LAND COVER LEGEND:
CURRENT DISTRIBUTION OF SAGEBRUSH AND ASSOCIATED VEGETATION IN THE COLUMBIA BASIN AND SOUTHWESTERN REGIONS

Ecological system descriptions citation:

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ECOLOGICAL SYSTEMS / LAND COVER DESCRIPTIONS

ECOLOGICAL SYSTEM CLASSES

1 CES300.728—NORTH AMERICAN ALPINE ICE FIELD

Primary Division:
Land Cover Class: Barren
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland
Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Ice Fields / Glaciers; Glaciated; Alpine Slopes
Concept Summary: This widespread ecological system is composed of unvegetated landscapes of annual/perennial ice and snow at the highest elevations, where snowfall accumulation exceeds melting. The primary ecological processes include snow/ice retention, wind desiccation, and permafrost. The snowpack/ice field never melts or, if so, then for only a few weeks. The alpine substrate/ice field ecological system is part of the alpine mosaic consisting of alpine bedrock and scree, tundra dry meadow, wet meadow, fell-fields, and dwarf-shrubland.
Comments: The barren rock and rubble within the glaciers is part of this system, not the alpine rock and scree systems.

DISTRIBUTION

Range: This ecological system is found throughout North America where altitude results in permanent ice and snow fields, from the mountains of Alaska south and east through the cordillera of the Cascades and the Rocky Mountains.
Divisions: 104:C, 105:C, 204:C, 306:C
TNC Ecoregions: 3:C, 7:C, 9:C, 20:C, 69:C, 70:C, 71:P, 76:C, 77:P, 78:C, 79:C
Subnations: AB, AK, BC, CO, ID, MT, OR, WA, WY

CONCEPT

Associations:
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Alliances:

SOURCES

References: Comer et al. 2003, Meidinger and Pojar 1991, Neely et al. 2001
Version: 04 Apr 2005 **Stakeholders:** Canada, Midwest, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

2 CES306.809—ROCKY MOUNTAIN ALPINE BEDROCK AND SCREE

Primary Division: Rocky Mountain (306)
Land Cover Class: Barren
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland
Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Talus (Substrate); Rock Outcrops/Barrens/Glades; Oligotrophic Soil; Very Shallow Soil; Alpine Slopes
Concept Summary: This ecological system is restricted to the highest elevations of the Rocky Mountains, from Alberta and British Columbia south into New Mexico, west into the highest mountain ranges of the Great Basin. It is composed of barren and sparsely vegetated alpine substrates, typically including both bedrock outcrop and scree slopes, with nonvascular- (lichen) dominated communities. Exposure to desiccating winds, rocky and sometimes unstable substrates, and a short growing season limit plant growth. There can be sparse cover of forbs, grasses, lichens and low shrubs.

DISTRIBUTION

Range: Restricted to the highest elevations of the Rocky Mountains, from Alberta and British Columbia south into New Mexico, west into the highest mountain ranges of the Great Basin.
Divisions: 304:C, 306:C
TNC Ecoregions: 7:C, 8:C, 9:C, 11:C, 19:C, 20:C, 21:C, 68:C
Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

Associations:
- *Aquilegia caerulea - Cirsium scopulorum* Scree Sparse Vegetation (CEGL001938, GU)
- *Aquilegia flavescens - Senecio megacephalus* Sparse Vegetation (CEGL005899, G2G3)
- *Athyrium americanum - Cryptogramma acrostichoides* Sparse Vegetation (CEGL005900, G2G3)
- *Cirsium scopulorum - Polemonium viscosum* Herbaceous Vegetation (CEGL001959, GU)
- *Claytonia megarhiza* Herbaceous Vegetation (CEGL001878, GU)

- *Ivesia cryptocaulis* Alpine Sparse Vegetation (CEGL002735, G1)
- *Phacelia hastata - (Penstemon ellipticus*) Sparse Vegetation (CEGL005901, G2G3)
- *Polemonium viscosum* Herbaceous Vegetation (CEGL001928, G3G4)
- *Saxifraga bronchialis* Scree Slope Sparse Vegetation (CEGL005902, G3?)
- *Saxifraga mertensiana* Cliff Crevice Sparse Vegetation (CEGL005903, G2?)
- *Senecio taraxacoides - Oxyria digyna* Herbaceous Vegetation (CEGL001932, GU)
- Sparse Nonvascular Vegetation (on rock and unconsolidated substrates) (CEGL002888, GNR)

Alliances:

- *Aquilegia (caerulea, flavescens)* Sparsely Vegetated Alliance (A.1603)
- *Athyrium americanum* Sparsely Vegetated Alliance (A.1625)
- *Cirsium scopulorum* Herbaceous Alliance (A.1608)
- *Claytonia megarhiza* Herbaceous Alliance (A.1626)
- *Ivesia cryptocaulis* Sparsely Vegetated Alliance (A.2513)
- *Phacelia hastata* Sparsely Vegetated Alliance (A.2634)
- *Polemonium viscosum* Herbaceous Alliance (A.1631)
- *Saxifraga (chrysantha, mertensiana)* Sparsely Vegetated Alliance (A.1632)
- *Saxifraga bronchialis* Sparsely Vegetated Alliance (A.2635)
- *Senecio taraxacoides* Herbaceous Alliance (A.1634)
- Sparse Nonvascular Vegetation Alliance (on rock and unconsolidated substrates) (A.2660)

SOURCES

References: Anderson 1999, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1997, Komarkova 1976, Komarkova 1980, Meidinger and Pojar 1991, Neely et al. 2001, Nelson 1998, Willard 1963

Version: 20 Feb 2003 **Stakeholders:** Canada, Midwest, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

3 CES206.899—MEDITERRANEAN CALIFORNIA ALPINE BEDROCK AND SCREE

Primary Division: Mediterranean California (206)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Ridge/Summit/Upper Slope; Temperate [Temperate Oceanic]; Nonvascular; Alpine Mosaic

Concept Summary: This system occurs in limited alpine environments mostly concentrated in the Sierra Nevada, but also on Mount Shasta and as far south as the Peninsular Ranges and White Mountains. Alpine elevations begin around 3500 m (10,600 feet) in the southern mountain ranges and 2700 m (8200 feet) in the southern Cascades. These are barren and sparsely vegetated alpine substrates, typically including both bedrock outcrops and scree slopes, with nonvascular (lichen)-dominated communities. This also encompasses a limited area of "alpine desert" with unstable sandy substrates and scattered individuals of *Astragalus* spp., *Arabis* spp., *Draba* spp., and *Oxytropis* spp., which mostly fall to the east of the Sierra Nevada crest. Exposure to desiccating winds, rocky and sometimes unstable substrates, and a short growing season limit plant growth.

DISTRIBUTION

Range: Concentrated in the Sierra Nevada, but also on Mount Shasta and as far south as the Peninsular Ranges and White Mountains. Alpine elevations begin around 3500 m (10,600 feet) in the southern mountain ranges and 2700 m (8200 feet) in the southern Cascades.

Divisions: 206:C

TNC Ecoregions: 5:C, 12:C, 16:P

Subnations: CA, MXBC, NV, OR

CONCEPT

Associations:

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Alliances:

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Version: 17 Mar 2003 **Stakeholders:** Latin America, West

Concept Author: P. Comer, T. Keeler-Wolf **LeadResp:** West

4 CES306.811—ROCKY MOUNTAIN ALPINE FELL-FIELD

Primary Division: Rocky Mountain (306)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Herbaceous; Ridge/Summit/Upper Slope; Oligotrophic Soil; Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Very Short Disturbance Interval; W-Patch/High Intensity; Cushion plants; Alpine Slopes
Concept Summary: This ecological system is found discontinuously at alpine elevations throughout the Rocky Mountains, west into the mountainous areas of the Great Basin, and north into the Canadian Rockies. Small areas are represented in the west side of the Okanagan Ecoregion in the eastern Cascades. These are wind-scoured fell-fields that are free of snow in the winter, such as ridgetops and exposed saddles, exposing the plants to severe environmental stress. Soils on these windy unproductive sites are shallow, stony, low in organic matter, and poorly developed; wind deflation often results in a gravelly pavement. Most fell-field plants are cushioned or matted, frequently succulent, flat to the ground in rosettes and often densely haired and thickly cutinized. Plant cover is 15-50%, while exposed rocks make up the rest. Fell-fields are usually within or adjacent to alpine tundra dry meadows. Common species include *Arenaria capillaris, Geum rossii, Kobresia myosuroides, Minuartia obtusiloba, Myosotis asiatica, Paronychia pulvinata, Phlox pulvinata, Sibbaldia procumbens, Silene acaulis, Trifolium dasyphyllum*, and *Trifolium parryi*.
Comments: Alpine fell-fields in the Cascades occur at a very small-scale spatial pattern not mappable (recognizable) at landscape levels. These small-scale fell-fields are conceptually included here.

DISTRIBUTION

Range: This system is found discontinuously at alpine elevations throughout the Rocky Mountains, west into the mountainous areas of the Great Basin. Outlier sites occur in the northeastern Cascades and on Mount Rainier in Washington.
Divisions: 304:C, 306:C
TNC Ecoregions: 7:C, 8:C, 9:C, 11:C, 20:C, 21:C, 68:C
Subnations: AB, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

Associations:
- *Arenaria capillaris / Polytrichum piliferum* Herbaceous Vegetation (CEGL005855, G2G3)
- *Carex albonigra - Myosotis asiatica* Herbaceous Vegetation (CEGL005863, G2G3)
- *Carex paysonis - Sibbaldia procumbens* Herbaceous Vegetation (CEGL005865, G3G4?)
- *Dasiphora fruticosa* ssp. *floribunda / Artemisia michauxiana* Shrub Herbaceous Vegetation [Provisional] (CEGL005833, G3G4)
- *Geum rossii - Minuartia obtusiloba* Herbaceous Vegetation (CEGL001965, G3?)
- *Kobresia myosuroides - Euphrasia disjuncta* Herbaceous Vegetation (CEGL005872, G2?)
- *Minuartia obtusiloba* Herbaceous Vegetation (CEGL001919, G4)
- *Paronychia pulvinata - Silene acaulis* Dwarf-shrubland (CEGL001976, G5)
- *Phlox pulvinata - Trifolium dasyphyllum* Herbaceous Vegetation (CEGL001980, G2Q)
- *Phlox pulvinata* Herbaceous Vegetation [Provisional] (CEGL002740, G4)
- *Potentilla sierrae-blancae* Herbaceous Vegetation (CEGL001982, G1)
- *Rubus idaeus* Scree Shrubland (CEGL001134, GU)
- *Sibbaldia procumbens - Polygonum bistortoides* Herbaceous Vegetation (CEGL001933, G3?)
- *Silene acaulis* Herbaceous Vegetation (CEGL001934, G5?)
- *Trifolium dasyphyllum* Herbaceous Vegetation (CEGL001935, G4)
- *Trifolium parryi* Herbaceous Vegetation (CEGL001936, GU)

Alliances:
- *Arenaria capillaris* Herbaceous Alliance (A.2630)
- *Carex albonigra* Herbaceous Alliance (A.2638)
- *Carex paysonis* Herbaceous Alliance (A.2640)
- *Dasiphora fruticosa* ssp. *floribunda* Shrub Herbaceous Alliance (A.1534)
- *Geum rossii* Herbaceous Alliance (A.1645)
- *Kobresia myosuroides* Herbaceous Alliance (A.1326)
- *Minuartia obtusiloba* Herbaceous Alliance (A.1630)
- *Paronychia pulvinata* Dwarf-shrubland Alliance (A.1085)
- *Phlox pulvinata* Herbaceous Alliance (A.1651)
- *Potentilla sierrae-blancae* Herbaceous Alliance (A.1652)
- *Rubus idaeus* ssp. *strigosus* Shrubland Alliance (A.927)
- *Sibbaldia procumbens* Herbaceous Alliance (A.1635)
- *Silene acaulis* Herbaceous Alliance (A.1636)
- *Trifolium (dasyphyllum, nanum)* Herbaceous Alliance (A.1637)
- *Trifolium parryi* Herbaceous Alliance (A.1638)

SOURCES

References: Bamberg 1961, Bamberg and Major 1968, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1997, Douglas and Bliss 1977, Hamann 1972, Komarkova 1976, Komarkova 1980, Meidinger and Pojar 1991, Neely et al. 2001, Willard 1963
Version: 07 Sep 2005 **Stakeholders:** Canada, West

6 CES306.815—ROCKY MOUNTAIN CLIFF, CANYON AND MASSIVE BEDROCK

Primary Division: Rocky Mountain (306)
Land Cover Class: Barren
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland
Diagnostic Classifiers: Canyon; Cliff (Landform); Ridgetop bedrock outcrop; Talus (Substrate); Rock Outcrops/Barrens/Glades; Oligotrophic Soil; Very Shallow Soil; Landslide
Concept Summary: This ecological system of barren and sparsely vegetated landscapes (generally <10% plant cover) is found from foothill to subalpine elevations on steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock types. It is located throughout the Rocky Mountains and northeastern Cascade Ranges in North America. Also included are unstable scree and talus slopes that typically occur below cliff faces. In general these are the dry sparsely vegetated places on a landscape. The biota on them reflect what is surrounding them, unless it is an extreme parent material. There may be small patches of dense vegetation, but it typically includes scattered trees and/or shrubs. Characteristic trees includes species from the surrounding landscape, such as *Pseudotsuga menziesii, Pinus ponderosa, Pinus flexilis, Populus tremuloides, Abies concolor, Abies lasiocarpa*, or *Pinus edulis* and *Juniperus* spp. at lower elevations. There may be scattered shrubs present, such as species of *Holodiscus, Ribes, Physocarpus, Rosa, Juniperus*, and *Jamesia americana, Mahonia repens, Rhus trilobata*, or *Amelanchier alnifolia*. Soil development is limited, as is herbaceous cover.
Comments: This has a very broad elevation range (<3350 m) for a system; consider dividing into foothills/montane and subalpine. And/or by floristic division. This is in the Okanagan and Rockies as the montane sparse. North Pacific Montane Massive Bedrock, Cliff and Talus (CES204.093) includes everything in the Cascades and west, except the northeastern Cascades, where occurrences are this system (CES306.815). Inter-Mountain Basins Cliff and Canyon (CES304.779) occurs in the dry foothills on the east side of EDC MapZone1.

DISTRIBUTION

Range: This system is located throughout the Rocky Mountain and northeastern Cascade Ranges in North America.
Divisions: 306:C
TNC Ecoregions: 7:C, 8:C, 9:C, 20:C, 21:C, 25:C, 68:C
Subnations: AB, AZ, BC, CO, ID, MT, NM, OR, TX, UT, WA, WY

CONCEPT

Associations:
- *Abies concolor / Holodiscus dumosus* Scree Woodland (CEGL000889, G4)
- *Abies concolor / Jamesia americana* Scree Woodland (CEGL000890, GNR)
- *Abies lasiocarpa / Holodiscus dumosus* Scree Woodland (CEGL000918, G3)
- *Abies lasiocarpa / Salix brachycarpa* Scree Woodland (CEGL000922, GUQ)
- *Abies lasiocarpa / Salix glauca* Scree Woodland (CEGL000923, GUQ)
- *Abies lasiocarpa / Saxifraga bronchialis* Scree Woodland (CEGL000924, G4)
- *Abies lasiocarpa* Scree Woodland (CEGL000925, G5?)
- *Aletes anisatus - Scutellaria brittonii* Scree Herbaceous Vegetation (CEGL001948, GU)
- *Athyrium americanum* Sparse Vegetation (CEGL001849, GU)
- *Carex nardina* Scree Herbaceous Vegetation (CEGL001812, GNR)
- Granite - Metamorphic Black Hills Rock Outcrop Sparse Vegetation (CEGL002295, G4)
- *Heuchera bracteata - Heuchera parvifolia* var. *nivalis* Herbaceous Vegetation (CEGL001971, GU)
- Igneous - Metamorphic Black Hills Butte Sparse Vegetation (CEGL005283, GNR)
- *Jamesia americana* Rock Outcrop Shrubland (CEGL002783, GNR)
- *Picea engelmannii / Saxifraga bronchialis* Scree Sparse Vegetation (CEGL000893, G4)
- *Pinus contorta* Scree Woodland (CEGL000766, G5?)
- *Pinus flexilis* / Scree Woodland (CEGL000815, G3Q)
- *Pinus ponderosa / Ribes inerme* Scree Woodland (CEGL000876, G4)
- *Pinus ponderosa* Limestone Cliff Sparse Vegetation (CEGL002055, G4?)
- *Populus tremuloides / Physocarpus malvaceus - Amelanchier alnifolia* Scree Woodland (CEGL000945, G4Q)
- *Pseudotsuga menziesii / Holodiscus dumosus* Scree Woodland (CEGL000902, G3G4)
- *Pseudotsuga menziesii* Scree Woodland (CEGL000911, G5)
- *Ribes cereum / Leymus ambiguus* Shrubland (CEGL001124, G2)
- *Rubus idaeus* Scree Shrubland (CEGL001134, GU)
- *Saxifraga rivularis* Herbaceous Vegetation (CEGL001930, GU)
- Scree - Talus Black Hills Sparse Vegetation (CEGL002307, GNR)
- Sparse Nonvascular Vegetation (on rock and unconsolidated substrates) (CEGL002888, GNR)

Alliances:
- *Abies concolor* Woodland Alliance (A.553)
- *Abies lasiocarpa* Woodland Alliance (A.559)

- *Aletes anisatus* Herbaceous Alliance (A.1639)
- *Athyrium americanum* Sparsely Vegetated Alliance (A.1625)
- *Carex nardina* Herbaceous Alliance (A.1299)
- *Heuchera bracteata* Herbaceous Alliance (A.1646)
- *Jamesia americana* Shrubland Alliance (A.2566)
- *Picea engelmannii* Sparsely Vegetated Alliance (A.556)
- *Pinus contorta* Woodland Alliance (A.512)
- *Pinus flexilis* Woodland Alliance (A.540)
- *Pinus ponderosa* Woodland Alliance (A.530)
- *Populus tremuloides* Woodland Alliance (A.610)
- *Pseudotsuga menziesii* Woodland Alliance (A.552)
- *Ribes cereum* Shrubland Alliance (A.923)
- *Rubus idaeus* ssp. *strigosus* Shrubland Alliance (A.927)
- *Saxifraga rivularis* Herbaceous Alliance (A.1633)
- Lowland Talus Sparsely Vegetated Alliance (A.1847)
- Open Cliff Sparsely Vegetated Alliance (A.1836)
- Rock Outcrop Sparsely Vegetated Alliance (A.1838)
- Sparse Nonvascular Vegetation Alliance (on rock and unconsolidated substrates) (A.2660)

SOURCES

References: Andrews and Righter 1992, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Ecosystems Working Group 1998, Hess and Wasser 1982, Larson et al. 2000, Neely et al. 2001, Peet 1981
Version: 04 Apr 2005 **Stakeholders:** Canada, Midwest, Southeast, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

7 CES206.901—SIERRA NEVADA CLIFF AND CANYON

Primary Division: Mediterranean California (206)
Land Cover Class: Barren
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland
Diagnostic Classifiers: Canyon; Cliff (Substrate); Talus (Substrate); Rock Outcrops/Barrens/Glades; Mediterranean [Mediterranean Xeric-Oceanic]
Concept Summary: Found from foothill to subalpine elevations throughout the Sierra Nevada and nearby mountain ranges, these are barren and sparsely vegetated areas (<10% plant cover) of steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock. This system also includes unstable scree and talus slopes typically occurring below cliff faces. Scattered vegetation may include *Abies magnifica, Pseudotsuga menziesii, Pinus contorta var. murrayana, Pinus ponderosa, Pinus jeffreyi, Populus tremuloides,* or *Pinus monophylla, Juniperus osteosperma,* and *Cercocarpus ledifolius* at lower elevations. There may be shrubs including species of *Arctostaphylos* or *Ceanothus.* Soil development is limited as is herbaceous cover.

DISTRIBUTION

Range: Found from foothill to subalpine elevations throughout the Sierra Nevada and nearby mountain ranges.
Divisions: 206:C
TNC Ecoregions: 4:C, 5:C, 12:C
Subnations: CA, NV, OR

CONCEPT

Associations:
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Alliances:

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995
Version: 17 Mar 2003 **Stakeholders:** West
Concept Author: P. Comer, T. Keeler-Wolf **LeadResp:** West

8 CES303.665—WESTERN GREAT PLAINS CLIFF AND OUTCROP

Primary Division: Western Great Plains (303)
Land Cover Class: Barren
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Concept Summary: This system includes cliffs and outcrops throughout the Western Great Plains Division. Substrate can range from sandstone and limestone, which can often form bands in the examples of this system. Vegetation is restricted to shelves, cracks and crevices in the rock. However, this system differs from Western Great Plains Badlands (CES303.663) in that often the soil is slightly developed and less erodible, and some grass and shrub species can occur at greater than 10%. Common species in this system include short shrubs such as *Rhus trilobata* and *Artemisia longifolia* and mixedgrass species such as *Bouteloua curtipendula* and *Bouteloua gracilis* and *Calamovilfa longifolia*. Drought and wind erosion are the most common natural dynamics affecting this system.

DISTRIBUTION

Range: This system ranges throughout the Western Great Plains Division from northern Texas to southern Canada.
Divisions: 303:C
TNC Ecoregions: 26:C, 27:C, 28:C, 29:C, 33:C, 37:P, 66:P, 67:P
Subnations: CO, KS, MB, MT, ND, NE, NM, OK, TX

CONCEPT

Associations:
- *Adiantum capillus-veneris - Thelypteris ovata* var. *lindheimeri* Herbaceous Vegetation (CEGL004514, G2)
- *Arenaria hookeri* Barrens Herbaceous Vegetation (CEGL001951, GU)
- *Artemisia longifolia - Calamovilfa longifolia* Sparse Vegetation (CEGL001521, G3G4)
- *Lesquerella (gordonii, ovalifolia) - Schizachyrium scoparium* Herbaceous Vegetation (CEGL004917, G2G3)
- Limestone Butte Sparse Vegetation (CEGL002296, GNR)
- Sandstone Butte Sparse Vegetation (CEGL002297, GNR)
- Sandstone Dry Cliff Sparse Vegetation (CEGL002045, G4G5)
- Sandstone Great Plains Dry Cliff Sparse Vegetation (CEGL005257, G4G5)
- Sandstone Great Plains Xeric Butte - Bluff Sparse Vegetation (CEGL002290, GNR)
- *Sedum nuttallianum - Selaginella peruviana* Granitic Outcrop Sparse Vegetation (CEGL004396, G2)
- Shale Barren Slopes Sparse Vegetation (CEGL002294, GNR)
- Siltstone - Sandstone Rock Outcrop Sparse Vegetation (CEGL002047, G4?)

Alliances:
- *Adiantum capillus-veneris* Saturated Herbaceous Alliance (A.1683)
- *Arenaria hookeri* Barrens Herbaceous Alliance (A.1642)
- *Artemisia longifolia* Sparsely Vegetated Alliance (A.1874)
- *Lesquerella (gordonii, ovalifolia)* Herbaceous Alliance (A.1619)
- *Sedum nuttallianum* Sparsely Vegetated Alliance (A.1846)
- Open Cliff Sparsely Vegetated Alliance (A.1836)
- Rock Outcrop Sparsely Vegetated Alliance (A.1838)

Environment: This system is includes cliff and outcrops throughout the Western Great Plains Division with substrate ranging from sandstone to limestone. Areas of shelves, cracks, and crevices accumulated materials and allow soils to develop enough to support more vegetation.
Vegetation: Short shrubs and mixedgrass species dominate the vegetation of this system. Common species include *Rhus trilobata, Artemisia longifolia, Bouteloua curtipendula* and *Bouteloua gracilis*, and *Calamovilfa longifolia*, although species can vary somewhat with substrate and exposure.
Dynamics: Drought and wind erosion are the major influences affecting this system.

SOURCES

References: Comer et al. 2003
Version: 05 Mar 2003 **Stakeholders:** Canada, Midwest, Southeast, West
Concept Author: S. Menard and K. Kindscher **LeadResp:** Midwest

9 CES304.779—INTER-MOUNTAIN BASINS CLIFF AND CANYON

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Barren
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland
Diagnostic Classifiers: Cliff (Landform); Rock Outcrops/Barrens/Glades
Concept Summary: This ecological system is found from foothill to subalpine elevations and includes barren and sparsely vegetated landscapes (generally <10% plant cover) of steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock types. Also included is vegetation of unstable scree and talus slopes that typically occurs below cliff faces. Widely scattered trees and shrubs may include *Abies concolor, Pinus edulis, Pinus flexilis, Pinus monophylla, Juniperus* spp., *Artemisia tridentata, Purshia tridentata, Cercocarpus ledifolius, Ephedra* spp., *Holodiscus discolor*, and other species often common in adjacent plant communities.

DISTRIBUTION

Divisions: 304:C
TNC Ecoregions: 4:?, 6:C, 11:C, 18:C
Subnations: CA, ID, NV, OR, UT, WA, WY

CONCEPT

Associations:
- *Cercocarpus intricatus* Slickrock Sparse Vegetation (CEGL002977, GNR)
- *Cercocarpus montanus* Rock Pavement Sparse Vegetation (CEGL002978, GNR)
- *Chrysothamnus viscidiflorus* Talus Shrubland (CEGL002347, GNR)
- *Crataegus rivularis* Shrubland (CEGL002889, G2Q)
- *Glossopetalon spinescens* var. *aridum / Pseudoroegneria spicata* Shrubland (CEGL001100, G4)
- *Juniperus osteosperma / Cercocarpus intricatus* Woodland (CEGL000733, GNR)
- *Leymus salinus* Shale Sparse Vegetation (CEGL002745, GNR)
- *Pinus monophylla - Juniperus osteosperma* / Sparse Understory Woodland (CEGL000829, G5)
- *Pinus ponderosa* Slickrock Sparse Vegetation (CEGL002972, GNR)

Alliances:
- *Cercocarpus intricatus* Sparsely Vegetated Alliance (A.2543)
- *Cercocarpus montanus* Sparsely Vegetated Alliance (A.2544)
- *Chrysothamnus viscidiflorus* Shrubland Alliance (A.2651)
- *Crataegus rivularis* Temporarily Flooded Shrubland Alliance (A.2597)
- *Glossopetalon spinescens* Shrubland Alliance (A.1032)
- *Juniperus osteosperma* Woodland Alliance (A.536)
- *Leymus salinus* ssp. *salmonis* Sparsely Vegetated Alliance (A.1258)
- *Pinus monophylla - (Juniperus osteosperma)* Woodland Alliance (A.543)
- Wooded Bedrock Sparsely Vegetated Alliance (A.2546)

SOURCES

References: Comer et al. 2003, Knight 1994
Version: 20 Feb 2003 **Stakeholders:** Midwest, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

10 CES304.765—COLORADO PLATEAU MIXED BEDROCK CANYON AND TABLELAND

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Barren
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland
Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Shrubland (Shrub-dominated); Ridge/Summit/Upper Slope; Sedimentary Rock; Temperate [Temperate Xeric]; Alkaline Soil; Aridic
Concept Summary: The distribution of this ecological system is centered on the Colorado Plateau where it is comprised of barren and sparsely vegetated landscapes (generally <10% plant cover) of steep cliff faces, narrow canyons, and open tablelands of predominantly sedimentary rocks, such as sandstone, shale, and limestone. Some eroding shale layers similar to Inter-Mountain Basins Shale Badland (CES304.789) may be interbedded between the harder rocks. The vegetation is characterized by very open tree canopy or scattered trees and shrubs with a sparse herbaceous layer. Common species includes *Pinus edulis, Pinus ponderosa, Juniperus* spp., *Cercocarpus intricatus*, and other short-shrub and herbaceous species, utilizing moisture from cracks and pockets where soil accumulates.
Comments: Geographically restricted and distinct from the related, but broader Inter-Mountain Basins Cliff and Canyon (CES304.779). Shale areas are not extensive as in shale badlands.

DISTRIBUTION

Range: Colorado Plateau.
Divisions: 304:C
TNC Ecoregions: 18:C, 19:C, 20:?
Subnations: AZ, CO, NM, UT

CONCEPT

Associations:
- *Atriplex canescens - (Ephedra viridis) / (Muhlenbergia porteri)* Sandstone Sparse Vegetation [Provisional] (CEGL002927, GNR)
- *Cercocarpus intricatus* Slickrock Sparse Vegetation (CEGL002977, GNR)
- *Cercocarpus montanus* Rock Pavement Sparse Vegetation (CEGL002978, GNR)
- *Ephedra torreyana - (Atriplex canescens, Atriplex confertifolia)* Sparse Vegetation (CEGL005801, GNR)
- *Fendlera rupicola* Talus Shrubland (CEGL002765, GNR)
- *Juniperus osteosperma / Artemisia nova* / Rock Woodland (CEGL000729, G5)

- *Juniperus osteosperma / Cercocarpus intricatus* Woodland (CEGL000733, GNR)
- *Pinus edulis - Juniperus osteosperma / Cercocarpus intricatus* Woodland (CEGL000779, G3)
- *Pinus ponderosa* Slickrock Sparse Vegetation (CEGL002972, GNR)

Alliances:

- *Cercocarpus intricatus* Sparsely Vegetated Alliance (A.2543)
- *Cercocarpus montanus* Sparsely Vegetated Alliance (A.2544)
- *Ephedra torreyana* Sparsely Vegetated Alliance (A.2571)
- *Fendlera rupicola* Shrubland Alliance (A.2656)
- *Juniperus osteosperma* Woodland Alliance (A.536)
- *Pinus edulis - (Juniperus* spp.) Woodland Alliance (A.516)
- Sandstone Sparsely Vegetated Alliance (A.2568)
- Wooded Bedrock Sparsely Vegetated Alliance (A.2546)

Environment: This system includes limestone escarpments and plateaus occurring in a relatively narrow band of unvegetated or sparsely vegetated badlands formed by the red beds of the Claron (Wasatch) Formation along the eastern edge of the Pausaugunt Plateau (Bryce Canyon) and the western edge of the Markagunt Plateau (Cedar Breaks National Monument) (Graybosch and Buchanan 1983). It includes areas of which often 90% of the exposed surface consists of barren rock. It forms, or includes, areas of fixed bedrock forming the vertical or near-vertical parts on the plateau faces. The rocks forming such areas are predominantly limestone-capped plateaus. These areas are highly erodible and form the basic scenic structure of Bryce Canyon and Cedar Breaks national parks. The area is generally too steep to allow any significant soil development. Scattered plants obtain a precarious foothold in the crevices of the rocks. Knolls may form at the base of the cliffs.

This ecological system also includes sandstone and shale escarpments, which form, or include, areas of fixed bedrock forming the vertical or near-vertical parts of canyon walls and plateau faces. The scenic cliffs of the East Tavaputs area, e.g., the Book Cliffs, are excellent examples of this. The rocks forming such areas are predominantly sandstone and shale with some limestone and marlstone. These areas are unstable and rocks are frequently rolling down onto the talus slopes below (often forming Inter-Mountain Basins Shale Badland (CES304.789)). The area is generally too steep to allow any significant soil development. Scattered plants obtain a precarious foothold in the crevices of the rocks. Knolls may form at the base of the cliffs. The larger drainages (e.g., East Fork Parachute Creek) plunge several hundred feet at this escarpment, which creates scenic and lush hanging gardens. Many of these escarpments are over 1000 feet in height and provide excellent habitat for cliff-nesting birds such as peregrine falcons and golden eagles.

The Claron limestone, a Tertiary deposit, is divisible into Red Eocene beds and White Oligocene beds, which differ somewhat in presence or absence of pigmentation in the form of iron and manganese oxides, and in amounts of sand and conglomerates in the limestone (Graybosch and Buchanan 1983). The Claron Formation is characterized by a rapid rate of erosion, largely a function of creep resulting from winter freeze-thaw activity and wash away by summer thunderstorm runoff (Graybosch and Buchanan 1983). Freeze-thaw cycles are most pronounced on south-facing slopes. Soil development is limited. Infiltration rates are low and runoff high.

Vegetation: For the most part, this system is sparsely vegetated. Small patches of scattered trees and shrubs may occur. These small vegetated patches are usually dominated by conifer trees, and may include *Abies concolor, Juniperus scopulorum, Picea pungens, Pinus flexilis, Pinus longaeva, Pinus ponderosa*, and *Pseudotsuga menziesii*. If a shrub layer exists it may include *Acer glabrum, Amelanchier utahensis, Arctostaphylos patula, Ceanothus martinii, Cercocarpus montanus, Cercocarpus intricatus, Juniperus communis, Mahonia repens, Purshia tridentata, Ribes cereum*, and *Gutierrezia sarothrae*. Grasses and forbs, if present, may include *Astragalus kentrophyta, Cirsium arizonicum, Clematis columbiana, Leymus salinus, Eriogonum panguicense, Achnatherum hymenoides*, and *Linum kingii*.

This ecological system is noted for its high rate of endemic species of forbs, especially in Bryce Canyon. Nine of the eleven endemic species occur in the *Pinus longaeva* community, three are found in the *Pinus ponderosa - Arctostaphylos patula* plant association, and two occur in the mixed conifer type. Species that occur only in the *Pinus longaeva* type have the narrowest geographic distributions, although *Eriogonum panguicense var. panguicense* is an exception (Graybosch and Buchanan 1983). Within Bryce Canyon, most of these endemics are restricted to the Claron Formation (Graybosch and Buchanan 1983). The majority of endemic species found in southern Utah are restricted to substrates derived from a specific geologic formation (Welsh 1979). Welsh notes that most of these taxa are found in areas of exposed parent material. The distribution of endemic species in Utah is not a random one; fine-textured substrates support more species than coarser ones, and desert and foothill vegetation is richer in endemic species than montane communities (Welsh 1978, 1979).

Dynamics: This ecological system has a naturally high rate of erosion. Fires are infrequent and not an important ecological process.

SPATIAL CHARACTERISTICS

Adjacent Ecological System Comments: Some eroding shale layers similar to Inter-Mountain Basins Shale Badland (CES304.789) may be interbedded between the harder rocks.

SOURCES

References: Comer et al. 2003, Graybosch and Buchanan 1983, LaMarche and Mooney 1972, Shute and West 1978, Thorne Ecological Institute 1973a, Welsh 1979, Welsh and Chatterly 1985

Version: 20 Feb 2003 **Stakeholders:** West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

11 CES304.789—INTER-MOUNTAIN BASINS SHALE BADLAND

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Barren
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland
Diagnostic Classifiers: Lowland [Lowland]; Badlands; Badland; Alkaline Soil; Shale and Mudstone; Silt Soil Texture; Clay Soil Texture
Concept Summary: This widespread ecological system of the intermountain western U.S. is composed of barren and sparsely vegetated substrates (<10% plant cover) typically derived from marine shales but also includes substrates derived from siltstones and mudstones (clay). Landforms are typically rounded hills and plains that form a rolling topography. The harsh soil properties and high rate of erosion and deposition are driving environmental variables supporting sparse dwarf-shrubs, e.g., *Atriplex corrugata, Atriplex gardneri, Artemisia pedatifida*, and herbaceous vegetation.

DISTRIBUTION

Range: This system is found in the intermountain western U.S. It is confirmed by Oregon and Washington review to not occur in either of those states.
Divisions: 304:C, 306:C
TNC Ecoregions: 6:P, 9:C, 10:C, 11:C, 12:?, 18:C, 19:C, 20:C, 21:C
Subnations: AZ, CA, CO, ID, MT, NM, NV, UT, WY

CONCEPT

Associations:
- *Achnatherum hymenoides* Shale Barren Herbaceous Vegetation (CEGL001651, G2)
- *Artemisia bigelovii / Achnatherum hymenoides* Shrubland (CEGL000990, G3Q)
- *Artemisia pedatifida - Atriplex gardneri* Shrubland (CEGL001525, G3?)
- *Artemisia pedatifida / Elymus elymoides* Shrubland (CEGL001450, G3?)
- *Artemisia pedatifida / Festuca idahoensis* Shrubland (CEGL001526, G2?)
- *Artemisia pedatifida / Pascopyrum smithii* Shrubland (CEGL001451, G3?)
- *Artemisia pedatifida / Pseudoroegneria spicata* Shrubland (CEGL001527, G3)
- *Artemisia pygmaea / Elymus elymoides - Achnatherum hymenoides* Shrubland (CEGL001436, G3G4)
- *Atriplex corrugata* Dwarf-shrubland (CEGL001437, G5)
- *Atriplex cuneata - Frankenia jamesii / Sporobolus airoides* Shrubland (CEGL001316, G1?)
- *Atriplex gardneri - Picrothamnus desertorum* Dwarf-shrubland (CEGL001439, G2G3)
- *Atriplex gardneri / Achnatherum hymenoides* Dwarf-shrubland (CEGL001444, G3)
- *Atriplex gardneri / Artemisia tridentata* Dwarf-shrubland (CEGL001440, G3)
- *Atriplex gardneri / Leymus salinus* Dwarf-shrubland (CEGL001442, G2?)
- *Atriplex gardneri / Monolepis nuttalliana* Dwarf-shrubland (CEGL001443, G3?)
- *Atriplex gardneri / Pascopyrum smithii* Dwarf-shrubland (CEGL001445, G3)
- *Atriplex gardneri / Pleuraphis jamesii* Dwarf-shrubland (CEGL001441, G3G5)
- *Atriplex gardneri / Xylorhiza venusta* Dwarf-shrubland (CEGL001446, G3G5)
- *Atriplex gardneri* Dwarf-shrubland (CEGL001438, G3G5)
- *Atriplex obovata* Badland Sparse Vegetation (CEGL002928, GNR)
- *Atriplex obovata* Dwarf-shrubland [Placeholder] (CEGL001789, GNR)
- *Ephedra nevadensis* / Lichens Sparse Vegetation [Provisional] (CEGL002976, GNR)
- *Eriogonum corymbosum / Leymus salinus* Dwarf-shrubland (CEGL001343, G2G4)
- *Eriogonum corymbosum* Badlands Sparse Vegetation (CEGL002979, GNR)
- *Leymus salinus* Shale Sparse Vegetation (CEGL002745, GNR)
- *Pseudoroegneria spicata - Eriogonum brevicaule* Sparse Vegetation (CEGL001667, G3?)

Alliances:
- *Achnatherum hymenoides* Herbaceous Alliance (A.1262)
- *Artemisia bigelovii* Shrubland Alliance (A.1103)
- *Artemisia pedatifida* Shrubland Alliance (A.1127)
- *Artemisia pygmaea* Shrubland Alliance (A.1106)
- *Atriplex corrugata* Dwarf-shrubland Alliance (A.1109)
- *Atriplex cuneata* Shrubland Alliance (A.871)
- *Atriplex gardneri* Dwarf-shrubland Alliance (A.1110)
- *Atriplex obovata* Dwarf-shrubland Alliance (A.1108)
- *Eriogonum corymbosum* Dwarf-shrubland Alliance (A.1126)
- *Leymus salinus* ssp. *salmonis* Sparsely Vegetated Alliance (A.1258)
- *Pseudoroegneria spicata* Sparsely Vegetated Alliance (A.1876)
- Painted Desert Sparsely Vegetated Alliance (A.2545)

SOURCES

References: Comer et al. 2003, DeVelice and Lesica 1993, Knight 1994, Knight et al. 1987
Version: 20 Feb 2003 **Stakeholders:** West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

12 CES304.775—INTER-MOUNTAIN BASINS ACTIVE AND STABILIZED DUNE

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Barren
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland
Diagnostic Classifiers: Dune (Landform); Dune field; Dune (Substrate); Temperate [Temperate Continental]; Sand Soil Texture; Aridic; W-Landscape/High Intensity
Concept Summary: This ecological system occurs in Intermountain West basins and is composed of unvegetated to moderately vegetated (<10-30% plant cover) active and stabilized dunes and sandsheets. Species occupying these environments are often adapted to shifting, coarse-textured substrates (usually quartz sand) and form patchy or open grasslands, shrublands or steppe, and occasionally woodlands. Vegetation varies and may be composed of *Achnatherum hymenoides, Artemisia filifolia, Artemisia tridentata ssp. tridentata, Atriplex canescens, Ephedra* spp., *Coleogyne ramosissima, Ericameria nauseosa, Leymus flavescens, Psoralidium lanceolatum, Purshia tridentata, Redfieldia flexuosa, Sporobolus airoides, Sarcobatus vermiculatus, Tetradymia tetrameres,* or *Tiquilia* spp.

DISTRIBUTION

Range: This system occurs in intermountain basins of the western U.S.
Divisions: 304:C
TNC Ecoregions: 6:C, 10:C, 11:C, 19:C
Subnations: AZ, CO, ID, NM, NV, OR, UT, WA, WY

CONCEPT

Associations:
- *Achnatherum hymenoides - Psoralidium lanceolatum* Herbaceous Vegetation (CEGL001650, G3Q)
- *Achnatherum hymenoides - Sporobolus contractus* Herbaceous Vegetation (CEGL001652, G2G4)
- *Artemisia filifolia - Ephedra (torreyana, viridis)* Shrubland (CEGL002786, GNR)
- *Elymus lanceolatus - Phacelia hastata* Herbaceous Vegetation (CEGL001745, G2)
- *Ephedra cutleri* Shrubland [Provisional] (CEGL005804, GNR)
- *Ephedra torreyana - Achnatherum hymenoides* Hummock Shrubland (CEGL005802, GNR)
- *Ericameria nauseosa / Leymus flavescens / Psoralidium lanceolatum* Shrubland (CEGL001329, G1?)
- *Ericameria nauseosa* Sand Deposit Sparse Shrubland (CEGL002980, GNR)
- *Leymus flavescens* Herbaceous Vegetation (CEGL001563, G2)
- *Pinus ponderosa / Achnatherum hymenoides* Sparse Vegetation (CEGL001490, G1)
- *Populus angustifolia* Sand Dune Forest (CEGL002643, G1)
- *Psorothamnus polydenius* var. *polydenius / Achnatherum hymenoides* Shrubland (CEGL001353, G3G4)
- *Purshia tridentata - Artemisia tridentata* ssp. *tridentata* Shrubland (CEGL001054, G1)
- *Purshia tridentata - Ericameria nauseosa* Shrubland (CEGL001056, G1)
- *Purshia tridentata / Achnatherum hymenoides* Shrubland (CEGL001058, G1)
- *Purshia tridentata / Prunus virginiana* Shrubland (CEGL001060, G1?)
- Redbeds (Siltstone, Sandstone, Gypsum) Sparse Vegetation (CEGL005261, GNR)
- *Redfieldia flexuosa - (Psoralidium lanceolatum)* Herbaceous Vegetation (CEGL002917, G1?)
- *Sarcobatus vermiculatus* Dune Shrubland (CEGL001364, G5?)
- *Tetradymia tetrameres* Dune Sparse Vegetation (CEGL002759, G3Q)

Alliances:
- *Achnatherum hymenoides* Herbaceous Alliance (A.1262)
- *Artemisia filifolia* Shrubland Alliance (A.816)
- *Elymus lanceolatus* Herbaceous Alliance (A.1242)
- *Ephedra cutleri* Shrubland Alliance [Provisional] (A.2644)
- *Ephedra torreyana* Shrubland Alliance (A.2572)
- *Ericameria nauseosa* Shrubland Alliance (A.835)
- *Leymus flavescens* Herbaceous Alliance (A.1237)
- *Pinus ponderosa* Sparsely Vegetated Alliance (A.1859)
- *Populus angustifolia* Temporarily Flooded Forest Alliance (A.310)
- *Psorothamnus polydenius* Shrubland Alliance (A.1039)
- *Purshia tridentata* Shrubland Alliance (A.825)
- *Redfieldia flexuosa* Herbaceous Alliance (A.2505)
- *Sarcobatus vermiculatus* Shrubland Alliance (A.1041)

- *Tetradymia tetrameres* Sparsely Vegetated Alliance (A.2525)
- Rock Outcrop Sparsely Vegetated Alliance (A.1838)

SOURCES

References: Anderson 1999, Bowers 1982, Comer et al. 2003, Fryberger et al. 1990, Knight 1994, Pineada et al. 1999
Version: 21 Apr 2005 **Stakeholders:** West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

13 CES304.791—INTER-MOUNTAIN BASINS VOLCANIC ROCK AND CINDER LAND

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Barren
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland
Diagnostic Classifiers: Cinder cone; Lava flow (undifferentiated); Lava; Cinder; Basalt; Temperate [Temperate Continental]
Concept Summary: This ecological system occurs in the intermountain western U.S. and is limited to barren and sparsely vegetated volcanic substrates (generally <10% plant cover) such as basalt lava (malpais), basalt dikes with associated colluvium, basalt cliff faces and uplifted "backbones," tuff, cinder cones or cinder fields. It may occur as large-patch, small-patch and linear (dikes) spatial patterns. Vegetation is variable and includes a variety of species depending on local environmental conditions, e.g., elevation, age and type of substrate. At montane and foothill elevations scattered *Pinus ponderosa, Pinus flexilis*, or *Juniperus* spp. trees may be present. Shrubs such as *Ephedra* spp., *Atriplex canescens, Eriogonum corymbosum, Eriogonum ovalifolium*, and *Fallugia paradoxa* are often present on some lava flows and cinder fields. Species typical of sand dunes such as *Andropogon hallii* and *Artemisia filifolia* may be present on cinder substrates.

DISTRIBUTION

Range: Occurs in the Intermountain western U.S. and is limited to barren and sparsely vegetated volcanic substrates.
Divisions: 304:C
TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C
Subnations: AZ, ID, NM, NV, OR, UT

CONCEPT

Associations:
- *Andropogon hallii* Colorado Plateau Herbaceous Vegetation (CEGL002785, GNR)
- *Artemisia filifolia - Ephedra (torreyana, viridis)* Shrubland (CEGL002786, GNR)
- *Artemisia tridentata* ssp. *vaseyana / Poa secunda* Shrubland (CEGL001029, G3)
- *Ephedra nevadensis* Basalt Shrubland [Provisional] (CEGL002936, GNR)
- *Eriogonum corymbosum* Cinder Sparse Vegetation (CEGL005803, GNR)
- *Eriogonum fasciculatum* Rock Outcrop Shrubland (CEGL001260, G5?)
- *Eriogonum ovalifolium* var. *depressum* Dwarf-shrubland (CEGL001401, G1)
- *Fallugia paradoxa - (Atriplex canescens, Ephedra torreyana)* Cinder Shrubland (CEGL005806, GNR)
- *Juniperus monosperma* Cinder Wooded Herbaceous Vegetation (CEGL005807, GNR)
- *Pinus flexilis / Purshia tridentata* Woodland (CEGL000814, G1?)
- *Pinus ponderosa - (Populus tremuloides) / Fallugia paradoxa - (Holodiscus dumosus)* Lava Bed Sparse Vegetation (CEGL002929, GNR)
- *Pinus ponderosa / Andropogon hallii* Woodland (CEGL005808, GNR)
- *Pinus ponderosa* / Cinder Woodland (CEGL002998, GNR)
- *Purshia tridentata / Pseudoroegneria spicata - Leymus cinereus* Shrub Herbaceous Vegetation (CEGL001497, G1?)
- *Tiquilia latior / Sporobolus airoides* Dwarf-shrubland [Provisional] (CEGL005809, GNR)

Alliances:
- *Andropogon hallii* Herbaceous Alliance (A.1193)
- *Artemisia filifolia* Shrubland Alliance (A.816)
- *Artemisia tridentata* ssp. *vaseyana* Shrubland Alliance (A.831)
- *Ephedra nevadensis* Shrubland Alliance (A.857)
- *Eriogonum corymbosum* Sparsely Vegetated Alliance (A.2573)
- *Eriogonum fasciculatum* Shrubland Alliance (A.868)
- *Eriogonum ovalifolium* var. *depressum* Dwarf-shrubland Alliance (A.1082)
- *Fallugia paradoxa* Shrubland Alliance (A.2575)
- *Juniperus monosperma* Wooded Herbaceous Alliance (A.2576)
- *Pinus flexilis* Woodland Alliance (A.540)
- *Pinus ponderosa* Woodland Alliance (A.530)
- *Purshia tridentata* Shrub Tall Herbaceous Alliance (A.1517)
- *Tiquilia hispidissima* Dwarf-shrubland Alliance (A.1101)
- Aa Lava Bed Sparsely Vegetated Alliance (A.2569)

Dynamics: This ecological system is relatively young (geologically speaking). Lichens are the primary erosion process in this system and therefore soil buildup is a slow process. Lichens are susceptible to changes in air quality (Brodo et. al. 2001) and are considered a good indication of the health of air quality.

