93%	84%	103%	
SWL								4													31						1						37	84%	72%	95%	
SAM	1		2																2			29										34	85%	74%	97%		
DWD																							24									26	92%	82%	103%		
HGL																				1				32								33	97%	91%	103%		
HSS																								1	6							7	86%	57%	115%		
HES																					1						19					20	95%	84%	106%		
HWM																										1		20	1			24	83%	69%	98%		
HSF																												6				6	100%	92%	108%		
HPF																													3			3	100%	83%	117%		
VCT																													25			25	100%	98%	102%		
VSL/VEE																										1						23	96%	86%	105%		
CSA																														32	2	35	91%	82%	101%		
CSW																		1	1													32	88%	76%	99%		
Total	45	39	57	24	24	22	33	33	45	25	18	26	16	21	28	32	11	9	44	29	35	32	24	33	8	20	23	7	3	25	22	36	33	882			
PRODUCERS' ACCURACY	82%	77%	67%	88%	100%	86%	97%	85%	89%	100%	83%	85%	56%	90%	86%	94%	100%	89%	89%	93%	89%	91%	100%	97%	75%	95%	87%	86%	100%	100%	89%	85%					
90% Confidence Interval -	72%	65%	56%	74%	98%	72%	91%	73%	80%	98%	66%	71%	33%	78%	73%	85%	95%	66%	80%	84%	78%	81%	98%	91%	44%	84%	73%	57%	83%	98%	98%	79%	73%			Total Samples = 882	
90% Confidence Interval +	93%	89%	78%	101%	102%	101%	103%	97%	98%	102%	101%	98%	80%	103%	98%	102%	105%	112%	98%	103%	99%	101%	102%	103%	106%	106%	101%	115%	117%	102%	102%	99%	97%			Total Correct = 775	
GLACIER NATIONAL PARK	OVERALL ACCURACY = 87.9% KAPPA INDEX = 87.4% KAPPA INDEX LOWER 90% CONFIDENCE LEVEL = 85.6% KAPPA INDEX UPPER 90% CONFIDENCE LEVEL = 89.3%																												ACCUACY ASSESSMENT								
	*Map classes SAM and SDS each had one error to map class SMR. SMR was not assessed for accuracy and thus, is not shown in this matrix.																																				
	*Map classes FLP and FSP each had one error to map class FPW. FPW was not assessed for accuracy and thus, is not shown in this matrix.																																				