SOURCES

References: Barbour and Billings 2000, Comer et al. 2003, Day and Wright 1985, Hansen et al. 2004c, Tisdale et al. 1965
Version: 20 Feb 2003 **Stakeholders:** West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

14 CES304.781—INTER-MOUNTAIN BASINS WASH

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Barren
Spatial Scale & Pattern: Linear
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland
Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Wash; Toeslope/Valley Bottom; Riverine / Alluvial; Alkaline Soil; Xeromorphic Shrub; Sarcobatus vermiculatus
Concept Summary: This barren and sparsely vegetated (generally <10% plant cover) ecological system is restricted to intermittently flooded streambeds and banks that are often lined with shrubs such as *Sarcobatus vermiculatus, Ericameria nauseosa, Fallugia paradoxa*, and/or *Artemisia cana ssp. cana* (in more northern and mesic stands). *Grayia spinosa* may dominate in the Great Basin. Shrubs form a continuous or intermittent linear canopy in and along drainages but do not extend out into flats. Typically it includes patches of saltgrass meadow where water remains for the longest periods. Soils are generally less alkaline than those found in the playa system. Desert scrub species (e.g., *Acacia greggii, Prosopis* spp.), that are common in the Mojave, Sonoran and Chihuahuan desert washes, are not present. This type can occur in limited portions of the southwestern Great Plains.
Comments: Compare with Inter-Mountain Basins Greasewood Flat (CES304.780); should it include nonsparse shrublands? Invasive, exotic shrubs shrub as *Tamarix* spp. or *Chamaebatiaria millefolium* may be present to dominant in these washes where disturbed.

DISTRIBUTION

Range: This system occurs throughout the Intermountain western U.S. extending east into the western Great Plains.
Divisions: 303:C, 304:C, 306:C
TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 19:C, 20:C, 26:C
Subnations: AZ, CA, CO, ID, MT, NV, OR, UT, WA, WY

CONCEPT

Associations:
- *Distichlis spicata - (Scirpus nevadensis)* Herbaceous Vegetation (CEGL001773, G4)
- *Distichlis spicata - Lepidium perfoliatum* Herbaceous Vegetation (CEGL001772, GNA)
- *Distichlis spicata* Herbaceous Vegetation (CEGL001770, G5)
- *Distichlis spicata* Mixed Herb Herbaceous Vegetation (CEGL001771, G3G5)
- *Ericameria nauseosa / Bromus tectorum* Semi-natural Shrubland (CEGL002937, GNR)
- *Grayia spinosa / Poa secunda* Shrubland (CEGL001351, G1)
- *Hordeum brachyantherum* Herbaceous Vegetation (CEGL003430, G2)
- *Sarcobatus vermiculatus - Atriplex parryi / Distichlis spicata* Shrubland (CEGL002764, GNR)
- *Sarcobatus vermiculatus - Psorothamnus polydenius* Shrubland (CEGL002763, GNR)
- *Sarcobatus vermiculatus / Achnatherum hymenoides* Shrubland (CEGL001373, G4)
- *Sarcobatus vermiculatus / Atriplex confertifolia - (Picrothamnus desertorum, Suaeda moquinii)* Shrubland (CEGL001371, G5?)
- *Sarcobatus vermiculatus / Atriplex gardneri* Shrubland (CEGL001360, G4?)
- *Sarcobatus vermiculatus / Distichlis spicata* Shrubland (CEGL001363, G4)
- *Sarcobatus vermiculatus / Elymus elymoides - Pascopyrum smithii* Shrubland (CEGL001365, G2?)
- *Sarcobatus vermiculatus / Elymus elymoides* Shrubland (CEGL001372, G4)
- *Sarcobatus vermiculatus / Ericameria nauseosa* Shrubland (CEGL001362, G5)
- *Sarcobatus vermiculatus / Leymus cinereus* Shrubland (CEGL001366, G3)
- *Sarcobatus vermiculatus / Nitrophila occidentalis - Suaeda moquinii* Shrubland (CEGL001369, G5?)
- *Sarcobatus vermiculatus / Pascopyrum smithii - (Elymus lanceolatus)* Shrub Herbaceous Vegetation (CEGL001508, G4)
- *Sarcobatus vermiculatus / Sporobolus airoides* Sparse Vegetation (CEGL001368, G3?)
- *Sarcobatus vermiculatus / Suaeda moquinii* Shrubland (CEGL001370, GUQ)
- *Sarcobatus vermiculatus* Shrubland (CEGL001357, G5)

Alliances:
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Ericameria nauseosa* Shrubland Alliance (A.835)
- *Grayia spinosa* Shrubland Alliance (A.1038)
- *Hordeum brachyantherum* Temporarily Flooded Herbaceous Alliance (A.2585)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrub Herbaceous Alliance (A.1554)

- *Sarcobatus vermiculatus* Intermittently Flooded Shrubland Alliance (A.1046)
- *Sarcobatus vermiculatus* Intermittently Flooded Sparsely Vegetated Alliance (A.1877)

SOURCES

References: Comer et al. 2003, Knight 1994, West 1983b
Version: 05 Oct 2004 **Stakeholders:** Midwest, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

15 CES304.786—INTER-MOUNTAIN BASINS PLAYA

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Barren
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland
Diagnostic Classifiers: Lowland [Lowland]; Playa; Temperate [Temperate Xeric]; Depressional; Alkaline Soil; Saline Substrate Chemistry; Aridic; Alkaline Water; Saline Water Chemistry; Caliche Layer; Impermeable Layer; Intermittent Flooding
Concept Summary: This ecological system is composed of barren and sparsely vegetated playas (generally <10% plant cover) found in the intermountain western U.S. Salt crusts are common throughout, with small saltgrass beds in depressions and sparse shrubs around the margins. These systems are intermittently flooded. The water is prevented from percolating through the soil by an impermeable soil subhorizon and is left to evaporate. Soil salinity varies greatly with soil moisture and greatly affects species composition. Characteristic species may include *Allenrolfea occidentalis, Sarcobatus vermiculatus, Grayia spinosa, Puccinellia lemmonii, Leymus cinereus, Distichlis spicata*, and/or *Atriplex* spp.
Comments: Bjork (1997) refers to these as vernal lakes in Washington; his one example was ditched and may be artificial. There might have been these in Grand Coulee prior to Columbia Basin irrigation project.

DISTRIBUTION

Range: This system occurs throughout the Intermountain western U.S., extending east into the southwestern Great Plains.
Divisions: 304:C
TNC Ecoregions: 6:C, 10:C, 11:C, 19:C
Subnations: CA, CO, ID, NM, NV, OR, UT, WA?, WY

CONCEPT

Associations:
- *(Sarcocornia utahensis) - (Arthrocnemum subterminale)* Seasonally Flooded Herbaceous Vegetation [Placeholder] (CEGL003120, GNR)
- *Allenrolfea occidentalis / Atriplex gardneri* Shrubland (CEGL000989, G4?)
- *Allenrolfea occidentalis* Shrubland (CEGL000988, G3)
- *Artemisia papposa / Danthonia californica - Festuca idahoensis* Shrubland (CEGL002991, GNR)
- *Atriplex spinifera* Shrubland [Placeholder] (CEGL003015, G3?)
- *Chrysothamnus albidus / Puccinellia nuttalliana* Shrubland (CEGL001328, G3)
- *Distichlis spicata - (Scirpus nevadensis)* Herbaceous Vegetation (CEGL001773, G4)
- *Distichlis spicata - Lepidium perfoliatum* Herbaceous Vegetation (CEGL001772, GNA)
- *Distichlis spicata* Herbaceous Vegetation (CEGL001770, G5)
- *Distichlis spicata* Mixed Herb Herbaceous Vegetation (CEGL001771, G3G5)
- *Hordeum jubatum* Herbaceous Vegetation (CEGL001798, G4)
- *Krascheninnikovia lanata / Poa secunda* Dwarf-shrubland (CEGL001326, G3)
- *Leymus cinereus - Distichlis spicata* Herbaceous Vegetation (CEGL001481, G3)
- *Leymus cinereus - Pascopyrum smithii* Herbaceous Vegetation (CEGL001483, G3Q)
- *Leymus cinereus* Bottomland Herbaceous Vegetation (CEGL001480, G1)
- *Leymus triticoides - Carex* spp. Herbaceous Vegetation (CEGL001571, G4?)
- *Leymus triticoides - Poa secunda* Herbaceous Vegetation (CEGL001572, G2)
- *Pluchea sericea* Seasonally Flooded Shrubland [Placeholder] (CEGL003080, G3?)
- *Poa secunda - Muhlenbergia richardsonis* Herbaceous Vegetation (CEGL002755, GNR)
- *Puccinellia lemmonii - Poa secunda* Seasonally Flooded Herbaceous Vegetation (CEGL001658, G1)
- *Sarcobatus vermiculatus - Atriplex parryi / Distichlis spicata* Shrubland (CEGL002764, GNR)
- *Sarcobatus vermiculatus - Psorothamnus polydenius* Shrubland (CEGL002763, GNR)
- *Sarcobatus vermiculatus / Achnatherum hymenoides* Shrubland (CEGL001373, G4)
- *Sarcobatus vermiculatus / Artemisia tridentata* Shrubland (CEGL001359, G4)
- *Sarcobatus vermiculatus / Atriplex confertifolia - (Picrothamnus desertorum, Suaeda moquinii)* Shrubland (CEGL001371, G5?)
- *Sarcobatus vermiculatus / Distichlis spicata* Shrubland (CEGL001363, G4)
- *Sarcobatus vermiculatus / Elymus elymoides - Pascopyrum smithii* Shrubland (CEGL001365, G2?)
- *Sarcobatus vermiculatus / Elymus elymoides* Shrubland (CEGL001372, G4)
- *Sarcobatus vermiculatus / Ericameria nauseosa* Shrubland (CEGL001362, G5)
- *Sarcobatus vermiculatus / Leymus cinereus* Shrubland (CEGL001366, G3)

- *Sarcobatus vermiculatus / Nitrophila occidentalis - Suaeda moquinii* Shrubland (CEGL001369, G5?)
- *Sarcobatus vermiculatus / Pascopyrum smithii - (Elymus lanceolatus)* Shrub Herbaceous Vegetation (CEGL001508, G4)
- *Sarcobatus vermiculatus / Sporobolus airoides* Sparse Vegetation (CEGL001368, G3?)
- *Sarcobatus vermiculatus* Shrubland (CEGL001357, G5)
- *Spartina gracilis* Herbaceous Vegetation (CEGL001588, GU)
- *Sporobolus airoides - Distichlis spicata* Herbaceous Vegetation (CEGL001687, G4?)
- *Suaeda moquinii* Shrubland (CEGL001991, G5)

Alliances:

- *(Sarcocornia utahensis) - (Arthrocnemum subterminale)* Semipermanently Flooded Herbaceous Alliance (A.1676)
- *Allenrolfea occidentalis* Shrubland Alliance (A.866)
- *Artemisia papposa* Shrubland Alliance (A.2551)
- *Atriplex spinifera* Shrubland Alliance (A.865)
- *Chrysothamnus albidus* Shrubland Alliance (A.834)
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Hordeum jubatum* Temporarily Flooded Herbaceous Alliance (A.1358)
- *Krascheninnikovia lanata* Dwarf-shrubland Alliance (A.1104)
- *Leymus cinereus* Herbaceous Alliance (A.1204)
- *Leymus cinereus* Intermittently Flooded Herbaceous Alliance (A.1329)
- *Leymus triticoides* Temporarily Flooded Herbaceous Alliance (A.1353)
- *Pluchea sericea* Seasonally Flooded Shrubland Alliance (A.798)
- *Poa secunda* Seasonally Flooded Herbaceous Alliance (A.1410)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrub Herbaceous Alliance (A.1554)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrubland Alliance (A.1046)
- *Sarcobatus vermiculatus* Intermittently Flooded Sparsely Vegetated Alliance (A.1877)
- *Spartina gracilis* Seasonally Flooded Herbaceous Alliance (A.1407)
- *Sporobolus airoides* Intermittently Flooded Herbaceous Alliance (A.1331)
- *Suaeda moquinii* Intermittently Flooded Shrubland Alliance (A.941)

High-ranked species: Atriplex spinifera (G3?), Gratiola heterosepala (G3), Lepidium davisii (G3), Phacelia inundata (G2), Phacelia parishii (G2G3), Pseudocopaeodes eunus (G3G4), Rorippa calycina (G3), Sidalcea covillei (G2), Sisyrinchium funereum (G2G3)

SOURCES

References: Bjork 1997, Comer et al. 2003, Knight 1994, Nachlinger et al. 2001
Version: 14 Dec 2004 **Stakeholders:** West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

16 CES302.745—NORTH AMERICAN WARM DESERT BEDROCK CLIFF AND OUTCROP

Primary Division: North American Warm Desert (302)
Land Cover Class: Barren
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland
Diagnostic Classifiers: Canyon; Cliff (Landform); Rock Outcrops/Barrens/Glades; Temperate [Temperate Xeric]
Concept Summary: This ecological system is found from subalpine to foothill elevations and includes barren and sparsely vegetated landscapes (generally <10% plant cover) of steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock types. Also included are unstable scree and talus slopes that typically occur bellow cliff faces. Species present are diverse and may include *Bursera microphylla*, *Fouquieria splendens*, *Nolina bigelovii*, *Opuntia bigelovii*, and other desert species, especially succulents. Lichens are predominant lifeforms in some areas. May include a variety of desert shrublands less than 2 ha (5 acres) in size from adjacent areas.

DISTRIBUTION

Divisions: 302:C
TNC Ecoregions: 17:C, 22:C, 23:C, 24:C
Subnations: AZ, CA, MXBC, MXBS, MXCH, MXSO, NM, NV, TX

CONCEPT

Associations:

- *Fouquieria splendens / Bouteloua hirsuta* Shrubland (CEGL001377, G3?)
- *Fouquieria splendens* Shrubland [Placeholder] (CEGL004452, GNR)
- *Larrea tridentata - Jatropha dioica* var. *graminea* Shrubland (CEGL004566, G3?)
- *Larrea tridentata - Opuntia schottii* Shrubland (CEGL004567, G4?)
- *Opuntia bigelovii* Shrubland [Placeholder] (CEGL003065, G4?)

Alliances:

- *Fouquieria splendens* Shrubland Alliance (A.863)

- *Larrea tridentata* Shrubland Alliance (A.851)
- *Opuntia bigelovii* Shrubland Alliance (A.877)

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Dick-Peddie 1993, MacMahon 1988, MacMahon and Wagner 1985, Shreve and Wiggins 1964, Thomas et al. 2004
Version: 20 Feb 2003 **Stakeholders:** Latin America, Southeast, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

17 CES302.743—NORTH AMERICAN WARM DESERT BADLAND

Primary Division: North American Warm Desert (302)
Land Cover Class: Barren
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland
Diagnostic Classifiers: Badlands; Badland; Alkaline Soil; Shale and Mudstone; Silt Soil Texture; Clay Soil Texture
Concept Summary: This ecological system is restricted to barren and sparsely vegetated (generally <10% plant cover) substrates typically derived from marine shale or mudstone (badlands and mudhills). The harsh soil properties and high rate of erosion and deposition are driving environmental variables supporting sparse shrubs and dwarf-shrubs e.g., *Atriplex hymenelytra*, and herbaceous vegetation.

DISTRIBUTION

Divisions: 302:C
TNC Ecoregions: 17:C, 22:P, 23:P, 24:C
Subnations: AZ, MXCH, MXSO, NM, TX

CONCEPT

Associations:
- *Atriplex hymenelytra* Shrubland (CEGL001317, G5)
- *Cleome isomeris - Ephedra californica - Ericameria linearifolia* Shrubland [Placeholder] (CEGL003056, G1G3)

Alliances:
- *Atriplex hymenelytra* Shrubland Alliance (A.872)
- *Cleome isomeris - Ephedra californica - Ericameria linearifolia* Shrubland Alliance (A.819)

SOURCES

References: Comer et al. 2003, Thomas et al. 2004
Version: 20 Feb 2003 **Stakeholders:** Latin America, Southeast, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

18 CES302.744—NORTH AMERICAN WARM DESERT ACTIVE AND STABILIZED DUNE

Primary Division: North American Warm Desert (302)
Land Cover Class: Barren
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland
Diagnostic Classifiers: Dune (Landform); Dune field; Dune (Substrate); Temperate [Temperate Xeric]; Sand Soil Texture; W-Landscape/High Intensity
Concept Summary: This ecological system occurs across the warm deserts of North America and is composed of unvegetated to sparsely vegetated (generally <10% plant cover) active dunes and sandsheets derived from quartz or gypsum sands. Common vegetation includes *Ambrosia dumosa, Abronia villosa, Artemisia filifolia, Atriplex canescens, Eriogonum deserticola, Larrea tridentata, Pleuraphis rigida, Poliomintha* spp., *Prosopis* spp., *Psorothamnus* spp., *Rhus microphylla*, and *Sporobolus flexuosa*. Dune "blowouts" and subsequent stabilization through succession are characteristic processes.

DISTRIBUTION

Range: This system occurs across the warm deserts of North America.
Divisions: 302:C
TNC Ecoregions: 17:C, 22:C, 23:C, 24:C
Subnations: AZ, CA, MXBC, MXBS, MXCH, MXSO, NM, NV, TX

CONCEPT

Associations:
- *Abronia villosa* Sparse Vegetation [Placeholder] (CEGL003001, G2G3)
- *Artemisia filifolia - Psorothamnus scoparius - Dalea lanata* Gypsum Dune Shrubland (CEGL004561, G1G2)
- *Artemisia filifolia / Andropogon hallii - Achnatherum hymenoides* Gypsum Dune Shrubland (CEGL004559, G1G2)
- *Artemisia filifolia / Sporobolus flexuosus* Shrubland (CEGL001547, G5)

- *Artemisia filifolia / Sporobolus giganteus* Shrubland (CEGL001078, G5)
- *Cleome isomeris - Ephedra californica - Ericameria linearifolia* Shrubland [Placeholder] (CEGL003056, G1G3)
- *Eriogonum deserticola* Sand Dune Sparse Vegetation (CEGL001962, G1)
- *Heliotropium convolvulaceum - Psoralidium lanceolatum - Polanisia jamesii* Sparse Vegetation (CEGL004581, G2?)
- *Heliotropium racemosum - Chamaesyce* sp. Sparse Vegetation (CEGL004582, G1?)
- *Poliomintha incana / Muhlenbergia pungens* Shrubland (CEGL002672, G3)
- *Prosopis glandulosa / Atriplex canescens* Shrubland (CEGL001382, G5)
- *Prosopis glandulosa / Sporobolus flexuosus* Shrubland (CEGL001386, G4)
- *Psorothamnus polydenius* var. *polydenius / Achnatherum hymenoides* Shrubland (CEGL001353, G3G4)
- *Psorothamnus spinosus* Shrubland [Placeholder] (CEGL002701, G4G5)
- *Sporobolus flexuosus - Dasyochloa pulchella* Herbaceous Vegetation (CEGL001693, G2?)
- *Sporobolus flexuosus - Paspalum setaceum* Herbaceous Vegetation (CEGL001694, G1G2)
- *Sporobolus flexuosus - Sporobolus contractus* Herbaceous Vegetation (CEGL001696, GNRQ)

Alliances:

- *Abronia villosa* Sparsely Vegetated Alliance (A.1852)
- *Artemisia filifolia* Shrubland Alliance (A.816)
- *Cleome isomeris - Ephedra californica - Ericameria linearifolia* Shrubland Alliance (A.819)
- *Eriogonum deserticola* Sparsely Vegetated Alliance (A.1856)
- *Heliotropium convolvulaceum* Sparsely Vegetated Alliance (A.1853)
- *Heliotropium racemosum* Sparsely Vegetated Alliance (A.1854)
- *Poliomintha incana* Shrubland Alliance (A.862)
- *Prosopis glandulosa* Shrubland Alliance (A.1031)
- *Psorothamnus polydenius* Shrubland Alliance (A.1039)
- *Psorothamnus spinosus* Intermittently Flooded Shrubland Alliance (A.2520)
- *Sporobolus flexuosus* Herbaceous Alliance (A.1268)

SOURCES

References: Bowers 1982, Bowers 1984, Comer et al. 2003, Holland and Keil 1995, MacMahon 1988, Powell and Turner 1974, Thomas et al. 2004

Version: 21 Apr 2005 **Stakeholders:** Latin America, Southeast, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

19 CES302.754—NORTH AMERICAN WARM DESERT VOLCANIC ROCKLAND

Primary Division: North American Warm Desert (302)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Lava; Cinder; Basalt; Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]

Concept Summary: This ecological system occurs across the warm deserts of North America and is restricted to barren and sparsely vegetated (<10% plant cover) volcanic substrates such as basalt lava (malpais) and tuff. Vegetation is variable and includes a variety of species depending on local environmental conditions, e.g., elevation, age and type of substrate. Typically scattered *Larrea tridentata*, *Atriplex hymenelytra*, or other desert shrubs are present.

DISTRIBUTION

Range: Occurs across the warm deserts of North America.

Divisions: 302:C

TNC Ecoregions: 17:C, 22:C, 23:C, 24:C

Subnations: AZ, CA, MXBC, MXCH, MXSO, NM, NV, TX

CONCEPT

Associations:

- *Aloysia wrightii / Perityle staurophylla* Shrubland (CEGL001280, GNRQ)
- *Opuntia bigelovii* Shrubland [Placeholder] (CEGL003065, G4?)

Alliances:

- *Aloysia wrightii* Shrubland Alliance (A.1035)
- *Opuntia bigelovii* Shrubland Alliance (A.877)

SOURCES

References: Barbour and Major 1988, Brown 1982, Comer et al. 2003, Dick-Peddie 1993, Thomas et al. 2004

Version: 20 Feb 2003 **Stakeholders:** Latin America, Southeast, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

20 CES302.755—NORTH AMERICAN WARM DESERT WASH

Primary Division: North American Warm Desert (302)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Linear
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Toeslope/Valley Bottom; Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Riverine / Alluvial; Intermittent Flooding
Concept Summary: This ecological system is restricted to intermittently flooded washes or arroyos that dissect bajadas, mesas, plains and basin floors throughout the warm deserts of North America. Although often dry, the intermittent fluvial processes define this system, which are often associated with rapid sheet and gully flow. This system occurs as linear or braided strips within desert scrub- or desert grassland-dominated landscapes. The vegetation of desert washes is quite variable ranging from sparse and patchy to moderately dense and typically occurs along the banks, but may occur within the channel. The woody layer is typically intermittent to open and may be dominated by shrubs and small trees such as *Acacia greggii, Brickellia laciniata, Baccharis sarothroides, Chilopsis linearis, Fallugia paradoxa, Hymenoclea salsola, Hymenoclea monogyra, Juglans microcarpa, Prosopis* spp., *Psorothamnus spinosus, Prunus fasciculata, Rhus microphylla, Salazaria mexicana,* or *Sarcobatus vermiculatus*.

DISTRIBUTION

Range: Restricted to intermittently flooded washes or arroyos that dissect bajadas, mesas, plains and basin floors throughout the warm deserts of North America.
Divisions: 302:C
TNC Ecoregions: 17:C, 22:C, 23:C, 24:C
Subnations: AZ, CA, MXBC, MXCH, MXSO, NM, NV, TX

CONCEPT

Associations:
- *Acacia greggii - Parkinsonia microphylla* Shrubland (CEGL001340, G4G5)
- *Baccharis emoryi* Shrubland [Provisional] (CEGL002974, GNR)
- *Baccharis salicifolia / Muhlenbergia rigens* Shrubland (CEGL004572, G3?)
- *Baccharis sarothroides - Baccharis salicifolia* Shrubland (CEGL001160, G4)
- *Baccharis sarothroides - Parkinsonia microphylla* Shrubland (CEGL001159, G4)
- *Baccharis sergiloides* Shrubland [Placeholder] (CEGL002953, GNR)
- *Brickellia laciniata - Hymenoclea monogyra* Shrubland (CEGL001953, G4)
- *Chilopsis linearis / Brickellia laciniata* Shrubland (CEGL004933, G3G4)
- *Chilopsis linearis* Shrubland (CEGL001164, G3)
- *Encelia virginensis* Shrubland (CEGL001335, G4)
- *Ephedra californica* Shrubland [Placeholder] (CEGL002958, GNR)
- *Ericameria paniculata* Shrubland [Placeholder] (CEGL002706, G4G5)
- *Forestiera pubescens* Mojave Desert Shrubland [Provisional] (CEGL002959, GNR)
- *Grayia spinosa - Lycium andersonii* Shrubland (CEGL001347, G5)
- *Grayia spinosa - Lycium pallidum* Shrubland (CEGL001348, G5)
- *Hymenoclea monogyra* Thicket Shrubland (CEGL001169, G3)
- *Hymenoclea salsola - (Ambrosia eriocentra)* Shrubland (CEGL002702, G5)
- *Hymenoclea salsola - Salazaria mexicana* Shrubland (CEGL002703, G3?)
- *Hyptis emoryi* Shrubland [Placeholder] (CEGL002960, GNR)
- *Juglans microcarpa / Cladium mariscus* ssp. *jamaicense* Shrubland (CEGL004593, G2?)
- *Juglans microcarpa / Sorghastrum nutans* Shrubland (CEGL004594, G2G3)
- *Juglans microcarpa* Shrubland (CEGL001103, GNR)
- *Lepidospartum squamatum* Intermittently Flooded Shrubland [Placeholder] (CEGL003060, G3?)
- *Panicum bulbosum - Alopecurus aequalis* Herbaceous Vegetation (CEGL001653, G2)
- *Panicum bulbosum - Lycurus phleoides* Herbaceous Vegetation (CEGL001654, GNRQ)
- *Prosopis (glandulosa* var. *torreyana, velutina)* Woodland [Placeholder] (CEGL003082, G3?)
- *Prosopis glandulosa - Atriplex* spp. Shrubland (CEGL002193, GNR)
- *Prosopis glandulosa / Atriplex canescens* Shrubland (CEGL001382, G5)
- *Prosopis glandulosa / Bouteloua curtipendula - Nassella leucotricha* Woodland (CEGL002133, G3?)
- *Prosopis glandulosa / Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001510, G3G4)
- *Prosopis glandulosa / Bouteloua gracilis* Shrubland (CEGL001383, G5)
- *Prosopis glandulosa* / Mixed Grasses Shrubland (CEGL001384, GNRQ)
- *Prosopis glandulosa / Muhlenbergia porteri* Shrubland (CEGL001511, G5)
- *Prosopis glandulosa / Sporobolus airoides* Shrubland (CEGL001385, G5)
- *Prosopis glandulosa* Temporarily Flooded Woodland (CEGL004934, GNR)
- *Prosopis glandulosa* var. *glandulosa / Bouteloua gracilis - Buchloe dactyloides* Shrubland (CEGL003877, GNR)

- *Prosopis glandulosa* var. *torreyana* Shrubland (CEGL001381, G3)
- *Prosopis pubescens* Shrubland (CEGL001387, G1?)
- *Prosopis velutina - Acacia greggii* Shrubland (CEGL001388, GUQ)
- *Prunus fasciculata* Shrubland [Placeholder] (CEGL002704, G4G5)
- *Psorothamnus spinosus* Shrubland [Placeholder] (CEGL002701, G4G5)
- *Rhus microphylla / Bouteloua curtipendula* Shrubland (CEGL001354, GNR)
- *Sapindus saponaria - Juglans major* Forest (CEGL000557, GNR)
- *Viguiera reticulata* Shrubland [Placeholder] (CEGL002962, GNR)

Alliances:

- *Acacia greggii* Shrubland Alliance (A.1036)
- *Baccharis salicifolia* Intermittently Flooded Shrubland Alliance (A.933)
- *Baccharis sarothroides* Intermittently Flooded Shrubland Alliance (A.840)
- *Baccharis sergiloides* Intermittently Flooded Shrubland Alliance (A.2531)
- *Brickellia laciniata* Intermittently Flooded Shrubland Alliance (A.940)
- *Chilopsis linearis* Intermittently Flooded Shrubland Alliance (A.1044)
- *Encelia virginensis* Shrubland Alliance (A.860)
- *Ephedra californica* Intermittently Flooded Shrubland Alliance (A.2536)
- *Ericameria paniculata* Intermittently Flooded Shrubland Alliance (A.2509)
- *Forestiera pubescens* Temporarily Flooded Shrubland Alliance (A.969)
- *Grayia spinosa* Intermittently Flooded Shrubland Alliance (A.1045)
- *Hymenoclea monogyra* Shrubland Alliance (A.1034)
- *Hymenoclea salsola* Shrubland Alliance (A.2512)
- *Hyptis emoryi* Intermittently Flooded Shrubland Alliance (A.2537)
- *Juglans microcarpa* Temporarily Flooded Shrubland Alliance (A.945)
- *Lepidospartum squamatum* Intermittently Flooded Shrubland Alliance (A.838)
- *Panicum bulbosum* Temporarily Flooded Herbaceous Alliance (A.1356)
- *Prosopis (glandulosa, velutina)* Woodland Alliance (A.661)
- *Prosopis glandulosa* Shrub Herbaceous Alliance (A.1550)
- *Prosopis glandulosa* Shrubland Alliance (A.1031)
- *Prosopis glandulosa* Temporarily Flooded Woodland Alliance (A.637)
- *Prosopis glandulosa* Woodland Alliance (A.611)
- *Prosopis pubescens* Shrubland Alliance (A.1042)
- *Prosopis velutina* Shrubland Alliance (A.1043)
- *Prunus fasciculata* Intermittently Flooded Shrubland Alliance (A.2519)
- *Psorothamnus spinosus* Intermittently Flooded Shrubland Alliance (A.2520)
- *Rhus microphylla* Shrubland Alliance (A.1040)
- *Sapindus saponaria* Temporarily Flooded Forest Alliance (A.303)
- *Viguiera reticulata* Intermittently Flooded Shrubland Alliance (A.2539)

SOURCES

References: Barbour and Major 1988, Brown 1982, Comer et al. 2003, Dick-Peddie 1993, MacMahon 1988, Muldavin et al. 2000b, Szaro 1989, Thomas et al. 2004

Version: 20 Feb 2003 **Stakeholders:** Latin America, Southeast, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

21 CES302.750—NORTH AMERICAN WARM DESERT PAVEMENT

Primary Division: North American Warm Desert (302)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Desert Pavement; Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; W-Landscape/High Intensity

Concept Summary: This ecological system occurs throughout much of the warm deserts of North America and is composed of unvegetated to very sparsely vegetated (<2% plant cover) landscapes, typically flat basins where extreme temperature and wind develop ground surfaces of fine to medium gravel coated with "desert varnish." Very low cover of desert scrub species such as *Larrea tridentata* or *Eriogonum fasciculatum* is usually present. However, ephemeral herbaceous species may have high cover in response to seasonal precipitation, including *Chorizanthe rigida*, *Eriogonum inflatum*, and *Geraea canescens*.

DISTRIBUTION

Range: Occurs throughout much of the warm deserts of North America.

Divisions: 302:C

TNC Ecoregions: 17:C, 23:C, 24:C
Subnations: AZ, CA, MXCH, MXSO, NM, NV, TX

CONCEPT

Associations:
- *Ambrosia deltoidea / Simmondsia chinensis* Shrubland (CEGL000953, G4)
- *Ambrosia dumosa - Larrea tridentata* var. *tridentata* Dwarf-shrubland (CEGL000956, G4)
- *Eriogonum fasciculatum - Purshia glandulosa* Shrubland (CEGL001259, G4)
- *Eriogonum fasciculatum* Shrubland (CEGL001258, G5)

Alliances:
- *Ambrosia deltoidea* Shrubland Alliance (A.852)
- *Ambrosia dumosa* Dwarf-shrubland Alliance (A.1102)
- *Eriogonum fasciculatum* Shrubland Alliance (A.868)

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, MacMahon 1988, Thomas et al. 2004
Version: 20 Feb 2003 **Stakeholders:** Latin America, Southeast, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

22 CES302.751—NORTH AMERICAN WARM DESERT PLAYA

Primary Division: North American Warm Desert (302)
Land Cover Class: Barren
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland
Diagnostic Classifiers: Lowland [Lowland]; Playa; Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Depressional; Alkaline Soil; Aridic; Alkaline Water; Saline Water Chemistry; Caliche Layer; Impermeable Layer; Intermittent Flooding
Concept Summary: This ecological system is composed of barren and sparsely vegetated playas (generally <10% plant cover) found across the warm deserts of North America, extending into the extreme southern end of the San Joaquin Valley in California. Playas form with intermittent flooding, followed by evaporation, leaving behind a saline residue. Salt crusts are common throughout, with small saltgrass beds in depressions and sparse shrubs around the margins. Subsoils often include an impermeable layer of clay or caliche. Large desert playas tend to be defined by vegetation rings formed in response to salinity. Given their common location in windswept desert basins, dune fields often form downwind of large playas. In turn, playas associated with dunes often have a deeper water supply. Species may include *Allenrolfea occidentalis, Suaeda* spp., *Distichlis spicata, Eleocharis palustris, Oryzopsis* spp., *Sporobolus* spp., *Tiquilia* spp., or *Atriplex* spp. Ephemeral herbaceous species may have high cover periodically. Adjacent vegetation is typically Sonora-Mojave Mixed Salt Desert Scrub (CES302.749), Chihuahuan Mixed Salt Desert Scrub (CES302.017), Gulf of California Coastal Mixed Salt Desert Scrub (CES302.015), Baja California del Norte Gulf Coast Ocotillo-Limberbush-Creosotebush Desert Scrub (CES302.014), or Chihuahuan Creosotebush Xeric Basin Desert Scrub (CES302.731).

DISTRIBUTION

Range: Found across the warm deserts of North America, extending into the extreme southern end of the San Joaquin Valley in California.
Divisions: 302:C
TNC Ecoregions: 17:C, 22:C, 23:C, 24:C
Subnations: AZ, CA, MXBC, MXCH, MXSO, NM, NV, TX

CONCEPT

Associations:
- *(Sarcocornia utahensis) - (Arthrocnemum subterminale)* Seasonally Flooded Herbaceous Vegetation [Placeholder] (CEGL003120, GNR)
- *Allenrolfea occidentalis* Shrubland (CEGL000988, G3)
- *Atriplex (lentiformis, polycarpa)* Shrubland [Placeholder] (CEGL003016, G3)
- *Atriplex polycarpa / Pleuraphis mutica* Shrubland (CEGL001319, GU)
- *Atriplex polycarpa* Shrubland (CEGL001318, G5)
- *Atriplex spinifera* Shrubland [Placeholder] (CEGL003015, G3?)
- *Bouteloua breviseta* Sparse Vegetation (CEGL004609, G3?)
- *Sesuvium verrucosum* Sparse Vegetation (CEGL004595, G3?)

Alliances:
- *(Sarcocornia utahensis) - (Arthrocnemum subterminale)* Semipermanently Flooded Herbaceous Alliance (A.1676)
- *Allenrolfea occidentalis* Shrubland Alliance (A.866)
- *Atriplex (lentiformis, polycarpa)* Shrubland Alliance (A.864)
- *Atriplex polycarpa* Shrubland Alliance (A.873)
- *Atriplex spinifera* Shrubland Alliance (A.865)
- *Bouteloua breviseta* Sparsely Vegetated Alliance (A.1870)
- *Sesuvium verrucosum* Temporarily Flooded Sparsely Vegetated Alliance (A.1865)

High-ranked species: Atriplex griffithsii (G2G3), Atriplex spinifera (G3?), Branchinella acaciodea (G2G3), Branchinella sublettei (G3), Goodmania luteola (G2G3), Iva hayesiana (G3?), Ivesia kingii (G3), Nitrophila mohavensis (G1), Phacelia parishii (G2G3), Pseudocopaeodes eunus (G3G4), Puccinellia simplex (G3G4), Streptocephalus moorei (G1G2)

SPATIAL CHARACTERISTICS

Adjacent Ecological System Comments: Adjacent vegetation is typically Sonora-Mojave Mixed Salt Desert Scrub (CES302.749), Chihuahuan Mixed Salt Desert Scrub (CES302.017), Gulf of California Coastal Mixed Salt Desert Scrub (CES302.015), Baja California del Norte Gulf Coast Ocotillo-Limberbush-Creosotebush Desert Scrub (CES302.014), or Chihuahuan Creosotebush Xeric Basin Desert Scrub (CES302.731).

SOURCES

References: Barbour and Major 1988, Brown 1982, Comer et al. 2003, Dick-Peddie 1993, Holland and Keil 1995, Muldavin et al. 2000b, Thomas et al. 2004

Version: 14 Dec 2004 **Stakeholders:** Latin America, Southeast, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

23 CES306.813—ROCKY MOUNTAIN ASPEN FOREST AND WOODLAND

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Long Disturbance Interval; F-Patch/Medium Intensity; F-Landscape/Medium Intensity; Broad-Leaved Deciduous Tree; Populus tremuloides

Concept Summary: This widespread ecological system is more common in the southern and central Rocky Mountains, but occurs throughout much of the western U.S. and north into Canada, in the montane and subalpine zones. Elevations generally range from 1525 to 3050 m (5000-10,000 feet), but occurrences can be found at lower elevations in some regions. Distribution of this ecological system is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand, and secondarily is limited by the length of the growing season or low temperatures. These are upland forests and woodlands dominated by *Populus tremuloides* without a significant conifer component (<25% relative tree cover). The understory structure may be complex with multiple shrub and herbaceous layers, or simple with just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by graminoids or forbs. Associated shrub species include *Symphoricarpos* spp., *Rubus parviflorus*, *Amelanchier alnifolia*, and *Arctostaphylos uva-ursi*. Occurrences of this system originate and are maintained by stand-replacing disturbances such as avalanches, crown fire, insect outbreak, disease and windthrow, or clearcutting by man or beaver, within the matrix of conifer forests.

DISTRIBUTION

Range: More common in the southern and central Rocky Mountains, but occurs throughout much of the western U.S. and north into Canada, in the montane and subalpine zones. Elevations generally range from 1525 to 3050 m (5000-10,000 feet), but occurrences can be found at lower elevations in some regions.

Divisions: 204:C, 206:P, 304:C, 306:C

TNC Ecoregions: 1:P, 3:C, 4:P, 5:P, 7:C, 8:C, 9:C, 11:C, 12:P, 18:C, 19:C, 20:C, 21:P, 25:C, 81:P

Subnations: AB, AZ, BC, CA, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

CONCEPT

Associations:

- *Populus tremuloides* - Conifer / *Spiraea betulifolia* - *Symphoricarpos albus* Forest (CEGL005911, G3?)
- *Populus tremuloides / Acer glabrum* Forest (CEGL000563, G1G2)
- *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Bromus carinatus* Forest (CEGL000566, G3G5)
- *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Calamagrostis rubescens* Forest (CEGL000567, G4)
- *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus* / Mixed Graminoid Forest (CEGL002816, GNR)
- *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus* / Tall Forbs Forest (CEGL000568, G5)
- *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Thalictrum fendleri* Forest (CEGL000569, G5)
- *Populus tremuloides / Amelanchier alnifolia / Pteridium aquilinum* Forest (CEGL000565, G2G3)
- *Populus tremuloides / Amelanchier alnifolia* / Tall Forbs Forest (CEGL000570, G3G5)
- *Populus tremuloides / Amelanchier alnifolia / Thalictrum fendleri* Forest (CEGL000571, G3G4)
- *Populus tremuloides / Amelanchier alnifolia* Forest (CEGL000564, G4)
- *Populus tremuloides / Artemisia tridentata / Monardella odoratissima - Kelloggia galioides* Forest (CEGL003146, GNR)
- *Populus tremuloides / Artemisia tridentata* Forest (CEGL000572, G3G4)
- *Populus tremuloides / Bromus carinatus* Forest (CEGL000573, G5)
- *Populus tremuloides / Calamagrostis rubescens* Forest (CEGL000575, G5?)
- *Populus tremuloides / Carex geyeri* Forest (CEGL000579, G4)
- *Populus tremuloides / Carex rossii* Forest (CEGL000580, G5)
- *Populus tremuloides / Carex siccata* Forest (CEGL000578, G4)

- *Populus tremuloides / Ceanothus velutinus* Forest (CEGL000581, G2)
- *Populus tremuloides / Corylus cornuta* Forest (CEGL000583, G3)
- *Populus tremuloides / Festuca thurberi* Forest (CEGL000585, G4)
- *Populus tremuloides / Heracleum maximum* Forest (CEGL000595, G3)
- *Populus tremuloides / Heracleum sphondylium* Forest (CEGL000586, G4Q)
- *Populus tremuloides / Hesperostipa comata* Forest (CEGL000608, G2G4)
- *Populus tremuloides / Juniperus communis / Carex geyeri* Forest (CEGL000588, G4G5)
- *Populus tremuloides / Juniperus communis / Lupinus argenteus* Forest (CEGL000589, G3G4)
- *Populus tremuloides / Juniperus communis* Forest (CEGL000587, G4)
- *Populus tremuloides / Ligusticum filicinum* Forest (CEGL000591, G4Q)
- *Populus tremuloides / Lonicera involucrata* Forest (CEGL000592, G3)
- *Populus tremuloides / Lupinus argenteus* Forest (CEGL000593, GNR)
- *Populus tremuloides / Mahonia repens* Forest (CEGL000594, G3)
- *Populus tremuloides / Monardella odoratissima* Forest (CEGL003145, G3)
- *Populus tremuloides / Poa pratensis* Forest (CEGL003148, GNR)
- *Populus tremuloides / Prunus virginiana* Forest (CEGL000596, G3G4)
- *Populus tremuloides / Pteridium aquilinum* Forest (CEGL000597, G4)
- *Populus tremuloides / Quercus gambelii / Symphoricarpos oreophilus* Forest (CEGL000598, GNR)
- *Populus tremuloides / Ribes montigenum* Forest (CEGL000600, G2)
- *Populus tremuloides / Rosa woodsii* Forest (CEGL003149, GNR)
- *Populus tremuloides / Rubus parviflorus* Forest (CEGL000602, G2)
- *Populus tremuloides / Rudbeckia occidentalis* Forest (CEGL000603, GNRQ)
- *Populus tremuloides / Salix scouleriana* Forest (CEGL000604, G4)
- *Populus tremuloides / Sambucus racemosa* Forest (CEGL000605, G2G3)
- *Populus tremuloides / Shepherdia canadensis* Forest (CEGL000606, G3G4)
- *Populus tremuloides / Spiraea betulifolia* Forest (CEGL000607, G4Q)
- *Populus tremuloides / Symphoricarpos albus / Elymus glaucus* Woodland (CEGL000946, G3)
- *Populus tremuloides / Symphoricarpos albus* Forest (CEGL000609, G3?)
- *Populus tremuloides / Symphoricarpos occidentalis* Forest [Provisional] (CEGL005848, GNR)
- *Populus tremuloides / Symphoricarpos oreophilus / Bromus carinatus* Forest (CEGL000611, G5)
- *Populus tremuloides / Symphoricarpos oreophilus / Calamagrostis rubescens* Forest (CEGL000612, G3G5)
- *Populus tremuloides / Symphoricarpos oreophilus / Carex rossii* Forest (CEGL000613, G3G4)
- *Populus tremuloides / Symphoricarpos oreophilus / Festuca thurberi* Forest (CEGL000614, G3?)
- *Populus tremuloides / Symphoricarpos oreophilus* / Tall Forbs Forest (CEGL000615, G3G5)
- *Populus tremuloides / Symphoricarpos oreophilus / Thalictrum fendleri* Forest (CEGL000616, G5)
- *Populus tremuloides / Symphoricarpos oreophilus / Wyethia amplexicaulis* Forest (CEGL000617, G4Q)
- *Populus tremuloides / Symphoricarpos oreophilus* Forest (CEGL000610, G5)
- *Populus tremuloides* / Tall Forbs Forest (CEGL000618, G5)
- *Populus tremuloides / Thalictrum fendleri* Forest (CEGL000619, G5)
- *Populus tremuloides / Urtica dioica* Forest [Provisional] (CEGL005849, G2G3)
- *Populus tremuloides / Vaccinium myrtillus* Forest (CEGL000620, G3)
- *Populus tremuloides / Wyethia amplexicaulis* Forest (CEGL000622, G3)

Alliances:

- *Populus tremuloides* Forest Alliance (A.274)
- *Populus tremuloides* Temporarily Flooded Forest Alliance (A.300)
- *Populus tremuloides* Woodland Alliance (A.610)

Environment: Climate is temperate with a relatively long growing season, typically cold winters and deep snow. Mean annual precipitation is greater than 15 inches and typically greater than 20 inches, except in semi-arid environments where occurrences are restricted to mesic microsites such as seeps or large snow drifts. Distribution of this ecological system is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand (Mueggler 1988). Secondarily, its range is limited by the length of the growing season or low temperatures (Mueggler 1988). Topography is variable, sites range from level to steep slopes. Aspect varies according to the limiting factors. Occurrences at high elevations are restricted by cold temperatures and are found on warmer southern aspects. At lower elevations occurrences are restricted by lack of moisture and are found on cooler north aspects and mesic microsites. The soils are typically deep and well developed with rock often absent from the soil. Soil texture ranges from sandy loam to clay loams. Parent materials are variable and may include sedimentary, metamorphic or igneous rocks, but it appears to grow best on limestone, basalt, and calcareous or neutral shales (Mueggler 1988).

Vegetation: Occurrences have a somewhat closed canopy of trees of 5-20 m tall that is dominated by the cold-deciduous, broad-leaved tree *Populus tremuloides*. Conifers that may be present but never codominant include *Abies concolor*, *Abies lasiocarpa*, *Picea engelmannii*, *Picea pungens*, *Pinus ponderosa*, and *Pseudotsuga menziesii*. Conifer species may contribute up to 15% of the tree canopy before the occurrence is reclassified as a mixed occurrence. Because of the open growth form of *Populus tremuloides*, enough light can penetrate for lush understory development. Depending on available soil moisture and other factors like disturbance, the understory structure may be complex with multiple

shrub and herbaceous layers, or simple with just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by graminoids or forbs.

Common shrubs include *Acer glabrum, Amelanchier alnifolia, Artemisia tridentata, Juniperus communis, Prunus virginiana, Rosa woodsii, Shepherdia canadensis, Symphoricarpos oreophilus*, and the dwarf-shrubs *Mahonia repens* and *Vaccinium* spp. The herbaceous layers may be lush and diverse. Common graminoids may include *Bromus carinatus, Calamagrostis rubescens, Carex siccata (= Carex foenea), Carex geyeri, Carex rossii, Elymus glaucus, Elymus trachycaulus, Festuca thurberi*, and *Hesperostipa comata*. Associated forbs may include *Achillea millefolium, Eucephalus engelmannii (= Aster engelmannii), Delphinium* spp., *Geranium viscosissimum, Heracleum sphondylium, Ligusticum filicinum, Lupinus argenteus, Osmorhiza berteroi (= Osmorhiza chilensis), Pteridium aquilinum, Rudbeckia occidentalis, Thalictrum fendleri, Valeriana occidentalis, Wyethia amplexicaulis*, and many others. Exotic grasses such as the perennials *Poa pratensis* and *Bromus inermis* and the annual *Bromus tectorum* are often common in occurrences disturbed by grazing.

Dynamics: Occurrences in this ecological system often originate, and are likely maintained, by stand-replacing disturbances such as crown fire, disease and windthrow, or clearcutting by man or beaver. The stems of these thin-barked, clonal trees are easily killed by ground fires, but they can quickly and vigorously resprout in densities of up to 30,000 stems per hectare (Knight 1993). The stems are relatively short-lived (100-150 years), and the occurrence will succeed to longer-lived conifer forest if undisturbed. Occurrences are favored by fire in the conifer zone (Mueggler 1988). With adequate disturbance a clone may live many centuries. Although *Populus tremuloides* produces abundant seeds, seedling survival is rare because of the long moist conditions required to establish are rare in the habitats that it occurs in. Superficial soil drying will kill seedlings (Knight 1993).

SOURCES

References: Bartos 1979, Bartos and Cambell 1998, Bartos and Mueggler 1979, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2002, Comer et al. 2003, DeByle and Winokur 1985, DeVelice et al. 1986, Henderson et al. 1977, Hess and Wasser 1982, Johnston and Hendzel 1985, Keammerer 1974a, Mueggler 1988, Neely et al. 2001, Powell 1988a, Tuhy et al. 2002, Youngblood and Mauk 1985

Version: 20 Feb 2003 **Stakeholders:** Canada, Midwest, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

24 CES306.814—ROCKY MOUNTAIN BIGTOOTH MAPLE RAVINE WOODLAND

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Colluvial slope; Ravine; Stream terrace (undifferentiated); Toeslope; Mineral: W/ A-Horizon <10 cm; Unconsolidated; Broad-Leaved Deciduous Tree; Acer grandidentatum

Concept Summary: This ecological system occurs in cool ravines, on toeslopes and slump benches associated with riparian areas in the northern and central Wasatch Range and Tavaputs Plateau extending into southern Idaho, as well as in scattered localities in southwestern Utah, central Arizona and New Mexico and the Trans-Pecos of Texas. Substrates are typically rocky colluvial or alluvial soils with favorable soil moisture. These woodlands are dominated by *Acer grandidentatum* but may include mixed stands codominated by *Quercus gambelii* or with scattered conifers. Some stands may include *Acer negundo* or *Populus tremuloides* as minor components. It also occurs on steeper, north-facing slopes at higher elevations, often adjacent to Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818) or Rocky Mountain Aspen Forest and Woodland (CES306.813).

DISTRIBUTION

Range: Occurs in the northern and central Wasatch Range and Tavaputs Plateau extending into southern Idaho, as well as in scattered localities in southwestern Utah, central Arizona and New Mexico and the Trans-Pecos of Texas.

Divisions: 302:C, 304:?, 306:C

TNC Ecoregions: 6:C, 9:C, 18:P, 21:P, 24:C

Subnations: ID, NM, TX, UT

CONCEPT

Associations:

- *Abies concolor / Acer grandidentatum* Forest (CEGL000241, G4)
- *Acer grandidentatum - Quercus gravesii* Forest (CEGL004548, G1)
- *Acer grandidentatum - Quercus muehlenbergii* Forest (CEGL004547, G2?)
- *Acer grandidentatum / Calamagrostis rubescens* Forest (CEGL000558, G2Q)
- *Acer grandidentatum / Quercus gambelii* Forest (CEGL000559, G4G5)

Alliances:

- *Abies concolor* Forest Alliance (A.152)
- *Acer grandidentatum* Montane Forest Alliance (A.265)

SPATIAL CHARACTERISTICS

Adjacent Ecological System Comments: It may occur on steeper, north-facing slopes at higher elevations, often adjacent to Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818) or Rocky Mountain Aspen Forest and Woodland (CES306.813).

SOURCES

References: Comer et al. 2003, Gehlbach 1967, Ream 1964
Version: 20 Feb 2003 **Stakeholders:** Southeast, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

38 CES306.835—SOUTHERN ROCKY MOUNTAIN PINYON-JUNIPER WOODLAND

Primary Division: Rocky Mountain (306)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Very Shallow Soil; Shallow Soil; Mineral: W/ A-Horizon <10 cm; Aridic; Long Disturbance Interval; Needle-Leaved Tree; Pinus edulis, Juniperus monosperma
Concept Summary: This southern Rocky Mountain ecological system occurs on dry mountains and foothills in southern Colorado east of the Continental Divide, in mountains and plateaus of north-central New Mexico, and extends out onto limestone breaks in the southeastern Great Plains. These woodlands occur on warm, dry sites on mountain slopes, mesas, plateaus, and ridges. Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. Soils supporting this system vary in texture ranging from stony, cobbly, gravelly sandy loams to clay loam or clay. *Pinus edulis* and/or *Juniperus monosperma* dominate the tree canopy. *Juniperus scopulorum* may codominate or replace *Juniperus monosperma* at higher elevations. Stands with *Juniperus osteosperma* are representative the Colorado Plateau and are not included in this system. In southern transitional areas between Madrean Pinyon-Juniper Woodland (CES305.797) and Southern Rocky Mountain Pinyon-Juniper Woodland (CES306.835) in central New Mexico, *Juniperus deppeana* becomes common. Understory layers are variable and may be dominated by shrubs, graminoids, or be absent. Associated species are more typical of southern Rocky Mountains than the Colorado Plateau and include *Artemisia bigelovii, Cercocarpus montanus, Quercus gambelii, Achnatherum scribneri, Bouteloua gracilis, Festuca arizonica*, or *Pleuraphis jamesii*.

DISTRIBUTION

Range: Occurs on dry mountains and foothills in southern Colorado, in mountains and plateaus of northern New Mexico and Arizona, and extends out onto breaks in the Great Plains.
Divisions: 303:C, 304:C, 306:C
TNC Ecoregions: 20:C, 21:C, 22:P, 27:C, 28:C
Subnations: CO, NM

CONCEPT

Associations:
- *Juniperus monosperma - Rhus trilobata / Schizachyrium scoparium* Woodland (CEGL002121, GNR)
- *Juniperus monosperma / Agave lechuguilla* Woodland (CEGL000703, G4)
- *Juniperus monosperma / Andropogon hallii* Woodland (CEGL000704, G3?)
- *Juniperus monosperma / Artemisia bigelovii* Woodland (CEGL000705, G3?)
- *Juniperus monosperma / Artemisia tridentata* Woodland (CEGL000706, G5)
- *Juniperus monosperma / Atriplex confertifolia / Achnatherum hymenoides* Woodland (CEGL000707, G3G4)
- *Juniperus monosperma / Bouteloua curtipendula* Woodland (CEGL000708, G5)
- *Juniperus monosperma / Bouteloua eriopoda* Woodland (CEGL000709, GNR)
- *Juniperus monosperma / Bouteloua gracilis* Woodland (CEGL000710, G5)
- *Juniperus monosperma / Bouteloua hirsuta* Woodland (CEGL000711, GNR)
- *Juniperus monosperma / Cercocarpus montanus - Ribes cereum* Woodland (CEGL000714, GU)
- *Juniperus monosperma / Cercocarpus montanus* Woodland (CEGL000713, GNR)
- *Juniperus monosperma / Ericameria nauseosa - Fallugia paradoxa* Woodland (CEGL000715, G4)
- *Juniperus monosperma / Fallugia paradoxa / Xanthoparmelia neoconspersa* Woodland (CEGL000716, G4)
- *Juniperus monosperma / Hesperostipa neomexicana* Woodland (CEGL000722, G4)
- *Juniperus monosperma / Krascheninnikovia lanata* Woodland (CEGL000712, G3G4)
- *Juniperus monosperma / Nolina microcarpa - Agave lechuguilla* Woodland (CEGL000718, G4)
- *Juniperus monosperma / Quercus X pauciloba* Woodland (CEGL000721, G5)
- *Juniperus monosperma / Quercus turbinella* Woodland (CEGL000720, GNR)
- *Pinus edulis - (Juniperus monosperma) / Bouteloua gracilis* Woodland (CEGL002151, G5?)
- *Pinus edulis - (Juniperus monosperma, Juniperus osteosperma) / Hesperostipa comata* Woodland (CEGL000797, G2?)
- *Pinus edulis - Juniperus osteosperma / Cercocarpus ledifolius* Woodland (CEGL002940, GNR)
- *Pinus edulis - Juniperus scopulorum* Woodland [Provisional] (CEGL002907, GU)
- *Pinus edulis - Juniperus* spp. / *Artemisia tridentata* (ssp. *wyomingensis*, ssp. *vaseyana*) Woodland (CEGL000776, G5)
- *Pinus edulis - Juniperus* spp. / *Cercocarpus montanus* - Mixed Shrub Woodland (CEGL000780, G5)
- *Pinus edulis - Juniperus* spp. / *Poa fendleriana* Woodland (CEGL000787, G5)
- *Pinus edulis - Juniperus* spp. / *Quercus gambelii* Woodland (CEGL000791, G5)

- *Pinus edulis - Quercus arizonica / Rhus trilobata* Woodland (CEGL000790, G5?)
- *Pinus edulis / Achnatherum nelsonii* ssp. *dorei* Woodland (CEGL000796, G4)
- *Pinus edulis / Achnatherum scribneri* Woodland (CEGL000798, G3)
- *Pinus edulis / Andropogon hallii* Woodland (CEGL000774, G2)
- *Pinus edulis / Arctostaphylos pungens* Woodland (CEGL000775, G3)
- *Pinus edulis / Bouteloua curtipendula* Woodland (CEGL000777, GNR)
- *Pinus edulis / Festuca arizonica* Woodland (CEGL000783, G3)
- *Pinus edulis / Leymus ambiguus* Woodland (CEGL002908, GU)
- *Pinus edulis / Muhlenbergia dubia* Woodland (CEGL000784, G2)
- *Pinus edulis / Muhlenbergia pauciflora* Woodland (CEGL000785, G4)
- *Pinus edulis / Nolina microcarpa* Woodland (CEGL000786, GNR)
- *Pinus edulis / Pseudoroegneria spicata* Woodland (CEGL000788, G4)
- *Pinus edulis / Purshia tridentata* Woodland (CEGL000789, G5)
- *Pinus edulis / Quercus X pauciloba* Woodland (CEGL000793, G5)
- *Pinus edulis* / Rockland Woodland (CEGL000794, G5)
- *Pinus edulis* / Sparse Understory Forest (CEGL000795, G5)

Alliances:

- *Juniperus monosperma* Woodland Alliance (A.504)
- *Pinus edulis - (Juniperus* spp.) Woodland Alliance (A.516)
- *Pinus edulis* Forest Alliance (A.135)

SOURCES

References: Alexander 1981, Bradley et al. 1992, Comer et al. 2003, Commons et al. 1999, Dwyer and Pieper 1967, Eager 1999, Hess and Wasser 1982, Ladyman and Muldavin 1996, Lindauer et al. 1982, Mehl 1992, Muldavin et al. 1992, Muldavin et al. 1996, Neely et al. 2001, Powell 1988b, West 1999a, West 1999b

Version: 05 Oct 2004 **Stakeholders:** West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

39 CES304.767—COLORADO PLATEAU PINYON-JUNIPER WOODLAND

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Mesa; Ridge/Summit/Upper Slope; Sedimentary Rock; Temperate [Temperate Xeric]; Aridic; Pinus edulis, Juniperus osteosperma

Concept Summary: This ecological system occurs in dry mountains and foothills of the Colorado Plateau region including the Western Slope of Colorado to the Wasatch Range, south to the Mogollon Rim and east into the northwestern corner of New Mexico. It is typically found at lower elevations ranging from 1500-2440 m. These woodlands occur on warm, dry sites on mountain slopes, mesas, plateaus, and ridges. Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. Soils supporting this system vary in texture ranging from stony, cobbly, gravelly sandy loams to clay loam or clay. *Pinus edulis* and/or *Juniperus osteosperma* dominate the tree canopy. In the southern portion of the Colorado Plateau in northern Arizona and northwestern New Mexico, *Juniperus monosperma* and hybrids of *Juniperus* spp may dominate or codominate the tree canopy. *Juniperus scopulorum* may codominate or replace *Juniperus osteosperma* at higher elevations. Understory layers are variable and may be dominated by shrubs, graminoids, or be absent. Associated species include *Arctostaphylos patula, Artemisia tridentata, Cercocarpus intricatus, Cercocarpus montanus, Coleogyne ramosissima, Purshia stansburiana, Purshia tridentata, Quercus gambelii, Bouteloua gracilis, Pleuraphis jamesii,* or *Poa fendleriana*. This system occurs at higher elevations than Great Basin Pinyon-Juniper Woodland (CES304.773) and Colorado Plateau shrubland systems where sympatric.

DISTRIBUTION

Range: Occurs on dry mountains and foothills of the Colorado Plateau region from the Western Slope of Colorado to the Wasatch Range, south to the Mogollon Rim. It is typically found at lower elevations ranging from 1500-2440 m.

Divisions: 304:C, 306:C

TNC Ecoregions: 18:C, 19:C, 20:?

Subnations: AZ, CO, NM, UT

CONCEPT

Associations:

- *Juniperus monosperma - Rhus trilobata / Schizachyrium scoparium* Woodland (CEGL002121, GNR)
- *Juniperus monosperma / Agave lechuguilla* Woodland (CEGL000703, G4)
- *Juniperus monosperma / Andropogon hallii* Woodland (CEGL000704, G3?)
- *Juniperus monosperma / Artemisia bigelovii* Woodland (CEGL000705, G3?)
- *Juniperus monosperma / Artemisia tridentata* Woodland (CEGL000706, G5)

- *Juniperus monosperma / Atriplex confertifolia / Achnatherum hymenoides* Woodland (CEGL000707, G3G4)
- *Juniperus monosperma / Bouteloua curtipendula* Woodland (CEGL000708, G5)
- *Juniperus monosperma / Bouteloua eriopoda* Woodland (CEGL000709, GNR)
- *Juniperus monosperma / Bouteloua gracilis* Woodland (CEGL000710, G5)
- *Juniperus monosperma / Bouteloua hirsuta* Woodland (CEGL000711, GNR)
- *Juniperus monosperma / Cercocarpus montanus - Ribes cereum* Woodland (CEGL000714, GU)
- *Juniperus monosperma / Cercocarpus montanus* Woodland (CEGL000713, GNR)
- *Juniperus monosperma / Ericameria nauseosa - Fallugia paradoxa* Woodland (CEGL000715, G4)
- *Juniperus monosperma / Fallugia paradoxa / Xanthoparmelia neoconspersa* Woodland (CEGL000716, G4)
- *Juniperus monosperma / Hesperostipa neomexicana* Woodland (CEGL000722, G4)
- *Juniperus monosperma / Krascheninnikovia lanata* Woodland (CEGL000712, G3G4)
- *Juniperus monosperma / Nolina microcarpa - Agave lechuguilla* Woodland (CEGL000718, G4)
- *Juniperus monosperma / Quercus X pauciloba* Woodland (CEGL000721, G5)
- *Juniperus monosperma / Quercus turbinella* Woodland (CEGL000720, GNR)
- *Juniperus osteosperma - Juniperus monosperma* / Sparse Understory Woodland (CEGL000737, G4)
- *Juniperus osteosperma / Artemisia arbuscula* Woodland (CEGL002757, G5)
- *Juniperus osteosperma / Artemisia nova* / Rock Woodland (CEGL000729, G5)
- *Juniperus osteosperma / Artemisia nova* Woodland (CEGL000728, G5?)
- *Juniperus osteosperma / Artemisia tridentata / Achnatherum hymenoides* Woodland (CEGL000731, G4G5)
- *Juniperus osteosperma / Artemisia tridentata* ssp. *tridentata* Woodland (CEGL002360, GNR)
- *Juniperus osteosperma / Artemisia tridentata* ssp. *wyomingensis* Woodland (CEGL000730, G5?)
- *Juniperus osteosperma / Bromus tectorum* Semi-natural Woodland (CEGL002817, GNR)
- *Juniperus osteosperma / Cercocarpus intricatus* Woodland (CEGL000733, GNR)
- *Juniperus osteosperma / Cercocarpus ledifolius* Woodland (CEGL000734, G3?)
- *Juniperus osteosperma / Cercocarpus montanus* Woodland (CEGL000735, G2Q)
- *Juniperus osteosperma / Coleogyne ramosissima* Woodland [Provisional] (CEGL002909, GU)
- *Juniperus osteosperma / Hesperostipa comata* Wooded Herbaceous Vegetation (CEGL001489, G1Q)
- *Juniperus osteosperma / Hesperostipa neomexicana* Woodland (CEGL000740, GUQ)
- *Juniperus osteosperma / Leymus salinus* Woodland (CEGL001488, G1Q)
- *Juniperus osteosperma / Pleuraphis jamesii* Woodland (CEGL002362, GNR)
- *Juniperus osteosperma / Pleuraphis mutica* Woodland (CEGL000736, G2)
- *Juniperus osteosperma / Pseudoroegneria spicata* Woodland (CEGL000738, G4)
- *Juniperus osteosperma* / Sparse Understory Woodland (CEGL000732, GNRQ)
- *Juniperus osteosperma / Symphoricarpos oreophilus* Woodland (CEGL000741, GU)
- *Juniperus osteosperma* Wooded Shrubland [Placeholder] (CEGL002964, GNR)
- *Juniperus osteosperma* Woodland (CEGL000727, G5)
- *Pinus edulis - (Juniperus monosperma) / Bouteloua gracilis* Woodland (CEGL002151, G5?)
- *Pinus edulis - (Juniperus monosperma, Juniperus osteosperma) / Hesperostipa comata* Woodland (CEGL000797, G2?)
- *Pinus edulis - (Juniperus osteosperma) / Bouteloua gracilis* Woodland (CEGL000778, G5)
- *Pinus edulis - Juniperus osteosperma / Arctostaphylos patula* Woodland (CEGL002939, GNR)
- *Pinus edulis - Juniperus osteosperma / Cercocarpus intricatus* Woodland (CEGL000779, G3)
- *Pinus edulis - Juniperus osteosperma / Coleogyne ramosissima* Woodland (CEGL000781, G3)
- *Pinus edulis - Juniperus osteosperma / Purshia stansburiana* Woodland (CEGL000782, G4?)
- *Pinus edulis - Juniperus osteosperma / Shepherdia rotundifolia* Woodland (CEGL002335, GNR)
- *Pinus edulis - Juniperus* spp. / *Artemisia tridentata* (ssp. *wyomingensis*, ssp. *vaseyana*) Woodland (CEGL000776, G5)
- *Pinus edulis - Juniperus* spp. / *Cercocarpus montanus* - Mixed Shrub Woodland (CEGL000780, G5)
- *Pinus edulis - Juniperus* spp. / *Poa fendleriana* Woodland (CEGL000787, G5)
- *Pinus edulis - Juniperus* spp. / *Quercus gambelii* Woodland (CEGL000791, G5)
- *Pinus edulis - Quercus arizonica / Rhus trilobata* Woodland (CEGL000790, G5?)
- *Pinus edulis / Achnatherum nelsonii* ssp. *dorei* Woodland (CEGL000796, G4)
- *Pinus edulis / Achnatherum scribneri* Woodland (CEGL000798, G3)
- *Pinus edulis / Andropogon hallii* Woodland (CEGL000774, G2)
- *Pinus edulis / Arctostaphylos pungens* Woodland (CEGL000775, G3)
- *Pinus edulis / Bouteloua curtipendula* Woodland (CEGL000777, GNR)
- *Pinus edulis / Festuca arizonica* Woodland (CEGL000783, G3)
- *Pinus edulis / Muhlenbergia pauciflora* Woodland (CEGL000785, G4)
- *Pinus edulis / Nolina microcarpa* Woodland (CEGL000786, GNR)
- *Pinus edulis / Pseudoroegneria spicata* Woodland (CEGL000788, G4)
- *Pinus edulis / Purshia tridentata* Woodland (CEGL000789, G5)
- *Pinus edulis / Quercus X pauciloba* Woodland (CEGL000793, G5)
- *Pinus edulis* / Rockland Woodland (CEGL000794, G5)

- *Pinus edulis* / Sparse Understory Forest (CEGL000795, G5)

Alliances:

- *Juniperus monosperma* Woodland Alliance (A.504)
- *Juniperus osteosperma* Wooded Herbaceous Alliance (A.1502)
- *Juniperus osteosperma* Wooded Shrubland Alliance (A.2541)
- *Juniperus osteosperma* Woodland Alliance (A.536)
- *Pinus edulis - (Juniperus* spp.) Woodland Alliance (A.516)
- *Pinus edulis* Forest Alliance (A.135)

SOURCES

References: Baker and Kennedy 1985, Comer et al. 2003, Stuever and Hayden 1997a, Tuhy et al. 2002, West et al. 1998
Version: 05 Oct 2004 **Stakeholders:** West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

40 CES304.773—GREAT BASIN PINYON-JUNIPER WOODLAND

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Forest and Woodland (Treed); Foothill(s); Piedmont; Plateau; Ridge/Summit/Upper Slope; Aridic; Pinus monophylla, Juniperus osteosperma
Concept Summary: This ecological system occurs on dry mountain ranges of the Great Basin region and eastern foothills of the Sierra Nevada. It is typically found at lower elevations ranging from 1600-2600 m. These woodlands occur on warm, dry sites on mountain slopes, mesas, plateaus, and ridges. Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. Woodlands dominated by a mix of *Pinus monophylla* and *Juniperus osteosperma*, pure or nearly pure occurrences of *Pinus monophylla*, or woodlands dominated solely by *Juniperus osteosperma* comprise this system. *Cercocarpus ledifolius* is a common associate. Understory layers are variable. Associated species include shrubs such as *Arctostaphylos patula, Artemisia arbuscula, Artemisia nova, Artemisia tridentata, Cercocarpus ledifolius, Cercocarpus intricatus, Coleogyne ramosissima, Quercus gambelii, Quercus turbinella,* and bunch grasses *Hesperostipa comata, Festuca idahoensis, Pseudoroegneria spicata, Leymus cinereus (= Elymus cinereus),* and *Poa fendleriana*. This system occurs at lower elevations than Colorado Plateau Pinyon-Juniper Woodland (CES304.767) where sympatric.

DISTRIBUTION

Range: Occurs on dry mountain ranges of the Great Basin region and eastern foothills of the Sierra Nevada, typically at lower elevations ranging from 1600-2600 m.
Divisions: 206:C, 304:C
TNC Ecoregions: 6:C, 11:C, 12:C, 18:C
Subnations: CA, ID, NV, UT

CONCEPT

Associations:

- *Juniperus osteosperma / Artemisia arbuscula* Woodland (CEGL002757, G5)
- *Juniperus osteosperma / Artemisia nova* / Rock Woodland (CEGL000729, G5)
- *Juniperus osteosperma / Artemisia nova* Woodland (CEGL000728, G5?)
- *Juniperus osteosperma / Artemisia tridentata / Achnatherum hymenoides* Woodland (CEGL000731, G4G5)
- *Juniperus osteosperma / Bromus tectorum* Semi-natural Woodland (CEGL002817, GNR)
- *Juniperus osteosperma / Cercocarpus intricatus* Woodland (CEGL000733, GNR)
- *Juniperus osteosperma / Pseudoroegneria spicata* Woodland (CEGL000738, G4)
- *Juniperus osteosperma* / Sparse Understory Woodland (CEGL000732, GNRQ)
- *Juniperus scopulorum* Temporarily Flooded Woodland [Placeholder] (CEGL002777, G1)
- *Pinus monophylla - Juniperus osteosperma - Quercus gambelii / Artemisia tridentata* Woodland (CEGL000837, G4?)
- *Pinus monophylla - Juniperus osteosperma / (Shepherdia rotundifolia, Amelanchier utahensis)* Woodland (CEGL002942, GNR)
- *Pinus monophylla - Juniperus osteosperma / Artemisia arbuscula* Woodland (CEGL000830, G5)
- *Pinus monophylla - Juniperus osteosperma / Artemisia nova* Woodland (CEGL000831, G5?)
- *Pinus monophylla - Juniperus osteosperma / Artemisia tridentata* Woodland (CEGL000832, G5?)
- *Pinus monophylla - Juniperus osteosperma / Artemisia tridentata* ssp. *vaseyana / Pseudoroegneria spicata* Woodland (CEGL000833, G1)
- *Pinus monophylla - Juniperus osteosperma / Cercocarpus ledifolius / Pseudoroegneria spicata* Woodland (CEGL000834, G1)
- *Pinus monophylla - Juniperus osteosperma / Cercocarpus montanus - Quercus gambelii* Woodland [Provisional] (CEGL002968, GNR)
- *Pinus monophylla - Juniperus osteosperma / Coleogyne ramosissima* Woodland [Provisional] (CEGL002971, GNR)
- *Pinus monophylla - Juniperus osteosperma / Gutierrezia sarothrae / Pleuraphis jamesii* Woodland [Provisional] (CEGL002970, GNR)
- *Pinus monophylla - Juniperus osteosperma / Hesperostipa comata* Woodland (CEGL002969, GNR)
- *Pinus monophylla - Juniperus osteosperma / Leymus cinereus* Wooded Herbaceous Vegetation (CEGL000835, G1Q)

- *Pinus monophylla - Juniperus osteosperma / Prunus virginiana* Woodland (CEGL000836, G1Q)
- *Pinus monophylla - Juniperus osteosperma / Quercus turbinella* Woodland (CEGL002941, GNR)
- *Pinus monophylla - Juniperus osteosperma* / Sparse Understory Woodland (CEGL000829, G5)
- *Pinus monophylla - Quercus gambelii / Artemisia tridentata* Woodland (CEGL000838, G4?)
- *Pinus monophylla / Amelanchier alnifolia / Arctostaphylos patula* Woodland (CEGL000826, G3G4)
- *Pinus monophylla / Artemisia tridentata / Elymus elymoides* Woodland [Provisional] (CEGL003154, GNR)
- *Pinus monophylla / Artemisia tridentata* Woodland (CEGL000827, G5)
- *Pinus monophylla / Cercocarpus ledifolius / Artemisia tridentata - Purshia tridentata* Woodland [Provisional] (CEGL003152, GNR)
- *Pinus monophylla / Cercocarpus ledifolius* Woodland (CEGL000828, G5)
- *Pinus monophylla / Ribes velutinum* Woodland [Provisional] (CEGL003153, GNR)
- *Pinus monophylla / Symphoricarpos oreophilus - Artemisia tridentata* Woodland (CEGL000839, G5)
- *Pinus monophylla* Woodland (CEGL000825, G5)
- *Quercus turbinella - Juniperus osteosperma* Shrubland (CEGL000981, G4?)

Alliances:

- *Juniperus osteosperma* Woodland Alliance (A.536)
- *Juniperus scopulorum* Temporarily Flooded Woodland Alliance (A.563)
- *Pinus monophylla - (Juniperus osteosperma)* Woodland Alliance (A.543)
- *Pinus monophylla* Wooded Tall Herbaceous Alliance (A.1487)
- *Quercus turbinella* Shrubland Alliance (A.793)

SOURCES

References: Barbour and Major 1977, Comer et al. 2003, Holland and Keil 1995
Version: 20 Feb 2003 **Stakeholders:** West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

41 CES304.082—COLUMBIA BASIN WESTERN JUNIPER WOODLAND AND SAVANNA

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large Patch
Required Classifiers: Natural/Semi-natural, Vegetated (>10% vasc.), Upland
Diagnostic Classifiers: Montane [Lower Montane], Lowland [Foothill], Forest and Woodland (Treed), Ridge/Summit/Upper Slope, Aridic

Concept Summary: This woodland system is found along the northern and western margins of the Great Basin, from southwestern Idaho, along the eastern foothills of the Cascades, south to the Modoc Plateau of northeast California. Elevations range from under 200 m along the Columbia River in central Washington to over 1500 m. Generally soils are medium-textured, with abundant coarse fragments, and derived from volcanic parent materials. In central Oregon, the center of distribution, all aspects and slope positions occur. Where this system grades into relatively mesic forest or grassland habitats, these woodlands become restricted to rock outcrops or escarpments with excessively drained soils. *Pinus monophylla* is not present in this region, so *Juniperus occidentalis* is the only tree species, although *Pinus ponderosa* or *P. jeffreyi* may be present in some stands. *Cercocarpus ledifolius* may occasionally codominate. *Artemisia tridentata* is the most common shrub; others are *Purshia tridentata, Ericameria nauseosa, Chrysothamnus viscidiflorus, Ribes cereum,* and *Tetradymia* spp. Graminoids include *Carex filifolia, Festuca idahoensis, Poa secunda* and *Pseudoroegneria spicata*. These woodlands are generally restricted to rocky areas where fire frequency is low. Throughout much of its range, fire suppression and removal of fine fuels by grazing livestock has reduce fire frequency to allow *Juniperus occidentalis* seedlings to colonize adjacent alluvial soils and expend into the shrub steppe and grasslands. *Juniper occidentalis* savanna may occur on the drier edges of the woodland where trees are intermingling with or invading the surrounding grasslands, and where local edaphic or climatic conditions favor grasslands over shrublands.

Comments: These woodlands are composed of two very different types. There are old-growth *Juniperus occidentalis* woodlands with trees and stands often over 1000 years old, with fairly well-spaced trees with rounded crowns. There are also large areas where juniper has expanded into sagebrush steppe and bunchgrass dominated areas, with young, pointed crowned trees growing closely together. Currently, these two very different types are about equally distributed across the landscape, with *Juniperus occidentalis* continuing to expand, either from fire supression, grazing or climate change.

DISTRIBUTION

Divisions: 304
TNC Ecoregions: 6:C, 68:C, 7:C
Subnations/Nations: ID:c, NV:c, OR:c, WA:c

CONCEPT

Associations:

- Juniperus occidentalis / Achnatherum thurberianum Woodland (CEGL002635)
- Juniperus occidentalis / Artemisia arbuscula / Festuca idahoensis Wooded Herbaceous Vegetation (CEGL001716)
- Juniperus occidentalis / Artemisia arbuscula / Poa secunda Wooded Herbaceous Vegetation (CEGL001715)
- Juniperus occidentalis / Artemisia arbuscula / Pseudoroegneria spicata Wooded Herbaceous Vegetation (CEGL001717)

- Juniperus occidentalis / Artemisia rigida / Poa secunda Wooded Herbaceous Vegetation (CEGL001718)
- Juniperus occidentalis / Artemisia tridentata - Purshia tridentata Wooded Herbaceous Vegetation (CEGL001722)
- Juniperus occidentalis / Artemisia tridentata / Carex filifolia Wooded Herbaceous Vegetation (CEGL001719)
- Juniperus occidentalis / Artemisia tridentata / Festuca idahoensis Wooded Herbaceous Vegetation (CEGL001720)
- Juniperus occidentalis / Artemisia tridentata / Pseudoroegneria spicata Wooded Herbaceous Vegetation (CEGL001721)
- Juniperus occidentalis / Artemisia tridentata ssp. vaseyana Woodland (CEGL000723)
- Juniperus occidentalis / Cercocarpus ledifolius - Symphoricarpos oreophilus Woodland (CEGL000726)
- Juniperus occidentalis / Cercocarpus ledifolius / Carex geyeri Wooded Herbaceous Vegetation (CEGL000724)
- Juniperus occidentalis / Cercocarpus ledifolius / Leymus cinereus Wooded Herbaceous Vegetation (CEGL001723)
- Juniperus occidentalis / Cercocarpus ledifolius / Pseudoroegneria spicata Woodland (CEGL000725)
- Juniperus occidentalis / Festuca idahoensis Wooded Herbaceous Vegetation (CEGL001724)
- Juniperus occidentalis / Poa secunda - Achnatherum occidentale Wooded Herbaceous Vegetation (CEGL001727)
- Juniperus occidentalis / Pseudoroegneria spicata Wooded Herbaceous Vegetation (CEGL001728)
- Juniperus occidentalis / Purshia tridentata / Festuca idahoensis - Pseudoroegneria spicata Wooded Herbaceous Vegetation (CEGL002622)

California community types:

- Western Juniper Woodland (89.400.00)

SOURCES

References: Barbour and Major 1977, Holland and Keil 1995
Last updated: 20 Feb 2003 **Stakeholders:** WCS
Concept Author: NatureServe Western Ecology Team **LeadResp:** WCS

43 CES306.810—ROCKY MOUNTAIN ALPINE DWARF-SHRUBLAND

Primary Division: Rocky Mountain (306)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Patterned ground (undifferentiated); Glaciated; Acidic Soil; Udic; Very Long Disturbance Interval; Dwarf-Shrub; Alpine Slopes
Concept Summary: This widespread ecological system occurs above upper timberline throughout the Rocky Mountain cordillera, including alpine areas of ranges in Utah and Nevada, and north into Canada. Elevations are above 3360 m in the Colorado Rockies but drop to less than 2100 m in northwestern Montana and in the mountains of Alberta. This system occurs in areas of level or concave glacial topography, with late-lying snow and subirrigation from surrounding slopes. Soils have become relatively stabilized in these sites, are moist but well-drained, strongly acid, and often with substantial peat layers. Vegetation in these areas is controlled by snow retention, wind desiccation, permafrost, and a short growing season. This ecological system is characterized by a semi-continuous layer of ericaceous dwarf-shrubs or dwarf willows which form a heath type ground cover less than 0.5 m in height. Dense tuffs of graminoids and scattered forbs occur. *Dryas octopetala* or *Dryas integrifolia* communities are not included here, except for one very moist association, because they occur on more windswept and drier sites than the heath communities. Within these communities *Cassiope mertensiana, Salix arctica, Salix reticulata, Salix vestita*, or *Phyllodoce empetriformis* can be dominant shrubs. *Vaccinium* spp., *Ledum glandulosum, Phyllodoce glanduliflora*, and *Kalmia microphylla* may also be shrub associates. The herbaceous layer is a mixture of forbs and graminoids, especially sedges, including, *Erigeron* spp., *Luetkea pectinata, Antennaria lanata, Oreostemma alpigenum (= Aster alpigenus), Pedicularis* spp., *Castilleja* spp., *Deschampsia caespitosa, Caltha leptosepala, Erythronium* spp., *Juncus parryi, Luzula piperi, Carex spectabilis, Carex nigricans*, and *Polygonum bistortoides*. Fell-fields often intermingle with the alpine dwarf-shrubland.

DISTRIBUTION

Range: This system occurs above upper timberline throughout the Rocky Mountain cordillera, including alpine areas of ranges in Utah and Nevada, and north into Canada. Elevations are above 3360 m in the Colorado Rockies but drop to less than 2100 m in northwestern Montana.
Divisions: 304:C, 306:C
TNC Ecoregions: 4:P, 7:C, 8:C, 9:C, 11:C, 19:C, 20:C, 21:C, 68:P
Subnations: AB, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

Associations:

- *Cassiope mertensiana - Phyllodoce empetriformis* Dwarf-shrubland (CEGL001398, G5)
- *Cassiope mertensiana / Carex paysonis* Dwarf-shrubland (CEGL001396, G3?)
- *Dryas integrifolia - Carex* spp. Dwarf-shrub Herbaceous Vegetation (CEGL001890, G3Q)
- *Dryas octopetala - Polygonum viviparum* Dwarf-shrub Herbaceous Vegetation (CEGL001894, G3?)
- *Kalmia microphylla / Carex scopulorum* Dwarf-shrubland (CEGL001403, G3G4)
- *Phyllodoce empetriformis / Antennaria lanata* Dwarf-shrubland (CEGL001405, G3?)
- *Phyllodoce empetriformis / Lupinus latifolius* Dwarf-shrubland (CEGL001406, G4?)
- *Phyllodoce empetriformis / Vaccinium deliciosum* Dwarf-shrubland (CEGL001407, G4)

- *Phyllodoce empetriformis* Parkland Dwarf-shrubland (CEGL001404, G5)
- *Phyllodoce glanduliflora / Oreostemma alpigenum* Dwarf-shrubland (CEGL001408, G3G4)
- *Phyllodoce glanduliflora / Sibbaldia procumbens* Dwarf-shrubland (CEGL005877, G2G3)
- *Salix arctica - (Salix petrophila, Salix nivalis) / Polygonum bistortoides* Dwarf-shrubland (CEGL001431, G2G3Q)
- *Salix arctica - Salix nivalis* Dwarf-shrubland (CEGL001432, G2Q)
- *Salix arctica - Salix petrophila / Caltha leptosepala* Dwarf-shrubland (CEGL001429, G2G3)
- *Salix arctica / Carex nigricans* Dwarf-shrubland (CEGL005878, GNR)
- *Salix arctica / Geum rossii* Dwarf-shrubland (CEGL001430, G4)
- *Salix glauca* Shrubland (CEGL001136, G3?)
- *Salix nivalis / Geum rossii* Dwarf-shrubland (CEGL005936, GNR)
- *Salix reticulata / Caltha leptosepala* Dwarf-shrubland (CEGL001435, G3)
- *Vaccinium (caespitosum, scoparium)* Dwarf-shrubland (CEGL001140, G4)
- *Vaccinium (myrtillus, scoparium) / Luzula glabrata* var. *hitchcockii* Dwarf-shrubland (CEGL005879, G2G3)

Alliances:

- *Cassiope mertensiana* Dwarf-shrubland Alliance (A.1081)
- *Cassiope mertensiana* Temporarily Flooded Dwarf-shrubland Alliance (A.1089)
- *Dryas integrifolia* Dwarf-shrub Herbaceous Alliance (A.1576)
- *Dryas octopetala* Dwarf-shrub Herbaceous Alliance (A.1577)
- *Kalmia microphylla* Saturated Dwarf-shrubland Alliance (A.1096)
- *Phyllodoce empetriformis* Dwarf-shrubland Alliance (A.1083)
- *Phyllodoce glanduliflora* Dwarf-shrubland Alliance (A.1084)
- *Salix (reticulata, nivalis)* Dwarf-shrubland Alliance (A.1119)
- *Salix arctica* Dwarf-shrubland Alliance (A.1117)
- *Salix arctica* Saturated Dwarf-shrubland Alliance (A.1124)
- *Salix glauca* Temporarily Flooded Shrubland Alliance (A.963)
- *Salix reticulata* Saturated Dwarf-shrubland Alliance (A.1125)
- *Vaccinium (caespitosum, myrtillus, scoparium)* Dwarf-shrubland Alliance (A.1114)

SOURCES

References: Anderson 1999, Bamberg 1961, Bamberg and Major 1968, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1997, Douglas and Bliss 1977, Ecosystems Working Group 1998, Komarkova 1976, Komarkova 1980, Meidinger and Pojar 1991, Neely et al. 2001, Schwan and Costello 1951, Thilenius 1975, Willard 1963

Version: 01 Sep 2005 **Stakeholders:** Canada, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

44 CES304.770—COLUMBIA PLATEAU SCABLAND SHRUBLAND

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Basalt; Shallow Soil

Concept Summary: This ecological system is found in the Columbia Plateau region and forms extensive low shrublands. These xeric shrublands occur under relatively extreme soil-moisture conditions. Substrates are typically shallow lithic soils with limited water-holding capacity over fractured basalt. Because of poor drainage through basalt, these soils are often saturated from fall to spring by winter precipitation but typically dry out completely to bedrock by midsummer. Vegetation is characterized by an open dwarf-shrub canopy dominated by *Artemisia rigida* along with other shrub and dwarf-shrub species, particularly *Eriogonum* spp. Low cover of perennial bunch grasses such as *Danthonia unispicata, Elymus elymoides, Festuca idahoensis*, or primarily *Poa secunda*, as well as scattered forbs including species of *Allium, Antennaria, Balsamorhiza, Lomatium, Phlox*, and *Sedum*, characterize these sites. Individual sites can be dominated by grasses and semi-woody forbs, such as *Stenotus stenophyllus*. Annuals may be seasonally abundant, and cover of moss and lichen is often high in undisturbed areas (1-60% cover).

DISTRIBUTION

Range: Columbia Plateau.

Divisions: 304:C

TNC Ecoregions: 6:C, 7:C, 68:C

Subnations: CA?, ID, NV, OR, UT?, WA

CONCEPT

Associations:

- *Artemisia rigida / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL002995, G2)
- *Artemisia rigida / Poa secunda* Shrub Herbaceous Vegetation (CEGL001528, G4)
- *Artemisia rigida / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001529, G3)

- *Danthonia californica - Festuca idahoensis* Herbaceous Vegetation (CEGL001607, G1Q)
- *Danthonia unispicata - Poa secunda* Herbaceous Vegetation (CEGL001783, G3)
- *Eriogonum compositum / Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001784, G2)
- *Eriogonum douglasii / Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001785, G4)
- *Eriogonum microthecum - Physaria oregona* Dwarf-shrubland (CEGL001737, G2)
- *Eriogonum niveum / Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001786, G3)
- *Eriogonum sphaerocephalum / Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001448, G3)
- *Eriogonum strictum / Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001788, G3)
- *Eriogonum thymoides / Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001449, G3)
- *Lomatium cous - Poa secunda* Herbaceous Vegetation (CEGL001790, G4)

Alliances:

- *Artemisia rigida* Shrub Herbaceous Alliance (A.1574)
- *Danthonia californica* Herbaceous Alliance (A.1254)
- *Eriogonum microthecum* Dwarf-shrubland Alliance (A.1107)
- *Poa secunda* Dwarf-shrub Herbaceous Alliance (A.1568)
- *Poa secunda* Herbaceous Alliance (A.1291)

SOURCES

References: Comer et al. 2003, Copeland 1980a, Daubenmire 1970, Ganskopp 1979, Hall 1973, Johnson and Simon 1985, Poulton 1955
Version: 20 Feb 2003 **Stakeholders:** West
Concept Author: J. Kagan **LeadResp:** West

45 CES304.783—INTER-MOUNTAIN BASINS MAT SALTBUSH SHRUBLAND

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Alluvial flat; Alluvial plain; Plain; Alkaline Soil; Saline Substrate Chemistry; Calcareous; Silt Soil Texture; Clay Soil Texture; Dwarf-Shrub; Atriplex spp.
Concept Summary: This ecological system occurs on gentle slopes and rolling plains in the northern Colorado Plateau and Uinta Basin on Mancos Shale and arid, wind-swept basins and plains across parts of Wyoming. Substrates are shallow, typically saline, alkaline, fine-textured soils developed from shale or alluvium and may be associated with shale badlands. Infiltration rate is typically low. These landscapes that typically support dwarf-shrublands composed of relatively pure stands of *Atriplex* spp. such as *Atriplex corrugata* or *Atriplex gardneri*. Other dominant or codominant dwarf-shrubs may include *Artemisia longifolia, Artemisia pedatifida*, or *Picrothamnus desertorum*, sometimes with a mix of other low shrubs such as *Krascheninnikovia lanata* or *Tetradymia spinosa*. *Atriplex confertifolia* or *Atriplex canescens* may be present, but do not codominate. The herbaceous layer is typically sparse. Scattered perennial forbs occur, such as *Xylorhiza glabriuscula* and *Sphaeralcea grossulariifolia*, and the perennial grasses *Achnatherum hymenoides, Bouteloua gracilis, Elymus elymoides, Elymus lanceolatus ssp. lanceolatus, Pascopyrum smithii*, or *Sporobolus airoides* may dominate the herbaceous layer. In less saline areas, there may be inclusions grasslands dominated by *Hesperostipa comata, Leymus salinus, Pascopyrum smithii*, or *Pseudoroegneria spicata*. In Wyoming and possibly elsewhere, inclusions of non-saline, gravelly barrens or rock outcrops dominated by cushion plants such as *Arenaria hookeri* and *Phlox hoodii* without dwarf-shrubs may be present. Annuals are seasonally present and may include *Eriogonum inflatum, Plantago tweedyi*, and the introduced annual grass *Bromus tectorum*.

DISTRIBUTION

Range: Occurs on gentle slopes and rolling plains in the northern Colorado Plateau and Uinta Basin on Mancos Shale and arid, wind-swept basins and plains across parts of Wyoming.
Divisions: 304:C
TNC Ecoregions: 10:C, 19:C
Subnations: AZ, CO, NM, UT, WY

CONCEPT

Associations:

- *Atriplex corrugata* Dwarf-shrubland (CEGL001437, G5)
- *Atriplex cuneata - Frankenia jamesii / Sporobolus airoides* Shrubland (CEGL001316, G1?)
- *Atriplex gardneri - Picrothamnus desertorum* Dwarf-shrubland (CEGL001439, G2G3)
- *Atriplex gardneri / Achnatherum hymenoides* Dwarf-shrubland (CEGL001444, G3)
- *Atriplex gardneri / Artemisia tridentata* Dwarf-shrubland (CEGL001440, G3)
- *Atriplex gardneri / Leymus salinus* Dwarf-shrubland (CEGL001442, G2?)
- *Atriplex gardneri / Monolepis nuttalliana* Dwarf-shrubland (CEGL001443, G3?)
- *Atriplex gardneri / Pascopyrum smithii* Dwarf-shrubland (CEGL001445, G3)
- *Atriplex gardneri / Pleuraphis jamesii* Dwarf-shrubland (CEGL001441, G3G5)
- *Atriplex gardneri / Xylorhiza venusta* Dwarf-shrubland (CEGL001446, G3G5)

- *Atriplex gardneri* Dwarf-shrubland (CEGL001438, G3G5)

Alliances:

- *Atriplex corrugata* Dwarf-shrubland Alliance (A.1109)
- *Atriplex cuneata* Shrubland Alliance (A.871)
- *Atriplex gardneri* Dwarf-shrubland Alliance (A.1110)

Environment: This ecological system occurs on gentle slopes and rolling plains in the northern Colorado Plateau and Uinta Basin on Mancos Shale and arid, wind-swept plains and basins across parts of Wyoming. Substrates are shallow, typically saline, alkaline, fine-textured soils developed from shale or alluvium and may be associated with shale badlands. Infiltration rate is typically low. In Wyoming and possibly elsewhere inclusions of non-saline, gravelly barrens or rock outcrops may be present.

Vegetation: This ecological system typically supports dwarf-shrublands composed of relatively pure stands of *Atriplex* spp. such as *Atriplex corrugata* or *Atriplex gardneri*. Other dominant or codominant dwarf-shrub may include *Artemisia longifolia, Artemisia pedatifida*, or *Picrothamnus desertorum*, sometimes with a mix of other low shrubs such as *Krascheninnikovia lanata*, or *Tetradymia spinosa*. *Atriplex confertifolia* or *Atriplex canescens* may be present, but do not codominate. The herbaceous layer is typically sparse. Scattered perennial forbs occur, such as *Xylorhiza glabriuscula* and *Sphaeralcea grossulariifolia*, and the perennial grasses *Achnatherum hymenoides, Bouteloua gracilis, Elymus elymoides, Elymus lanceolatus ssp. lanceolatus, Pascopyrum smithii*, or *Sporobolus airoides* may dominate the herbaceous layer. In less saline areas, there may be inclusions grasslands dominated by *Hesperostipa comata, Leymus salinus, Pascopyrum smithii*, or *Pseudoroegneria spicata*. In Wyoming and possibly elsewhere, vegetation dominated by cushion plants such as *Arenaria hookeri, Phlox hoodii* without dwarf-shrubs may be present and occur on inclusions of non-saline, gravelly barrens or rock outcrops. Annuals are seasonally present and may include *Eriogonum inflatum, Plantago tweedyi*, and the introduced annual grass *Bromus tectorum*.

SOURCES

References: Branson et al. 1976, Comer et al. 2003, Knight 1994, Potter et al. 1985, Welsh 1957

Version: 20 Feb 2003 **Stakeholders:** West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

46 CES306.818—ROCKY MOUNTAIN GAMBEL OAK-MIXED MONTANE SHRUBLAND

Primary Division: Rocky Mountain (306)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Shrubland (Shrub-dominated); Shallow Soil; Mineral: W/ A-Horizon <10 cm; Loam Soil Texture; Sand Soil Texture; Ustic; Unconsolidated; Intermediate Disturbance Interval [Periodicity/Polycyclic Disturbance]; Broad-Leaved Deciduous Shrub

Concept Summary: This ecological system occurs in the mountains, plateaus and foothills in the southern Rocky Mountains and Colorado Plateau including the Uinta and Wasatch ranges and the Mogollon Rim. These shrublands are most commonly found along dry foothills, lower mountain slopes, and at the edge of the western Great Plains from approximately 2000 to 2900 m in elevation, and are often situated above pinyon-juniper woodlands. Substrates are variable and include soil types ranging from calcareous, heavy, fine-grained loams to sandy loams, gravelly loams, clay loams, deep alluvial sand, or coarse gravel. The vegetation is typically dominated by *Quercus gambelii* alone or codominant with *Amelanchier alnifolia, Amelanchier utahensis, Artemisia tridentata, Cercocarpus montanus, Prunus virginiana, Purshia stansburiana, Purshia tridentata, Robinia neomexicana, Symphoricarpos oreophilus*, or *Symphoricarpos rotundifolius*. There may be inclusions of other mesic montane shrublands with *Quercus gambelii* absent or as a relatively minor component. This ecological system intergrades with the lower montane-foothills shrubland system and shares many of the same site characteristics. Density and cover of *Quercus gambelii* and *Amelanchier* spp. often increase after fire.

DISTRIBUTION

Range: Occurs in the mountains, plateaus and foothills in the southern Rocky Mountains and Colorado Plateau including the Uinta and Wasatch ranges and the Mogollon Rim.

Divisions: 304:C, 306:C

TNC Ecoregions: 10:P, 18:C, 19:C, 20:C, 21:C

Subnations: AZ, CO, NM, UT, WY

CONCEPT

Associations:

- *Amelanchier (utahensis, alnifolia) - Cercocarpus montanus* Shrubland (CEGL001070, G2?)
- *Amelanchier alnifolia* / (Mixed Grass, Forb) Shrubland (CEGL005885, GNR)
- *Amelanchier alnifolia / Artemisia tridentata / Festuca idahoensis* Shrubland (CEGL001064, G4Q)
- *Amelanchier alnifolia / Pseudoroegneria spicata* - Bunchgrass Shrubland (CEGL001065, G3G4Q)
- *Amelanchier utahensis / Carex geyeri* Shrubland (CEGL001068, G2G3)
- *Amelanchier utahensis / Pseudoroegneria spicata* Shrubland (CEGL001069, G2G3)
- *Amelanchier utahensis* Shrubland (CEGL001067, G4)
- *Arctostaphylos patula - Quercus gambelii - (Amelanchier utahensis)* Shrubland (CEGL002695, GNR)
- *Juniperus scopulorum - Quercus gambelii* Woodland [Provisional] (CEGL002967, GNR)
- *Quercus gambelii - Cercocarpus montanus / (Carex geyeri)* Shrubland (CEGL001113, G3)

- *Quercus gambelii / Amelanchier alnifolia* Shrubland (CEGL001109, G3G5)
- *Quercus gambelii / Amelanchier utahensis* Shrubland (CEGL001110, G3G5)
- *Quercus gambelii / Artemisia tridentata* Shrubland (CEGL001111, G4G5)
- *Quercus gambelii / Carex inops* Shrubland (CEGL001112, GU)
- *Quercus gambelii / Hesperostipa comata* Shrubland [Provisional] (CEGL002915, GU)
- *Quercus gambelii / Paxistima myrsinites* Shrubland (CEGL001114, GU)
- *Quercus gambelii / Poa fendleriana* Shrubland [Provisional] (CEGL002949, GNR)
- *Quercus gambelii / Robinia neomexicana / Symphoricarpos rotundifolius* Shrubland (CEGL001116, GU)
- *Quercus gambelii / Robinia neomexicana* Shrubland (CEGL001115, G4)
- *Quercus gambelii / Symphoricarpos oreophilus* Shrubland (CEGL001117, G5)

Alliances:

- *Amelanchier alnifolia* Shrubland Alliance (A.913)
- *Amelanchier utahensis* Shrubland Alliance (A.916)
- *Arctostaphylos patula* Shrubland Alliance (A.788)
- *Juniperus scopulorum* Woodland Alliance (A.506)
- *Quercus gambelii* Shrubland Alliance (A.920)

Environment: This ecological system typically occupies the lower slope positions of the foothill and lower montane zones. They may occur on level to steep slopes, cliffs, escarpments, rimrock slopes, rocky outcrops, and scree slopes. Climate is semi-arid and characterized by mostly hot-dry summers with mild to cold winters and annual precipitation of 25 to 70 cm. Precipitation mostly occurs as winter snows but may also consist of some late summer rains. Soils are typically poorly developed, rocky to very rocky, and well-drained. Parent materials include alluvium, colluvium, and residuum derived from igneous, metamorphic, or sedimentary rocks such as granite, gneiss, limestone, quartz, monzonite, rhyolite, sandstone, schist, and shale. Although this is a shrub-dominated system, some trees may be present. In older occurrences, or occurrences on mesic sites, some of the shrubs may acquire tree-like sizes. Adjacent communities often include woodlands or forests of *Abies concolor, Pinus ponderosa, Pseudotsuga menziesii*, or *Populus tremuloides* at higher elevations, and *Pinus edulis* and *Juniperus osteosperma* on the lower and adjacent elevations. Shrublands of *Artemisia tridentata* or grasslands of *Festuca* sp., *Stipa* sp., or *Pseudoroegneria* sp. may also be present at the lower elevations.

Vegetation: Vegetation types in this system may occur as sparse to dense shrublands composed of moderate to tall shrubs. Occurrences may be multi-layered, with some short shrubby species occurring in the understory of the dominant overstory species. In many occurrences of this system, the canopy is dominated by the broad-leaved deciduous shrub *Quercus gambelii*, which occasionally reaches small tree size. Occurrences can range from dense thickets with little understory to relatively mesic mixed-shrublands with a rich understory of shrubs, grasses and forbs. These shrubs often have a patchy distribution with grass growing in between. Scattered trees are occasionally present in stands and typically include species of *Pinus* or *Juniperus*. Characteristic shrubs that may co-occur, or be singularly dominant, include *Amelanchier alnifolia, Amelanchier utahensis, Arctostaphylos patula, Artemisia tridentata, Cercocarpus montanus, Ptelea trifoliata, Prunus virginiana, Purshia stansburiana, Robinia neomexicana, Rosa* spp., *Symphoricarpos oreophilus*, and *Symphoricarpos rotundifolius*. The herbaceous layer is sparse to moderately dense, ranging from 1-40% cover. Perennial graminoids are the most abundant species, particularly *Bouteloua curtipendula, Bouteloua eriopoda, Bouteloua gracilis, Aristida* spp., *Carex inops, Carex geyeri, Elymus arizonicus, Eragrostis* spp., *Festuca* spp., *Koeleria macrantha, Muhlenbergia* spp., and *Stipa* spp. Many forb and fern species can occur, but none have much cover. Commonly present forbs include *Achillea millefolium, Artemisia* spp., *Geranium* spp., *Maianthemum stellatum, Thalictrum fendleri*, and *Vicia americana*. Ferns include species of *Cheilanthes* and *Woodsia*. Annual grasses and forbs are seasonally present, and weedy annuals are often present, at least seasonally.

Dynamics: Fire typically plays an important role in this system, causing die-back of the dominant shrub species in some areas, promoting stump sprouting of the dominant shrubs in other areas, and controlling the invasion of trees into the shrubland system. Natural fires typically result in a system with a mosaic of dense shrub clusters and openings dominated by herbaceous species. In some instances these associations may be seral to the adjacent *Pinus ponderosa, Abies concolor*, and *Pseudotsuga menziesii* woodlands and forests. Ream (1964) noted that on many sites in Utah, Gambel oak may be successional and replaced by bigtooth maple (*Acer grandidentatum)*.

SOURCES

References: Christensen 1955, Comer et al. 2002, Comer et al. 2003, Johnston and Hendzel 1985, Kunzler and Harper 1980, Kunzler et al. 1981, McKell 1950, Neely et al. 2001, Price and Brotherson 1987, Ream 1960, Ream 1964, Rondeau 2001, Shepperd 1990, Tuhy et al. 2002

Version: 20 Feb 2003 **Stakeholders:** West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

47 CES306.822—ROCKY MOUNTAIN LOWER MONTANE-FOOTHILL SHRUBLAND

Primary Division: Rocky Mountain (306)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Shrubland (Shrub-dominated); Very Shallow Soil; Aridic; Intermediate Disturbance Interval [Periodicity/Polycyclic Disturbance]

Concept Summary: This ecological system is found in the foothills, canyon slopes and lower mountains of the Rocky Mountains and on outcrops and canyon slopes in the western Great Plains. It ranges from southern New Mexico extending north into Wyoming, and west into

the Intermountain region. These shrublands occur between 1500-2900 m elevations and are usually associated with exposed sites, rocky substrates, and dry conditions, which limit tree growth. It is common where *Quercus gambelii* is absent such as the northern Colorado Front Range and in drier foothills and prairie hills. This system is generally drier than Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818), but may include mesic montane shrublands where *Quercus gambelii* does not occur. Scattered trees or inclusions of grassland patches or steppe may be present, but the vegetation is typically dominated by a variety of shrubs including *Amelanchier utahensis, Cercocarpus montanus, Purshia tridentata, Rhus trilobata, Ribes cereum, Symphoricarpos oreophilus*, or *Yucca glauca*. In northeastern Wyoming and north into adjacent Montana, *Cercocarpus ledifolius*, usually with *Artemisia tridentata*, is the common dominant shrub. Grasses are represented as species of *Muhlenbergia, Bouteloua, Hesperostipa*, and *Pseudoroegneria spicata*. Fires play an important role in this system as the dominant shrubs usually have a severe die-back, although some plants will stump sprout. *Cercocarpus montanus* requires a disturbance such as fire to reproduce, either by seed sprout or root crown sprouting. Fire suppression may have allowed an invasion of trees into some of these shrublands, but in many cases sites are too xeric for tree growth.

DISTRIBUTION

Range: Found in the foothills, canyon slopes and lower mountains of the Rocky Mountains and on outcrops and canyon slopes in the western Great Plains. It ranges from southern New Mexico extending north into Wyoming, and west into the Intermountain region.
Divisions: 303:C, 306:C
TNC Ecoregions: 10:C, 20:C, 21:C, 25:C, 26:C, 27:C
Subnations: CO, MT, NE?, NM, SD, WY

CONCEPT

Associations:
- *Artemisia frigida / Bouteloua gracilis* Shrubland [Provisional] (CEGL002782, GNR)
- *Artemisia nova / Leymus salinus* Shrub Herbaceous Vegetation (CEGL001421, G1G2Q)
- *Cercocarpus montanus - Rhus trilobata / Andropogon gerardii* Shrubland (CEGL002912, G2G3)
- *Cercocarpus montanus / Achnatherum scribneri* Shrubland (CEGL002913, G3)
- *Cercocarpus montanus / Bouteloua curtipendula* Shrubland (CEGL001086, G5)
- *Cercocarpus montanus / Elymus lanceolatus* ssp. *lanceolatus* Shrubland (CEGL001087, GU)
- *Cercocarpus montanus / Garrya flavescens* Shrubland (CEGL001088, GNR)
- *Cercocarpus montanus / Hesperostipa comata* Shrubland (CEGL001092, G2)
- *Cercocarpus montanus / Hesperostipa neomexicana* Shrubland (CEGL002911, G2G3)
- *Cercocarpus montanus / Muhlenbergia emersleyi* Shrub Herbaceous Vegetation (CEGL001500, G4)
- *Cercocarpus montanus / Muhlenbergia montana* Shrubland (CEGL002914, GU)
- *Cercocarpus montanus / Muhlenbergia pauciflora* Shrubland (CEGL001089, GNR)
- *Cercocarpus montanus / Pseudoroegneria spicata* Shrubland (CEGL001090, G4)
- *Cercocarpus montanus / Rhus trilobata* var. *trilobata* Shrubland (CEGL001091, GNRQ)
- *Cercocarpus montanus* var. *paucidentatus / Petrophyton caespitosum* Shrubland (CEGL004589, G3?)
- *Elaeagnus commutata / Pascopyrum smithii* Shrubland (CEGL001099, G3?)
- *Elaeagnus commutata* Shrubland (CEGL001098, G2Q)
- *Prunus virginiana - (Prunus americana)* Shrubland (CEGL001108, G4Q)
- *Purshia tridentata / Artemisia frigida / Hesperostipa comata* Shrubland (CEGL001055, G1G2)
- *Purshia tridentata / Muhlenbergia montana* Shrubland (CEGL001057, G2)
- *Rhus trilobata / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001505, G2?)
- *Rhus trilobata / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001120, G4)
- *Rhus trilobata* Rocky Mountain Shrub Herbaceous Vegetation (CEGL002910, G2)
- *Ribes cereum / Leymus ambiguus* Shrubland (CEGL001124, G2)
- *Spiraea betulifolia* Shrubland (CEGL005835, G3?)
- *Symphoricarpos occidentalis* Shrubland (CEGL001131, G4G5)

Alliances:
- *Artemisia frigida* Shrubland Alliance (A.2565)
- *Artemisia nova* Shrub Herbaceous Alliance (A.1567)
- *Cercocarpus montanus* Shrub Herbaceous Alliance (A.1538)
- *Cercocarpus montanus* Shrubland Alliance (A.896)
- *Elaeagnus commutata* Shrubland Alliance (A.918)
- *Elaeagnus commutata* Temporarily Flooded Shrubland Alliance (A.956)
- *Prunus virginiana* Shrubland Alliance (A.919)
- *Purshia tridentata* Shrubland Alliance (A.825)
- *Rhus trilobata* Shrub Herbaceous Alliance (A.1537)
- *Ribes cereum* Shrubland Alliance (A.923)
- *Spiraea betulifolia* Shrubland Alliance (A.2636)
- *Symphoricarpos occidentalis* Temporarily Flooded Shrubland Alliance (A.961)

SOURCES

References: Comer et al. 2003, Dick-Peddie 1993, Hess 1981, Hess and Wasser 1982, Hoffman and Alexander 1987, Marriott and Faber-Langendoen 2000, Mueggler and Stewart 1980, Muldavin 1994, Muldavin et al. 2000b, Neely et al. 2001, Roughton 1972, Thilenius et al. 1995

Version: 20 Feb 2003 **Stakeholders:** Midwest, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

48 CES303.671—WESTERN GREAT PLAINS SANDHILL SHRUBLAND

Primary Division: Western Great Plains (303)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Concept Summary: This system is found mostly in south-central areas of the Western Great Plains Division ranging from the Nebraska Sandhill region south to central Texas, although some examples may reach as far north as the Badlands of South Dakota. The climate is semi-arid to arid for much of the region in which this system occurs. This system is found on somewhat excessively to excessively well-drained, deep sandy soils that are often associated with dune systems and ancient floodplains. In some areas, this system may actually occur as a result of overgrazing in Western Great Plains Tallgrass Prairie (CES303.673) or Western Great Plains Sand Prairie (CES303.670). This system is characterized by a sparse to moderately dense woody layer dominated by *Artemisia filifolia*. Associated species can vary with geography, amount and season of precipitation, disturbance and soil texture. Several graminoid species such as *Andropogon hallii, Schizachyrium scoparium, Sporobolus cryptandrus, Calamovilfa gigantea, Hesperostipa comata*, and *Bouteloua* spp. can be connected with this system. Other shrub species may also be present including *Yucca glauca, Prosopis glandulosa, Rhus trilobata*, and *Prunus angustifolia*. In the southern range of this system, *Quercus havardii* may also be present and represents one succession pathway that develops over time following a disturbance. *Quercus havardii* is able to resprout following a fire and thus may persist for long periods of time once established. Fire and grazing are the most important dynamic processes for this type, although drought stress can impact this system significantly in some areas. Overgrazing can lead to decreasing dominance of some of the grass species such as *Andropogon hallii, Calamovilfa gigantea*, and *Schizachyrium scoparium*.

Comments: This system may overlap in concept with Crosstimbers Southern Xeric Sandhill (CES205.897).

DISTRIBUTION

Range: This system is found primarily within the south-central areas of the Western Great Plains Division ranging from the Nebraska Sandhills south into central Texas. However, examples of this system can be found as far north as the Badlands in South Dakota.

Divisions: 303:C

TNC Ecoregions: 26:C, 27:C, 28:C, 33:C

Subnations: CO, KS, NE, OK, TX?

CONCEPT

Associations:

- *Artemisia filifolia / Andropogon hallii* Shrubland (CEGL001459, G3?)
- *Artemisia filifolia / Bouteloua (curtipendula, gracilis)* Shrubland (CEGL002176, GNR)
- *Artemisia filifolia / Calamovilfa longifolia* Shrubland (CEGL002177, G2G3)
- *Artemisia filifolia / Schizachyrium scoparium - Andropogon hallii* Shrubland (CEGL002178, GNR)
- *Artemisia filifolia / Sporobolus cryptandrus* Shrubland (CEGL002179, GNR)
- *Prunus angustifolia / Schizachyrium scoparium* Shrubland (CEGL002180, GNA)
- *Quercus havardii / Sporobolus cryptandrus - Schizachyrium scoparium* Shrubland (CEGL002171, G3)

Alliances:

- *Artemisia filifolia* Shrubland Alliance (A.816)
- *Prunus angustifolia* Shrubland Alliance (A.1884)
- *Quercus havardii* Shrubland Alliance (A.780)

Environment: This system is found primarily in semi-arid to arid areas of the Western Great Plains Division. It occurs on somewhat excessively to excessively well-drained and deep sandy soils. This system is often found associated with dune systems and/or ancient floodplains but may occur in soils derived from sandstone residuum.

Vegetation: This system is distinguished by a sparse to a moderately dense shrub layer dominated by *Artemisia filifolia*. Graminoid species such as *Andropogon hallii, Schizachyrium scoparium, Sporobolus cryptandrus, Calamovilfa gigantea, Hesperostipa comata*, and *Bouteloua* spp. can also be found within this system. Other shrub species such as *Yucca glauca, Rhus trilobata*, and *Prunus angustifolia* may be present. *Quercus havardii* and *Prosopis glandulosa* may also be present in the southern extent of this system.

Dynamics: Fire and grazing constitute the most important processes impacting this system. Burning shrublands reduces cover of *Artemisia filifolia* for several years resulting in grassland patches that form a mosaic pattern with shrublands. Composition of grasslands depends on precipitation and management. Drought stress can also influence this system in some areas.

SOURCES

References: Comer et al. 2003, Ramaley 1939b, Sims et al. 1976, Tolstead 1942

Version: 11 Nov 2003 **Stakeholders:** Midwest, Southeast, West

Concept Author: S. Menard and K. Kindscher **LeadResp:** Midwest

50 CES304.772—INTER-MOUNTAIN BASINS MOUNTAIN MAHOGANY WOODLAND AND SHRUBLAND

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Aridic; Cercocarpus ledifolius
Concept Summary: This ecological system occurs in hills and mountain ranges of the Intermountain basins from the eastern foothills of the Sierra Nevada northeast to the foothills of the Big Horn Mountains. It typically occurs from 600 m to over 2650 m in elevation on rocky outcrops or escarpments and forms small- to large-patch stands in forested areas. Most stands occur as shrublands on ridges and steep rimrock slopes, but they may be composed of small trees in steppe areas. Scattered junipers or pines may also occur. This system includes both woodlands and shrublands dominated by *Cercocarpus ledifolius*. *Artemisia tridentata ssp. vaseyana, Purshia tridentata*, with species of *Arctostaphylos, Ribes*, or *Symphoricarpos* are often present. Undergrowth is often very sparse and dominated by bunch grasses, usually *Pseudoroegneria spicata* and *Festuca idahoensis*. *Cercocarpus ledifolius* is a slow-growing, drought-tolerant species that generally does not resprout after burning and needs the protection from fire that rocky sites provide.

DISTRIBUTION

Range: Occurs in hills and mountain ranges of the Intermountain basins from the eastern foothills of the Sierra Nevada northeast to the foothills of the Big Horn Mountains.
Divisions: 206:?, 304:C, 306:C
TNC Ecoregions: 6:P, 9:C, 10:P, 11:C, 12:C
Subnations: CA, CO, ID, MT, NV, OR, UT, WY

CONCEPT

Associations:
- *Artemisia arbuscula - Cercocarpus ledifolius / Pseudoroegneria spicata - Poa secunda* Shrubland (CEGL001487, G4Q)
- *Cercocarpus ledifolius / Artemisia tridentata* Woodland (CEGL000960, G3G4)
- *Cercocarpus ledifolius / Artemisia tridentata* ssp. *vaseyana* Woodland (CEGL001022, G3)
- *Cercocarpus ledifolius / Calamagrostis rubescens* Woodland (CEGL000961, G2)
- *Cercocarpus ledifolius / Festuca idahoensis* Woodland (CEGL000962, G3)
- *Cercocarpus ledifolius / Holodiscus dumosus* Woodland (CEGL000963, G1G2)
- *Cercocarpus ledifolius / Leymus salinus* ssp. *salmonis* Woodland (CEGL000964, G2Q)
- *Cercocarpus ledifolius / Mahonia repens* Shrubland (CEGL000965, GNR)
- *Cercocarpus ledifolius / Prunus virginiana* Shrubland (CEGL000966, G4)
- *Cercocarpus ledifolius / Pseudoroegneria spicata - Festuca idahoensis* Woodland (CEGL000968, G3G4)
- *Cercocarpus ledifolius / Pseudoroegneria spicata* Shrubland (CEGL000967, G4Q)
- *Cercocarpus ledifolius / Symphoricarpos longiflorus* Shrubland (CEGL000969, G4)
- *Cercocarpus ledifolius / Symphoricarpos oreophilus* Woodland (CEGL000970, G2)
- *Cercocarpus ledifolius* Woodland [Placeholder] (CEGL003038, G4?)

Alliances:
- *Cercocarpus ledifolius* Shrubland Alliance (A.828)
- *Cercocarpus ledifolius* Woodland Alliance (A.586)

SOURCES

References: Comer et al. 2003, Dealy 1975, Dealy 1978, Knight 1994, Knight et al. 1987, Lewis 1975b, Mueggler and Stewart 1980
Version: 31 Aug 2005 **Stakeholders:** West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

51 CES305.795—MADREAN ENCINAL

Primary Division: Sierra Madre (305)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Tropical/Subtropical [Tropical Xeric]; Xeric; F-Patch/Medium Intensity; Broad-Leaved Evergreen Tree; Graminoid; Quercus arizonica, Q. emoryi, Q. grisea, Q. oblongifolia Q. toumeyi
Concept Summary: Madrean Encinal occurs on foothills, canyons, bajadas and plateaus in the Sierra Madre Occidentale and Sierra Madre Orientale in Mexico, extending north into Trans-Pecos Texas, southern New Mexico and sub-Mogollon Arizona. These woodlands are dominated by Madrean evergreen oaks along a low-slope transition below Madrean Pine-Oak Forest and Woodland (CES305.796) and Madrean Pinyon-Juniper Woodland (CES305.797). Lower elevation stands are typically open woodlands or savannas where they transition into desert grasslands, chaparral or in some cases desertscrub. Common evergreen oak species include *Quercus arizonica*, *Quercus emoryi*,

Quercus intricata, Quercus grisea, Quercus oblongifolia, Quercus toumeyi, and in Mexico *Quercus chihuahuensis* and *Quercus albocincta*. Madrean pine, Arizona cypress, pinyon and juniper trees may be present but do not codominate. Chaparral species such as *Arctostaphylos pungens, Cercocarpus montanus, Purshia* spp., *Garrya wrightii, Quercus turbinella, Frangula betulifolia (= Rhamnus betulifolia)*, or *Rhus* spp. may be present but do not dominate. The graminoid layer is usually prominent between trees in grassland or steppe that is dominated by warm-season grasses such as *Aristida* spp., *Bouteloua gracilis, Bouteloua curtipendula, Bouteloua rothrockii, Digitaria californica, Eragrostis intermedia, Hilaria belangeri, Leptochloa dubia, Muhlenbergia* spp., *Pleuraphis jamesii*, or *Schizachyrium cirratum*, species typical of Apacherian-Chihuahuan Semi-Desert Grassland and Steppe (CES302.735). This system includes seral stands dominated by shrubby Madrean oaks typically with a strong graminoid layer. In transition areas with drier chaparral systems, stands of chaparral are not dominated by Madrean oaks; however, Madrean Encinal may extend down along drainages.
Comments: Although some stands may be shrubby especially in the north, E. Muldavin (pers. comm.) says encinal is considered woodland in Mexico.

DISTRIBUTION

Range: Sierra Madre Occidentale and Sierra Madre Orientale in Mexico, Trans-Pecos Texas, southern New Mexico and southeastern Arizona.
Divisions: 305:C
TNC Ecoregions: 22:C, 23:C, 24:C, 30:P
Subnations: AZ, NM, TX

CONCEPT

Associations:
- *Cupressus arizonica / Quercus hypoleucoides* Forest (CEGL000352, G2)
- *Cupressus arizonica / Quercus turbinella* Forest (CEGL000353, G2G3)
- *Quercus arizonica / Bouteloua curtipendula* Woodland (CEGL000680, G3)
- *Quercus arizonica / Muhlenbergia emersleyi* Woodland (CEGL000681, G4)
- *Quercus emoryi / Arctostaphylos pungens* Woodland (CEGL000682, GNR)
- *Quercus emoryi / Bouteloua curtipendula* Woodland (CEGL000683, G3)
- *Quercus emoryi / Dasylirion wheeleri* Woodland (CEGL000684, G3)
- *Quercus emoryi / Muhlenbergia emersleyi* Woodland (CEGL000685, G4)
- *Quercus emoryi / Piptochaetium fimbriatum* Woodland (CEGL000686, G2)
- *Quercus emoryi / Schizachyrium cirratum* Woodland (CEGL000687, GNR)
- *Quercus emoryi / Sporobolus flexuosus* Woodland (CEGL000688, G1)
- *Quercus grisea / Bouteloua curtipendula* Woodland (CEGL000689, G5)
- *Quercus grisea / Cercocarpus montanus* Woodland (CEGL000690, G5?)
- *Quercus grisea / Juniperus deppeana* Woodland (CEGL003521, GNR)
- *Quercus grisea / Rhus trilobata* Woodland (CEGL000691, GNR)
- *Quercus intricata - Dasylirion leiophyllum* Shrubland (CEGL004530, GNR)
- *Quercus oblongifolia / Bouteloua curtipendula* Shrubland (CEGL000973, G4)
- *Quercus oblongifolia / Dasylirion wheeleri* Shrubland (CEGL000974, G4)
- *Quercus pungens - Cercocarpus montanus* Shrubland (CEGL003832, G3?)
- *Quercus toumeyi / Bouteloua curtipendula* Shrubland (CEGL000975, G1)
- *Quercus toumeyi / Muhlenbergia emersleyi* Shrubland (CEGL000976, G1)

Alliances:
- *Cupressus arizonica* Forest Alliance (A.163)
- *Quercus arizonica* Woodland Alliance (A.482)
- *Quercus emoryi* Woodland Alliance (A.483)
- *Quercus grisea* Woodland Alliance (A.478)
- *Quercus intricata* Shrubland Alliance (A.781)
- *Quercus oblongifolia* Shrubland Alliance (A.791)
- *Quercus pungens* Shrubland Alliance (A.783)
- *Quercus toumeyi* Shrubland Alliance (A.792)

SPATIAL CHARACTERISTICS

Adjacent Ecological System Comments: This system occurs along a low-slope transition from Madrean Pinyon-Juniper Woodland (CES305.797) or Madrean Pine-Oak Forest and Woodland (CES305.796).

SOURCES

References: Barbour and Billings 2000, Brown 1982, Brown et al. 1980, Brown et al. 1998, Comer et al. 2003, Muldavin pers. comm.
Version: 11 Nov 2003 **Stakeholders:** Latin America, Southeast, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

52 CES304.766—COLORADO PLATEAU PINYON-JUNIPER SHRUBLAND

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Foothill]; Mesa; Ridge/Summit/Upper Slope; Sedimentary Rock; Temperate [Temperate Xeric]; Aridic; Pinus edulis, Juniperus osteosperma
Concept Summary: This ecological system is characteristic of the rocky mesatops and slopes on the Colorado Plateau and western slope of Colorado, but these stunted tree shrublands may extend further upslope along the low-elevation margins of taller pinyon-juniper woodlands. Sites are drier than Colorado Plateau Pinyon-Juniper Woodland (CES304.767). Substrates are shallow/rocky and shaley soils at lower elevations (1200-2000 m). Sparse examples of the system grade into Colorado Plateau Mixed Bedrock Canyon and Tableland (CES304.765). The vegetation is dominated by dwarfed (usually <3 m tall) *Pinus edulis* and/or *Juniperus osteosperma* trees forming extensive tall shrublands in the region along low-elevation margins of pinyon-juniper woodlands. Other shrubs, if present, may include *Artemisia nova, Artemisia tridentata ssp. wyomingensis, Chrysothamnus viscidiflorus*, or *Coleogyne ramosissima*. Herbaceous layers are sparse to moderately dense and typically composed of xeric graminoids.

DISTRIBUTION

Range: Rocky mesa tops and slopes on the Colorado Plateau.
Divisions: 304:C, 306:?
TNC Ecoregions: 18:C, 19:C, 20:?
Subnations: AZ, CO, NM, UT

CONCEPT

Associations:
- *Juniperus osteosperma / Cercocarpus intricatus* Woodland (CEGL000733, GNR)
- *Pinus edulis - Juniperus osteosperma / Arctostaphylos patula* Woodland (CEGL002939, GNR)
- *Pinus edulis - Juniperus osteosperma / Cercocarpus intricatus* Woodland (CEGL000779, G3)
- *Pinus edulis - Juniperus osteosperma / Coleogyne ramosissima* Woodland (CEGL000781, G3)
- *Pinus edulis - Juniperus osteosperma / Purshia stansburiana* Woodland (CEGL000782, G4?)
- *Pinus edulis - Juniperus* spp. / *Cercocarpus montanus* - Mixed Shrub Woodland (CEGL000780, G5)
- *Pinus edulis / Arctostaphylos pungens* Woodland (CEGL000775, G3)
- *Pinus edulis / Purshia tridentata* Woodland (CEGL000789, G5)
- *Pinus edulis* / Rockland Woodland (CEGL000794, G5)

Alliances:
- *Juniperus osteosperma* Woodland Alliance (A.536)
- *Pinus edulis - (Juniperus* spp.) Woodland Alliance (A.516)

SOURCES

References: Comer et al. 2003, Tuhy et al. 2002, West et al. 1998
Version: 05 Oct 2004 **Stakeholders:** West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

53 CES304.001—GREAT BASIN SEMI-DESERT CHAPARRAL

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Shrubland (Shrub-dominated); Temperate [Temperate Continental]; Broad-Leaved Evergreen Shrub
Concept Summary: This system includes chaparral on sideslopes transitioning from low-elevation desert landscapes up into pinyon-juniper woodlands of the western and central Great Basin. There are limited occurrences extending as far west as the inner Coast Ranges in central California. These are typically fairly open-canopy shrublands with open spaces either bare or supporting patchy grasses and forbs. Characteristic species may include *Arctostaphylos patula, Arctostaphylos pungens, Ceanothus greggii, Ceanothus velutinus, Cercocarpus montanus var. glaber, Cercocarpus intricatus, Eriogonum fasciculatum, Garrya flavescens, Quercus turbinella, Purshia stansburiana*, and *Rhus trilobata*. *Cercocarpus ledifolius* is generally absent. Typical fire regime in these systems varies with the amount of organic accumulation.

DISTRIBUTION

Range: Western and central Great Basin.
Divisions: 206:C, 304:C
TNC Ecoregions: 11:C, 12:C, 15:P
Subnations: CA, NV

CONCEPT

Associations:
- *Arctostaphylos patula - Artemisia tridentata* ssp. *vaseyana* Shrubland (CEGL002694, GNR)
- *Arctostaphylos patula - Quercus gambelii - (Amelanchier utahensis)* Shrubland (CEGL002695, GNR)
- *Arctostaphylos patula / Ceanothus velutinus - Ceanothus prostratus* Shrubland (CEGL000957, G3)
- *Arctostaphylos patula* Shrubland (CEGL002696, GNR)
- *Arctostaphylos pungens* Shrubland (CEGL000958, G4)
- *Ceanothus greggii - Fremontodendron californicum* Shrubland [Placeholder] (CEGL003026, G3?)
- *Ceanothus leucodermis* Shrubland [Placeholder] (CEGL003028, G4?)
- *Cercocarpus montanus* var. *glaber - Eriogonum fasciculatum* Shrubland [Placeholder] (CEGL003036, G3?)
- *Purshia stansburiana / Pseudoroegneria spicata* Shrubland (CEGL001053, G2G4)
- *Purshia stansburiana* Shrubland [Provisional] (CEGL002957, GNR)
- *Quercus turbinella - (Amelanchier utahensis)* Colluvial Shrubland (CEGL002950, GNR)
- *Quercus turbinella - Ephedra viridis* Shrubland (CEGL000980, G3?)
- *Quercus turbinella - Juniperus osteosperma* Shrubland (CEGL000981, G4?)

Alliances:
- *Arctostaphylos patula* Shrubland Alliance (A.788)
- *Arctostaphylos pungens* Shrubland Alliance (A.789)
- *Ceanothus greggii - Fremontodendron californicum* Shrubland Alliance (A.766)
- *Ceanothus leucodermis* Shrubland Alliance (A.767)
- *Cercocarpus montanus - Eriogonum fasciculatum* Shrubland Alliance (A.848)
- *Purshia (stansburiana, mexicana)* Shrubland Alliance (A.833)
- *Quercus turbinella* Shrubland Alliance (A.793)

SOURCES

References: Barbour and Major 1977, Comer et al. 2003, Sawyer and Keeler-Wolf 1995
Version: 24 Mar 2003 **Stakeholders:** West
Concept Author: K. Schulz, P. Comer **LeadResp:** West

54 CES304.777—INTER-MOUNTAIN BASINS BIG SAGEBRUSH SHRUBLAND

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Toeslope/Valley Bottom; Deep Soil; Aridic; Artemisia tridentata ssp. tridentata
Concept Summary: This ecological system occurs throughout much of the western U.S., typically in broad basins between mountain ranges, plains and foothills between 1500 and 2300 m elevation. Soils are typically deep, well-drained and non-saline. These shrublands are dominated by *Artemisia tridentata ssp. tridentata* and/or *Artemisia tridentata ssp. wyomingensis*. Scattered *Juniperus* spp., *Sarcobatus vermiculatus*, and *Atriplex* spp. may be present in some stands. *Ericameria nauseosa, Chrysothamnus viscidiflorus, Purshia tridentata*, or *Symphoricarpos oreophilus* may codominate disturbed stands. Perennial herbaceous components typically contribute less than 25% vegetative cover. Common graminoid species include *Achnatherum hymenoides, Bouteloua gracilis, Elymus lanceolatus, Festuca idahoensis, Hesperostipa comata, Leymus cinereus, Pleuraphis jamesii, Pascopyrum smithii, Poa secunda*, or *Pseudoroegneria spicata*.

DISTRIBUTION

Range: Occurs throughout much of the western U.S., typically in broad basins between mountain ranges, plains and foothills between 1500-2300 m elevation.
Divisions: 303:C, 304:C, 306:C
TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 26:C, 27:C
Subnations: CA, CO, ID, MT, NV, OR, UT, WA, WY

CONCEPT

Associations:
- *Artemisia tridentata (*ssp. *tridentata*, ssp. *xericensis) / Pseudoroegneria spicata - Poa secunda* Shrub Herbaceous Vegetation (CEGL001019, G1)
- *Artemisia tridentata (*ssp. *tridentata*, ssp. *xericensis) / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001018, G2G4)
- *Artemisia tridentata - (Ericameria nauseosa) / Bromus tectorum* Semi-natural Shrubland (CEGL002699, GNR)
- *Artemisia tridentata - Atriplex canescens - Sarcobatus vermiculatus / (Achnatherum hymenoides)* Shrubland (CEGL001355, G1)
- *Artemisia tridentata - Ephedra nevadensis* Shrubland (CEGL001002, G5)
- *Artemisia tridentata - Ephedra viridis* Shrubland (CEGL001003, G5)
- *Artemisia tridentata / Achnatherum hymenoides* Shrubland (CEGL001006, G3G5)
- *Artemisia tridentata / Achnatherum lettermanii* Shrubland (CEGL001011, G5)

- *Artemisia tridentata / Bouteloua gracilis - Pascopyrum smithii* Shrubland (CEGL000997, G5)
- *Artemisia tridentata / Bouteloua gracilis - Pleuraphis jamesii* Shrubland (CEGL000996, G5)
- *Artemisia tridentata / Bouteloua gracilis* Shrubland (CEGL000995, G4)
- *Artemisia tridentata / Chrysothamnus viscidiflorus / Poa secunda* Shrubland (CEGL000999, G5)
- *Artemisia tridentata / Elymus elymoides* Shrubland (CEGL001001, G5?)
- *Artemisia tridentata / Ericameria nauseosa* Shrubland (CEGL000998, G5)
- *Artemisia tridentata / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001530, G4Q)
- *Artemisia tridentata / Leymus cinereus* Shrub Herbaceous Vegetation (CEGL001458, G2G4)
- *Artemisia tridentata / Pleuraphis jamesii* Shrubland (CEGL001005, G5)
- *Artemisia tridentata / Symphoricarpos longiflorus* Shrubland (CEGL001012, G5)
- *Artemisia tridentata* Shrubland (CEGL000991, G5?)
- *Artemisia tridentata* Upperzone Community Shrubland (CEGL001013, G5?)
- *Artemisia tridentata* ssp. *tridentata - Grayia spinosa* Shrubland (CEGL001004, G5)
- *Artemisia tridentata* ssp. *tridentata / Distichlis spicata* Shrubland (CEGL001000, G5)
- *Artemisia tridentata* ssp. *tridentata / Festuca idahoensis* Shrubland (CEGL001014, G4?)
- *Artemisia tridentata* ssp. *tridentata / Hesperostipa comata* Shrubland (CEGL002966, G4?)
- *Artemisia tridentata* ssp. *tridentata / Leymus cinereus* Shrubland (CEGL001016, G2)
- *Artemisia tridentata* ssp. *tridentata / Pascopyrum smithii - (Elymus lanceolatus)* Shrubland (CEGL001017, G3?)
- *Artemisia tridentata* ssp. *tridentata / Pleuraphis jamesii* Shrubland (CEGL001015, G2G4)
- *Artemisia tridentata* ssp. *tridentata / Poa secunda* Shrubland (CEGL001008, G3G5)
- *Artemisia tridentata* ssp. *wyomingensis - Atriplex confertifolia* Shrubland (CEGL001040, G3G5)
- *Artemisia tridentata* ssp. *wyomingensis - Peraphyllum ramosissimum / Festuca idahoensis* Shrubland (CEGL001048, G2)
- *Artemisia tridentata* ssp. *wyomingensis - Purshia tridentata / Pseudoroegneria spicata* Shrubland (CEGL001050, G3Q)
- *Artemisia tridentata* ssp. *wyomingensis / Achnatherum hymenoides* Shrubland (CEGL001046, G5)
- *Artemisia tridentata* ssp. *wyomingensis / Achnatherum thurberianum* Shrubland (CEGL001052, G3)
- *Artemisia tridentata* ssp. *wyomingensis / Balsamorhiza sagittata* Shrubland (CEGL000994, G5)
- *Artemisia tridentata* ssp. *wyomingensis / Carex filifolia* Shrubland (CEGL001042, G1Q)
- *Artemisia tridentata* ssp. *wyomingensis / Elymus albicans* Shrubland (CEGL001044, G4)
- *Artemisia tridentata* ssp. *wyomingensis / Elymus elymoides* Shrubland (CEGL001043, G4G5)
- *Artemisia tridentata* ssp. *wyomingensis / Hesperostipa comata* Colorado Plateau Shrubland (CEGL002761, GNR)
- *Artemisia tridentata* ssp. *wyomingensis / Hesperostipa comata* Shrubland (CEGL001051, G2)
- *Artemisia tridentata* ssp. *wyomingensis / Leymus ambiguus* Shrubland (CEGL001045, G2)
- *Artemisia tridentata* ssp. *wyomingensis* / Mixed Grasses Shrub Herbaceous Vegetation (CEGL001534, G5)
- *Artemisia tridentata* ssp. *wyomingensis / Pascopyrum smithii* Shrub Herbaceous Vegetation (CEGL001047, G4)
- *Artemisia tridentata* ssp. *wyomingensis / Poa fendleriana* Shrubland (CEGL002775, GNR)
- *Artemisia tridentata* ssp. *wyomingensis / Poa secunda* Shrubland (CEGL001049, G4)
- *Artemisia tridentata* ssp. *wyomingensis / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001535, G4)
- *Artemisia tridentata* ssp. *wyomingensis / Pseudoroegneria spicata* Shrubland (CEGL001009, G5?)
- *Artemisia tridentata* ssp. *wyomingensis* / Sparse Understory Shrubland (CEGL002768, GNR)
- *Ericameria nauseosa* Shrubland (CEGL002713, G5)

Alliances:

- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrub Herbaceous Alliance (A.1522)
- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrubland Alliance (A.830)
- *Artemisia tridentata* Shrub Herbaceous Alliance (A.1521)
- *Artemisia tridentata* Shrubland Alliance (A.829)
- *Artemisia tridentata* ssp. *wyomingensis* Shrub Herbaceous Alliance (A.1527)
- *Artemisia tridentata* ssp. *wyomingensis* Shrubland Alliance (A.832)
- *Atriplex canescens* Shrubland Alliance (A.869)
- *Ephedra nevadensis* Shrubland Alliance (A.857)
- *Ephedra viridis* Shrubland Alliance (A.858)
- *Ericameria nauseosa* Shrubland Alliance (A.835)

SOURCES

References: Barbour and Billings 1988, Barbour and Major 1977, Comer et al. 2003, Holland and Keil 1995, West 1983a

Version: 05 Oct 2004 **Stakeholders:** Midwest, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

55 CES304.774—GREAT BASIN XERIC MIXED SAGEBRUSH SHRUBLAND

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Foothill]; Shrubland (Shrub-dominated); Ridge/Summit/Upper Slope; Aridic; Low Artemisia spp.
Concept Summary: This ecological system occurs in the Great Basin on dry flats and plains, alluvial fans, rolling hills, rocky hillslopes, saddles and ridges at elevations between 1000 and 2600 m. Sites are dry, often exposed to desiccating winds, with typically shallow, rocky, non-saline soils. Shrublands are dominated by *Artemisia nova* (mid and low elevations), *Artemisia arbuscula* (higher elevation) and may be codominated by *Artemisia tridentata ssp. wyomingensis* or *Chrysothamnus viscidiflorus*. Other shrubs that may be present include *Atriplex confertifolia, Ephedra* spp., *Ericameria* spp., *Grayia spinosa, Lycium shockleyi, Picrothamnus desertorum, Sarcobatus vermiculatus,* and *Tetradymia* spp. The herbaceous layer is likely sparse and composed of perennial bunch grasses such as *Achnatherum hymenoides, Achnatherum speciosum, Achnatherum thurberianum, Elymus elymoides,* or *Poa secunda*.

DISTRIBUTION

Range: Occurs in the Great Basin on dry flats and plains, alluvial fans, rolling hills, rocky hill slopes, saddles and ridges at elevations between 1000-2600 m.
Divisions: 206:C, 304:C
TNC Ecoregions: 6:P, 11:C, 12:C, 18:P
Subnations: CA, ID?, NV, OR, UT

CONCEPT

Associations:
- *Artemisia arbuscula* ssp. *arbuscula - Artemisia tridentata* ssp. *wyomingensis / Festuca idahoensis* Shrubland [Provisional] (CEGL002983, GNR)
- *Artemisia arbuscula* ssp. *arbuscula - Purshia tridentata / Pseudoroegneria spicata - Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001518, G2G3)
- *Artemisia arbuscula* ssp. *arbuscula / Achnatherum thurberianum* Shrub Herbaceous Vegetation (CEGL001413, G4G5)
- *Artemisia arbuscula* ssp. *arbuscula / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001409, G5)
- *Artemisia arbuscula* ssp. *arbuscula / Leymus salinus* ssp. *salmonis* Shrub Herbaceous Vegetation (CEGL001410, G1G2Q)
- *Artemisia arbuscula* ssp. *arbuscula / Poa secunda* Shrub Herbaceous Vegetation (CEGL001411, G5)
- *Artemisia arbuscula* ssp. *arbuscula / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001412, G5)
- *Artemisia arbuscula* ssp. *longicaulis - Grayia spinosa* Shrubland (CEGL002984, G4)
- *Artemisia arbuscula* ssp. *longicaulis / Bromus tectorum* Semi-natural Shrubland (CEGL002985, GNA)
- *Artemisia arbuscula* ssp. *longicaulis / Elymus elymoides* Shrubland (CEGL002986, G3)
- *Artemisia arbuscula* ssp. *longiloba / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001522, G3)
- *Artemisia arbuscula* ssp. *longiloba / Pascopyrum smithii* Shrub Herbaceous Vegetation (CEGL001415, GU)
- *Artemisia arbuscula* ssp. *longiloba / Poa secunda* Shrub Herbaceous Vegetation (CEGL001523, G3Q)
- *Artemisia arbuscula* ssp. *longiloba / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001416, GNR)
- *Artemisia arbuscula* ssp. *longiloba* Shrubland (CEGL001414, G4G5)
- *Artemisia nova - Ericameria nana* Shrubland (CEGL002773, G3)
- *Artemisia nova - Gutierrezia sarothrae / Bouteloua gracilis - Pleuraphis jamesii* Shrubland (CEGL001419, G4)
- *Artemisia nova / Achnatherum hymenoides* Shrubland (CEGL001422, G4G5)
- *Artemisia nova / Elymus elymoides* Shrubland (CEGL001418, G4G5)
- *Artemisia nova / Hesperostipa comata* Shrubland (CEGL001425, G3?)
- *Artemisia nova / Pleuraphis jamesii* Shrubland (CEGL001420, G3G5)
- *Artemisia nova / Poa fendleriana* Shrubland (CEGL002698, GNR)
- *Artemisia nova / Poa secunda* Shrubland (CEGL001423, G3)
- *Artemisia nova / Pseudoroegneria spicata* Shrubland (CEGL001424, G4G5)
- *Artemisia nova* Shrubland (CEGL001417, G3G5)
- *Artemisia tridentata* ssp. *wyomingensis - Atriplex confertifolia* Shrubland (CEGL001040, G3G5)
- *Artemisia tridentata* ssp. *wyomingensis - Purshia tridentata / Pseudoroegneria spicata* Shrubland (CEGL001050, G3Q)
- *Artemisia tridentata* ssp. *wyomingensis / Achnatherum hymenoides* Shrubland (CEGL001046, G5)
- *Artemisia tridentata* ssp. *wyomingensis / Achnatherum thurberianum* Shrubland (CEGL001052, G3)
- *Artemisia tridentata* ssp. *wyomingensis / Balsamorhiza sagittata* Shrubland (CEGL000994, G5)
- *Artemisia tridentata* ssp. *wyomingensis / Bouteloua gracilis* Shrubland (CEGL001041, G5)
- *Artemisia tridentata* ssp. *wyomingensis / Elymus elymoides* Shrubland (CEGL001043, G4G5)
- *Artemisia tridentata* ssp. *wyomingensis / Hesperostipa comata* Shrubland (CEGL001051, G2)
- *Artemisia tridentata* ssp. *wyomingensis* / Mixed Grasses Shrub Herbaceous Vegetation (CEGL001534, G5)
- *Artemisia tridentata* ssp. *wyomingensis / Poa secunda* Shrubland (CEGL001049, G4)
- *Artemisia tridentata* ssp. *wyomingensis / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001535, G4)
- *Artemisia tridentata* ssp. *wyomingensis / Pseudoroegneria spicata* Shrubland (CEGL001009, G5?)
- *Grayia spinosa / Artemisia nova / Achnatherum speciosum* Shrubland (CEGL001344, G4)

Alliances:
- *Artemisia arbuscula* ssp. *arbuscula* Shrub Herbaceous Alliance (A.1566)
- *Artemisia arbuscula* ssp. *arbuscula* Shrubland Alliance (A.2547)

- *Artemisia arbuscula* ssp. *longicaulis* Shrubland Alliance (A.2548)
- *Artemisia arbuscula* ssp. *longiloba* Shrub Herbaceous Alliance (A.2552)
- *Artemisia arbuscula* ssp. *longiloba* Shrubland Alliance (A.2549)
- *Artemisia nova* Shrubland Alliance (A.1105)
- *Artemisia tridentata* ssp. *wyomingensis* Shrub Herbaceous Alliance (A.1527)
- *Artemisia tridentata* ssp. *wyomingensis* Shrubland Alliance (A.832)
- *Grayia spinosa* Shrubland Alliance (A.1038)

Environment: This ecological system is widely distributed in the western United States. Climate is generally arid with 20 to 30 cm of annual precipitation and warm summers and cold winters. This shrubland system occurs at elevations from 1000 to 2600 m in the southwestern United States. It occupies flat to steeply sloping upland sites, on a wide variety of landform positions. These include toeslopes, lower and middle slopes, badly eroded badland slopes, and foothills. Sites with little slope tend to have deep soils, while those with steeper slopes have shallow to moderately deep soils that are well-drained. Sloping sites tend to have southerly aspects. Soil texture is loam, sandy loam, or clay loam (Hansen and Hoffman 1988), and there is often a significant amount of coarse fragments in the soil profile. Hironaka et al. (1983) reported that most of the habitat occurred on calcareous soils, often with a cemented duripan or silica hardpan at about 1 m in depth.

Dynamics: This shrubland system is associated with shallow, rocky soils which experience extreme drought in summer. The plants are low and widely spaced, which tends to decrease the risk of fire (Chappell et al. 1997). Barbour and Major (1988) report that *Artemisia nova* is utilized by livestock to a much greater degree than other species of *Artemisia*, resulting in low, pruned plants. *Artemisia nova* dwarf-shrublands grow in more xeric sites than other *Artemisia* shrublands. Blackburn and Tueller (1970) noted rapid invasion of these communities by *Juniperus osteosperma* and *Pinus monosperma* in Nevada, citing overgrazing coupled with fire suppression, and possibly climate change as causative variables.

SOURCES

References: Baker and Kennedy 1985, Barbour and Major 1988, Blackburn and Tueller 1970, Chappell et al. 1997, Comer et al. 2003, Hansen and Hoffman 1988, Hironaka et al. 1983, West 1983a

Version: 20 Feb 2003 **Stakeholders:** West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

56 CES304.762—COLORADO PLATEAU MIXED LOW SAGEBRUSH SHRUBLAND

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Shrubland (Shrub-dominated); Ridge/Summit/Upper Slope; Temperate [Temperate Xeric]; Aridic

Concept Summary: This ecological system occurs in the Colorado Plateau, Tavaputs Plateau and Uinta Basin in canyons, gravelly draws, hilltops, and dry flats at elevations generally below 1800 m. Soils are often rocky, shallow, and alkaline. This type extends across northern New Mexico into the southern Great Plains on limestone hills. It includes open shrublands and steppe dominated by *Artemisia nova* or *Artemisia bigelovii* sometimes with *Artemisia tridentata ssp. wyomingensis* codominant. Semi-arid grasses such as *Achnatherum hymenoides*, *Aristida purpurea*, *Bouteloua gracilis*, *Hesperostipa comata*, *Pleuraphis jamesii*, or *Poa fendleriana* are often present and may form a graminoid layer with over 25% cover.

DISTRIBUTION

Range: Occurs in the Colorado Plateau, Tavaputs Plateau and Uinta Basin in canyons, gravelly draws, hilltops, and dry flats at elevations generally below 1800 m.

Divisions: 303:C, 304:C

TNC Ecoregions: 18:C, 19:C, 20:C, 27:C, 28:C

Subnations: AZ, CO, NM

CONCEPT

Associations:

- *Artemisia bigelovii / Achnatherum hymenoides* Shrubland (CEGL000990, G3Q)
- *Artemisia bigelovii / Bouteloua eriopoda* Dwarf-shrub Herbaceous Vegetation (CEGL001741, GNRQ)
- *Artemisia bigelovii / Bouteloua gracilis* Dwarf-shrub Herbaceous Vegetation (CEGL001742, GNR)
- *Artemisia bigelovii* Shrubland (CEGL000276, GNR)
- *Artemisia nova - Ericameria nana* Shrubland (CEGL002773, G3)
- *Artemisia nova - Gutierrezia sarothrae / Bouteloua gracilis - Pleuraphis jamesii* Shrubland (CEGL001419, G4)
- *Artemisia nova / Achnatherum hymenoides* Shrubland (CEGL001422, G4G5)
- *Artemisia nova / Elymus elymoides* Shrubland (CEGL001418, G4G5)
- *Artemisia nova / Hesperostipa comata* Shrubland (CEGL001425, G3?)
- *Artemisia nova / Pleuraphis jamesii* Shrubland (CEGL001420, G3G5)
- *Artemisia nova / Poa fendleriana* Shrubland (CEGL002698, GNR)

- *Artemisia nova / Poa secunda* Shrubland (CEGL001423, G3)
- *Artemisia nova / Pseudoroegneria spicata* Shrubland (CEGL001424, G4G5)
- *Artemisia nova* Shrubland (CEGL001417, G3G5)
- *Artemisia tridentata* ssp. *wyomingensis / Bouteloua gracilis* Shrubland (CEGL001041, G5)

Alliances:

- *Artemisia bigelovii* Shrubland Alliance (A.1103)
- *Artemisia nova* Shrubland Alliance (A.1105)
- *Artemisia tridentata* ssp. *wyomingensis* Shrubland Alliance (A.832)
- *Bouteloua eriopoda* Dwarf-shrub Herbaceous Alliance (A.1570)
- *Bouteloua gracilis* Dwarf-shrub Herbaceous Alliance (A.1571)

SOURCES

References: Brown 1982, Comer et al. 2003, Dick-Peddie 1993, Francis 1986
Version: 20 Feb 2003 **Stakeholders:** West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

57 CES302.741—MOGOLLON CHAPARRAL

Primary Division: North American Warm Desert (302)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Intermediate Disturbance Interval; F-Patch/High Intensity; Evergreen Sclerophyllous Shrub
Concept Summary: This ecological system occurs across central Arizona (Mogollon Rim), western New Mexico and southern Utah and Nevada. It often dominants along the mid-elevation transition from the Mojave, Sonoran, and northern Chihuahuan deserts into mountains (1000-2200 m). It occurs on foothills, mountain slopes and canyons in drier habitats below the encinal and *Pinus ponderosa* woodlands. Stands are often associated with more xeric and coarse-textured substrates such as limestone, basalt or alluvium, especially in transition areas with more mesic woodlands. The moderate to dense shrub canopy includes species such as *Quercus turbinella, Quercus toumeyi, Cercocarpus montanus, Canotia holacantha, Ceanothus greggii, Forestiera pubescens (= Forestiera neomexicana), Garrya wrightii, Juniperus deppeana, Purshia stansburiana, Rhus ovata, Rhus trilobata,* and *Arctostaphylos pungens* and *Arctostaphylos pringlei* at higher elevations. Most chaparral species are fire-adapted, resprouting vigorously after burning or producing fire-resistant seeds. Stands occurring within montane woodlands are seral and a result of recent fires.

DISTRIBUTION

Range: Occurs across central Arizona (Mogollon Rim), western New Mexico and southern Utah. It often dominants along the mid-elevation transition from the Mojave, Sonoran, and northern Chihuahuan deserts into mountains (1000-2200 m).
Divisions: 302:C, 304:P, 306:P
TNC Ecoregions: 17:C, 19:C, 21:C, 22:C, 23:C, 24:C
Subnations: AZ, CA?, MXSO?, NM, NV, UT

CONCEPT

Associations:

- *Arctostaphylos patula - Quercus gambelii - (Amelanchier utahensis)* Shrubland (CEGL002695, GNR)
- *Arctostaphylos patula* Shrubland (CEGL002696, GNR)
- *Arctostaphylos pungens* Shrubland (CEGL000958, G4)
- *Cercocarpus montanus / Garrya flavescens* Shrubland (CEGL001088, GNR)
- *Cercocarpus montanus / Muhlenbergia pauciflora* Shrubland (CEGL001089, GNR)
- *Mortonia scabrella / Dasylirion wheeleri* Shrubland (CEGL001279, G4)
- *Purshia stansburiana - Arctostaphylos patula* Shrubland [Provisional] (CEGL002948, GNR)
- *Quercus pungens - Cercocarpus montanus* Shrubland (CEGL003832, G3?)
- *Quercus toumeyi / Bouteloua curtipendula* Shrubland (CEGL000975, G1)
- *Quercus turbinella - (Amelanchier utahensis)* Colluvial Shrubland (CEGL002950, GNR)
- *Quercus turbinella - Cercocarpus montanus* Shrubland (CEGL000979, G4)
- *Quercus turbinella - Coleogyne ramosissima* Shrubland (CEGL000982, G4)
- *Quercus turbinella - Ephedra viridis* Shrubland (CEGL000980, G3?)
- *Quercus turbinella - Garrya flavescens - Arctostaphylos pungens* Shrubland (CEGL000977, G4)
- *Quercus turbinella - Juniperus osteosperma* Shrubland (CEGL000981, G4?)
- *Quercus turbinella / Bouteloua eriopoda* Shrubland (CEGL000978, GNR)

Alliances:

- *Arctostaphylos patula* Shrubland Alliance (A.788)
- *Arctostaphylos pungens* Shrubland Alliance (A.789)
- *Cercocarpus montanus* Shrubland Alliance (A.896)

- *Mortonia sempervirens* Shrubland Alliance (A.859)
- *Purshia (stansburiana, mexicana)* Shrubland Alliance (A.833)
- *Quercus pungens* Shrubland Alliance (A.783)
- *Quercus toumeyi* Shrubland Alliance (A.792)
- *Quercus turbinella* Shrubland Alliance (A.793)

SOURCES

References: Carmichael et al. 1978, Comer et al. 2003, Dick-Peddie 1993, Muldavin et al. 1994a, Muldavin et al. 2000b
Version: 11 Nov 2003 **Stakeholders:** Latin America, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

58 CES302.733—APACHERIAN-CHIHUAHUAN MESQUITE UPLAND SCRUB

Primary Division: North American Warm Desert (302)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Foothill, Lowland]; Shrubland (Shrub-dominated); Thorn Shrub; Prosopis spp.-dominated
Concept Summary: This ecological system occurs as upland shrublands that are concentrated in the extensive grassland-shrubland transition in foothills and piedmont in the Chihuahuan Desert. It extends into the Sky Island region to the west and the Edwards Plateau to the east. Substrates are typically derived from alluvium, often gravelly without a well-developed argillic or calcic soil horizon that would limit infiltration and storage of winter precipitation in deeper soil layers. *Prosopis* spp. and other deep-rooted shrubs exploit this deep soil moisture that is unavailable to grasses and cacti. Vegetation is typically dominated by *Prosopis glandulosa* or *Prosopis velutina* and succulents. Other desert scrub that may codominate or dominate includes *Acacia neovernicosa, Acacia constricta, Juniperus monosperma*, or *Juniperus coahuilensis*. Grass cover is typically low. During the last century, the area occupied by this system has increased through conversion of desert grasslands as a result of drought, overgrazing by livestock, and/or decreases in fire frequency. It is similar to Chihuahuan Mixed Desert and Thorn Scrub (CES302.734) but is generally found at higher elevations where *Larrea tridentata* and other desert scrub are not codominant. It is also similar to Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub (CES302.737) but does not occur on eolian-deposited substrates.

DISTRIBUTION

Range: This system is found on foothills and piedmont in the Chihuahuan Desert, extending into the Sky Island region and into the lower Mogollon Rim to the west and the Edwards Plateau to the east.
Divisions: 302:C
TNC Ecoregions: 22:C, 24:C, 29:P, 30:P
Subnations: AZ, MXCH, MXSO, NM, TX

CONCEPT

Associations:
- *Acacia neovernicosa / Flourensia cernua* Shrubland (CEGL001341, G4)
- *Acacia neovernicosa / Muhlenbergia porteri* Shrubland (CEGL001342, GNRQ)
- *Juniperus coahuilensis / Canotia holacantha* Woodland (CEGL000701, G3)
- *Juniperus monosperma / Bouteloua eriopoda* Woodland (CEGL000709, GNR)
- *Juniperus monosperma / Prosopis glandulosa* Woodland (CEGL000719, G5)
- *Prosopis glandulosa / Atriplex canescens* Shrubland (CEGL001382, G5)
- *Prosopis glandulosa / Bouteloua gracilis* Shrubland (CEGL001383, G5)
- *Prosopis glandulosa / Muhlenbergia porteri* Shrubland (CEGL001511, G5)
- *Prosopis glandulosa / Sporobolus airoides* Shrubland (CEGL001385, G5)
- *Prosopis glandulosa / Sporobolus flexuosus* Shrubland (CEGL001386, G4)
- *Prosopis glandulosa* var. *torreyana* Shrubland (CEGL001381, G3)
- *Prosopis velutina - Acacia greggii* Shrubland (CEGL001388, GUQ)
- *Prosopis velutina / Celtis laevigata* var. *reticulata* Shrubland (CEGL001390, GNR)
- *Prosopis velutina / Muhlenbergia porteri* Shrubland (CEGL001391, G3Q)

Alliances:
- *Acacia neovernicosa* Shrubland Alliance (A.1037)
- *Juniperus coahuilensis* Woodland Alliance (A.503)
- *Juniperus monosperma* Woodland Alliance (A.504)
- *Prosopis glandulosa* Shrubland Alliance (A.1031)
- *Prosopis velutina* Shrubland Alliance (A.1043)

SOURCES

References: Comer et al. 2003, MacMahon 1988, McAuliffe 1995, McPherson 1995, Muldavin et al. 2002
Version: 20 Feb 2003 **Stakeholders:** Latin America, Southeast, West

59 CES304.763—COLORADO PLATEAU BLACKBRUSH-MORMON-TEA SHRUBLAND

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Foothill]; Shrubland (Shrub-dominated); Temperate [Temperate Xeric]; Aridic
Concept Summary: This ecological system occurs in the Colorado Plateau on benchlands, colluvial slopes, pediments or bajadas. Elevation ranges from 560-1650 m. Substrates are shallow, typically calcareous, non-saline and gravelly or sandy soils over sandstone or limestone bedrock, caliche or limestone alluvium. It also occurs in deeper soils on sandy plains where it may have invaded desert grasslands. The vegetation is characterized by extensive open shrublands dominated by *Coleogyne ramosissima* often with *Ephedra viridis*, *Ephedra torreyana*, or *Grayia spinosa*. Sandy portions may include *Artemisia filifolia* as codominant. The herbaceous layer is sparse and composed of graminoids such as *Achnatherum hymenoides*, *Pleuraphis jamesii*, or *Sporobolus cryptandrus*.

DISTRIBUTION

Range: Occurs in the Colorado Plateau on benchlands, colluvial slopes, pediments or bajadas. Elevation ranges from 560-1600 m.
Divisions: 304:C
TNC Ecoregions: 18:C, 19:C
Subnations: AZ, CO, NM, UT

CONCEPT

Associations:
- *Artemisia filifolia / Bouteloua eriopoda* Shrubland (CEGL001077, G4)
- *Artemisia filifolia* Colorado Plateau Shrubland (CEGL002697, GNR)
- *Coleogyne ramosissima / Pleuraphis jamesii* Shrubland (CEGL001334, G5)
- *Coleogyne ramosissima* Shrubland (CEGL001332, G4G5)
- *Ephedra nevadensis - Ephedra viridis - Salvia dorrii - Lycium andersonii* Shrubland (CEGL001256, G4)
- *Ephedra nevadensis / Achnatherum hymenoides* Shrubland (CEGL001255, G4)
- *Ephedra torreyana / Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001731, G2)
- *Ephedra viridis / Achnatherum hymenoides - Bouteloua gracilis* Shrub Herbaceous Vegetation (CEGL001648, G2G4)
- *Ephedra viridis / Achnatherum hymenoides - Sporobolus cryptandrus* Shrub Herbaceous Vegetation (CEGL001649, G2G4)
- *Ephedra viridis / Bromus tectorum* Semi-natural Shrubland (CEGL002355, GNR)
- *Ephedra viridis / Pleuraphis rigida* Shrubland (CEGL001257, G3)

Alliances:
- *Achnatherum hymenoides* Shrub Herbaceous Alliance (A.1543)
- *Artemisia filifolia* Shrubland Alliance (A.816)
- *Bouteloua eriopoda* Xeromorphic Shrub Herbaceous Alliance (A.1553)
- *Coleogyne ramosissima* Shrubland Alliance (A.874)
- *Ephedra nevadensis - Ephedra viridis* Shrubland Alliance (A.856)
- *Ephedra nevadensis* Shrubland Alliance (A.857)
- *Ephedra viridis* Shrubland Alliance (A.858)

Environment: This ecological system typically occurs on gentle to steep, bouldery or rocky slopes of mountains, canyons, and mesas with varying aspects. This system is an evergreen, microphyllous desert scrub with succulents, half-shrubs, and scattered deciduous shrubs typically found at elevations ranging from 580 to 1650 m. (1903-5413 feet). This shrubland system occurs in an arid to semi-arid climate with annual precipitation in the form of summer monsoons and winter storms averaging approximately 20 cm. Soils are highly variable and parent materials may include shale, sandstone, limestone, quartzites, and igneous rocks. Soils are generally coarse-textured, often rocky, shallow and well-drained. Effective soil moisture appears to be primarily controlled by regolith depth and position in relation to the water table. This brushland system occupies most sites where regolith is uniformly shallow. In association with blackbrush (*Coleogyne ramosissima*) sites, the soil moisture is concentrated on top of impermeable bedrock at a shallow depth. This perching effect allows for gradual uptake of moisture by the plants roots (Loope and West 1979). This permits growth of plants with more mesic habitat requirements (Warren et al. 1982). On sites with deep soil, blackbrush may occur in almost pure occurrences with only a few associated species (Warren et al. 1982). Dark-colored cryptogamic soil crusts, composed of lichens, mosses, fungi, and algae, are often present in this system in fairly undisturbed areas. Sandy soils may have more cryptogamic crusts than clayish or silty soil surfaces.
Vegetation: This ecological system is dominated by sparse to moderately dense shrubs. Dominant shrubs include *Coleogyne ramosissima*, *Ephedra nevadensis*, and *Ephedra viridis* (which may codominate with *Grayia spinosa*, *Salvia dorrii*, and *Lycium andersonii*). There is usually a sparse herbaceous layer with some perennial grasses and forbs. Annual grasses and forbs are present seasonally. Some characteristic species associated with this system include the shrubs *Gutierrezia sarothrae*, *Chrysothamnus viscidiflorus*, *Yucca baccata*, and *Krameria grayi*, succulents such as *Ferocactus cylindraceus (= Ferocactus acanthodes)*, *Opuntia* spp., *Echinocereus* spp., *Echinocactus* spp., and *Agave* spp., the graminoid *Pleuraphis rigida*, and perennial forbs such as *Machaeranthera pinnatifida* and *Sphaeralcea ambigua*.

Dynamics: Fire does not appear to play a role in maintenance of shrublands within this system. Topographic breaks dissect the landscape, and isolated pockets of vegetation are separated by rock walls or steep canyons. Blackbrush is fire-intolerant (Loope and West 1979). Following fires, these communities are often colonized by non-native grasses, which serve to encourage recurrent fires and delay shrub regeneration (IVC 1999). In shallow regolith situations, secondary succession, in the sense of site preparation by seral plants, may not occur at all (Loope and West 1979).

SPATIAL CHARACTERISTICS

Adjacent Ecological System Comments: Adjacent vegetation often includes *Atriplex* dominated shrubland communities and upland areas of pinyon-juniper woodlands. Grasslands dominated by *Pleuraphis jamesii*, *Hesperostipa comata*, and *Achnatherum hymenoides* also occur.

SOURCES

References: Comer et al. 2003, Loope and West 1979, Thatcher 1975, Tuhy and MacMahon 1988, Tuhy et al. 2002, Warren et al. 1982, West 1983d

Version: 05 Oct 2004 **Stakeholders:** West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

60 CES302.742—MOJAVE MID-ELEVATION MIXED DESERT SCRUB

Primary Division: North American Warm Desert (302)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Shrubland (Shrub-dominated); Evergreen Sclerophyllous Tree

Concept Summary: This ecological system represents the extensive desert scrub in the transition zone above *Larrea tridentata - Ambrosia dumosa* desert scrub and below the lower montane woodlands (700-1800 m elevations) that occurs in the eastern and central Mojave Desert. It is also common on lower piedmont slopes in the transition zone into the southern Great Basin. The vegetation in this ecological systems is quite variable. Codominants and diagnostic species include *Coleogyne ramosissima, Eriogonum fasciculatum, Ephedra nevadensis, Grayia spinosa, Menodora spinescens, Nolina* spp., *Opuntia acanthocarpa, Salazaria mexicana, Viguiera parishii, Yucca brevifolia*, or *Yucca schidigera*. Desert grasses, including *Achnatherum hymenoides, Achnatherum speciosum, Muhlenbergia porteri, Pleuraphis jamesii, Pleuraphis rigida,* or *Poa secunda,* may form an herbaceous layer. Scattered *Juniperus osteosperma* or desert scrub species may also be present.

DISTRIBUTION

Range: Eastern and central Mojave Desert and on lower piedmont slopes in the transition zone into the southern Great Basin.

Divisions: 206:P, 302:C, 304:P

TNC Ecoregions: 11:C, 12:P, 17:C, 23:P

Subnations: AZ, CA, NV, UT

CONCEPT

Associations:

- *Artemisia tridentata* ssp. *tridentata - Grayia spinosa* Shrubland (CEGL001004, G5)
- *Coleogyne ramosissima - Eriogonum fasciculatum* Shrubland (CEGL001333, G5)
- *Coleogyne ramosissima - Purshia stansburiana* Shrubland (CEGL002720, G4?)
- *Coleogyne ramosissima - Thamnosma montana* Shrubland (CEGL002718, G4?)
- *Coleogyne ramosissima* Shrubland (CEGL001332, G4G5)
- *Ephedra nevadensis - Ericameria cooperi* Shrubland (CEGL001253, G3G4)
- *Ephedra nevadensis - Eriogonum fasciculatum* Shrubland (CEGL001254, G4)
- *Ephedra nevadensis / Achnatherum hymenoides* Shrubland (CEGL001255, G4)
- *Ephedra viridis / Pleuraphis rigida* Shrubland (CEGL001257, G3)
- *Ericameria parryi* Shrubland [Provisional] (CEGL003040, G3G4)
- *Ericameria teretifolia* Shrubland [Placeholder] (CEGL002963, GNR)
- *Eriogonum fasciculatum* Rock Outcrop Shrubland (CEGL001260, G5?)
- *Eriogonum fasciculatum* Shrubland (CEGL001258, G5)
- *Grayia spinosa - Lycium andersonii* Shrubland (CEGL001347, G5)
- *Grayia spinosa - Lycium pallidum* Shrubland (CEGL001348, G5)
- *Grayia spinosa - Menodora spinescens* Shrubland (CEGL001349, G5)
- *Juniperus californica* Wooded Shrubland (CEGL003058, G4?)
- *Menodora spinescens* Dwarf-shrubland [Placeholder] (CEGL002767, G4?)
- *Nolina bigelovii* Shrubland [Placeholder] (CEGL003064, G3?)
- *Nolina parryi* Shrubland [Placeholder] (CEGL002956, GNR)
- *Peucephyllum schottii* Shrubland [Placeholder] (CEGL002722, G4)
- *Salazaria mexicana* Shrubland [Placeholder] (CEGL002961, GNR)
- *Viguiera parishii* Shrubland [Placeholder] (CEGL002721, G4)

- *Yucca brevifolia - Juniperus osteosperma / Artemisia tridentata* Wooded Shrubland (CEGL002744, G2G3)
- *Yucca brevifolia / Pleuraphis rigida* Wooded Herbaceous Vegetation (CEGL002725, G2?)
- *Yucca brevifolia* Wooded Shrubland [Placeholder] (CEGL003116, G4)
- *Yucca schidigera* Shrubland [Placeholder] (CEGL003117, G3?)

Alliances:

- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrubland Alliance (A.830)
- *Coleogyne ramosissima* Shrubland Alliance (A.874)
- *Ephedra nevadensis* Shrubland Alliance (A.857)
- *Ephedra viridis* Shrubland Alliance (A.858)
- *Ericameria parryi* Shrubland Alliance (A.818)
- *Ericameria teretifolia* Shrubland Alliance (A.2540)
- *Eriogonum fasciculatum* Shrubland Alliance (A.868)
- *Grayia spinosa* Intermittently Flooded Shrubland Alliance (A.1045)
- *Grayia spinosa* Shrubland Alliance (A.1038)
- *Juniperus californica* Wooded Shrubland Alliance (A.502)
- *Menodora spinescens* Dwarf-shrubland Alliance (A.2515)
- *Nolina bigelovii* Shrubland Alliance (A.2534)
- *Nolina parryi* Shrubland Alliance (A.2535)
- *Peucephyllum schottii* Shrubland Alliance (A.2516)
- *Salazaria mexicana* Shrubland Alliance (A.2538)
- *Viguiera parishii* Shrubland Alliance (A.2526)
- *Yucca brevifolia* Wooded Herbaceous Alliance (A.2527)
- *Yucca brevifolia* Wooded Shrubland Alliance (A.884)
- *Yucca schidigera* Shrubland Alliance (A.881)

SPATIAL CHARACTERISTICS

Spatial Summary: Transition zone shrublands desert scrub above Mojave desert scrub and below the lower montane woodlands.

SOURCES

References: Barbour and Major 1988, Beatley 1976, Comer et al. 2003, Holland and Keil 1995, MacMahon 1988, Ostler et al. 2000, Sawyer and Keeler-Wolf 1995, Thomas et al. 2004

Version: 11 Nov 2003 **Stakeholders:** Latin America, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

61 CES302.738—CHIHUAHUAN SUCCULENT DESERT SCRUB

Primary Division: North American Warm Desert (302)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Temperate [Temperate Xeric]; Succulent Shrub; Cacti-dominated

Concept Summary: This ecological system is found in the Chihuahuan Desert on colluvial slopes, upper bajadas, sideslopes, ridges, canyons, hills and mesas. Sites are hot and dry. Gravel and rock are often abundant on the ground surface. The vegetation is characterized by the relatively high cover of succulent species such as *Agave lechuguilla, Euphorbia antisyphilitica, Fouquieria splendens, Ferocactus* spp., *Opuntia engelmannii, Opuntia imbricata, Opuntia spinosior, Yucca baccata*, and many others. Perennial grass cover is generally low. The abundance of succulents is diagnostic of this desert scrub system, but desert shrubs are usually present. This system does not include desert grasslands or shrub-steppe with a strong cacti component.

DISTRIBUTION

Range: Chihuahuan Desert on colluvial slopes, upper bajadas, sideslopes and mesas.

Divisions: 302:C

TNC Ecoregions: 22:P, 24:C

Subnations: AZ, MXCH, NM, TX

CONCEPT

Associations:

- *Dasylirion leiophyllum - Agave lechuguilla / Bouteloua hirsuta - Bouteloua gracilis - Bouteloua eriopoda* Shrubland (CEGL004245, GNR)
- *Dasylirion leiophyllum - Viguiera stenoloba - Agave lechuguilla / Bouteloua ramosa* Shrubland (CEGL004604, G3G4)
- *Larrea tridentata - Agave lechuguilla* Shrubland (CEGL004562, G4?)
- *Larrea tridentata - Euphorbia antisyphilitica* Shrubland (CEGL004564, G3)
- *Larrea tridentata - Opuntia schottii* Shrubland (CEGL004567, G4?)
- *Opuntia imbricata* Shrubland (CEGL004588, GNA)

Alliances:
- *Dasylirion leiophyllum - (Agave lechuguilla, Viguiera stenoloba)* Shrubland Alliance (A.850)
- *Larrea tridentata* Shrubland Alliance (A.851)
- *Opuntia imbricata* Shrubland Alliance (A.878)

SOURCES

References: Comer et al. 2003, MacMahon 1988, Muldavin et al. 2000b, Muldavin et al. 2002
Version: 05 Oct 2004 **Stakeholders:** Latin America, Southeast, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

62 CES302.734—CHIHUAHUAN MIXED DESERT AND THORN SCRUB

Primary Division: North American Warm Desert (302)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Foothill, Lowland]; Shrubland (Shrub-dominated)
Concept Summary: This Chihuahuan Desert ecological system is the widespread mixed desert scrub that occurs in the transition zone above Chihuahuan Creosotebush Xeric Basin Desert Scrub (CES302.731) and extends up to the lower montane woodlands. Vegetation is characterized by *Larrea tridentata* mixed with thornscrub and other desertscrub such as *Agave lechuguilla, Aloysia wrightii, Fouquieria splendens, Dasylirion leiophyllum, Flourensia cernua, Leucophyllum minus, Mimosa aculeaticarpa var. biuncifera, Mortonia scabrella (= Mortonia sempervirens ssp. scabrella), Opuntia engelmannii, Parthenium incanum, Prosopis glandulosa,* and *Tiquilia greggii*. Stands of *Acacia constricta*- or *Acacia neovernicosa*- or *Acacia greggii*-dominated thornscrub are included in this system, and limestone substrates appear important for at least these species. Grasses such as *Bouteloua eriopoda* and *Pleuraphis mutica* may be common but generally have lower cover than shrubs.

DISTRIBUTION

Range: Chihuahuan Desert.
Divisions: 302:C
TNC Ecoregions: 22:C, 24:C
Subnations: AZ, MXCH, MXSO, NM, TX

CONCEPT

Associations:
- *Acacia neovernicosa / Bouteloua hirsuta - Bouteloua gracilis - Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL004244, GNR)
- *Acacia neovernicosa / Flourensia cernua* Shrubland (CEGL001341, G4)
- *Acacia neovernicosa / Muhlenbergia porteri* Shrubland (CEGL001342, GNRQ)
- *Flourensia cernua / Achnatherum eminens* Shrubland (CEGL001338, GNRQ)
- *Flourensia cernua / Bouteloua curtipendula* Shrubland (CEGL001336, GNRQ)
- *Flourensia cernua / Pleuraphis mutica* Shrubland (CEGL001541, G4)
- *Flourensia cernua / Sporobolus airoides* Shrubland (CEGL001337, GNRQ)
- *Fouquieria splendens / Bouteloua curtipendula* Shrubland (CEGL001376, GNR)
- *Fouquieria splendens / Bouteloua hirsuta* Shrubland (CEGL001377, G3?)
- *Fouquieria splendens / Parthenium incanum* Shrubland (CEGL001378, GNR)
- *Fouquieria splendens / Petrophyton caespitosum* Shrubland (CEGL001379, G3)
- *Larrea tridentata - Flourensia cernua* Shrubland (CEGL001270, G5?)
- *Larrea tridentata - Hechtia texensis* Shrubland (CEGL004565, G3?)
- *Larrea tridentata - Jatropha dioica* var. *graminea* Shrubland (CEGL004566, G3?)
- *Larrea tridentata - Parthenium incanum* Shrubland (CEGL001274, G5)
- *Larrea tridentata - Prosopis glandulosa* Shrubland (CEGL001275, GUQ)
- *Larrea tridentata / Bouteloua gracilis* Shrubland (CEGL001266, GNR)
- *Larrea tridentata / Bouteloua hirsuta - Bouteloua gracilis - Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL004246, GNR)
- *Larrea tridentata / Sporobolus airoides* Shrubland (CEGL001277, GNR)
- *Lycium berlandieri - Larrea tridentata* var. *tridentata* Shrubland (CEGL001380, GUQ)
- *Mortonia scabrella / Dasylirion wheeleri* Shrubland (CEGL001279, G4)

Alliances:
- *Acacia neovernicosa* Shrubland Alliance (A.1037)
- *Bouteloua hirsuta - Bouteloua gracilis - Bouteloua eriopoda* Shrub Herbaceous Alliance (A.1548)
- *Flourensia cernua* Shrubland Alliance (A.861)
- *Fouquieria splendens* Shrubland Alliance (A.863)
- *Larrea tridentata* Shrubland Alliance (A.851)
- *Lycium berlandieri - Larrea tridentata* Shrubland Alliance (A.1058)
- *Mortonia sempervirens* Shrubland Alliance (A.859)

SPATIAL CHARACTERISTICS

Adjacent Ecological System Comments: This system occurs in the transition zone above Chihuahuan Creosotebush Xeric Basin Desert Scrub (CES302.731).

SOURCES

References: Brown 1982, Comer et al. 2003, Dick-Peddie 1993, MacMahon 1988, Muldavin et al. 2000b, Muldavin et al. 2002
Version: 20 Feb 2003 **Stakeholders:** Latin America, Southeast, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

63 CES302.761—SONORAN PALOVERDE-MIXED CACTI DESERT SCRUB

Primary Division: North American Warm Desert (302)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Foothill, Lowland]; Shrubland (Shrub-dominated); Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Aridic; Xeromorphic Shrub; Succulent Shrub; Cacti-dominated
Concept Summary: This ecological system occurs on hillsides, mesas and upper bajadas in southern Arizona and extreme southeastern California. The vegetation is characterized by a diagnostic sparse, emergent tree layer of *Carnegia gigantea* (3-16 m tall) and/or a sparse to moderately dense canopy codominated by xeromorphic deciduous and evergreen tall shrubs *Parkinsonia microphylla* and *Larrea tridentata* with *Prosopis* sp., *Olneya tesota*, and *Fouquieria splendens* less prominent. Other common shrubs and dwarf-shrubs include *Acacia greggii, Ambrosia deltoidea, Ambrosia dumosa* (in drier sites), *Calliandra eriophylla, Jatropha cardiophylla, Krameria erecta, Lycium* spp., *Menodora scabra, Simmondsia chinensis*, and many cacti including *Ferocactus* spp., *Echinocereus* spp., and *Opuntia* spp. (both cholla and prickly pear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. On slopes, plants are often distributed in patches around rock outcrops where suitable habitat is present.

DISTRIBUTION

Range: Southern Arizona and extreme southeastern California.
Divisions: 302:C
TNC Ecoregions: 23:C
Subnations: AZ, CA, MXBC, MXSO, NV?

CONCEPT

Associations:
- *Acacia greggii - Parkinsonia microphylla* Shrubland (CEGL001340, G4G5)
- *Ambrosia deltoidea / Simmondsia chinensis* Shrubland (CEGL000953, G4)
- *Carnegia gigantea / Prosopis velutina* Wooded Shrubland (CEGL001389, GNR)
- *Fouquieria splendens / Bouteloua curtipendula* Shrubland (CEGL001376, GNR)
- *Fouquieria splendens / Bouteloua hirsuta* Shrubland (CEGL001377, G3?)
- *Opuntia bigelovii* Shrubland [Placeholder] (CEGL003065, G4?)
- *Parkinsonia florida - Olneya tesota* Woodland [Placeholder] (CEGL003035, G3?)
- *Parkinsonia florida / Hilaria belangeri* Shrubland (CEGL001374, G3)
- *Parkinsonia microphylla - Larrea tridentata* Shrubland (CEGL001375, G4)
- *Simmondsia chinensis - Parkinsonia microphylla* Shrubland (CEGL000983, G4)

Alliances:
- *Acacia greggii* Shrubland Alliance (A.1036)
- *Ambrosia deltoidea* Shrubland Alliance (A.852)
- *Carnegia gigantea* Wooded Shrubland Alliance (A.885)
- *Fouquieria splendens* Shrubland Alliance (A.863)
- *Opuntia bigelovii* Shrubland Alliance (A.877)
- *Parkinsonia florida - Olneya tesota* Woodland Alliance (A.588)
- *Parkinsonia florida* Shrubland Alliance (A.882)
- *Parkinsonia microphylla* Shrubland Alliance (A.883)
- *Simmondsia chinensis* Shrubland Alliance (A.853)

SOURCES

References: Bowers and McLaughlin 1987, Brown 1982, Comer et al. 2003, MacMahon 1988, McAuliffe 1993, Niering and Lowe 1984, Robichaux 1999, Shreve and Wiggins 1964
Version: 20 Feb 2003 **Stakeholders:** Latin America, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

65 CES304.784—INTER-MOUNTAIN BASINS MIXED SALT DESERT SCRUB

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Alluvial flat; Alluvial plain; Plain; Alkaline Soil; Saline Substrate Chemistry; Calcareous; Silt Soil Texture; Clay Soil Texture; Xeromorphic Shrub; Dwarf-Shrub; Atriplex spp.
Concept Summary: This extensive ecological system includes open-canopied shrublands of typically saline basins, alluvial slopes and plains across the Intermountain western U.S. This type also extends in limited distribution into the southern Great Plains. Substrates are often saline and calcareous, medium- to fine-textured, alkaline soils, but include some coarser-textured soils. The vegetation is characterized by a typically open to moderately dense shrubland composed of one or more *Atriplex* species such as *Atriplex confertifolia, Atriplex canescens, Atriplex polycarpa,* or *Atriplex spinifera*. Other shrubs present to codominate may include *Artemisia tridentata ssp. wyomingensis, Chrysothamnus viscidiflorus, Ericameria nauseosa, Ephedra nevadensis, Grayia spinosa, Krascheninnikovia lanata, Lycium* spp., *Picrothamnus desertorum,* or *Tetradymia* spp. *Sarcobatus vermiculatus* is generally absent, but if present does not codominate. The herbaceous layer varies from sparse to moderately dense and is dominated by perennial graminoids such as *Achnatherum hymenoides, Bouteloua gracilis, Elymus lanceolatus ssp. lanceolatus, Pascopyrum smithii, Pleuraphis jamesii, Pleuraphis rigida, Poa secunda,* or *Sporobolus airoides*. Various forbs are also present.

DISTRIBUTION

Range: Intermountain western U.S., extending in limited distribution into the southern Great Plains.
Divisions: 303:C, 304:C, 306:C
TNC Ecoregions: 4:?, 6:C, 8:?, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 21:C, 26:C, 27:C, 28:C
Subnations: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

Associations:
- *Atriplex (lentiformis, polycarpa)* Shrubland [Placeholder] (CEGL003016, G3)
- *Atriplex canescens - Artemisia tridentata* Shrubland (CEGL001282, G4)
- *Atriplex canescens - Ephedra viridis* Talus Shrubland (CEGL001287, G4)
- *Atriplex canescens - Krascheninnikovia lanata* Shrubland (CEGL001285, G5)
- *Atriplex canescens / Achnatherum hymenoides* Shrubland (CEGL001289, G3G5)
- *Atriplex canescens / Bouteloua gracilis* Shrubland (CEGL001283, G3)
- *Atriplex canescens / Calycoseris parryi* Shrubland (CEGL001284, G2)
- *Atriplex canescens / Parthenium confertum* Shrubland (CEGL001290, GNRQ)
- *Atriplex canescens / Pleuraphis jamesii* Shrubland (CEGL001288, G3G4)
- *Atriplex canescens / Purshia stansburiana* Shrubland (CEGL001286, GUQ)
- *Atriplex canescens / Sporobolus airoides* Shrubland (CEGL001291, G5?)
- *Atriplex canescens / Sporobolus wrightii* Shrubland (CEGL001292, GNRQ)
- *Atriplex canescens* Shrubland (CEGL001281, G5)
- *Atriplex confertifolia - Ephedra nevadensis* Shrubland (CEGL001303, G5)
- *Atriplex confertifolia - Krascheninnikovia lanata* Shrubland (CEGL001301, G3G5)
- *Atriplex confertifolia - Lycium andersonii* Shrubland (CEGL001308, G3)
- *Atriplex confertifolia - Lycium pallidum / Mirabilis pudica* Shrubland (CEGL001309, G3G4Q)
- *Atriplex confertifolia - Lycium shockleyi* Shrubland (CEGL001310, G4)
- *Atriplex confertifolia - Picrothamnus desertorum / Achnatherum hymenoides* Shrubland (CEGL001297, G5?)
- *Atriplex confertifolia - Picrothamnus desertorum / Krascheninnikovia lanata* Shrubland (CEGL001296, G5?)
- *Atriplex confertifolia - Picrothamnus desertorum / Sarcobatus vermiculatus* Shrubland (CEGL001298, G5?)
- *Atriplex confertifolia - Picrothamnus desertorum* Shrubland (CEGL001295, G5)
- *Atriplex confertifolia - Sarcobatus vermiculatus* Shrubland (CEGL001313, G5)
- *Atriplex confertifolia / Achnatherum hymenoides* Shrubland (CEGL001311, G3)
- *Atriplex confertifolia / Elymus elymoides* Shrubland (CEGL001302, G3G5)
- *Atriplex confertifolia / Ericameria nauseosa* Shrubland (CEGL001300, G3Q)
- *Atriplex confertifolia / Hesperostipa comata* Shrubland (CEGL001314, G2)
- *Atriplex confertifolia / Kochia americana* Shrubland (CEGL001305, G3G5)
- *Atriplex confertifolia / Leymus salinus* Shrubland (CEGL001307, G3G5)
- *Atriplex confertifolia / Leymus salinus* ssp. *salmonis* Shrubland (CEGL001306, G2Q)
- *Atriplex confertifolia / Pleuraphis jamesii* Shrubland (CEGL001304, G3G5)
- *Atriplex confertifolia / Pseudoroegneria spicata* Shrubland (CEGL001312, G3)
- *Atriplex confertifolia / Tetradymia glabrata* Shrubland (CEGL001315, G3G5)
- *Atriplex confertifolia* Great Basin Shrubland (CEGL001294, G5)
- *Atriplex confertifolia* Wyoming Basins Shrubland (CEGL001293, G5)

- *Atriplex obovata / Pleuraphis jamesii - Sporobolus airoides* Shrub Herbaceous Vegetation (CEGL001775, GU)
- *Atriplex obovata / Sporobolus airoides - Sporobolus cryptandrus* Dwarf-shrubland (CEGL001447, G1Q)
- *Atriplex obovata / Tidestromia carnosa* Dwarf-shrubland (CEGL004575, G2?)
- *Atriplex parryi* Shrubland [Placeholder] (CEGL002711, G3)
- *Atriplex polycarpa / Pleuraphis mutica* Shrubland (CEGL001319, GU)
- *Atriplex polycarpa* Shrubland (CEGL001318, G5)
- *Atriplex spinifera* Shrubland [Placeholder] (CEGL003015, G3?)
- *Krascheninnikovia lanata / Achnatherum hymenoides* Dwarf-shrubland (CEGL001323, G4)
- *Krascheninnikovia lanata / Hesperostipa comata* Dwarf-shrubland (CEGL001327, G3)
- *Krascheninnikovia lanata* Dwarf-shrubland [Provisional] (CEGL001320, G5?)
- *Picrothamnus desertorum / Elymus elymoides* Shrubland [Provisional] (CEGL002992, GNR)
- *Picrothamnus desertorum* Shrubland (CEGL001452, G3G4)

Alliances:

- *Atriplex (lentiformis, polycarpa)* Shrubland Alliance (A.864)
- *Atriplex canescens* Shrubland Alliance (A.869)
- *Atriplex confertifolia* Shrubland Alliance (A.870)
- *Atriplex obovata* Dwarf-shrubland Alliance (A.1108)
- *Atriplex parryi* Shrubland Alliance (A.2507)
- *Atriplex polycarpa* Shrubland Alliance (A.873)
- *Atriplex spinifera* Shrubland Alliance (A.865)
- *Krascheninnikovia lanata* Dwarf-shrubland Alliance (A.1104)
- *Picrothamnus desertorum* Shrubland Alliance (A.1128)
- *Pleuraphis jamesii* Shrub Herbaceous Alliance (A.1532)

Environment: This salt-desert shrubland system is a matrix system in the Intermountain West. This system is comprised of arid to semi-arid shrublands on lowland and upland sites usually at elevations between 1520 and 2200 m (4987-7218 feet). Sites can be found on all aspects and include valley bottoms, alluvial and alkaline flats, mesas and plateaus, playas, drainage terraces, washes and interdune basins, bluffs, and gentle to moderately steep sandy or rocky slopes. Slopes are typically gentle to moderately steep, but are sometimes unstable and prone to surface movement. Many areas within this system are degraded due to erosion and may resemble ?badlands.? Soil surface is often very barren in occurrences of this system. The interspaces between the characteristic plant clusters are commonly covered by a microphytic crust (West 1982).

This is typically a system of extreme climatic conditions, with warm to hot summers and freezing winters. Annual precipitation ranges from approximately 13-33 cm. In much of the ecological system, the period of greatest moisture will be mid- to late summer, although in the more northern areas a moist period is to be expected in the cold part of the year. However, plotted seasonality of occurrence is probably of less importance on this desert system than in other ecosystems because desert precipitation comes with an extreme irregularity that does not appear in graphs of long-term seasonal or monthly averages (Blaisdell and Holmgren 1984). Soils are shallow to moderately deep, poorly developed, and a product of an arid climate and little precipitation. Soils are often alkaline or saline. Vegetation within this system is tolerant of these soil conditions but not restricted to it. The shallow soils of much of the area are poorly developed Entisols. Vegetation within this system can occur on level pediment remnants where coarse-textured and well-developed soil profiles have been derived from sandstone gravel and are alkaline, or on Mancos shale badlands, where soil profiles are typically fine-textured and non-alkaline throughout (West and Ibrahim 1968). They can also occur in alluvial basins where parent materials from the other habitats have been deposited over Mancos shale and the soils are heavy-textured and saline-alkaline throughout the profile (West and Ibrahim 1968).

Vegetation: Occurrences of this ecological system vary from almost pure occurrences of single species to fairly complex mixtures. The characteristic mix of low shrubs and grasses is sparse, with large open spaces between the plants (Blaisdell and Holmgren 1984). Occurrences have a sparse to moderately dense cover of woody species that is dominated by *Atriplex canescens* (may codominate with *Artemisia tridentata*), *Atriplex confertifolia* (may codominate with *Lycium andersonii*), *Atriplex obovata, Picrothamnus desertorum,* or *Krascheninnikovia lanata*. Other shrubs that may occur within these occurrences include *Purshia stansburiana, Psorothamnus polydenius, Ephedra* spp., *Acacia greggii, Encelia frutescens, Tiquilia latior, Parthenium confertum, Atriplex polycarpa, Atriplex lentiformis, Atriplex spinifera, Picrothamnus desertorum (= Artemisia spinescens), Frankenia salina, Artemisia frigida, Chrysothamnus* spp., *Lycium* ssp., *Suaeda* spp., *Yucca glauca,* and *Tetradymia spinosa*. Dwarf-shrubs include *Gutierrezia sarothrae* and *Eriogonum* spp. Warm-season medium-tall and short perennial grasses dominate in the sparse to moderately dense graminoid layer. The species present depend on the geographic range of the grasses, alkalinity/salinity and past land use. Species may include *Pleuraphis jamesii, Bouteloua gracilis, Sporobolus airoides, Sporobolus cryptandrus, Achnatherum hymenoides, Elymus elymoides, Distichlis spicata, Leymus salinus, Pascopyrum smithii, Hesperostipa comata, Pseudoroegneria spicata, Poa secunda, Leymus ambiguus,* and *Muhlenbergia torreyi*. A number of annual species may also grow in association with the shrubs and grasses of this system, although they are usually rare and confined to areas of recent disturbance (Blaisdell and Holmgren 1984). Forb cover is generally sparse. Perennial forbs that might occur include *Sphaeralcea coccinea, Chaetopappa ericoides, Xylorhiza venusta, Descurainia sophia,* and *Mentzelia* species. Annual natives include *Plantago* spp., *Vulpia octoflora*, or *Monolepis nuttalliana*. Associated halophytic annuals include *Salicornia rubra, Salicornia bigelovii,* and *Suaeda* species. Exotic annuals that may occur include *Salsola kali, Bromus rubens,* and *Bromus tectorum*. Cacti like *Opuntia* spp. and *Echinocereus* spp. may be present in some occurrences. Trees are not usually present but some scattered *Juniperus* spp. may be found.

Dynamics: West (1982) stated that ?salt desert shrub vegetation occurs mostly in two kinds of situations that promote soil salinity, alkalinity, or both. These are either at the bottom of drainages in enclosed basins or where marine shales outcrop.? However, salt-desert shrub vegetation may be an indication of climatically dry as well as physiologically dry soils (Blaisdell and Holmgren 1984). Not all salt-desert shrub soils are salty, and their hydrologic characteristics may often be responsible for the associated vegetation (Naphan 1966). Species of the salt-desert shrub complex have different degrees of tolerance to salinity and aridity, and they tend to sort themselves out along a moisture/salinity gradient (West 1982). Species and communities are apparently sorted out along physical, chemical, moisture, and topographic gradients through complex relations that are not understood and are in need of further study (Blaisdell and Holmgren 1984).

The winter months within this system are a good time for soil moisture accumulation and storage. There is generally at least one good snow storm per season that will provide sufficient moisture to the vegetation. The winter moisture accumulation amounts will affect spring plant growth. Plants may grow as little as a few inches to 1 m. Unless more rains come in the spring, the soil moisture will be depleted in a few weeks, growth will slow and ultimately cease, and the perennial plants will assume their various forms of dormancy (Blaisdell and Holmgren 1984). If effective rain comes later in the warm season, some of the species will renew their growth from the stage at which it had stopped. Others, having died back, will start over as if emerging from winter dormancy (Blaisdell and Holmgren 1984). *Atriplex confertifolia* shrubs often develop large leaves in the spring, which increase the rate of photosynthesis. As soil moisture decreases, the leaves are lost, and the plant takes on a dead appearance. During late fall, very small overwintering leaves appear which provide some photosynthetic capability through the remainder of the year (IVC 1999). Other communities are maintained by intra- or inter-annual cycles of flooding followed by extended drought, which favor accumulation of transported salts. The moisture supporting these intermittently flooded wetlands is usually derived off-site, and they are dependent upon natural watershed function for persistence (Reid et al. 1999).

In summary, desert communities of perennial plants are dynamic and changing. The composition within this system may change dramatically and may be both cyclic and unidirectional. Superimposed on the compositional change is great variation from year to year in growth of all the vegetation ? the sum of varying growth responses of individual species to specific conditions of different years (Blaisdell and Holmgren 1984). Desert plants grow when temperature is satisfactory, but only if soil moisture is available at the same time. Because amount of moisture is variable from year to year and because different species flourish under different seasons of soil moisture, seldom do all components of the vegetation thrive in the same year (Blaisdell and Holmgren 1984).

SOURCES

References: Barbour and Major 1988, Blaisdell and Holmgren 1984, Branson et al. 1967, Branson et al. 1976, Brown 1982, Campbell 1977, Comer et al. 2003, Francis 1986, Holland and Keil 1995, Reid et al. 1999, West 1979, West 1982, West 1983b, West and Ibrahim 1968

Version: 20 Feb 2003 **Stakeholders:** Midwest, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

67 CES302.731—CHIHUAHUAN CREOSOTEBUSH XERIC BASIN DESERT SCRUB

Primary Division: North American Warm Desert (302)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Shrubland (Shrub-dominated); Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Xeromorphic Shrub

Concept Summary: This ecological system is limited to extremely xeric, lower-elevation basin bottoms and lower positions of alluvial fans in the Chihuahuan Desert. Substrates are gravelly, non-saline and typically covered by desert pavement. The vegetation is an open to sparse shrub layer dominated by *Larrea tridentata* without codominant thornscrub or succulent species that are common on the piedmont and alluvial fans. *Parthenium incanum* or *Tiquilia hispidissima* may be codominate. Cover of grasses is low. Common species may include *Dasyochloa pulchella, Bouteloua curtipendula, Bouteloua eriopoda, Bouteloua ramosa,* or *Muhlenbergia porteri*. Species diversity is low.

DISTRIBUTION

Range: Lower elevation broad basins in the Chihuahuan Desert.

Divisions: 302:C

TNC Ecoregions: 22:C, 24:C

Subnations: AZ, MXCH, MXSO?, NM, TX

CONCEPT

Associations:

- *Larrea tridentata - Parthenium incanum* Shrubland (CEGL001274, G5)
- *Larrea tridentata / Bouteloua eriopoda* Shrubland (CEGL001265, G4)
- *Larrea tridentata / Bouteloua ramosa* Shrubland (CEGL004563, G3?)
- *Larrea tridentata / Dasyochloa pulchella* Shrubland (CEGL001269, G5)
- *Larrea tridentata / Muhlenbergia porteri* Shrubland (CEGL001272, GNR)
- *Larrea tridentata* / Sparse Understory Shrubland (CEGL001276, GNR)
- *Larrea tridentata / Tiquilia hispidissima* Shrubland (CEGL001267, G4)

Alliances:

- *Larrea tridentata* Shrubland Alliance (A.851)

SOURCES

References: Comer et al. 2003, Dick-Peddie 1993, MacMahon 1988, Muldavin et al. 2000b, Muldavin et al. 2002
Version: 05 Oct 2004 **Stakeholders:** Latin America, Southeast, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

68 CES302.737—CHIHUAHUAN STABILIZED COPPICE DUNE AND SAND FLAT SCRUB

Primary Division: North American Warm Desert (302)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Plain; Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Sand Soil Texture; Aridic; Very Short Disturbance Interval; W-Landscape/High Intensity; Thorn Shrub; Prosopis spp.-dominated
Concept Summary: This ecological system includes the open shrublands of vegetated coppice dunes and sandsheets found in the Chihuahuan Desert. Usually dominated by *Prosopis glandulosa* but includes *Atriplex canescens, Ephedra torreyana, Ephedra trifurca, Poliomintha incana*, and *Rhus microphylla* coppice sand scrub with 10-30% total vegetation cover. *Yucca elata, Gutierrezia sarothrae*, and *Sporobolus flexuosus* are commonly present.

DISTRIBUTION

Range: Dunes and sandsheets found in the Chihuahuan Desert.
Divisions: 302:C
TNC Ecoregions: 24:C
Subnations: MXCH, NM, TX

CONCEPT

Associations:
- *Atriplex canescens / Sporobolus wrightii* Shrubland (CEGL001292, GNRQ)
- *Ephedra torreyana - Achnatherum hymenoides* Hummock Shrubland (CEGL005802, GNR)
- *Prosopis glandulosa / Atriplex canescens* Shrubland (CEGL001382, G5)
- *Prosopis glandulosa / Bouteloua gracilis* Shrubland (CEGL001383, G5)
- *Prosopis glandulosa / Muhlenbergia porteri* Shrubland (CEGL001511, G5)
- *Prosopis glandulosa / Sporobolus flexuosus* Shrubland (CEGL001386, G4)
- *Psorothamnus scoparius / Sporobolus flexuosus* Shrubland (CEGL001695, G5)
- *Rhus microphylla / Bouteloua curtipendula* Shrubland (CEGL001354, GNR)

Alliances:
- *Atriplex canescens* Shrubland Alliance (A.869)
- *Ephedra torreyana* Shrubland Alliance (A.2572)
- *Prosopis glandulosa* Shrubland Alliance (A.1031)
- *Psorothamnus scoparius* Shrubland Alliance (A.837)
- *Rhus microphylla* Shrubland Alliance (A.1040)

SOURCES

References: Bowers 1982, Bowers 1984, Comer et al. 2003, Dick-Peddie 1993, Muldavin et al. 2000b
Version: 20 Feb 2003 **Stakeholders:** Latin America, Southeast, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

69 CES302.756—SONORA-MOJAVE CREOSOTEBUSH-WHITE BURSAGE DESERT SCRUB

Primary Division: North American Warm Desert (302)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Aridic; Xeromorphic Shrub
Concept Summary: This ecological system forms the vegetation matrix in broad valleys, lower bajadas, plains and low hills in the Mojave and lower Sonoran deserts. This desert scrub is characterized by a sparse to moderately dense layer (2-50% cover) of xeromorphic microphyllous and broad-leaved shrubs. *Larrea tridentata* and *Ambrosia dumosa* are typically dominants, but many different shrubs, dwarf-shrubs, and cacti may codominate or form typically sparse understories. Associated species may include *Atriplex canescens, Atriplex hymenelytra, Encelia farinosa, Ephedra nevadensis, Fouquieria splendens, Lycium andersonii*, and *Opuntia basilaris*. The herbaceous layer

is typically sparse, but may be seasonally abundant with ephemerals. Herbaceous species such as *Chamaesyce* spp., *Eriogonum inflatum*, *Dasyochloa pulchella*, *Aristida* spp., *Cryptantha* spp., *Nama* spp., and *Phacelia* spp. are common.

DISTRIBUTION

Range: Broad valleys, lower bajadas, plains and low hills in the Mojave and lower Sonoran deserts.
Divisions: 302:C
TNC Ecoregions: 17:C, 23:C
Subnations: AZ, CA, MXBC, MXSO, NV, UT

CONCEPT

Associations:
- *Ambrosia deltoidea / Simmondsia chinensis* Shrubland (CEGL000953, G4)
- *Ambrosia dumosa - Ephedra nevadensis* Dwarf-shrubland (CEGL000954, GNR)
- *Ambrosia dumosa - Larrea tridentata* var. *tridentata* Dwarf-shrubland (CEGL000956, G4)
- *Ambrosia dumosa / Pleuraphis rigida* Dwarf-shrubland (CEGL000955, G2)
- *Eriogonum fasciculatum - Purshia glandulosa* Shrubland (CEGL001259, G4)
- *Eriogonum fasciculatum* Rock Outcrop Shrubland (CEGL001260, G5?)
- *Eriogonum fasciculatum* Shrubland (CEGL001258, G5)
- *Grayia spinosa - Ephedra viridis* Shrubland (CEGL001346, G5)
- *Grayia spinosa - Lycium andersonii* Shrubland (CEGL001347, G5)
- *Grayia spinosa - Lycium pallidum* Shrubland (CEGL001348, G5)
- *Grayia spinosa - Menodora spinescens* Shrubland (CEGL001349, G5)
- *Grayia spinosa - Prunus andersonii* Shrubland (CEGL001352, G4)
- *Grayia spinosa / Achnatherum hymenoides* Shrubland (CEGL001350, G4)
- *Grayia spinosa / Achnatherum thurberianum* Shrubland (CEGL002681, G2G3)
- *Grayia spinosa / Picrothamnus desertorum* Shrubland (CEGL001345, G5)
- *Larrea tridentata - Ambrosia dumosa* Shrubland [Placeholder] (CEGL002954, G3G4)
- *Larrea tridentata - Atriplex confertifolia* Shrubland (CEGL001263, G5)
- *Larrea tridentata - Atriplex hymenelytra* Shrubland (CEGL001264, G5)
- *Larrea tridentata - Coleogyne ramosissima* Shrubland (CEGL002717, G4?)
- *Larrea tridentata - Encelia farinosa* Shrubland [Placeholder] (CEGL002955, GNR)
- *Larrea tridentata - Ephedra nevadensis* Shrubland (CEGL001268, G5)
- *Larrea tridentata - Opuntia basilaris - Fouquieria splendens* Shrubland (CEGL001273, G4)
- *Larrea tridentata / Lycium andersonii - Grayia spinosa* Shrubland (CEGL001271, G5)
- *Larrea tridentata / Yucca* spp. Shrubland (CEGL001278, G5)
- *Larrea tridentata* Monotype Shrubland (CEGL001261, G5)

Alliances:
- *Ambrosia deltoidea* Shrubland Alliance (A.852)
- *Ambrosia dumosa* Dwarf-shrubland Alliance (A.1102)
- *Eriogonum fasciculatum* Shrubland Alliance (A.868)
- *Grayia spinosa - Ephedra viridis* Shrubland Alliance (A.1057)
- *Grayia spinosa* Intermittently Flooded Shrubland Alliance (A.1045)
- *Grayia spinosa* Shrubland Alliance (A.1038)
- *Larrea tridentata - Ambrosia dumosa* Shrubland Alliance (A.2532)
- *Larrea tridentata - Encelia farinosa* Shrubland Alliance (A.2533)
- *Larrea tridentata* Shrubland Alliance (A.851)

SOURCES

References: Barbour and Major 1988, Brown 1982, Comer et al. 2003, Holland and Keil 1995, MacMahon 1988, Thomas et al. 2004
Version: 20 Feb 2003 **Stakeholders:** Latin America, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

70 CES302.749—SONORA-MOJAVE MIXED SALT DESERT SCRUB

Primary Division: North American Warm Desert (302)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Basin floor; Toeslope/Valley Bottom; Temperate [Temperate Xeric]; Alkaline Soil; Atriplex spp.
Concept Summary: This system includes extensive open-canopied shrublands of typically saline basins in the Mojave and Sonoran deserts. Stands often occur around playas. Substrates are generally fine-textured, saline soils. Vegetation is typically composed of one or more *Atriplex* species such as *Atriplex canescens* or *Atriplex polycarpa* along with other species of *Atriplex*. Species of *Allenrolfea*, *Salicornia*,

Suaeda, or other halophytic plants are often present to codominant. Graminoid species may include *Sporobolus airoides* or *Distichlis spicata* at varying densities.

DISTRIBUTION

Range: Saline basins in the Mojave and Sonoran deserts.
Divisions: 302:C
TNC Ecoregions: 17:C, 22:C, 23:C
Subnations: AZ, CA, MXBC, MXSO, NV, UT

CONCEPT

Associations:
- *Atriplex (lentiformis, polycarpa)* Shrubland [Placeholder] (CEGL003016, G3)
- *Atriplex canescens - Artemisia tridentata* Shrubland (CEGL001282, G4)
- *Atriplex canescens - Ephedra viridis* Talus Shrubland (CEGL001287, G4)
- *Atriplex canescens - Krascheninnikovia lanata* Shrubland (CEGL001285, G5)
- *Atriplex canescens / Bouteloua gracilis* Shrubland (CEGL001283, G3)
- *Atriplex canescens / Calycoseris parryi* Shrubland (CEGL001284, G2)
- *Atriplex canescens / Pleuraphis jamesii* Shrubland (CEGL001288, G3G4)
- *Atriplex canescens* Shrubland (CEGL001281, G5)
- *Atriplex confertifolia - Atriplex polycarpa* Shrubland (CEGL001299, G5)
- *Atriplex confertifolia - Ephedra nevadensis* Shrubland (CEGL001303, G5)
- *Atriplex confertifolia - Lycium andersonii* Shrubland (CEGL001308, G3)
- *Atriplex confertifolia - Sarcobatus vermiculatus* Shrubland (CEGL001313, G5)
- *Atriplex hymenelytra* Shrubland (CEGL001317, G5)
- *Atriplex polycarpa* Shrubland (CEGL001318, G5)
- *Atriplex spinifera* Shrubland [Placeholder] (CEGL003015, G3?)
- *Distichlis spicata* Herbaceous Vegetation (CEGL001770, G5)

Alliances:
- *Atriplex (lentiformis, polycarpa)* Shrubland Alliance (A.864)
- *Atriplex canescens* Shrubland Alliance (A.869)
- *Atriplex confertifolia* Shrubland Alliance (A.870)
- *Atriplex hymenelytra* Shrubland Alliance (A.872)
- *Atriplex polycarpa* Shrubland Alliance (A.873)
- *Atriplex spinifera* Shrubland Alliance (A.865)
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)

SOURCES

References: Barbour and Major 1988, Brown 1982, Comer et al. 2003, Holland and Keil 1995, MacMahon 1988, Thomas et al. 2004
Version: 20 Feb 2003 **Stakeholders:** Latin America, Southeast, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

71 CES304.785—INTER-MOUNTAIN BASINS MONTANE SAGEBRUSH STEPPE

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Steppe/Savanna
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Upper Montane, Montane, Lower Montane]; Woody-Herbaceous
Concept Summary: This ecological system includes sagebrush communities occurring at montane and subalpine elevations across the western U.S. from 1000 m in eastern Oregon and Washington to over 3000 m in the southern Rockies. In British Columbia, it occurs between 450 and 1650 m in the southern Fraser Plateau and the Thompson and Okanagan basins. Climate is cool, semi-arid to subhumid. This system primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. In general this system shows an affinity for mild topography, fine soils, and some source of subsurface moisture. It is composed primarily of *Artemisia tridentata ssp. vaseyana* (mountain sagebrush) and related taxa such as *Artemisia tridentata ssp. spiciformis (= Artemisia spiciformis). Purshia tridentata* may codominate or even dominate some stands. Other common shrubs include *Symphoricarpos* spp., *Amelanchier* spp., *Ericameria nauseosa, Peraphyllum ramosissimum, Ribes cereum*, and *Chrysothamnus viscidiflorus*. Most stands have an abundant perennial herbaceous layer (over 25% cover), but this system also includes *Artemisia tridentata ssp. vaseyana* shrublands. Common graminoids include *Festuca arizonica, Festuca idahoensis, Hesperostipa comata, Poa fendleriana, Elymus trachycaulus, Bromus carinatus, Poa secunda, Leucopoa kingii, Deschampsia caespitosa, Calamagrostis rubescens*, and *Pseudoroegneria spicata*. In many areas, frequent wildfires maintain an open herbaceous-rich steppe condition, although at most sites, shrub cover can be unusually high for a steppe system (>40%), with the moisture providing equally high grass and forb cover.

DISTRIBUTION

Range: This system is found at montane and subalpine elevations across the western U.S. from 1000 m in eastern Oregon and Washington to over 3000 m in the southern Rockies. In British Columbia, it occurs in the southern Fraser Plateau and the Thompson and Okanagan basins.

Divisions: 304:C, 306:C

TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 12:C, 18:C, 19:C, 20:C, 68:C

Subnations: AZ?, BC, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

Associations:

- *Artemisia arbuscula* ssp. *arbuscula - Artemisia tridentata* ssp. *vaseyana / Festuca idahoensis* Shrubland [Provisional] (CEGL002982, GNR)
- *Artemisia arbuscula* ssp. *thermopola / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001519, G2)
- *Artemisia rothrockii / Monardella odoratissima* Shrubland (CEGL008652, G3?)
- *Artemisia rothrockii* Shrubland [Provisional] (CEGL003014, G3?)
- *Artemisia tridentata / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001530, G4Q)
- *Artemisia tridentata* Upperzone Community Shrubland (CEGL001013, G5?)
- *Artemisia tridentata* ssp. *spiciformis / Bromus carinatus* Shrubland (CEGL002989, GNR)
- *Artemisia tridentata* ssp. *spiciformis / Carex geyeri* Shrubland (CEGL002990, GNR)
- *Artemisia tridentata* ssp. *spiciformis* Shrub Herbaceous Vegetation [Provisional] (CEGL002993, GNR)
- *Artemisia tridentata* ssp. *vaseyana - Purshia tridentata / Pseudoroegneria spicata* Shrubland (CEGL001032, G5?)
- *Artemisia tridentata* ssp. *vaseyana - Symphoricarpos oreophilus / Bromus carinatus* Shrubland (CEGL001035, G4Q)
- *Artemisia tridentata* ssp. *vaseyana - Symphoricarpos oreophilus / Elymus trachycaulus* ssp. *trachycaulus* Shrubland (CEGL001034, G3G4)
- *Artemisia tridentata* ssp. *vaseyana - Symphoricarpos oreophilus / Festuca idahoensis* Shrubland (CEGL001036, G4)
- *Artemisia tridentata* ssp. *vaseyana - Symphoricarpos oreophilus / Hesperostipa comata* Shrubland (CEGL001039, G3?)
- *Artemisia tridentata* ssp. *vaseyana - Symphoricarpos oreophilus / Poa secunda* Shrubland (CEGL001037, G5?)
- *Artemisia tridentata* ssp. *vaseyana - Symphoricarpos oreophilus / Pseudoroegneria spicata* Shrubland (CEGL001038, G5?)
- *Artemisia tridentata* ssp. *vaseyana / Achnatherum occidentale* Shrubland (CEGL001033, G2)
- *Artemisia tridentata* ssp. *vaseyana / Balsamorhiza sagittata* Shrubland (CEGL001020, GNR)
- *Artemisia tridentata* ssp. *vaseyana / Bromus carinatus* Shrubland (CEGL001021, G4?)
- *Artemisia tridentata* ssp. *vaseyana / Carex exserta* Shrubland (CEGL008651, GNR)
- *Artemisia tridentata* ssp. *vaseyana / Carex geyeri* Shrub Herbaceous Vegetation (CEGL001532, G3)
- *Artemisia tridentata* ssp. *vaseyana / Festuca campestris* Shrub Herbaceous Vegetation (CEGL001531, G3Q)
- *Artemisia tridentata* ssp. *vaseyana / Festuca idahoensis - Bromus carinatus* Shrubland (CEGL001023, G4Q)
- *Artemisia tridentata* ssp. *vaseyana / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001533, G5)
- *Artemisia tridentata* ssp. *vaseyana / Festuca thurberi* Shrubland (CEGL001024, G3G4)
- *Artemisia tridentata* ssp. *vaseyana / Hesperostipa comata* Shrubland (CEGL002931, GNR)
- *Artemisia tridentata* ssp. *vaseyana / Leucopoa kingii - Koeleria macrantha* Shrubland (CEGL001026, G4)
- *Artemisia tridentata* ssp. *vaseyana / Leucopoa kingii* Shrubland (CEGL001025, G3)
- *Artemisia tridentata* ssp. *vaseyana / Leymus cinereus* Shrubland (CEGL001027, G4?)
- *Artemisia tridentata* ssp. *vaseyana / Monardella odoratissima* Shrubland (CEGL003476, GNR)
- *Artemisia tridentata* ssp. *vaseyana / Pascopyrum smithii* Shrubland (CEGL001028, G3?)
- *Artemisia tridentata* ssp. *vaseyana / Phlox condensata* Shrubland (CEGL002770, GNR)
- *Artemisia tridentata* ssp. *vaseyana / Poa fendleriana* Shrubland (CEGL002812, GNR)
- *Artemisia tridentata* ssp. *vaseyana / Poa secunda* Shrubland (CEGL001029, G3)
- *Artemisia tridentata* ssp. *vaseyana / Pseudoroegneria spicata - Poa fendleriana* Shrubland (CEGL001031, G5)
- *Artemisia tridentata* ssp. *vaseyana / Pseudoroegneria spicata* Shrubland (CEGL001030, G5)
- *Artemisia tridentata* ssp. *wyomingensis - Peraphyllum ramosissimum / Festuca idahoensis* Shrubland (CEGL001048, G2)
- *Symphoricarpos oreophilus* Shrubland (CEGL002951, GNR)

Alliances:

- *Artemisia arbuscula* ssp. *arbuscula* Shrubland Alliance (A.2547)
- *Artemisia arbuscula* ssp. *thermopola* Shrub Herbaceous Alliance (A.2553)
- *Artemisia rothrockii* Shrubland Alliance (A.1098)
- *Artemisia tridentata* Shrub Herbaceous Alliance (A.1521)
- *Artemisia tridentata* Shrubland Alliance (A.829)
- *Artemisia tridentata* ssp. *spiciformis* Shrub Herbaceous Alliance (A.2555)
- *Artemisia tridentata* ssp. *spiciformis* Shrubland Alliance (A.2550)
- *Artemisia tridentata* ssp. *vaseyana* Shrub Herbaceous Alliance (A.1526)
- *Artemisia tridentata* ssp. *vaseyana* Shrubland Alliance (A.831)
- *Artemisia tridentata* ssp. *wyomingensis* Shrubland Alliance (A.832)

- *Symphoricarpos oreophilus* Shrubland Alliance (A.2530)

Environment: This ecological system occurs in many of the western United States, usually at middle elevations (1000-2500 m). The climate regime is cool, semi-arid to subhumid, with yearly precipitation ranging from 25 to 90 cm/year. Much of this precipitation falls as snow. Temperatures are continental with large annual and diurnal variation. In general this system shows an affinity for mild topography, fine soils, and some source of subsurface moisture. Soils generally are moderately deep to deep, well-drained, and of loam, sandy loam, clay loam, or gravelly loam textural classes; soils often have a substantial volume of coarse fragments, and are derived from a variety of parent materials. This system primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. All aspects are represented, but the higher elevation occurrences may be restricted to south- or west-facing slopes.

Vegetation: Vegetation types within this ecological system are usually less than 1.5 m tall and dominated by *Artemisia tridentata ssp. vaseyana, Artemisia cana ssp. viscidula,* or *Artemisia tridentata ssp. spiciformis*. A variety of other shrubs can be found in some occurrences, but these are seldom dominant. They include *Artemisia rigida, Artemisia arbuscula, Ericameria nauseosa, Chrysothamnus viscidiflorus, Symphoricarpos oreophilus, Purshia tridentata, Peraphyllum ramosissimum, Ribes cereum, Rosa woodsii, Ceanothus velutinus*, and *Amelanchier alnifolia*. The canopy cover is usually between 20-80%. The herbaceous layer is usually well represented, but bare ground may be common in particularly arid or disturbed occurrences. Graminoids that can be abundant include *Festuca idahoensis, Festuca thurberi, Festuca ovina, Elymus elymoides, Deschampsia caespitosa, Danthonia intermedia, Danthonia parryi, Stipa* spp., *Pascopyrum smithii, Bromus carinatus, Elymus trachycaulus, Koeleria macrantha, Pseudoroegneria spicata, Poa fendleriana,* or *Poa secunda,* and *Carex* spp. Forbs are often numerous and an important indicator of health. Forb species may include *Castilleja, Potentilla, Erigeron, Phlox, Astragalus, Geum, Lupinus*, and *Eriogonum, Balsamorhiza sagittata, Achillea millefolium, Antennaria rosea*, and *Eriogonum umbellatum, Fragaria virginiana, Artemisia ludoviciana, Hymenoxys hoopesii (= Helenium hoopesii),* etc.

Dynamics: Healthy sagebrush shrublands are very productive, are often grazed by domestic livestock, and are strongly preferred during the growing season (Padgett et al. 1989). Prolonged livestock use can cause a decrease in the abundance of native bunch grasses and increase in the cover of shrubs and non-native grass species, such as *Poa pratensis*. *Artemisia cana* resprouts vigorously following spring fire, and prescribed burning may increase shrub cover. Conversely, fire in the fall may decrease shrub abundance (Hansen et al. 1995). *Artemisia tridentata* is generally killed by fires and may take over ten years to form occurrences of some 20% cover or more. The condition of most sagebrush steppe has been degraded due to fire suppression and heavy livestock grazing. It is unclear how long restoration will take to restore degraded occurrences.

SOURCES

References: Comer et al. 2003, Ecosystems Working Group 1998, Hansen et al. 1995, Hironaka et al. 1983, Johnston 2001, Mueggler and Stewart 1980, Neely et al. 2001, Padgett et al. 1989, West 1983c

Version: 09 Feb 2005 **Stakeholders:** Canada, Midwest, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

74 CES306.834—SOUTHERN ROCKY MOUNTAIN JUNIPER WOODLAND AND SAVANNA

Primary Division: Rocky Mountain (306)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Woody-Herbaceous; Shallow Soil; Mineral: W/ A-Horizon <10 cm; Aridic; Needle-Leaved Tree; Graminoid; Juniperus monosperma and grasses

Concept Summary: This ecological system occupies the lower and warmest elevations, growing from 1370 to 1830 m in a semi-arid climate, primarily along the east and south slopes of the southern Rockies and Arizona-New Mexico mountains. It is best represented just below the lower elevational range of ponderosa pine and often intermingles with grasslands and shrublands. This system is best described as a savanna that has widely spaced, mature (>150 years old) juniper trees and occasionally *Pinus edulis*. *Juniperus monosperma* and *Juniperus scopulorum* (at higher elevations) are the dominant tall shrubs or short trees. These savannas may have inclusions of more dense juniper woodlands and have expanded into adjacent grasslands during the last century. Graminoid species are similar to those found in Western Great Plains Shortgrass Prairie (CES303.672), with *Bouteloua gracilis* and *Pleuraphis jamesii* being most common. In addition, succulents such as species of *Yucca* and *Opuntia* are typically present.

DISTRIBUTION

Range: Occupies the lower and warmest elevations growing from 1370 to 1830 m in a semi-arid climate, primarily along the east and south slopes of the southern Rockies and Arizona-New Mexico mountains.

Divisions: 303:C, 304:C, 306:C

TNC Ecoregions: 20:C, 21:C, 27:C

Subnations: CO, NM

CONCEPT

Associations:

- *Juniperus monosperma / Andropogon hallii* Woodland (CEGL000704, G3?)
- *Juniperus monosperma / Bouteloua curtipendula* Woodland (CEGL000708, G5)
- *Juniperus monosperma / Bouteloua eriopoda* Woodland (CEGL000709, GNR)
- *Juniperus monosperma / Bouteloua gracilis* Woodland (CEGL000710, G5)

- *Juniperus monosperma / Cercocarpus montanus - Ribes cereum* Woodland (CEGL000714, GU)
- *Juniperus monosperma / Cercocarpus montanus* Woodland (CEGL000713, GNR)
- *Juniperus monosperma / Hesperostipa neomexicana* Woodland (CEGL000722, G4)

Alliances:

- *Juniperus monosperma* Woodland Alliance (A.504)

SOURCES

References: Anderson et al. 1985, Barnes 1987, Bassett et al. 1987, Blackburn and Tueller 1970, Comer et al. 2003, Commons et al. 1999, Dick-Peddie 1993, Dwyer and Pieper 1967, Eager 1999, Fitzhugh et al. 1987, Francis 1986, Gehlbach 1967, Ladyman and Muldavin 1996, Larson and Moir 1986, Larson and Moir 1987, Mehl 1992, Neely et al. 2001, Rogers 1950, West 1999b, West and Young 2000, Wright and Bailey 1982

Version: 05 Oct 2004 **Stakeholders:** West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

75 CES304.782—INTER-MOUNTAIN BASINS JUNIPER SAVANNA

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Temperate [Temperate Continental]; Intermediate Disturbance Interval; F-Landscape/Medium Intensity; Evergreen Sclerophyllous Tree; Graminoid

Concept Summary: This widespread ecological system occupies dry foothills and sandsheets of western Colorado, northwestern New Mexico, northern Arizona, Utah, west into the Great Basin of Nevada and southern Idaho. It is typically found at lower elevations ranging from 1500-2300 m. This system is generally found at lower elevations and more xeric sites than Great Basin Pinyon-Juniper Woodland (CES304.773) or Colorado Plateau Pinyon-Juniper Woodland (CES304.767). These occurrences are found on lower mountain slopes, hills, plateaus, basins and flats often where juniper is expanding into semi-desert grasslands and steppe. The vegetation is typically open savanna, although there may be inclusions of more dense juniper woodlands. This savanna is typically dominated by *Juniperus osteosperma* trees with high cover of perennial bunch grasses and forbs, with *Bouteloua gracilis, Hesperostipa comata*, and *Pleuraphis jamesii* being most common. In the southern Colorado Plateau, *Juniperus monosperma* or juniper hybrids may dominate the tree layer. Pinyon trees are typically not present because sites are outside the ecological or geographic range of *Pinus edulis* and *Pinus monophylla*.

DISTRIBUTION

Range: This juniper savanna occurs from northwestern New Mexico, northern Arizona, western Colorado, Utah, west into the Great Basin of Nevada and southern Idaho.

Divisions: 304:C, 306:C

TNC Ecoregions: 6:C, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 21:C

Subnations: AZ, CA, CO, ID, NM, NV, OR, UT, WY

CONCEPT

Associations:

- *Juniperus monosperma / Andropogon hallii* Woodland (CEGL000704, G3?)
- *Juniperus monosperma / Bouteloua curtipendula* Woodland (CEGL000708, G5)
- *Juniperus monosperma / Bouteloua eriopoda* Woodland (CEGL000709, GNR)
- *Juniperus monosperma / Bouteloua gracilis* Woodland (CEGL000710, G5)
- *Juniperus monosperma / Cercocarpus montanus - Ribes cereum* Woodland (CEGL000714, GU)
- *Juniperus monosperma / Cercocarpus montanus* Woodland (CEGL000713, GNR)
- *Juniperus monosperma / Hesperostipa neomexicana* Woodland (CEGL000722, G4)
- *Juniperus osteosperma / Hesperostipa comata* Wooded Herbaceous Vegetation (CEGL001489, G1Q)
- *Juniperus osteosperma / Hesperostipa neomexicana* Woodland (CEGL000740, GUQ)
- *Juniperus osteosperma / Leymus salinus* Woodland (CEGL001488, G1Q)
- *Juniperus osteosperma / Pleuraphis mutica* Woodland (CEGL000736, G2)
- *Juniperus osteosperma / Pseudoroegneria spicata* Woodland (CEGL000738, G4)
- *Juniperus osteosperma / Symphoricarpos oreophilus* Woodland (CEGL000741, GU)
- *Juniperus scopulorum / Pseudoroegneria spicata* Woodland (CEGL000748, G4)
- *Juniperus scopulorum / Schizachyrium scoparium* Woodland (CEGL000750, G2)

Alliances:

- *Juniperus monosperma* Woodland Alliance (A.504)
- *Juniperus osteosperma* Wooded Herbaceous Alliance (A.1502)
- *Juniperus osteosperma* Woodland Alliance (A.536)
- *Juniperus scopulorum* Woodland Alliance (A.506)

SOURCES

References: Bassett et al. 1987, Blackburn and Tueller 1970, Comer et al. 2003, Fitzhugh et al. 1987, Francis 1986, Knight 1994, Larson and Moir 1986, Larson and Moir 1987, Tuhy et al. 2002

Version: 05 Oct 2004 **Stakeholders:** West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

77 CES302.735—APACHERIAN-CHIHUAHUAN SEMI-DESERT GRASSLAND AND STEPPE

Primary Division: North American Warm Desert (302)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill, Lowland]; Herbaceous; Temperate [Temperate Xeric]; Short Disturbance Interval; F-Patch/High Intensity [Seasonality/Winter Fire]; Xeromorphic Tree; Thorn Shrub; Graminoid

Concept Summary: This ecological system is a broadly defined desert grassland, mixed shrub-succulent or xeromorphic tree savanna that is typical of the Borderlands of Arizona, New Mexico and northern Mexico [Apacherian region] but extends west to the Sonoran Desert, north into the Mogollon Rim and throughout much of the Chihuahuan Desert. It is found on gently sloping bajadas that support frequent fire throughout the Sky Islands and on mesas and steeper piedmont and foothill slopes in the Chihuahuan Desert. It is characterized by typically diverse perennial grasses. Common grass species include *Bouteloua eriopoda, Bouteloua hirsuta, Bouteloua rothrockii, Bouteloua curtipendula, Bouteloua gracilis, Eragrostis intermedia, Muhlenbergia porteri, Muhlenbergia setifolia, Pleuraphis jamesii, Pleuraphis mutica,* and *Sporobolus airoides*, succulent species of *Agave, Dasylirion,* and *Yucca*, and tall-shrub/short-tree species of *Prosopis* and various oaks (e.g., *Quercus grisea, Quercus emoryi, Quercus arizonica*). Many of the historical desert grassland and savanna areas have been converted, some to Apacherian-Chihuahuan Mesquite Upland Scrub (CES302.733) (*Prosopis* spp.-dominated), through intensive grazing and other land uses.

DISTRIBUTION

Range: Borderlands of Arizona, New Mexico and northern Mexico [Apacherian region], extending to the Sonoran Desert and throughout much of the Chihuahuan Desert.

Divisions: 302:C

TNC Ecoregions: 22:C, 24:C, 28:C

Subnations: AZ, MXCH, NM, TX

CONCEPT

Associations:

- *Artemisia bigelovii / Bouteloua eriopoda* Dwarf-shrub Herbaceous Vegetation (CEGL001741, GNRQ)
- *Artemisia bigelovii / Bouteloua gracilis* Dwarf-shrub Herbaceous Vegetation (CEGL001742, GNR)
- *Artemisia bigelovii / Muhlenbergia setifolia* Shrub Herbaceous Vegetation (CEGL001544, GNR)
- *Ayenia microphylla / Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001729, G1G2)
- *Bouteloua curtipendula - Bothriochloa barbinodis* Herbaceous Vegetation (CEGL001590, G4)
- *Bouteloua curtipendula - Hilaria belangeri - Bouteloua eriopoda* Herbaceous Vegetation (CEGL001591, G3)
- *Bouteloua curtipendula - Schizachyrium cirratum* Herbaceous Vegetation (CEGL001592, G4)
- *Bouteloua eriopoda - Bouteloua curtipendula* Herbaceous Vegetation (CEGL001747, G2)
- *Bouteloua eriopoda - Bouteloua gracilis* Herbaceous Vegetation (CEGL001748, G2)
- *Bouteloua eriopoda - Bouteloua hirsuta* Herbaceous Vegetation (CEGL001749, G2)
- *Bouteloua eriopoda - Bouteloua trifida* Herbaceous Vegetation (CEGL001750, GNRQ)
- *Bouteloua eriopoda - Hesperostipa neomexicana* Herbaceous Vegetation (CEGL001753, GNRQ)
- *Bouteloua eriopoda - Pleuraphis jamesii* Herbaceous Vegetation (CEGL001751, G3)
- *Bouteloua eriopoda* Semi-desert Herbaceous Vegetation (CEGL001752, G2Q)
- *Bouteloua gracilis - Bouteloua curtipendula* Herbaceous Vegetation (CEGL001754, G5)
- *Bouteloua gracilis - Bouteloua hirsuta* Herbaceous Vegetation (CEGL001755, G3G4)
- *Bouteloua gracilis - Buchloe dactyloides* Herbaceous Vegetation (CEGL001756, G4)
- *Bouteloua gracilis - Eragrostis intermedia* Herbaceous Vegetation (CEGL001758, G3)
- *Bouteloua gracilis - Hesperostipa neomexicana* Herbaceous Vegetation (CEGL001763, GNRQ)
- *Bouteloua gracilis - Sporobolus cryptandrus* Herbaceous Vegetation (CEGL001761, GNRQ)
- *Bouteloua gracilis - Sporobolus flexuosus* Herbaceous Vegetation (CEGL001762, GNRQ)
- *Bouteloua hirsuta - Bouteloua curtipendula* Herbaceous Vegetation (CEGL001764, G4)
- *Bouteloua hirsuta - Bouteloua radicosa* Herbaceous Vegetation (CEGL001765, G2)
- *Bouteloua hirsuta - Digitaria californica* Herbaceous Vegetation (CEGL001767, GNRQ)
- *Bouteloua hirsuta - Hesperostipa neomexicana* Herbaceous Vegetation (CEGL001766, GNRQ)
- *Bouteloua ramosa* Herbaceous Vegetation (CEGL004522, GNR)
- *Dasylirion leiophyllum - Agave lechuguilla / Bouteloua hirsuta - Bouteloua gracilis - Bouteloua eriopoda* Shrubland (CEGL004245, GNR)

- *Dasylirion leiophyllum - Viguiera stenoloba - Agave lechuguilla / Bouteloua ramosa* Shrubland (CEGL004604, G3G4)
- *Dasylirion wheeleri / Bouteloua curtipendula* Shrub Herbaceous Vegetation (CEGL001593, GNR)
- *Dasylirion wheeleri / Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001730, GNRQ)
- *Dasylirion wheeleri / Muhlenbergia setifolia* Shrub Herbaceous Vegetation (CEGL001512, GNRQ)
- *Fouquieria splendens / Bouteloua curtipendula* Shrubland (CEGL001376, GNR)
- *Fouquieria splendens / Bouteloua hirsuta* Shrubland (CEGL001377, G3?)
- *Fouquieria splendens / Muhlenbergia setifolia* Shrub Herbaceous Vegetation (CEGL001513, GNRQ)
- *Hesperostipa neomexicana - Bouteloua curtipendula* Herbaceous Vegetation (CEGL001709, G3?)
- *Hesperostipa neomexicana - Dasylirion wheeleri* Herbaceous Vegetation (CEGL001710, GNR)
- *Larrea tridentata / Pleuraphis mutica* Shrub Herbaceous Vegetation (CEGL001542, G2)
- *Muhlenbergia emersleyi - Bouteloua curtipendula* Herbaceous Vegetation (CEGL001644, GNR)
- *Muhlenbergia emersleyi - Bouteloua hirsuta* Herbaceous Vegetation (CEGL001645, G2?)
- *Parthenium incanum / Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001734, G3)
- *Pleuraphis jamesii - Sporobolus airoides* Herbaceous Vegetation (CEGL001778, G2G3)
- *Prosopis glandulosa / Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001510, G3G4)
- *Prosopis glandulosa / Pleuraphis mutica* Shrub Herbaceous Vegetation (CEGL001641, G5)
- *Quercus arizonica / Bouteloua curtipendula* Woodland (CEGL000680, G3)
- *Quercus arizonica / Muhlenbergia emersleyi* Woodland (CEGL000681, G4)
- *Quercus emoryi / Bouteloua curtipendula* Woodland (CEGL000683, G3)
- *Quercus emoryi / Muhlenbergia emersleyi* Woodland (CEGL000685, G4)
- *Quercus emoryi / Schizachyrium cirratum* Woodland (CEGL000687, GNR)
- *Quercus grisea / Bouteloua curtipendula* Woodland (CEGL000689, G5)
- *Schizachyrium scoparium* var. *scoparium - Muhlenbergia pungens* Herbaceous Vegetation (CEGL001684, G2)
- *Sporobolus airoides - Muhlenbergia porteri* Herbaceous Vegetation (CEGL001689, GUQ)
- *Yucca faxoniana / Bouteloua hirsuta - Bouteloua gracilis - Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL004248, GNR)

Alliances:

- *Bouteloua curtipendula* Herbaceous Alliance (A.1244)
- *Bouteloua curtipendula* Shrub Herbaceous Alliance (A.1552)
- *Bouteloua eriopoda* Dwarf-shrub Herbaceous Alliance (A.1570)
- *Bouteloua eriopoda* Herbaceous Alliance (A.1284)
- *Bouteloua eriopoda* Xeromorphic Shrub Herbaceous Alliance (A.1553)
- *Bouteloua gracilis* Dwarf-shrub Herbaceous Alliance (A.1571)
- *Bouteloua gracilis* Herbaceous Alliance (A.1282)
- *Bouteloua hirsuta - Bouteloua gracilis - Bouteloua eriopoda* Shrub Herbaceous Alliance (A.1548)
- *Bouteloua hirsuta* Herbaceous Alliance (A.1285)
- *Bouteloua ramosa* Herbaceous Alliance (A.1275)
- *Dasylirion leiophyllum - (Agave lechuguilla, Viguiera stenoloba)* Shrubland Alliance (A.850)
- *Fouquieria splendens* Shrubland Alliance (A.863)
- *Hesperostipa neomexicana* Herbaceous Alliance (A.1272)
- *Muhlenbergia emersleyi* Herbaceous Alliance (A.1259)
- *Muhlenbergia setifolia / Artemisia bigelovii* Shrub Herbaceous Alliance (A.1530)
- *Muhlenbergia setifolia* Shrub Herbaceous Alliance (A.1541)
- *Pleuraphis jamesii* Herbaceous Alliance (A.1287)
- *Pleuraphis mutica* Shrub Herbaceous Alliance (A.1551)
- *Prosopis glandulosa* Shrub Herbaceous Alliance (A.1550)
- *Quercus arizonica* Woodland Alliance (A.482)
- *Quercus emoryi* Woodland Alliance (A.483)
- *Quercus grisea* Woodland Alliance (A.478)
- *Schizachyrium scoparium* Bunch Herbaceous Alliance (A.1266)
- *Sporobolus airoides* Herbaceous Alliance (A.1267)

SOURCES

References: Brown 1982, Burgess 1995, Comer et al. 2003, Dick-Peddie 1993, McAuliffe 1995, McPherson 1995, Muldavin et al. 2000b, Muldavin et al. 2002

Version: 05 Oct 2004 **Stakeholders:** Latin America, Southeast, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

78 CES304.778—INTER-MOUNTAIN BASINS BIG SAGEBRUSH STEPPE

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Lowland]; Deep Soil; Aridic; Xeromorphic Shrub; Bunch grasses; Artemisia tridentata ssp. tridentata
Concept Summary: This widespread matrix-forming ecological system occurs throughout much of the Columbia Plateau and northern Great Basin and Wyoming and is found at slightly higher elevations farther south. Soils are typically deep and non-saline, often with a microphytic crust. This shrub-steppe is dominated by perennial grasses and forbs (>25% cover) with *Artemisia tridentata ssp. tridentata, Artemisia tridentata ssp. xericensis, Artemisia tridentata ssp. wyomingensis, Artemisia tripartita ssp. tripartita,* and/or *Purshia tridentata* dominating or codominating the open to moderately dense (10-40% cover) shrub layer. *Atriplex confertifolia, Chrysothamnus viscidiflorus, Ericameria nauseosa, Tetradymia* spp., or *Artemisia frigida* may be common especially in disturbed stands. Associated graminoids include *Achnatherum hymenoides, Calamagrostis montanensis, Elymus lanceolatus ssp. lanceolatus, Festuca idahoensis, Festuca campestris, Koeleria macrantha, Poa secunda,* and *Pseudoroegneria spicata*. Common forbs are *Phlox hoodii, Arenaria* spp., and *Astragalus* spp. Areas with deeper soils more commonly support *Artemisia tridentata ssp. tridentata* but have largely been converted for other land uses. The natural fire regime of this ecological system likely maintains a patchy distribution of shrubs, so the general aspect of the vegetation is a grassland. Shrubs may increase following heavy grazing and/or with fire suppression, particularly in moist portions of the northern Columbia Plateau where it forms a landscape mosaic pattern with shallow-soil scabland shrublands. Where fire frequency has allowed for shifts to a native grassland condition, maintained without significant shrub invasion over a 50- to 70-year interval, the area would be considered Columbia Basin Foothill and Canyon Dry Grassland (CES304.993).

DISTRIBUTION

Range: Occurs throughout much of the Columbia Plateau and northern Great Basin and Wyoming, and is found at slightly higher elevations further south.
Divisions: 304:C, 306:C
TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 20:C, 26:C
Subnations: BC, CA, CO, ID, MT, NV, OR, UT, WA, WY

CONCEPT

Associations:
- *Artemisia tridentata (*ssp. *tridentata,* ssp. *xericensis) / Pseudoroegneria spicata - Poa secunda* Shrub Herbaceous Vegetation (CEGL001019, G1)
- *Artemisia tridentata (*ssp. *tridentata,* ssp. *xericensis) / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001018, G2G4)
- *Artemisia tridentata / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001530, G4Q)
- *Artemisia tridentata / Leymus cinereus* Shrub Herbaceous Vegetation (CEGL001458, G2G4)
- *Artemisia tridentata / Sporobolus cryptandrus - Achnatherum hymenoides* Shrub Herbaceous Vegetation (CEGL001545, G2?)
- *Artemisia tridentata* ssp. *tridentata - Grayia spinosa* Shrubland (CEGL001004, G5)
- *Artemisia tridentata* ssp. *tridentata / Distichlis spicata* Shrubland (CEGL001000, G5)
- *Artemisia tridentata* ssp. *tridentata / Festuca idahoensis* Shrubland (CEGL001014, G4?)
- *Artemisia tridentata* ssp. *tridentata / Hesperostipa comata* Shrubland (CEGL002966, G4?)
- *Artemisia tridentata* ssp. *tridentata / Leymus cinereus* Shrubland (CEGL001016, G2)
- *Artemisia tridentata* ssp. *tridentata / Pascopyrum smithii - (Elymus lanceolatus)* Shrubland (CEGL001017, G3?)
- *Artemisia tridentata* ssp. *tridentata / Pleuraphis jamesii* Shrubland (CEGL001015, G2G4)
- *Artemisia tridentata* ssp. *tridentata / Poa secunda* Shrubland (CEGL001008, G3G5)
- *Artemisia tridentata* ssp. *wyomingensis* / Mixed Grasses Shrub Herbaceous Vegetation (CEGL001534, G5)
- *Artemisia tridentata* ssp. *wyomingensis / Pascopyrum smithii* Shrub Herbaceous Vegetation (CEGL001047, G4)
- *Artemisia tridentata* ssp. *wyomingensis / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001535, G4)
- *Artemisia tripartita* ssp. *tripartita / Festuca campestris* Shrub Herbaceous Vegetation (CEGL001537, G2?)
- *Artemisia tripartita* ssp. *tripartita / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001536, G3)
- *Artemisia tripartita* ssp. *tripartita / Hesperostipa comata* Shrub Herbaceous Vegetation (CEGL001539, G1)
- *Artemisia tripartita* ssp. *tripartita / Leymus cinereus* Shrub Herbaceous Vegetation (CEGL002994, GU)
- *Artemisia tripartita* ssp. *tripartita / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001538, G2G3)
- *Purshia tridentata / Festuca campestris* Shrub Herbaceous Vegetation (CEGL001494, G2?)
- *Purshia tridentata / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL002674, G3G5)
- *Purshia tridentata / Hesperostipa comata* Shrub Herbaceous Vegetation (CEGL001498, G2)
- *Purshia tridentata / Poa secunda* Shrubland (CEGL001059, G1?Q)
- *Purshia tridentata / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001495, G3)

Alliances:
- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrub Herbaceous Alliance (A.1522)
- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrubland Alliance (A.830)
- *Artemisia tridentata* Shrub Herbaceous Alliance (A.1521)
- *Artemisia tridentata* ssp. *wyomingensis* Shrub Herbaceous Alliance (A.1527)
- *Artemisia tripartita* ssp. *tripartita* Shrub Herbaceous Alliance (A.1528)
- *Purshia tridentata* Shrub Herbaceous Alliance (A.1523)
- *Purshia tridentata* Shrubland Alliance (A.825)
- *Sporobolus cryptandrus* Shrub Herbaceous Alliance (A.1525)

Dynamics: The natural fire regime of this ecological system likely maintains patchy distribution of shrubs, so the general aspect of the vegetation is a grassland. Shrubs may increase following heavy grazing and/or with fire suppression, particularly in moist portions of the northern Columbia Plateau where it forms a landscape mosaic pattern with shallow-soil scabland shrublands. Microphytic crust is very important in this ecological system.

SOURCES

References: Barbour and Major 1977, Barbour and Major 1988, Comer et al. 2003, Daubenmire 1970, Ecosystems Working Group 1998, Knight 1994, Mueggler and Stewart 1980, West 1983c

Version: 08 Sep 2004 **Stakeholders:** Canada, Midwest, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

79 CES304.788—INTER-MOUNTAIN BASINS SEMI-DESERT SHRUB-STEPPE

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill, Lowland]; Woody-Herbaceous; Temperate [Temperate Xeric]; Alkaline Soil; Aridic; Very Short Disturbance Interval; G-Landscape/High Intensity; Graminoid

Concept Summary: This ecological system occurs throughout the intermountain western U.S., typically at lower elevations on alluvial fans and flats with moderate to deep soils. This semi-arid shrub-steppe is typically dominated by graminoids (>25% cover) with an open shrub layer. Characteristic grasses include *Achnatherum hymenoides, Bouteloua gracilis, Distichlis spicata, Hesperostipa comata, Pleuraphis jamesii, Poa secunda*, and *Sporobolus airoides*. The woody layer is often a mixture of shrubs and dwarf-shrubs. Characteristic species include *Atriplex canescens, Artemisia tridentata, Chrysothamnus greenei, Chrysothamnus viscidiflorus, Ephedra* spp., *Ericameria nauseosa, Gutierrezia sarothrae*, and *Krascheninnikovia lanata*. *Artemisia tridentata* may be present but does not dominate. The general aspect of occurrences may be either open shrubland with patchy grasses or patchy open herbaceous layer. Disturbance may be important in maintaining the woody component. Microphytic crust is very important in some stands.

DISTRIBUTION

Range: Occurs throughout the Intermountain western U.S., typically at lower elevations.

Divisions: 304:C

TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 21:C

Subnations: AZ, CA, CO, ID, MT?, NM, NV, OR, UT, WA, WY

CONCEPT

Associations:

- *Achnatherum speciosum* Shrub Herbaceous Vegetation [Placeholder] (CEGL003113, G1Q)
- *Artemisia bigelovii / Bouteloua gracilis* Dwarf-shrub Herbaceous Vegetation (CEGL001742, GNR)
- *Artemisia tridentata - (Ericameria nauseosa) / Bromus tectorum* Semi-natural Shrubland (CEGL002699, GNR)
- *Artemisia tridentata - Atriplex confertifolia* Shrubland (CEGL000993, G4)
- *Atriplex obovata / Pleuraphis jamesii - Sporobolus airoides* Shrub Herbaceous Vegetation (CEGL001775, GU)
- *Bouteloua eriopoda* Coconino Plateau Shrub Herbaceous Vegetation (CEGL002787, GNR)
- *Bouteloua gracilis - Hesperostipa comata* Herbaceous Vegetation [Provisional] (CEGL002932, GNR)
- *Bouteloua gracilis* Dwarf-shrub Herbaceous Vegetation [Placeholder] (CEGL005810, GNR)
- *Chrysothamnus viscidiflorus - Ericameria parryi* Shrub Herbaceous Vegetation [Provisional] (CEGL002781, GNR)
- *Chrysothamnus viscidiflorus / Hesperostipa comata* Shrubland (CEGL002799, GNR)
- *Chrysothamnus viscidiflorus / Leymus salinus* ssp. *salinus* Shrub Herbaceous Vegetation (CEGL001501, G2G4)
- *Chrysothamnus viscidiflorus / Poa pratensis* Semi-Natural Shrub Herbaceous Vegetation (CEGL002933, GNR)
- *Ephedra nevadensis* Basalt Shrubland [Provisional] (CEGL002936, GNR)
- *Ephedra viridis / Achnatherum hymenoides - Bouteloua gracilis* Shrub Herbaceous Vegetation (CEGL001648, G2G4)
- *Ephedra viridis / Achnatherum hymenoides - Sporobolus cryptandrus* Shrub Herbaceous Vegetation (CEGL001649, G2G4)
- *Ericameria nauseosa / Bouteloua gracilis* Shrub Herbaceous Vegetation (CEGL003495, GNR)
- *Ericameria nauseosa / Bromus tectorum* Semi-natural Shrubland (CEGL002937, GNR)
- *Ericameria nauseosa / Muhlenbergia pungens - Achnatherum hymenoides* Shrub Herbaceous Vegetation (CEGL002921, GNR)
- *Ericameria nauseosa / Pleuraphis jamesii - (Hesperostipa comata)* Shrub Herbaceous Vegetation (CEGL002996, GNR)
- *Ericameria parryi / Pleuraphis jamesii - Bouteloua gracilis* Shrubland (CEGL001331, GUQ)
- *Gutierrezia sarothrae* - (*Opuntia* spp.) / *Pleuraphis jamesii* Dwarf-shrubland (CEGL002690, GNR)
- *Gutierrezia sarothrae - Krascheninnikovia lanata - Atriplex canescens / Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001733, G2)
- *Gutierrezia sarothrae / Pleuraphis rigida* Shrub Herbaceous Vegetation (CEGL001543, G2Q)
- *Gutierrezia sarothrae / Sporobolus airoides - Pleuraphis jamesii* Shrub Herbaceous Vegetation (CEGL001776, GU)
- *Krascheninnikovia lanata / Bouteloua gracilis* Dwarf-shrub Herbaceous Vegetation (CEGL001321, G4)
- *Krascheninnikovia lanata / Pascopyrum smithii - Bouteloua gracilis* Dwarf-shrub Herbaceous Vegetation (CEGL001324, G4)

- *Krascheninnikovia lanata / Pleuraphis jamesii* Dwarf-shrubland (CEGL001322, G3G4)
- *Krascheninnikovia lanata / Poa secunda* Dwarf-shrubland (CEGL001326, G3)
- *Poliomintha incana / (Pleuraphis jamesii)* Shrubland (CEGL002930, GNR)

Alliances:

- *Achnatherum hymenoides* Shrub Herbaceous Alliance (A.1543)
- *Achnatherum speciosum* Shrub Herbaceous Alliance (A.1549)
- *Artemisia tridentata* Shrubland Alliance (A.829)
- *Artemisia tridentata* ssp. *wyomingensis* Shrubland Alliance (A.832)
- *Bouteloua eriopoda* Microphyllous Evergreen Shrub Herbaceous Alliance (A.1545)
- *Bouteloua eriopoda* Xeromorphic Shrub Herbaceous Alliance (A.1553)
- *Bouteloua gracilis* Dwarf-shrub Herbaceous Alliance (A.1571)
- *Bouteloua gracilis* Herbaceous Alliance (A.1282)
- *Chrysothamnus viscidiflorus* Shrubland Alliance (A.2651)
- *Chrysothamnus viscidiflorus* Shrub Herbaceous Alliance (A.1524)
- *Ephedra nevadensis* Shrubland Alliance (A.857)
- *Ericameria nauseosa* Shrub Short Herbaceous Alliance (A.1546)
- *Ericameria nauseosa* Shrubland Alliance (A.835)
- *Ericameria parryi* Shrubland Alliance (A.818)
- *Gutierrezia sarothrae* Dwarf-shrubland Alliance (A.2528)
- *Krascheninnikovia lanata* Dwarf-shrub Herbaceous Alliance (A.1565)
- *Krascheninnikovia lanata* Dwarf-shrubland Alliance (A.1104)
- *Pleuraphis jamesii* Shrub Herbaceous Alliance (A.1532)
- *Pleuraphis rigida / Gutierrezia sarothrae* Shrub Herbaceous Alliance (A.1529)
- *Poliomintha incana* Shrubland Alliance (A.862)

Environment: This ecological system occurs throughout the Intermountain West from the western Great Basin to the northern Rocky Mountains and Colorado Plateau at elevations ranging from 300 m up to 2500 m. The climate where this system occurs is generally hot in summers and cold in winters with low annual precipitation, ranging from 18-40 cm and high inter-annual variation. Much of the precipitation falls as snow, and growing-season drought is characteristic. Temperatures are continental with large annual and diurnal variation. Sites are generally alluvial fans and flats with moderate to deep soils. Some sites can be flat, poorly drained and intermittently flooded with a shallow or perched water table often within 1 m depth (West 1983). Substrates are generally shallow, calcareous, fine-textured soils (clays to silt-loams), derived from alluvium; or deep, fine to medium-textured alluvial soils with some source of sub-irrigation during the summer season. Soils may be alkaline and typically moderately saline (West 1983). Some occurrences occur on deep, sandy soils, or soils that are highly calcareous (Hironaka et al. 1983).

Vegetation: The plant associations in this system are characterized by a somewhat sparse to moderately dense (10-70% cover) shrub layer of *Artemisia filifolia, Ephedra cutleri, Ephedra nevadensis, Ephedra torreyana, Ephedra viridis, Ericameria nauseosa, Chrysothamnus viscidiflorus, Gutierrezia sarothrae, Sarcobatus vermiculatus*, or *Atriplex canescens*. Other shrubs occasionally present include *Purshia tridentata* and *Tetradymia canescens*. *Artemisia tridentata* may be present but does not dominate. Trees are very rarely present in this system, but some individuals of *Pinus ponderosa, Juniperus scopulorum, Juniperus occidentalis*, or *Cercocarpus ledifolius* may occur. The herbaceous layer is dominated by bunch grasses which occupy patches in the shrub matrix. The most widespread species is *Pseudoroegneria spicata*, which occurs from the Columbia Basin to the northern Rockies. Other locally dominant or important species include *Sporobolus airoides, Leymus cinereus, Festuca idahoensis, Pascopyrum smithii, Bouteloua gracilis, Distichlis spicata, Pleuraphis jamesii, Elymus lanceolatus, Elymus elymoides, Koeleria macrantha, Muhlenbergia richardsonis, Hesperostipa comata*, and *Poa secunda*. Annual grasses, especially the exotics *Bromus japonicus* and *Bromus tectorum*, may be present to abundant. Forbs are generally of low importance and are highly variable across the range, but may be diverse in some occurrences. Species that often occur are *Symphyotrichum ascendens (= Aster adscendens), Collinsia parviflora, Penstemon caespitosus, Achillea millefolium, Erigeron compositus, Senecio* spp, and *Taraxacum officinale*. Other important genera include *Astragalus, Oenothera, Eriogonum*, and *Balsamorhiza*. Mosses and lichens may be important ground cover. Forbs are common on disturbed weedy sites. Weedy annual forbs may include the exotics *Descurainia* spp., *Helianthus annuus, Halogeton glomeratus, Lactuca serriola*, and *Lepidium perfoliatum*.

SOURCES

References: Branson et al. 1976, Comer et al. 2003, Hanson 1929, Hironaka et al. 1983, Tuhy et al. 2002, West 1983e

Version: 20 Feb 2003 **Stakeholders:** West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

80 CES302.732—CHIHUAHUAN GYPSOPHILOUS GRASSLAND AND STEPPE

Primary Division: North American Warm Desert (302)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Alkaline Soil; Gypsiferous; Dwarf-Shrub; Graminoid

Concept Summary: This ecological system is restricted to gypsum outcrops or sandy gypsiferous and/or often alkaline soils that occur in basins and slopes in the Chihuahuan Desert. Elevation range is from 1100-2000 m. These typically sparse grasslands, steppes or dwarf-shrublands are dominated by a variety of gypsophilous plants, many of which are endemic to these habitats. Characteristic species include *Tiquilia hispidissima, Atriplex canescens, Calylophus hartwegii, Ephedra torreyana, Frankenia jamesii, Bouteloua breviseta, Mentzelia perennis, Nama carnosum, Calylophus hartwegii (= Oenothera hartwegii), Selinocarpus lanceolatus, Sporobolus nealleyi, Sporobolus airoides,* and *Sartwellia flaveriae*. This system does not include the sparsely vegetated gypsum dunes that are included in North American Warm Desert Active and Stabilized Dune (CES302.744).

DISTRIBUTION

Range: Basins and slopes in the Chihuahuan Desert; elevation range from 1100-2000 m.
Divisions: 302:C
TNC Ecoregions: 22:P, 24:C
Subnations: AZ, MXCH, NM, TX

CONCEPT

Associations:
- *Atriplex obovata / Tidestromia carnosa* Dwarf-shrubland (CEGL004575, G2?)
- *Fouquieria splendens / Sporobolus nealleyi* Shrub Herbaceous Vegetation (CEGL001517, GNRQ)
- *Schizachyrium scoparium* var. *scoparium - Muhlenbergia pungens* Herbaceous Vegetation (CEGL001684, G2)
- *Sporobolus airoides - Scleropogon brevifolius* Herbaceous Vegetation (CEGL001692, G5)
- *Sporobolus nealleyi - Bouteloua eriopoda* Herbaceous Vegetation (CEGL001697, GU)
- *Sporobolus nealleyi - Calylophus hartwegii* Herbaceous Vegetation (CEGL001698, G3)
- *Tidestromia carnosa - Kallstroemia grandiflora* Sparse Vegetation (CEGL004580, G2G3)
- *Tiquilia hispidissima - Yucca torreyi / Sporobolus nealleyi* Dwarf-shrubland (CEGL003959, G2G3)
- *Tiquilia hispidissima / Bouteloua breviseta - Mentzelia humilis* Dwarf-shrubland (CEGL004573, G2)
- *Tiquilia hispidissima / Sporobolus airoides* Dwarf-shrubland (CEGL004574, G2G3)
- *Tiquilia hispidissima / Sporobolus nealleyi* Dwarf-shrubland (CEGL001546, G2)
- *Tiquilia hispidissima* Dwarf-shrubland [Provisional] (CEGL008425, GNR)

Alliances:
- *Atriplex obovata* Dwarf-shrubland Alliance (A.1108)
- *Schizachyrium scoparium* Bunch Herbaceous Alliance (A.1266)
- *Sporobolus airoides* Herbaceous Alliance (A.1267)
- *Sporobolus nealleyi* Herbaceous Alliance (A.1269)
- *Sporobolus nealleyi* Shrub Herbaceous Alliance (A.1542)
- *Tidestromia carnosa* Sparsely Vegetated Alliance (A.1873)
- *Tiquilia hispidissima* Dwarf-shrubland Alliance (A.1101)

SOURCES

References: Comer et al. 2003, Dick-Peddie 1993, Henrickson et al. 1985, MacMahon 1988, Muldavin et al. 2000b, Muldavin et al. 2002, Powell and Turner 1974
Version: 20 Feb 2003 **Stakeholders:** Latin America, Southeast, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

81 CES306.816—ROCKY MOUNTAIN DRY TUNDRA

Primary Division: Rocky Mountain (306)
Land Cover Class: Herbaceous
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Oligotrophic Soil; Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Aridic; Very Long Disturbance Interval; Graminoid; Alpine Slopes
Concept Summary: This widespread ecological system occurs above upper treeline throughout the Rocky Mountain cordillera, including alpine areas of ranges in Utah and Nevada, and isolated alpine sites in the northeastern Cascades. It is found on gentle to moderate slopes, flat ridges, valleys, and basins, where the soil has become relatively stabilized and the water supply is more or less constant. Vegetation in these areas is controlled by snow retention, wind desiccation, permafrost, and a short growing season. This system is characterized by a dense cover of low-growing, perennial graminoids and forbs. Rhizomatous, sod-forming sedges are the dominant graminoids, and prostrate and mat-forming plants with thick rootstocks or taproots characterize the forbs. Dominant species include *Artemisia arctica, Carex elynoides, Carex siccata, Carex scirpoidea, Carex nardina, Carex rupestris, Deschampsia caespitosa, Festuca brachyphylla, Festuca idahoensis, Geum rossii, Kobresia myosuroides, Phlox pulvinata,* and *Trifolium dasyphyllum*. Although alpine tundra dry meadow is the matrix of the alpine zone, it typically intermingles with alpine bedrock and scree, ice field, fell-field, alpine dwarf-shrubland, and alpine/subalpine wet meadow systems.

DISTRIBUTION

Range: This system occurs above upper treeline throughout the North American Rocky Mountain cordillera, including alpine areas of ranges in Utah and Nevada, and isolated alpine sites in the northeastern Cascades.
Divisions: 204:P, 306:C
TNC Ecoregions: 7:C, 8:C, 9:C, 11:C, 20:C, 21:C, 68:C
Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

Associations:

- *Arctostaphylos uva-ursi / Festuca campestris - Festuca idahoensis* Dwarf-shrubland (CEGL005830, G3G4)
- *Arctostaphylos uva-ursi / Pseudoroegneria spicata* Dwarf-shrubland (CEGL005831, G2G3)
- *Arctostaphylos uva-ursi / Solidago multiradiata* Dwarf-shrubland (CEGL005832, G2G3)
- *Artemisia arctica* ssp. *arctica* Herbaceous Vegetation (CEGL001848, GU)
- *Calamagrostis purpurascens* Herbaceous Vegetation (CEGL001850, G2)
- *Carex arapahoensis* Herbaceous Vegetation (CEGL001851, GU)
- *Carex duriuscula - Poa secunda* Herbaceous Vegetation (CEGL001736, G2Q)
- *Carex ebenea - Trifolium parryi* Herbaceous Vegetation (CEGL001873, GUQ)
- *Carex elynoides - Geum rossii* Herbaceous Vegetation (CEGL001853, G4)
- *Carex elynoides - Lupinus argenteus* Herbaceous Vegetation (CEGL001854, G3)
- *Carex elynoides - Oreoxis* spp. Herbaceous Vegetation (CEGL001855, G4)
- *Carex elynoides - Oxytropis sericea* Herbaceous Vegetation (CEGL001856, G3)
- *Carex elynoides* Herbaceous Vegetation (CEGL001852, G4)
- *Carex haydeniana* Herbaceous Vegetation (CEGL001875, GU)
- *Carex perglobosa - Silene acaulis* Herbaceous Vegetation (CEGL001858, GU)
- *Carex rupestris - Geum rossii* Herbaceous Vegetation (CEGL001861, G4)
- *Carex rupestris - Potentilla ovina* Herbaceous Vegetation (CEGL001862, G4)
- *Carex rupestris - Trifolium dasyphyllum* Herbaceous Vegetation (CEGL001863, G3G4)
- *Carex rupestris* var. *drummondiana* Herbaceous Vegetation (CEGL001864, G4)
- *Carex scirpoidea - Geum rossii* Herbaceous Vegetation (CEGL001866, G4)
- *Carex scirpoidea - Potentilla diversifolia* Herbaceous Vegetation (CEGL001867, G3?)
- *Carex scirpoidea - Zigadenus elegans* Herbaceous Vegetation (CEGL005866, G4G5)
- *Carex siccata - Geum rossii* Herbaceous Vegetation (CEGL001808, GU)
- *Carex* spp. - *Geum rossii* Herbaceous Vegetation (CEGL001870, G4Q)
- *Carex vernacula* Herbaceous Vegetation (CEGL001868, GU)
- *Cirsium scopulorum - Polemonium viscosum* Herbaceous Vegetation (CEGL001959, GU)
- *Dryas octopetala - Carex rupestris* Dwarf-shrub Herbaceous Vegetation (CEGL001892, G4)
- *Dryas octopetala - Carex* spp. Dwarf-shrub Herbaceous Vegetation (CEGL001893, G3?)
- *Dryas octopetala* Dwarf-shrub Herbaceous Vegetation (CEGL001891, G3?)
- *Festuca brachyphylla - Geum rossii* var. *turbinatum* Herbaceous Vegetation (CEGL001895, GUQ)
- *Festuca brachyphylla - Trisetum spicatum* Herbaceous Vegetation (CEGL001896, G3?)
- *Festuca brachyphylla* Herbaceous Vegetation (CEGL001797, G4?)
- *Festuca thurberi* Subalpine Grassland Herbaceous Vegetation (CEGL001631, G3)
- *Geum rossii - Carex albonigra* Herbaceous Vegetation (CEGL001966, G1G2Q)
- *Geum rossii - Minuartia obtusiloba* Herbaceous Vegetation (CEGL001965, G3?)
- *Geum rossii - Selaginella densa* Herbaceous Vegetation (CEGL001968, G2G3Q)
- *Geum rossii - Trifolium* spp. Herbaceous Vegetation (CEGL001970, G3)
- *Geum rossii* Herbaceous Vegetation (CEGL001964, G4G5Q)
- *Kobresia myosuroides - Carex rupestris* var. *drummondiana* Herbaceous Vegetation (CEGL001907, G3)
- *Kobresia myosuroides - Geum rossii* Herbaceous Vegetation (CEGL001908, G5)
- *Kobresia myosuroides - Trifolium dasyphyllum* Herbaceous Vegetation (CEGL001909, GU)
- *Leucopoa kingii - Carex elynoides* Herbaceous Vegetation (CEGL001911, G3)
- *Leucopoa kingii - Oxytropis campestris* Herbaceous Vegetation (CEGL001912, G3?)
- *Leucopoa kingii - Phlox pulvinata* Herbaceous Vegetation (CEGL001913, G3)
- *Leucopoa kingii - Poa fendleriana* ssp. *fendleriana* Herbaceous Vegetation (CEGL001914, G3)
- *Leucopoa kingii* Herbaceous Vegetation (CEGL001910, G3Q)
- *Minuartia obtusiloba* Herbaceous Vegetation (CEGL001919, G4)
- *Poa arctica* ssp. *grayana* Herbaceous Vegetation (CEGL001924, GU)
- *Poa lettermanii* Herbaceous Vegetation (CEGL001927, GU)
- *Poa nervosa - Achnatherum lettermanii* Herbaceous Vegetation (CEGL001656, G1G2)
- *Pseudoroegneria spicata* - Cushion Plants Herbaceous Vegetation (CEGL001666, G3?)
- *Ribes montigenum* Shrubland (CEGL001133, GU)

- *Saxifraga chrysantha* Sparse Vegetation (CEGL001929, GU)
- *Sibbaldia procumbens - Polygonum bistortoides* Herbaceous Vegetation (CEGL001933, G3?)

Alliances:

- *Arctostaphylos uva-ursi* Dwarf-shrubland Alliance (A.1079)
- *Artemisia arctica* Herbaceous Alliance (A.1624)
- *Calamagrostis purpurascens* Herbaceous Alliance (A.1301)
- *Carex (ebenea, haydeniana)* Herbaceous Alliance (A.1302)
- *Carex arapahoensis* Herbaceous Alliance (A.1319)
- *Carex duriuscula* Herbaceous Alliance (A.1283)
- *Carex elynoides* Herbaceous Alliance (A.1303)
- *Carex perglobosa* Herbaceous Alliance (A.1304)
- *Carex rupestris* Herbaceous Alliance (A.1307)
- *Carex scirpoidea* Herbaceous Alliance (A.1308)
- *Carex siccata* Herbaceous Alliance (A.1298)
- *Carex vernacula* Herbaceous Alliance (A.1309)
- *Cirsium scopulorum* Herbaceous Alliance (A.1608)
- *Dryas octopetala* Dwarf-shrub Herbaceous Alliance (A.1577)
- *Festuca brachyphylla* Herbaceous Alliance (A.1321)
- *Festuca thurberi* Herbaceous Alliance (A.1256)
- *Geum rossii* Herbaceous Alliance (A.1645)
- *Kobresia myosuroides* Herbaceous Alliance (A.1326)
- *Leucopoa kingii* Herbaceous Alliance (A.1323)
- *Minuartia obtusiloba* Herbaceous Alliance (A.1630)
- *Poa arctica* Herbaceous Alliance (A.1311)
- *Poa lettermanii* Herbaceous Alliance (A.1327)
- *Poa nervosa* Herbaceous Alliance (A.1264)
- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)
- *Ribes montigenum* Shrubland Alliance (A.926)
- *Saxifraga (chrysantha, mertensiana)* Sparsely Vegetated Alliance (A.1632)
- *Sibbaldia procumbens* Herbaceous Alliance (A.1635)

SOURCES

References: Anderson 1999, Baker 1980a, Bamberg 1961, Bamberg and Major 1968, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1997, Douglas and Bliss 1977, Ecosystems Working Group 1998, Komarkova 1976, Komarkova 1980, Meidinger and Pojar 1991, Neely et al. 2001, Schwan and Costello 1951, Thilenius 1975, Willard 1963

Version: 07 Sep 2005 **Stakeholders:** Canada, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

83 CES306.829—ROCKY MOUNTAIN SUBALPINE-MONTANE MESIC MEADOW

Primary Division: Rocky Mountain (306)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Upper Montane]; Herbaceous; Silt Soil Texture; Clay Soil Texture; Udic; Forb

Concept Summary: This Rocky Mountain ecological system is restricted to sites from lower montane to subalpine where finely textured soils, snow deposition, or windswept dry conditions limit tree establishment. It is found typically above 2000 m in elevation in the southern part of its range and above 600 m in the northern part. These upland communities occur on gentle to moderate-gradient slopes. The soils are typically seasonally moist to saturated in the spring, but if so will dry out later in the growing season. These sites are not as wet as those found in Rocky Mountain Alpine-Montane Wet Meadow (CES306.812). Vegetation is typically forb-rich, with forbs contributing more to overall herbaceous cover than graminoids. Important taxa include *Erigeron* spp., Asteraceae spp., *Mertensia* spp., *Penstemon* spp., *Campanula* spp., *Lupinus* spp., *Solidago* spp., *Ligusticum* spp., *Thalictrum occidentale, Valeriana sitchensis, Rudbeckia occidentalis, Balsamorhiza sagittata, Wyethia* spp., *Deschampsia caespitosa, Koeleria macrantha*, and *Dasiphora fruticosa*. Burrowing mammals can increase the forb diversity.

DISTRIBUTION

Range: Rocky Mountains.

Divisions: 304:C, 306:C

TNC Ecoregions: 7:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 68:C

Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

Associations:

- *Agastache urticifolia - Heliomeris multiflora* Herbaceous Vegetation (CEGL001937, GNR)
- *Antennaria microphylla - Artemisia scopulorum* Herbaceous Vegetation (CEGL001847, G1Q)
- *Chamerion angustifolium* Rocky Mountain Herbaceous Vegetation [Provisional] (CEGL005856, G4G5)
- *Deschampsia caespitosa - Achillea millefolium* var. *occidentalis* Herbaceous Vegetation (CEGL001880, G5)
- *Deschampsia caespitosa - Geum rossii* Herbaceous Vegetation (CEGL001884, G5)
- *Deschampsia caespitosa - Ligusticum tenuifolium* Herbaceous Vegetation (CEGL001885, GU)
- *Deschampsia caespitosa - Mertensia ciliata* Herbaceous Vegetation (CEGL001887, GU)
- *Deschampsia caespitosa - Phleum alpinum* Herbaceous Vegetation (CEGL001888, G3Q)
- *Deschampsia caespitosa - Potentilla diversifolia* Herbaceous Vegetation (CEGL001889, G5)
- *Deschampsia caespitosa - Symphyotrichum foliaceum* Herbaceous Vegetation (CEGL001881, G2Q)
- *Geum rossii - Trifolium* spp. Herbaceous Vegetation (CEGL001970, G3)
- *Heracleum maximum - Rudbeckia occidentalis* Herbaceous Vegetation (CEGL001940, G4)
- *Ivesia gordonii - Eriogonum caespitosum* Herbaceous Vegetation (CEGL001903, G2?)
- *Ivesia gordonii - Minuartia obtusiloba* Herbaceous Vegetation (CEGL001902, G2?)
- *Ligusticum filicinum - Delphinium X occidentale* Herbaceous Vegetation (CEGL001941, G3)
- *Ligusticum porteri - Lupinus parviflorus* ssp. *myrianthus* Herbaceous Vegetation (CEGL001915, GU)
- *Ligusticum porteri - Vicia americana* Herbaceous Vegetation (CEGL001916, G3)
- *Ligusticum tenuifolium - Trollius laxus* ssp. *albiflorus* Herbaceous Vegetation (CEGL001917, GU)
- *Lupinus argenteus - Fragaria virginiana* Herbaceous Vegetation (CEGL001942, G3?)
- *Lupinus* spp. - *Poa* spp. Herbaceous Vegetation (CEGL001943, G1Q)
- *Luzula glabrata* var. *hitchcockii - Erythronium grandiflorum* Herbaceous Vegetation (CEGL005873, GNR)
- *Mertensia ciliata* Herbaceous Vegetation (CEGL001944, G3)
- *Phleum alpinum - Achillea millefolium* Herbaceous Vegetation (CEGL001920, G5)
- *Trifolium dasyphyllum* Herbaceous Vegetation (CEGL001935, G4)
- *Trifolium parryi* Herbaceous Vegetation (CEGL001936, GU)
- *Wyethia amplexicaulis* Herbaceous Vegetation (CEGL001947, G3?)
- *Xerophyllum tenax* Herbaceous Vegetation (CEGL005859, GNR)

Alliances:

- *Agastache urticifolia* Herbaceous Alliance (A.1602)
- *Antennaria microphylla* Herbaceous Alliance (A.1623)
- *Chamerion angustifolium* Herbaceous Alliance (A.3535)
- *Deschampsia caespitosa* Seasonally Flooded Herbaceous Alliance (A.1408)
- *Deschampsia caespitosa* Temporarily Flooded Herbaceous Alliance (A.1355)
- *Geum rossii* Herbaceous Alliance (A.1645)
- *Heracleum maximum* Temporarily Flooded Herbaceous Alliance (A.1661)
- *Ivesia gordonii* Herbaceous Alliance (A.1627)
- *Ligusticum filicinum* Herbaceous Alliance (A.1604)
- *Ligusticum porteri* Herbaceous Alliance (A.1601)
- *Ligusticum tenuifolium* Herbaceous Alliance (A.1628)
- *Lupinus argenteus* Herbaceous Alliance (A.1605)
- *Luzula glabrata* var. *hitchcockii* Herbaceous Alliance (A.2641)
- *Mertensia ciliata* Herbaceous Alliance (A.1606)
- *Phleum alpinum* Herbaceous Alliance (A.1310)
- *Trifolium (dasyphyllum, nanum)* Herbaceous Alliance (A.1637)
- *Trifolium parryi* Herbaceous Alliance (A.1638)
- *Wyethia amplexicaulis* Herbaceous Alliance (A.1607)
- *Xerophyllum tenax* Herbaceous Alliance (A.1600)

SOURCES

References: Buckner 1977, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Ellison 1954, Fritz 1981, Gregory 1983, Hall 1971, Hammerson 1979, Marr 1977a, Meidinger and Pojar 1991, Nachlinger 1985, Neely et al. 2001, Potkin and Munn 1989, Starr 1974

Version: 07 Sep 2005 **Stakeholders:** Canada, Midwest, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

85 CES306.824—SOUTHERN ROCKY MOUNTAIN MONTANE-SUBALPINE GRASSLAND

Primary Division: Rocky Mountain (306)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Acidic Soil; Mineral: W/ A-Horizon >10 cm; Loam Soil Texture; Silt Soil Texture; Aridic; Short Disturbance Interval; Graminoid; Cool-season bunch grasses

Concept Summary: This Rocky Mountain ecological system typically occurs between 2200 and 3000 m on flat to rolling plains and parks or on lower sideslopes that are dry, but it may extend up to 3350 m on warm aspects. Soils resemble prairie soils in that the A-horizon is dark brown, relatively high in organic matter, slightly acid, and usually well-drained. An occurrence usually consists of a mosaic of two or three plant associations with one of the following dominant bunch grasses: *Danthonia intermedia, Danthonia parryi, Festuca idahoensis, Festuca arizonica, Festuca thurberi, Muhlenbergia filiculmis,* or *Pseudoroegneria spicata*. The subdominants include *Muhlenbergia montana, Bouteloua gracilis,* and *Poa secunda*. These large-patch grasslands are intermixed with matrix stands of spruce-fir, lodgepole, ponderosa pine, and aspen forests. In limited circumstances (e.g., South Park in Colorado), they form the "matrix" of high-elevation plateaus.
Comments: Montane grasslands are very similar and intergrade with their subalpine counterparts, but are separated here to represent those species that do not occur at higher altitudes.

DISTRIBUTION

Range: Occurs between 2200-3000 m in the Colorado Rockies.
Divisions: 304:C, 306:C
TNC Ecoregions: 18:C, 19:C, 20:C, 21:C
Subnations: AZ, CO, NM, UT, WY

CONCEPT

Associations:
- *Agrostis variabilis* Herbaceous Vegetation (CEGL001846, G2G3)
- *Bromus inermis - (Pascopyrum smithii)* Semi-natural Herbaceous Vegetation (CEGL005264, GNA)
- *Danthonia intermedia - Solidago multiradiata* Herbaceous Vegetation (CEGL001879, G3G4)
- *Danthonia intermedia* Herbaceous Vegetation (CEGL001794, G2G3)
- *Danthonia parryi* Herbaceous Vegetation (CEGL001795, G3)
- *Deschampsia caespitosa* Herbaceous Vegetation (CEGL001599, G4)
- *Festuca arizonica - Blepharoneuron tricholepis* Herbaceous Vegetation (CEGL004508, G1G2)
- *Festuca arizonica - Muhlenbergia filiculmis* Herbaceous Vegetation (CEGL001605, GU)
- *Festuca arizonica - Muhlenbergia montana* Herbaceous Vegetation (CEGL001606, G3)
- *Festuca idahoensis - Carex filifolia* Herbaceous Vegetation (CEGL001898, G3)
- *Festuca idahoensis - Danthonia intermedia* Herbaceous Vegetation (CEGL001612, G3?Q)
- *Festuca idahoensis - Festuca thurberi* Herbaceous Vegetation (CEGL001617, G3G4)
- *Festuca idahoensis - Geranium viscosissimum* Herbaceous Vegetation (CEGL001618, G2G3)
- *Festuca idahoensis - Pseudoroegneria spicata* Herbaceous Vegetation (CEGL001624, G4)
- *Festuca roemeri - Delphinium glareosum* Herbaceous Vegetation (CEGL001613, G2)
- *Festuca thurberi - Lathyrus lanszwertii* var. *leucanthus* Herbaceous Vegetation (CEGL001630, G4)
- *Festuca thurberi* Subalpine Grassland Herbaceous Vegetation (CEGL001631, G3)
- *Leymus cinereus* Herbaceous Vegetation (CEGL001479, G2G3Q)
- *Muhlenbergia filiculmis* Herbaceous Vegetation (CEGL001780, G2)
- *Muhlenbergia montana - Hesperostipa comata* Herbaceous Vegetation (CEGL001647, G1G2)
- *Muhlenbergia montana* Herbaceous Vegetation (CEGL001646, G3G4)
- *Muhlenbergia pungens* Herbaceous Vegetation (CEGL002363, GNR)
- *Pascopyrum smithii - Bouteloua gracilis* Herbaceous Vegetation (CEGL001578, G5)
- *Poa fendleriana* Herbaceous Vegetation (CEGL001925, GU)
- *Pseudoroegneria spicata - Hesperostipa comata* Herbaceous Vegetation (CEGL001679, G4)
- *Pseudoroegneria spicata - Poa fendleriana* Herbaceous Vegetation (CEGL001676, G1G2)
- *Pseudoroegneria spicata* Herbaceous Vegetation (CEGL001660, G2)

Alliances:
- *Agrostis variabilis* Herbaceous Alliance (A.1318)
- *Bromus inermis* Semi-natural Herbaceous Alliance (A.3561)
- *Danthonia intermedia* Herbaceous Alliance (A.1315)
- *Danthonia parryi* Herbaceous Alliance (A.1316)
- *Deschampsia caespitosa* Seasonally Flooded Herbaceous Alliance (A.1408)
- *Festuca arizonica* Herbaceous Alliance (A.1245)
- *Festuca idahoensis* Alpine Herbaceous Alliance (A.1313)
- *Festuca idahoensis* Herbaceous Alliance (A.1251)
- *Festuca thurberi* Herbaceous Alliance (A.1256)
- *Leymus cinereus* Herbaceous Alliance (A.1204)
- *Muhlenbergia filiculmis* Herbaceous Alliance (A.1288)
- *Muhlenbergia montana* Herbaceous Alliance (A.1260)
- *Muhlenbergia pungens* Herbaceous Alliance (A.2652)
- *Pascopyrum smithii* Herbaceous Alliance (A.1232)
- *Poa fendleriana* Intermittently Flooded Herbaceous Alliance (A.1336)
- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)

SOURCES

References: Bowns and Bagley 1986, Comer et al. 2002, Comer et al. 2003, Hess 1981, Hess and Wasser 1982, Moir 1967, Neely et al. 2001, Passey et al. 1982, Shepherd 1975, Stewart 1940, Tuhy et al. 2002, Turner 1975, Turner and Dortignac 1954
Version: 05 Oct 2004 **Stakeholders:** Midwest, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

86 CES303.817—WESTERN GREAT PLAINS FOOTHILL AND PIEDMONT GRASSLAND

Primary Division: Western Great Plains (303)
Land Cover Class: Herbaceous
Spatial Scale & Pattern: Large Patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Concept Summary: This system typically occurs between 1600-2200 m in elevation. It is best characterized as a mixed-grass to tallgrass prairie on mostly moderate to gentle slopes, usually at the base of foothill slopes, e.g., the hogbacks of the Rocky Mountain Front Range where it typically occurs as a relatively narrow elevational band between montane woodlands and shrublands and the shortgrass steppe, but extends east on the Front Range piedmont alongside the chalk bluffs along the Colorado-Wyoming border, out into the Great Plains on the Palmer Divide, and on piedmont slopes below mesas and foothills in northeastern New Mexico. A combination of increased precipitation from orographic rain, temperature, and soils limit this system to the lower elevations zone with approximately 40 cm of precipitation/year. It is maintained by frequent fire and associated with well-drained clay soils. Usually occurrences of this system have multiple plant associations that may be dominated by *Andropogon gerardii, Schizachyrium scoparium, Muhlenbergia montana, Nassella viridula, Pascopyrum smithii, Sporobolus cryptandrus, Bouteloua gracilis, Hesperostipa comata*, or *Hesperostipa neomexicana*. In Wyoming, typical grasses found in this system include *Pseudoroegneria spicata, Festuca idahoensis, Hesperostipa comata*, and species of *Poa*. Typical adjacent ecological systems include foothill shrublands, ponderosa pine savannas, juniper savannas, as well as shortgrass prairie.

Comments: Need to incorporate Northern Rockies information.

DISTRIBUTION

Range: This mixed-grass prairie ecological system occurs in the narrow to broad transition band between the Rocky Mountains and the Shortgrass Steppe where increased soil moisture from oreographic lifting and local topography favors tall and mid height grasses. The band is restricted to the Rocky Mountain foothills and piedmont and adjacent plains,extending farther east on the Palmer Divide, north alongside the cChalk Bluffs near the Colorado-Wyoming border, and south on and below mesas and escarpments in southeastern Colorado, northeastern New Mexico and the panhandles of Oklahoma and Texas.

Divisions: 303, 306
TNC Ecoregions: 10:C, 20:C, 21:C, 24:C, 25:P, 26:P, 27:C, 28:P
Subnations: CO, KS, NE, OK, SD, TX

CONCEPT

Associations:

- *Artemisia frigida / Bouteloua gracilis* Shrubland [Provisional] (CEGL002782)
- *Andropogon gerardii - Schizachyrium scoparium* Western Great Plains Herbaceous Vegetation (CEGL001463)
- *Andropogon gerardii - Sorghastrum nutans* Western Great Plains Herbaceous Vegetation (CEGL001464)
- *Andropogon gerardii - Sporobolus heterolepis* Western Foothills Herbaceous Vegetation (CEGL001465)
- *Bouteloua gracilis - Bouteloua curtipendula* Herbaceous Vegetation (CEGL001754)
- *Bouteloua gracilis - Bouteloua hirsuta* Herbaceous Vegetation (CEGL001755)
- *Bouteloua gracilis - Buchloe dactyloides* Herbaceous Vegetation (CEGL001756)
- *Bouteloua gracilis* Herbaceous Vegetation (CEGL001760)
- *Bouteloua hirsuta - Bouteloua curtipendula* Herbaceous Vegetation (CEGL001764)
- *Bouteloua hirsuta - Hesperostipa neomexicana* Herbaceous Vegetation (CEGL001766)
- *Hesperostipa comata* Colorado Front Range Herbaceous Vegetation (CEGL001702)
- *Hesperostipa comata - Achnatherum hymenoides* Herbaceous Vegetation (CEGL001703)
- *Hesperostipa neomexicana* Herbaceous Vegetation (CEGL001708)
- *Nassella viridula* Herbaceous Vegetation (CEGL001713)
- *Poliomintha incana / Bouteloua gracilis* Shrubland (CEGL001339)
- *Pseudoroegneria spicata - Hesperostipa comata* Herbaceous Vegetation (CEGL001679)
- *Pseudoroegneria spicata - Pascopyrum smithii* Herbaceous Vegetation (CEGL001675)
- *Pseudoroegneria spicata - Poa secunda* Herbaceous Vegetation (CEGL001677)
- *Pseudoroegneria spicata* Herbaceous Vegetation (CEGL001660)
- *Schizachyrium scoparium - Bouteloua curtipendula* Western Great Plains Herbaceous Vegetation (CEGL001594)
- *Schizachyrium scoparium - Muhlenbergia cuspidata* Herbaceous Vegetation (CEGL001683)
- *Yucca glauca / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001499)

Alliances:
- *Artemisia frigida* Shrubland Alliance (A.2565)
- *Andropogon gerardii – (Sorghastrum nutans)* Herbaceous Alliance (A.1192)
- *Bouteloua gracilis* Herbaceous Alliance (A.1282)
- *Bouteloua hirsuta* Herbaceous Alliance (A.1285)
- *Hesperostipa comata - Bouteloua gracilis* Herbaceous Alliance (A.1234)
- *Hesperostipa comata* Bunch Herbaceous Alliance (A.1270)
- *Hesperostipa neomexicana* Herbaceous Alliance (A.1272)
- *Nassella viridula* Herbaceous Alliance (A.1261)
- *Poliomintha incana* SHRUBLAND ALLIANCE (A.862)
- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)
- *Schizachyrium scoparium - Bouteloua curtipendula* Herbaceous Alliance (A.1225)
- *Schizachyrium scoparium* Bunch Herbaceous Alliance (A.1266)
- *Yucca glauca* Shrub Herbaceous Alliance (A.1540)

SOURCES

References: Albertson and Weaver 1956,Anderson 1999, Hess and Wasser 1982, Lauenroth and Milchunas 1992, Mast et al. 1997, Mast et al. 1998, Neely et al. 2001, Opler and Krizek 1984

Version: 20 Feb 2003 **Stakeholders:** WCS
Concept Author: NatureServe Western Ecology Team **LeadResp:** WCS

87 CES303.659—CENTRAL MIXEDGRASS PRAIRIE

Primary Division: Western Great Plains (303)
Land Cover Class: Herbaceous
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Concept Summary: This mixedgrass prairie system ranges from South Dakota to northern Texas and is bordered by the shortgrass prairie on the western edge and the tallgrass prairie to the east. The loessal regions in west-central Kansas and central Nebraska, the Red Hills region of south-central Kansas and northern Oklahoma are all located within this system. Because of its proximity to other ecoregions, this system contains elements from both shortgrass and tallgrass prairies, which combine to form the mixedgrass prairie ecological system throughout its range. The distribution, species richness and productivity of plant species within the mixedgrass ecological system is controlled primarily by environmental conditions, in particular soil moisture and topography. Grazing and fire are important dynamic processes in this system. The relative dominance of the various grass and forb species within different associations in the system also can strongly depend on the degree of natural or human disturbance. This system can contain grass species such as *Bouteloua curtipendula, Schizachyrium scoparium, Andropogon gerardii, Hesperostipa comata, Sporobolus heterolepis*, and *Bouteloua gracilis*, although the majority of the associations within the region are dominated by *Pascopyrum smithii* or *Schizachyrium scoparium*. Numerous forb and sedge species (*Carex* spp.) can also occur within the mixedgrass system in the Western Great Plains. Although forbs do not always significantly contribute to the canopy, they can be very important. Some dominant forb species include *Ambrosia psilostachya, Echinacea angustifolia*, and *Lygodesmia juncea*. Oak species such as *Quercus macrocarpa* can occur also in areas protected from fire due to topographic position. This can cause an almost oak savanna situation in certain areas, although fire suppression may allow for a more closed canopy and expansion of bur oak beyond those sheltered areas. In those situations, further information will be needed to determine if those larger areas with a more closed canopy of bur oak should be considered part of Western Great Plains Dry Bur Oak Forest and Woodland (CES303.667). Likewise, within the mixedgrass system, small seeps may occur, especially during the wettest years. Although these are not considered a separate system, the suppression of fire within the region has enabled the invasion of both exotics and some shrub species such as *Juniperus virginiana* and also allowed for the establishment of *Pinus ponderosa* in some northern areas.

DISTRIBUTION

Range: This system is found throughout the central and southern areas of the Western Great Plains ranging from southern South Dakota into northern Texas.
Divisions: 303:C
TNC Ecoregions: 27:P, 28:P, 29:C, 32:C, 33:C, 37:P
Subnations: CO, KS, NE, OK, SD, TX

CONCEPT

Associations:
- *Artemisia tridentata* ssp. *wyomingensis* / Mixed Grasses Shrub Herbaceous Vegetation (CEGL001534, G5)
- Blacktailed Prairie Dog Town Grassland Complex (CECX005703, G4)
- *Cornus drummondii - (Rhus glabra, Prunus* spp.) Shrubland (CEGL005219, GNA)
- *Cynodon dactylon* Herbaceous Vegetation (CEGL004701, GNA)

- *Hesperostipa comata - Bouteloua gracilis - Carex filifolia* Herbaceous Vegetation (CEGL002037, G5)
- *Hesperostipa comata - Carex filifolia* Herbaceous Vegetation (CEGL001700, G4)
- *Hesperostipa comata - Carex inops* ssp. *heliophila* Herbaceous Vegetation (CEGL001701, G4)
- *Hesperostipa comata* Colorado Front Range Herbaceous Vegetation (CEGL001702, G1G2)
- *Hesperostipa curtiseta - Elymus lanceolatus* Herbaceous Vegetation (CEGL002253, GNR)
- *Juniperus virginiana* var. *virginiana / Schizachyrium scoparium - Bouteloua curtipendula* Great Plains Herbaceous Vegetation (CEGL004066, G2)
- *Juniperus virginiana* var. *virginiana / Schizachyrium scoparium* Forest (CEGL003628, GNA)
- *Krascheninnikovia lanata / Bouteloua gracilis* Dwarf-shrub Herbaceous Vegetation (CEGL001321, G4)
- *Pascopyrum smithii - Bouteloua gracilis* Herbaceous Vegetation (CEGL001578, G5)
- *Pascopyrum smithii - Hesperostipa comata* Central Mixedgrass Herbaceous Vegetation (CEGL002034, G4)
- *Pascopyrum smithii* Herbaceous Vegetation (CEGL001577, G3G5Q)
- *Pleuraphis mutica - Buchloe dactyloides* Herbaceous Vegetation (CEGL002272, G4?)
- *Poa palustris* Herbaceous Vegetation (CEGL001659, GNA)
- *Poa pratensis - (Pascopyrum smithii)* Semi-natural Herbaceous Vegetation (CEGL005265, GNA)
- *Quercus macrocarpa* / Mixedgrass Loam Wooded Herbaceous Vegetation (CEGL002163, G1Q)
- *Quercus macrocarpa* / Mixedgrass Sand Wooded Herbaceous Vegetation (CEGL002162, G1)
- *Quercus macrocarpa* / Mixedgrass Shale Wooded Herbaceous Vegetation (CEGL002164, G1Q)
- *Sarcobatus vermiculatus / Sporobolus airoides* Sparse Vegetation (CEGL001368, G3?)
- *Schizachyrium scoparium - Bouteloua (curtipendula, gracilis) - Carex filifolia* Herbaceous Vegetation (CEGL001681, G3G4)
- *Schizachyrium scoparium - Bouteloua curtipendula - Bouteloua gracilis* Central Plains Herbaceous Vegetation (CEGL002246, G2G4)
- *Schizachyrium scoparium - Bouteloua curtipendula - Nassella leucotricha* Herbaceous Vegetation (CEGL004070, GNR)
- *Schizachyrium scoparium - Bouteloua curtipendula* Chalkflat Herbaceous Vegetation (CEGL002247, G2)
- *Schizachyrium scoparium - Bouteloua curtipendula* Loess Mixedgrass Herbaceous Vegetation (CEGL002036, G3?)
- *Schizachyrium scoparium - Bouteloua curtipendula* Red Hills Herbaceous Vegetation (CEGL002248, G2Q)
- *Schizachyrium scoparium - Bouteloua curtipendula* Western Great Plains Herbaceous Vegetation (CEGL001594, G3)
- *Schizachyrium scoparium - Lesquerella gordonii - Castilleja purpurea* var. *citrina* Herbaceous Vegetation (CEGL002252, G2?)
- *Yucca glauca / Calamovilfa longifolia* Shrub Herbaceous Vegetation (CEGL002675, G4)

Alliances:

- *Artemisia tridentata* ssp. *wyomingensis* Shrub Herbaceous Alliance (A.1527)
- *Cornus drummondii* Shrubland Alliance (A.3558)
- *Cynodon dactylon* Herbaceous Alliance (A.1279)
- *Hesperostipa comata - Bouteloua gracilis* Herbaceous Alliance (A.1234)
- *Hesperostipa curtiseta - Elymus lanceolatus* Herbaceous Alliance (A.3523)
- *Juniperus virginiana* Semi-natural Forest Alliance (A.137)
- *Krascheninnikovia lanata* Dwarf-shrub Herbaceous Alliance (A.1565)
- *Pascopyrum smithii* Herbaceous Alliance (A.1232)
- *Pleuraphis mutica* Herbaceous Alliance (A.1249)
- *Poa palustris* Semi-natural Seasonally Flooded Herbaceous Alliance (A.1409)
- *Poa pratensis* Semi-natural Herbaceous Alliance (A.3562)
- *Quercus macrocarpa* Wooded Medium-Tall Herbaceous Alliance (A.1505)
- *Sarcobatus vermiculatus* Intermittently Flooded Sparsely Vegetated Alliance (A.1877)
- *Schizachyrium scoparium - Bouteloua curtipendula* Herbaceous Alliance (A.1225)
- *Yucca glauca* Shrub Herbaceous Alliance (A.1540)

Environment: Differences in topography and soil characteristics also occur across the range of this system. It is often characterized by rolling to extremely hilly landscapes with soils developed from loess, shale, limestone or sandstone parent material. Mollisol soils are most prevalent and range from silt loams and silty clay loams with sandy loams possible on the western edge of the range. The Red Hills region of Kansas and Oklahoma, which contains examples of this system, contains somewhat unique soil characteristics and has developed from a diversity of sources including red shale, red clay, sandy shale, siltstone, or sandstone. These soils have developed a characteristic reddish color from the primary material. These soils can consist of silt, loam, or clay and can have textures ranging from a fine sandy loam to a more clayey surface.

Vegetation: This system contains elements from both Western Great Plains Shortgrass Prairie (CES303.672) and Western Great Plains Tallgrass Prairie (CES303.673). This system typically contains grass species such as *Bouteloua curtipendula, Schizachyrium scoparium, Andropogon gerardii, Hesperostipa comata, Sporobolus heterolepis*, and *Bouteloua gracilis*, although the majority of the associations within the region are dominated by *Pascopyrum smithii* or *Schizachyrium scoparium*. Isolated patches of *Quercus macrocarpa* also can occur.

Dynamics: Fire and grazing are the primary processes occurring within the system. The diversity in this mixedgrass system likely reflects both the short- and long-term responses of the vegetation to these often concurrent disturbance regimes. Fire suppression and overgrazing can lead to the invasion of this system by woody species such as *Juniperus virginiana* and *Pinus ponderosa*. Likewise, fire suppression may lead to a more closed canopy of bur oak.

SOURCES

References: Barbour and Billings 1988, Comer et al. 2003, Ricketts et al. 1999, Weaver and Albertson 1956, Weaver and Bruner 1948
Version: 05 Mar 2003 **Stakeholders:** Midwest, Southeast, West
Concept Author: S. Menard and K. Kindscher **LeadResp:** Midwest

88 CES303.672—WESTERN GREAT PLAINS SHORTGRASS PRAIRIE

Primary Division: Western Great Plains (303)
Land Cover Class: Herbaceous
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Concept Summary: This system is found primarily in the western half of the Western Great Plains Division in the rainshadow of the Rocky Mountains and ranges from the Nebraska Panhandle south into Texas and New Mexico, although grazing-impacted examples may reach as far north as southern Canada where it grades into Northwestern Great Plains Mixedgrass Prairie (CES303.674). This system occurs primarily on flat to rolling uplands with loamy, ustic soils ranging from sandy to clayey. In much of its range, this system forms the matrix system with *Bouteloua gracilis* dominating this system. Associated graminoids may include *Aristida purpurea, Bouteloua curtipendula, Bouteloua hirsuta, Buchloe dactyloides, Hesperostipa comata, Koeleria macrantha (= Koeleria cristata), Pascopyrum smithii (= Agropyron smithii), Pleuraphis jamesii, Sporobolus airoides,* and *Sporobolus cryptandrus*. Although mid-height grass species may be present, especially on more mesic land positions and soils, they are secondary in importance to the sod-forming short grasses. Sandy soils have higher cover of *Hesperostipa comata, Sporobolus cryptandrus,* and *Yucca elata*. Scattered shrub and dwarf-dwarf species such as *Artemisia filifolia, Artemisia frigida, Artemisia tridentata, Atriplex canescens, Eriogonum effusum, Gutierrezia sarothrae,* and *Lycium pallida* may also be present. Also, because this system spans a wide range, there can be some differences in the relative dominance of some species from north to south and from east to west. Large-scale processes such as climate, fire and grazing influence this system. High variation in amount and timing of annual precipitation impacts the relative cover of cool- and warm-season herbaceous species.

In contrast to other prairie systems, fire is less important, especially in the western range of this system, because the often dry and xeric climate conditions can decrease the fuel load and thus the relative fire frequency within the system. However, historically, fires that did occur were often very expansive. Currently, fire suppression and more extensive grazing in the region have likely decreased the fire frequency even more, and it is unlikely that these processes could occur at a natural scale. A large part of the range for this system (especially in the east and near rivers) has been converted to agriculture. Areas of the central and western range have been impacted by the unsuccessful attempts to develop dryland cultivation during the Dust Bowl of the 1930s. The short grasses that dominate this system are extremely drought- and grazing-tolerant. These species evolved with drought and large herbivores and, because of their stature, are relatively resistant to overgrazing. This system in combination with the associated wetland systems represents one of the richest areas for mammals and birds. Endemic bird species to the shortgrass system may constitute one of the fastest declining bird populations.

DISTRIBUTION

Range: This system is found primarily in the western half of the Western Great Plains Division east of the Rocky Mountains and ranges from the Nebraska Panhandle south into the panhandles of Oklahoma and Texas and New Mexico, although some examples may reach as far north as southern Canada where it grades into Northwestern Great Plains Mixedgrass Prairie (CES303.674).
Divisions: 303:C
TNC Ecoregions: 26:P, 27:C, 28:C, 33:P
Subnations: CO, KS, NE, NM, OK, TX, WY

CONCEPT

Associations:
- *Aristida purpurea* Herbaceous Vegetation (CEGL005800, GNR)
- Blacktailed Prairie Dog Town Grassland Complex (CECX005703, G4)
- *Bouteloua curtipendula - Bouteloua (eriopoda, gracilis)* Herbaceous Vegetation (CEGL002250, G4)
- *Bouteloua eriopoda - Bouteloua gracilis* Herbaceous Vegetation (CEGL001748, G2)
- *Bouteloua eriopoda - Bouteloua hirsuta* Herbaceous Vegetation (CEGL001749, G2)
- *Bouteloua gracilis - Bouteloua curtipendula* Herbaceous Vegetation (CEGL001754, G5)
- *Bouteloua gracilis - Bouteloua hirsuta* Herbaceous Vegetation (CEGL001755, G3G4)
- *Bouteloua gracilis - Buchloe dactyloides - Pleuraphis jamesii* Herbaceous Vegetation (CEGL002271, GNR)
- *Bouteloua gracilis - Buchloe dactyloides* Herbaceous Vegetation (CEGL001756, G4)
- *Bouteloua gracilis - Buchloe dactyloides* Xeric Soil Herbaceous Vegetation (CEGL002270, G3G5)
- *Bouteloua gracilis - Pleuraphis jamesii* Herbaceous Vegetation (CEGL001759, G2G4)
- *Bouteloua gracilis* Herbaceous Vegetation (CEGL001760, G4Q)
- *Bouteloua hirsuta - Bouteloua curtipendula* Herbaceous Vegetation (CEGL001764, G4)
- *Bouteloua hirsuta* Herbaceous Vegetation [Placeholder] (CEGL002673, GNR)
- *Hesperostipa neomexicana* Mixed Prairie Herbaceous Vegetation (CEGL001711, GU)
- *Sporobolus airoides* Southern Plains Herbaceous Vegetation (CEGL001685, G3Q)
- *Yucca glauca / Calamovilfa longifolia* Shrub Herbaceous Vegetation (CEGL002675, G4)

Alliances:
- *Aristida purpurea* Herbaceous Alliance (A.2570)
- *Bouteloua curtipendula* Herbaceous Alliance (A.1244)
- *Bouteloua eriopoda* Herbaceous Alliance (A.1284)
- *Bouteloua gracilis* Herbaceous Alliance (A.1282)
- *Bouteloua hirsuta* Herbaceous Alliance (A.1285)
- *Hesperostipa neomexicana* Herbaceous Alliance (A.1272)
- *Sporobolus airoides* Herbaceous Alliance (A.1267)
- *Yucca glauca* Shrub Herbaceous Alliance (A.1540)

Environment: Climate is continental with mean annual precipitation generally about 300 mm ranging to 500 mm to the south in Texas. Most of the annual precipitation occurs during the growing season as thunderstorms. Precipitation events are mostly <10 cm with occasional larger events.

This system is located on primarily flat to rolling uplands. Soils typically are loamy and ustic and range from sandy to clayey.

Vegetation: This system spans a wide range and thus there can be some differences in the relative dominance of some species from north to south and from east to west. This system is primarily dominated by *Bouteloua gracilis* throughout its range with various associated graminoid species depending on precipitation, soils and management. Associated graminoids may include *Achnatherum hymenoides, Aristida purpurea, Bouteloua curtipendula, Bouteloua hirsuta, Buchloe dactyloides, Carex filifolia, Hesperostipa comata, Koeleria macrantha (= Koeleria cristata), Muhlenbergia torreyana, Pascopyrum smithii (= Agropyron smithii), Pleuraphis jamesii, Sporobolus airoides,* and *Sporobolus cryptandrus*. Although mid-height grass species may be present especially on more mesic land positions and soils, they are secondary in importance to the sod-forming short grasses. Sandy soils have higher cover of *Hesperostipa comata, Sporobolus cryptandrus,* and *Yucca elata*. Scattered shrub and dwarf-dwarf species such as *Artemisia filifolia, Artemisia frigida, Artemisia tridentata, Atriplex canescens, Eriogonum effusum, Gutierrezia sarothrae,* and *Lycium pallida* may also be present. High annual variation in amount and timing of precipitation impacts relative cover of herbaceous species. Cover of cool-season grasses is dependant on winter and early spring precipitation.

Dynamics: Climate, fire and grazing constitute the primary processes impacting this system. Drought-tolerant shortgrass species have root systems that extend up near the soil surface where they can utilize low precipitation events (Sala and Lauenroth 1982). Fire is less important in this system compared to other Western Great Plains prairie systems, especially in the western portion of its range. Previous comments in the literature citing *Opuntia* spp. increasing with overgrazing may not be borne out by more recent research (R. Rondeau pers. comm.). Conversion to agriculture and pastureland with subsequent irrigation has degraded and extirpated this system in some areas of its range.

SPATIAL CHARACTERISTICS

Adjacent Ecological System Comments: Some examples may reach as far north as southern Canada where it grades into Northwestern Great Plains Mixedgrass Prairie (CES303.674).

SOURCES

References: Barbour and Billings 1988, Comer et al. 2003, Dick-Peddie 1993, Lauenroth and Milchunas 1992, Milchunas et al. 1989, Ricketts et al. 1999, Rondeau pers. comm., Sala and Lauenroth 1982

Version: 11 Nov 2003 **Stakeholders:** Midwest, Southeast, West

Concept Author: S. Menard and K. Kindscher **LeadResp:** Midwest

90 CES304.787—INTER-MOUNTAIN BASINS SEMI-DESERT GRASSLAND

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill, Lowland]; Herbaceous; Temperate [Temperate Xeric]; Alkaline Soil; Aridic; Graminoid

Concept Summary: This widespread ecological system occurs throughout the intermountain western U.S. on dry plains and mesas, at approximately 1450 to 2320 m (4750-7610 feet) elevation. These grasslands occur in lowland and upland areas and may occupy swales, playas, mesatops, plateau parks, alluvial flats, and plains, but sites are typically xeric. Substrates are often well-drained sandy or loamy-textured soils derived from sedimentary parent materials but are quite variable and may include fine-textured soils derived from igneous and metamorphic rocks. When they occur near foothill grasslands they will be at lower elevations. The dominant perennial bunch grasses and shrubs within this system are all very drought-resistant plants. These grasslands are typically dominated or codominated by *Achnatherum hymenoides, Aristida* spp., *Bouteloua gracilis, Hesperostipa comata, Muhlenbergia* sp., or *Pleuraphis jamesii* and may include scattered shrubs and dwarf-shrubs of species of *Artemisia, Atriplex, Coleogyne, Ephedra, Gutierrezia,* or *Krascheninnikovia lanata*.

DISTRIBUTION

Range: Occurs throughout the Intermountain western U.S. on dry plains and mesas, at approximately 1450 to 2320 m (4750-7610 feet) in elevation.

Divisions: 304:C, 306:C

TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 21:C

Subnations: AZ, CA, CO, ID, MT?, NM, NV, OR, UT, WA, WY

CONCEPT

Associations:

- *Achnatherum hymenoides - Sporobolus contractus* Herbaceous Vegetation (CEGL001652, G2G4)
- *Achnatherum lettermanii - Oxytropis oreophila* Herbaceous Vegetation (CEGL002734, G2?)
- *Achnatherum nelsonii - Koeleria macrantha* Herbaceous Vegetation (CEGL001707, GNR)
- *Achnatherum speciosum* Herbaceous Vegetation [Placeholder] (CEGL003112, G1Q)
- *Aristida purpurea* Herbaceous Vegetation (CEGL005800, GNR)
- *Aristida purpurea* var. *longiseta - Poa secunda* Herbaceous Vegetation (CEGL001781, G3)
- *Aristida purpurea* var. *longiseta - Pseudoroegneria spicata - Sporobolus cryptandrus* Herbaceous Vegetation (CEGL001589, G2)
- *Aristida purpurea* var. *longiseta - Sporobolus cryptandrus* Herbaceous Vegetation (CEGL001515, G1)
- *Atriplex obovata / Pleuraphis jamesii - Sporobolus airoides* Shrub Herbaceous Vegetation (CEGL001775, GU)
- *Bouteloua eriopoda - Hesperostipa neomexicana* Herbaceous Vegetation (CEGL001753, GNRQ)
- *Bouteloua eriopoda - Pleuraphis jamesii* Herbaceous Vegetation (CEGL001751, G3)
- *Bouteloua eriopoda* Semi-desert Herbaceous Vegetation (CEGL001752, G2Q)
- *Bouteloua gracilis - Bouteloua curtipendula* Herbaceous Vegetation (CEGL001754, G5)
- *Bouteloua gracilis - Bouteloua hirsuta* Herbaceous Vegetation (CEGL001755, G3G4)
- *Bouteloua gracilis - Hesperostipa comata* Herbaceous Vegetation [Provisional] (CEGL002932, GNR)
- *Bouteloua gracilis - Pleuraphis jamesii* Herbaceous Vegetation (CEGL001759, G2G4)
- *Bouteloua gracilis* Herbaceous Vegetation (CEGL001760, G4Q)
- *Bouteloua hirsuta - Bouteloua radicosa* Herbaceous Vegetation (CEGL001765, G2)
- *Bromus inermis - (Pascopyrum smithii)* Semi-natural Herbaceous Vegetation (CEGL005264, GNA)
- *Bromus tectorum* Semi-natural Herbaceous Vegetation (CEGL003019, GNA)
- *Ericameria nauseosa / Bouteloua gracilis* Shrub Herbaceous Vegetation (CEGL003495, GNR)
- *Gutierrezia sarothrae - Krascheninnikovia lanata - Atriplex canescens / Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001733, G2)
- *Hesperostipa comata - (Bouteloua eriopoda, Pleuraphis jamesii)* Herbaceous Vegetation (CEGL002997, GNR)
- *Hesperostipa comata - Achnatherum hymenoides* Herbaceous Vegetation (CEGL001703, G2?)
- *Hesperostipa comata* Great Basin Herbaceous Vegetation (CEGL001705, G2G4)
- *Hesperostipa neomexicana* Herbaceous Vegetation (CEGL001708, G3)
- *Muhlenbergia asperifolia* Herbaceous Vegetation (CEGL001779, GU)
- *Muhlenbergia pungens* Herbaceous Vegetation (CEGL002363, GNR)
- *Pleuraphis jamesii* Herbaceous Vegetation (CEGL001777, G2G4)
- *Pleuraphis rigida* Herbaceous Vegetation [Placeholder] (CEGL003051, G3G4)
- *Pleuraphis rigida* Shrub Herbaceous Vegetation [Placeholder] (CEGL003052, G3G4)
- *Poa fendleriana* ssp. *fendleriana* Herbaceous Vegetation (CEGL001655, G2)
- *Poa secunda - Muhlenbergia richardsonis* Herbaceous Vegetation (CEGL002755, GNR)
- *Poa secunda* Herbaceous Vegetation (CEGL001657, G4?)
- *Pseudoroegneria spicata - Achnatherum hymenoides* Herbaceous Vegetation (CEGL001674, G3G4)
- *Pseudoroegneria spicata* ssp. *inermis* Herbaceous Vegetation (CEGL001661, GNR)
- *Sporobolus airoides - Bouteloua gracilis* Herbaceous Vegetation (CEGL001686, GNRQ)
- *Sporobolus airoides* Monotype Herbaceous Vegetation (CEGL001688, GUQ)
- *Sporobolus airoides* Sod Herbaceous Vegetation [Placeholder] (CEGL001791, GNR)
- *Sporobolus cryptandrus - Poa secunda* Herbaceous Vegetation (CEGL001516, G2)
- *Sporobolus cryptandrus* Great Basin Herbaceous Vegetation (CEGL002691, GNR)
- *Sporobolus cryptandrus* Shrub Herbaceous Vegetation (CEGL001514, G2)
- *Thinopyrum intermedium* Semi-natural Herbaceous Vegetation (CEGL002935, GNA)

Alliances:

- *Achnatherum hymenoides* Herbaceous Alliance (A.1262)
- *Achnatherum lettermanii* Herbaceous Alliance (A.2524)
- *Achnatherum nelsonii* Herbaceous Alliance (A.1271)
- *Achnatherum speciosum* Herbaceous Alliance (A.1290)
- *Aristida purpurea* Herbaceous Alliance (A.2570)
- *Bouteloua eriopoda* Herbaceous Alliance (A.1284)
- *Bouteloua eriopoda* Microphyllous Evergreen Shrub Herbaceous Alliance (A.1545)
- *Bouteloua gracilis* Herbaceous Alliance (A.1282)
- *Bouteloua hirsuta* Herbaceous Alliance (A.1285)
- *Bromus inermis* Semi-natural Herbaceous Alliance (A.3561)
- *Bromus tectorum* Semi-natural Herbaceous Alliance (A.1814)
- *Ericameria nauseosa* Shrub Short Herbaceous Alliance (A.1546)
- *Hesperostipa comata* Bunch Herbaceous Alliance (A.1270)
- *Hesperostipa neomexicana* Herbaceous Alliance (A.1272)

- *Muhlenbergia asperifolia* Intermittently Flooded Herbaceous Alliance (A.1334)
- *Muhlenbergia pungens* Herbaceous Alliance (A.2652)
- *Pleuraphis jamesii* Herbaceous Alliance (A.1287)
- *Pleuraphis jamesii* Shrub Herbaceous Alliance (A.1532)
- *Pleuraphis rigida* Herbaceous Alliance (A.1246)
- *Pleuraphis rigida* Shrub Herbaceous Alliance (A.1539)
- *Poa fendleriana* Herbaceous Alliance (A.1263)
- *Poa secunda* Herbaceous Alliance (A.1291)
- *Poa secunda* Seasonally Flooded Herbaceous Alliance (A.1410)
- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)
- *Sporobolus airoides* Herbaceous Alliance (A.1267)
- *Sporobolus airoides* Sod Herbaceous Alliance (A.1241)
- *Sporobolus cryptandrus* Herbaceous Alliance (A.1252)
- *Sporobolus cryptandrus* Shrub Herbaceous Alliance (A.1525)
- *Thinopyrum intermedium* Semi-natural Herbaceous Alliance (A.2529)

Environment: Low-elevation grasslands in the Intermountain West region occur in semi-arid to arid climates at approximately 1450 to 2320 m (4750-7610 feet) in elevation. Grasslands within this system are typically characterized by a sparse to moderately dense herbaceous layer dominated by medium-tall and short bunch grasses, often in a sod-forming growth. These grasslands occur in lowland and upland areas and may occupy swales, playas, mesa tops, plateau parks, alluvial flats, and plains. These grasslands typically occur on xeric sites. This system experiences cold temperate conditions. Hot summers and cold winters with freezing temperatures and snow are common. Annual precipitation is usually from 20-40 cm (7.9-15.7 inches). A significant portion of the precipitation falls in July through October during the summer monsoon storms, with the rest falling as snow during the winter and early spring months.

These grasslands occur on a variety of aspects and slopes. Sites may range from flat to moderately steep. Soils supporting this system also vary from deep to shallow, and from sandy to finer-textured. The substrate is typically sand- or shale-derived. Some sandy soil occurrences have a high cover of cryptogams on the soil. These cryptogamic species would tend to increase the stability of the highly erodible sandy soils of these grasslands during torrential summer rains and heavy wind storms (Kleiner and Harper 1977). *Muhlenbergia*-dominated grasslands which flood temporarily, combined with high evaporation rates in this dry system, can have accumulations of soluble salts in the soil. Soil salinity depends on the amount and timing of precipitation and flooding.

Dynamics: This system is maintained by frequent fires and sometimes associated with specific soils, often well-drained clay soils. A combination of precipitation, temperature, and soils limits this system to the lower elevations within the region. The dominant perennial bunch grasses and shrubs within this system are all very drought-resistant plants. Grasses that dominate semi-arid grasslands develop a dense network of roots concentrated in the upper parts of the soil where rainfall penetrates most frequently (Blydenstein 1966, Cable 1969, Sala and Lauenroth 1985, as cited by McClaran and Van Devender 1995). *Bouteloua gracilis* is also very grazing-tolerant and generally forms a short sod. *Pleuraphis jamesii* is only moderately palatable to livestock, but decreases when heavily grazed during drought and in the more arid portions of its range where it is the dominant grass (West 1972). This grass reproduces extensively from scaly rhizomes. These rhizomes make the plant resistant to trampling by livestock and have good soil-binding properties (Weaver and Albertson 1956, West 1972). *Achnatherum hymenoides* is one of the most drought-tolerant grasses in the western U.S. (USDA 1937). It is also a valuable forage grass in arid and semi-arid regions. Improperly managed livestock grazing could increase soil erosion, decrease cover of this palatable plant species and increase weedy species (USDA 1937). *Muhlenbergia asperifolia* with its flooding regime combined with high evaporation rate in these dry climates causes accumulations of soluble salts in the soil. Total vegetation cover (density and height), species composition and soil salinity depend on the amount and timing of precipitation and flooding. Growth-inhibiting salt concentrations are diluted when the soil is saturated allowing the growth of less salt-tolerant species. As the saturated soils dry, the salt concentrates until it precipitates out on the soil surface (Dodd and Coupland 1966, Ungar 1968). *Hesperostipa comata* is a deep-rooted grass that uses soil moisture below 0.5 m during the dry summers.

SOURCES

References: Cable 1967, Cable 1969, Cable 1975, Comer et al. 2003, Dodd and Coupland 1966, Kleiner and Harper 1977, Mast et al. 1997, Mast et al. 1998, McClaran and Van Devender 1995, Tuhy et al. 2002, Ungar 1968, Weaver and Albertson 1956, West 1983e

Version: 20 Feb 2003 **Stakeholders:** West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

96 CES304.780—INTER-MOUNTAIN BASINS GREASEWOOD FLAT

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Toeslope/Valley Bottom; Alkaline Soil; Deep Soil; Xeromorphic Shrub

Concept Summary: This ecological system occurs throughout much of the western U.S. in Intermountain basins and extends onto the western Great Plains. It typically occurs near drainages on stream terraces and flats or may form rings around more sparsely vegetated playas.

Sites typically have saline soils, a shallow water table and flood intermittently, but remain dry for most growing seasons. The water table remains high enough to maintain vegetation, despite salt accumulations. This system usually occurs as a mosaic of multiple communities, with open to moderately dense shrublands dominated or codominated by *Sarcobatus vermiculatus*. *Atriplex canescens, Atriplex confertifolia*, or *Krascheninnikovia lanata* may be present to codominant. Occurrences are often surrounded by mixed salt desert scrub. The herbaceous layer, if present, is usually dominated by graminoids. There may be inclusions of *Sporobolus airoides, Distichlis spicata* (where water remains ponded the longest), or *Eleocharis palustris* herbaceous types.

DISTRIBUTION

Range: Occurs throughout much of the western U.S. in Intermountain basins and extends onto the western Great Plains.
Divisions: 303:C, 304:C
TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 19:C, 20:C, 26:C
Subnations: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

Associations:
- *Distichlis spicata - (Scirpus nevadensis)* Herbaceous Vegetation (CEGL001773, G4)
- *Distichlis spicata - Lepidium perfoliatum* Herbaceous Vegetation (CEGL001772, GNA)
- *Distichlis spicata* Herbaceous Vegetation (CEGL001770, G5)
- *Distichlis spicata* Mixed Herb Herbaceous Vegetation (CEGL001771, G3G5)
- *Eleocharis palustris* Herbaceous Vegetation (CEGL001833, G5)
- *Ericameria nauseosa / Sporobolus airoides* Shrubland [Provisional] (CEGL002918, G3Q)
- *Leymus cinereus - Distichlis spicata* Herbaceous Vegetation (CEGL001481, G3)
- *Leymus cinereus* Bottomland Herbaceous Vegetation (CEGL001480, G1)
- *Leymus cinereus* Herbaceous Vegetation (CEGL001479, G2G3Q)
- *Puccinellia nuttalliana* Herbaceous Vegetation (CEGL001799, G3?)
- *Salicornia rubra* Herbaceous Vegetation (CEGL001999, G2G3)
- *Sarcobatus vermiculatus - Atriplex parryi / Distichlis spicata* Shrubland (CEGL002764, GNR)
- *Sarcobatus vermiculatus - Psorothamnus polydenius* Shrubland (CEGL002763, GNR)
- *Sarcobatus vermiculatus / Achnatherum hymenoides* Shrubland (CEGL001373, G4)
- *Sarcobatus vermiculatus / Artemisia tridentata* Shrubland (CEGL001359, G4)
- *Sarcobatus vermiculatus / Atriplex confertifolia - (Picrothamnus desertorum, Suaeda moquinii)* Shrubland (CEGL001371, G5?)
- *Sarcobatus vermiculatus / Atriplex gardneri* Shrubland (CEGL001360, G4?)
- *Sarcobatus vermiculatus / Bouteloua gracilis* Shrubland (CEGL001361, G1Q)
- *Sarcobatus vermiculatus / Distichlis spicata* Shrubland (CEGL001363, G4)
- *Sarcobatus vermiculatus / Elymus elymoides - Pascopyrum smithii* Shrubland (CEGL001365, G2?)
- *Sarcobatus vermiculatus / Elymus elymoides* Shrubland (CEGL001372, G4)
- *Sarcobatus vermiculatus / Juncus balticus* Sparse Vegetation (CEGL002919, G3?)
- *Sarcobatus vermiculatus / Leymus cinereus* Shrubland (CEGL001366, G3)
- *Sarcobatus vermiculatus / Nitrophila occidentalis - Suaeda moquinii* Shrubland (CEGL001369, G5?)
- *Sarcobatus vermiculatus / Pascopyrum smithii - (Elymus lanceolatus)* Shrub Herbaceous Vegetation (CEGL001508, G4)
- *Sarcobatus vermiculatus / Pseudoroegneria spicata* Shrubland (CEGL001367, G3)
- *Sarcobatus vermiculatus / Sporobolus airoides* Sparse Vegetation (CEGL001368, G3?)
- *Sarcobatus vermiculatus / Suaeda moquinii* Shrubland (CEGL001370, GUQ)
- *Sarcobatus vermiculatus* Shrubland (CEGL001357, G5)
- *Sporobolus airoides - Distichlis spicata* Herbaceous Vegetation (CEGL001687, G4?)
- *Sporobolus airoides* Southern Plains Herbaceous Vegetation (CEGL001685, G3Q)

Alliances:
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Eleocharis palustris* Seasonally Flooded Herbaceous Alliance (A.1422)
- *Ericameria nauseosa* Shrubland Alliance (A.835)
- *Leymus cinereus* Herbaceous Alliance (A.1204)
- *Leymus cinereus* Intermittently Flooded Herbaceous Alliance (A.1329)
- *Puccinellia nuttalliana* Intermittently Flooded Herbaceous Alliance (A.1335)
- *Salicornia rubra* Seasonally Flooded Herbaceous Alliance (A.1818)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrub Herbaceous Alliance (A.1554)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrubland Alliance (A.1046)
- *Sarcobatus vermiculatus* Intermittently Flooded Sparsely Vegetated Alliance (A.1877)
- *Sarcobatus vermiculatus* Shrubland Alliance (A.1041)
- *Sporobolus airoides* Herbaceous Alliance (A.1267)
- *Sporobolus airoides* Intermittently Flooded Herbaceous Alliance (A.1331)

High-ranked species: Astragalus pterocarpus (G3), Atriplex bonnevillensis (G2G3Q), Phacelia parishii (G2G3), Pseudocopaeodes eunus (G3G4), Puccinellia simplex (G3G4)

Other Comments: Carmen says this is NOT in Okanagan in BC. She put their DISSTR in to playas.

SOURCES

References: Comer et al. 2003, Knight 1994, West 1983b
Version: 20 Feb 2003 **Stakeholders:** Midwest, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

98 CES302.752—NORTH AMERICAN WARM DESERT RIPARIAN MESQUITE BOSQUE

Primary Division: North American Warm Desert (302)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Linear
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Lowland [Lowland]; Toeslope/Valley Bottom; Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Riverine / Alluvial; Prosopis spp.-dominated
Concept Summary: This ecological system consists of low-elevation (<1100 m) riparian corridors along intermittent streams in valleys of southern Arizona and New Mexico, and adjacent Mexico. Dominant trees include *Prosopis glandulosa* and *Prosopis velutina*. Shrub dominants include *Baccharis salicifolia, Pluchea sericea,* and *Salix exigua*. Vegetation, especially the mesquites, tap groundwater below the streambed when surface flows stop. Vegetation is dependent upon annual rise in the water table for growth and reproduction.

DISTRIBUTION

Range: Along intermittent streams in valleys of southern Arizona and New Mexico, and adjacent Mexico.
Divisions: 302:C
TNC Ecoregions: 17:C, 22:C, 23:C, 24:C
Subnations: AZ, CA, MXBC, MXCH, MXSO, NM, NV, TX

CONCEPT

Associations:
- *Baccharis salicifolia / Muhlenbergia rigens* Shrubland (CEGL004572, G3?)
- *Baccharis sarothroides - Baccharis salicifolia* Shrubland (CEGL001160, G4)
- *Baccharis sarothroides - Parkinsonia microphylla* Shrubland (CEGL001159, G4)
- *Baccharis sergiloides* Shrubland [Placeholder] (CEGL002953, GNR)
- *Pluchea sericea* Seasonally Flooded Shrubland [Placeholder] (CEGL003080, G3?)
- *Prosopis (glandulosa* var. *torreyana, velutina)* Woodland [Placeholder] (CEGL003082, G3?)
- *Prosopis glandulosa - Artemisia filifolia / Sporobolus giganteus* Shrubland (CEGL002192, G4)
- *Prosopis glandulosa - Atriplex* spp. Shrubland (CEGL002193, GNR)
- *Prosopis glandulosa / Atriplex canescens* Shrubland (CEGL001382, G5)
- *Prosopis glandulosa / Bouteloua curtipendula - Nassella leucotricha* Woodland (CEGL002133, G3?)
- *Prosopis glandulosa / Bouteloua curtipendula* Shrubland (CEGL002194, GNR)
- *Prosopis glandulosa / Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001510, G3G4)
- *Prosopis glandulosa / Bouteloua gracilis* Shrubland (CEGL001383, G5)
- *Prosopis glandulosa* / Mixed Grasses Shrubland (CEGL001384, GNRQ)
- *Prosopis glandulosa / Muhlenbergia porteri* Shrubland (CEGL001511, G5)
- *Prosopis glandulosa / Pleuraphis mutica* Shrub Herbaceous Vegetation (CEGL001641, G5)
- *Prosopis glandulosa / Sporobolus airoides* Shrubland (CEGL001385, G5)
- *Prosopis glandulosa / Sporobolus flexuosus* Shrubland (CEGL001386, G4)
- *Prosopis glandulosa* Temporarily Flooded Woodland (CEGL004934, GNR)
- *Prosopis glandulosa* var. *glandulosa / Bouteloua gracilis - Buchloe dactyloides* Shrubland (CEGL003877, GNR)
- *Prosopis glandulosa* var. *torreyana* Shrubland (CEGL001381, G3)
- *Prosopis pubescens* Shrubland (CEGL001387, G1?)
- *Prosopis velutina - Acacia greggii* Shrubland (CEGL001388, GUQ)
- *Prosopis velutina / Celtis laevigata* var. *reticulata* Shrubland (CEGL001390, GNR)
- *Prosopis velutina / Muhlenbergia porteri* Shrubland (CEGL001391, G3Q)

Alliances:
- *Baccharis salicifolia* Intermittently Flooded Shrubland Alliance (A.933)
- *Baccharis sarothroides* Intermittently Flooded Shrubland Alliance (A.840)
- *Baccharis sergiloides* Intermittently Flooded Shrubland Alliance (A.2531)
- *Pleuraphis mutica* Shrub Herbaceous Alliance (A.1551)
- *Pluchea sericea* Seasonally Flooded Shrubland Alliance (A.798)
- *Prosopis (glandulosa, velutina)* Woodland Alliance (A.661)
- *Prosopis glandulosa* Shrub Herbaceous Alliance (A.1550)
- *Prosopis glandulosa* Shrubland Alliance (A.1031)
- *Prosopis glandulosa* Temporarily Flooded Woodland Alliance (A.637)

- *Prosopis glandulosa* Woodland Alliance (A.611)
- *Prosopis pubescens* Shrubland Alliance (A.1042)
- *Prosopis velutina* Shrubland Alliance (A.1043)

SOURCES

References: Barbour and Major 1988, Brown 1982, Comer et al. 2003, Dick-Peddie 1993, Muldavin et al. 2000a, Muldavin et al. 2000b, Szaro 1989, Thomas et al. 2004

Version: 20 Feb 2003 **Stakeholders:** Latin America, Southeast, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

100 CES300.729—NORTH AMERICAN ARID WEST EMERGENT MARSH

Primary Division:

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)

Diagnostic Classifiers: Herbaceous; Depressional [Lakeshore, Pond]; Mineral: W/ A-Horizon >10 cm; Aquatic Herb; Graminoid; Deep (>15 cm) Water; Saturated Soil

Concept Summary: This widespread ecological system occurs throughout much of the arid and semi-arid regions of western North America, typically surrounded by savanna, shrub steppe, steppe, or desert vegetation. Natural marshes may occur in depressions in the landscape (ponds, kettle ponds), as fringes around lakes, and along slow-flowing streams and rivers (such riparian marshes are also referred to as sloughs). Marshes are frequently or continually inundated, with water depths up to 2 m. Water levels may be stable, or may fluctuate 1 m or more over the course of the growing season. Water chemistry may include some alkaline or semi-alkaline situations, but the alkalinity is highly variable even within the same complex of wetlands. Marshes have distinctive soils that are typically mineral, but can also accumulate organic material. Soils have characteristics that result from long periods of anaerobic conditions in the soils (e.g., gleyed soils, high organic content, redoximorphic features). The vegetation is characterized by herbaceous plants that are adapted to saturated soil conditions. Common emergent and floating vegetation includes species of *Scirpus* and/or *Schoenoplectus, Typha, Juncus, Potamogeton, Polygonum, Nuphar*, and *Phalaris*. This system may also include areas of relatively deep water with floating-leaved plants (*Lemna, Potamogeton*, and *Brasenia*) and submergent and floating plants (*Myriophyllum, Ceratophyllum*, and *Elodea*).

Comments: This ecological system occurs in the arid and semi-arid regions of western North America, where semipermanently flooded habitats are found as small patches in the matrix of a relatively dry landscape.

DISTRIBUTION

Range: Occurs throughout much of the arid and semi-arid regions of western North America.

Divisions: 301:C, 302:C, 303:C, 304:C, 305:C, 306:C

TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 11:C, 17:C, 18:C, 19:C, 20:C, 21:C, 23:C, 24:C, 26:C, 27:C, 28:C, 29:C, 30:C, 68:C

Subnations: AB, AZ, BC, CA, CO, ID, MT, MXBC, MXCH, MXSO, ND, NE, NM, NV, OK, OR, SD, TX, UT, WA, WY

CONCEPT

Associations:

- *Calamagrostis canadensis* Western Herbaceous Vegetation (CEGL001559, G4)
- *Carex nebrascensis* Herbaceous Vegetation (CEGL001813, G4)
- *Carex utriculata* Herbaceous Vegetation (CEGL001562, G5)
- *Carex vesicaria* Herbaceous Vegetation (CEGL002661, G4Q)
- *Distichlis spicata - (Scirpus nevadensis)* Herbaceous Vegetation (CEGL001773, G4)
- *Eleocharis (montevidensis, palustris, quinqueflora)* Seasonally Flooded Herbaceous Vegetation [Placeholder] (CEGL003050, G5)
- *Glyceria borealis* Herbaceous Vegetation (CEGL001569, G4)
- *Juncus balticus - Carex rossii* Herbaceous Vegetation (CEGL001839, G2G4)
- *Juncus balticus* Herbaceous Vegetation (CEGL001838, G5)
- *Lemna* spp. Permanently Flooded Herbaceous Vegetation (CEGL003059, G3?)
- *Myriophyllum sibiricum* Herbaceous Vegetation (CEGL002000, GUQ)
- *Nuphar lutea* ssp. *polysepala* Herbaceous Vegetation (CEGL002001, G5)
- *Phalaris arundinacea* Western Herbaceous Vegetation (CEGL001474, G5)
- *Phragmites australis* Western North America Temperate Semi-natural Herbaceous Vegetation (CEGL001475, G5)
- *Potamogeton diversifolius* Herbaceous Vegetation (CEGL002007, G1?)
- *Potamogeton foliosus* Herbaceous Vegetation (CEGL002742, G3?)
- *Potamogeton natans* Herbaceous Vegetation (CEGL002925, G5?)
- *Ranunculus aquatilis - Callitriche palustris* Herbaceous Vegetation (CEGL001984, GU)
- *Ruppia (cirrhosa, maritima)* Permanently Flooded Herbaceous Vegetation [Placeholder] (CEGL003119, G1G3)
- *Salicornia rubra* Herbaceous Vegetation (CEGL001999, G2G3)
- *Schoenoplectus acutus - Typha latifolia - (Schoenoplectus tabernaemontani)* Sandhills Herbaceous Vegetation (CEGL002030, G4)
- *Schoenoplectus acutus* Herbaceous Vegetation (CEGL001840, G5)
- *Schoenoplectus americanus - Carex* spp. Herbaceous Vegetation (CEGL004144, GNR)

- *Schoenoplectus americanus - Eleocharis palustris* Herbaceous Vegetation (CEGL001585, G4)
- *Schoenoplectus americanus - Eleocharis* spp. Herbaceous Vegetation (CEGL001586, GNR)
- *Schoenoplectus americanus - Flaveria chlorifolia - (Helianthus paradoxus)* Herbaceous Vegetation (CEGL004592, G1)
- *Schoenoplectus americanus* Western Herbaceous Vegetation (CEGL001841, G3Q)
- *Schoenoplectus maritimus* Herbaceous Vegetation (CEGL001843, G4)
- *Schoenoplectus pungens* Herbaceous Vegetation (CEGL001587, G3G4)
- *Schoenoplectus tabernaemontani* Temperate Herbaceous Vegetation (CEGL002623, G5)
- *Sparganium angustifolium* Herbaceous Vegetation (CEGL001990, G4)
- *Sparganium eurycarpum* Herbaceous Vegetation (CEGL003323, G4)
- *Spartina gracilis* Herbaceous Vegetation (CEGL001588, GU)
- *Spartina pectinata* Western Herbaceous Vegetation (CEGL001476, G3?)
- *Stuckenia filiformis* Herbaceous Vegetation (CEGL002008, GU)
- *Triglochin maritima* Herbaceous Vegetation (CEGL001995, GU)
- *Typha (latifolia, angustifolia)* Western Herbaceous Vegetation (CEGL002010, G5)
- *Typha domingensis* Western Herbaceous Vegetation (CEGL001845, G5?)

Alliances:

- *(Potamogeton diversifolius, Stuckenia filiformis)* Permanently Flooded Herbaceous Alliance (A.1763)
- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex nebrascensis* Seasonally Flooded Herbaceous Alliance (A.1417)
- *Carex vesicaria* Seasonally Flooded Herbaceous Alliance (A.2501)
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Eleocharis (montevidensis, palustris, quinqueflora)* Seasonally Flooded Herbaceous Alliance (A.1371)
- *Glyceria borealis* Semipermanently Flooded Herbaceous Alliance (A.1445)
- *Juncus balticus* Seasonally Flooded Herbaceous Alliance (A.1374)
- *Lemna* spp. Permanently Flooded Herbaceous Alliance (A.1747)
- *Myriophyllum sibiricum* Permanently Flooded Herbaceous Alliance (A.1761)
- *Nymphaea odorata - Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Phalaris arundinacea* Seasonally Flooded Herbaceous Alliance (A.1381)
- *Phragmites australis* Semipermanently Flooded Herbaceous Alliance (A.1431)
- *Potamogeton foliosus* Permanently Flooded Herbaceous Alliance (A.2518)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Ranunculus aquatilis* Semipermanently Flooded Herbaceous Alliance (A.1679)
- *Ruppia (cirrhosa, maritima)* Permanently Flooded Herbaceous Alliance (A.1755)
- *Salicornia rubra* Seasonally Flooded Herbaceous Alliance (A.1818)
- *Schoenoplectus acutus - (Schoenoplectus tabernaemontani)* Semipermanently Flooded Herbaceous Alliance (A.1443)
- *Schoenoplectus americanus* Semipermanently Flooded Herbaceous Alliance (A.1432)
- *Schoenoplectus maritimus* Semipermanently Flooded Herbaceous Alliance (A.1444)
- *Schoenoplectus pungens* Semipermanently Flooded Herbaceous Alliance (A.1433)
- *Sparganium angustifolium* Permanently Flooded Herbaceous Alliance (A.1760)
- *Sparganium eurycarpum* Permanently Flooded Herbaceous Alliance (A.2598)
- *Spartina gracilis* Seasonally Flooded Herbaceous Alliance (A.1407)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)
- *Triglochin maritima* Semipermanently Flooded Herbaceous Alliance (A.1681)
- *Typha (angustifolia, latifolia) - (Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Typha domingensis* Seasonally Flooded Temperate Herbaceous Alliance (A.1392)

High-ranked species: Agelaius tricolor (G2G3), Bufo exsul (G1Q), Cyprinodon macularius (G1), Cyprinodon radiosus (G1), Cyprinodon salinus (G1Q), Sidalcea neomexicana ssp. thurberi (G4?T3T4)

SOURCES

References: Brown 1982, Comer et al. 2003, Cooper 1986b, Dick-Peddie 1993, Faber-Langendoen et al. 1997, Hansen et al. 1995, Kittel et al. 1994, Neely et al. 2001, Padgett et al. 1989, Rondeau 2001, Szaro 1989, Ungar 1965, Ungar 1972

Version: 14 Dec 2004 **Stakeholders:** Canada, Latin America, Midwest, Southeast, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

102 CES306.812—ROCKY MOUNTAIN ALPINE-MONTANE WET MEADOW

Primary Division: Rocky Mountain (306)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)

Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Montane [Upper Montane]; Herbaceous; Seepage-Fed Sloping [Mineral]; Depressional [Lakeshore, Pond]; Graminoid

Concept Summary: These are high-elevation communities found throughout the Rocky Mountains and Intermountain regions, dominated by herbaceous species found on wetter sites with very low-velocity surface and subsurface flows. They range in elevation from montane to alpine (1000-3600 m). These types occur as large meadows in montane or subalpine valleys, as narrow strips bordering ponds, lakes, and streams, and along toeslope seeps. They are typically found on flat areas or gentle slopes, but may also occur on sub-irrigated sites with slopes up to 10%. In alpine regions, sites typically are small depressions located below late-melting snow patches or on snowbeds. Soils of this system may be mineral or organic. In either case, soils show typical hydric soil characteristics, including high organic content and/or low chroma and redoximorphic features. This system often occurs as a mosaic of several plant associations, often dominated by graminoids, including *Calamagrostis stricta, Caltha leptosepala, Cardamine cordifolia, Carex illota, Carex microptera, Carex nigricans, Carex scopulorum, Carex utriculata, Carex vernacula, Deschampsia caespitosa, Eleocharis quinqueflora, Juncus drummondii, Phippsia algida, Rorippa alpina, Senecio triangularis, Trifolium parryi*, and *Trollius laxus*. Often alpine dwarf-shrublands, especially those dominated by *Salix*, are immediately adjacent to the wet meadows. Wet meadows are tightly associated with snowmelt and typically not subjected to high disturbance events such as flooding.

Comments: Similar systems to this one include Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998) and Boreal Wet Meadow (CES103.873). The Rocky Mountain Alpine-Montane Wet Meadow (CES306.812) occurs to the east of the coastal and Sierran mountains, in the semi-arid interior regions of western North America. Boreal wet meadow systems occur further north and east in boreal regions where the climatic regime is generally colder than that of the Rockies or Pacific Northwest regions. Floristics of these three systems are somewhat similar, but there are differences related to biogeographic affinities of the species composing the vegetation.

DISTRIBUTION

Range: Found throughout the Rocky Mountains and Intermountain regions, ranging in elevation from montane to alpine (1000-3600 m).
Divisions: 304:C, 306:C
TNC Ecoregions: 7:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 22:P, 25:C, 68:C
Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

CONCEPT

Associations:

- *Betula nana / Carex* spp. Shrubland (CEGL005887, GNR)
- *Betula nana / Carex utriculata* Shrubland (CEGL001079, G4?)
- *Betula nana* / Mesic Forbs - Mesic Graminoids Shrubland (CEGL002653, G3G4)
- *Calamagrostis canadensis - Carex scopulorum - Mertensia ciliata* Herbaceous Vegetation (CEGL001560, GUQ)
- *Calamagrostis canadensis - Senecio triangularis* Herbaceous Vegetation (CEGL001561, G2Q)
- *Calamagrostis canadensis* Western Herbaceous Vegetation (CEGL001559, G4)
- *Calamagrostis stricta* Herbaceous Vegetation [Provisional] (CEGL002891, GU)
- *Caltha leptosepala - Polygonum bistortoides* Herbaceous Vegetation (CEGL001956, G2Q)
- *Caltha leptosepala - Rhodiola rhodantha* Herbaceous Vegetation (CEGL001957, GNRQ)
- *Caltha leptosepala* Herbaceous Vegetation (CEGL001954, G4)
- *Camassia cusickii* Herbaceous Vegetation (CEGL003440, G2)
- *Cardamine cordifolia - Caltha leptosepala* Herbaceous Vegetation (CEGL001958, GU)
- *Cardamine cordifolia - Mertensia ciliata - Senecio triangularis* Herbaceous Vegetation (CEGL002662, G4)
- *Carex amplifolia* Herbaceous Vegetation (CEGL003427, G3)
- *Carex aperta* Herbaceous Vegetation (CEGL001801, G1?)
- *Carex aquatilis - Carex utriculata* Herbaceous Vegetation (CEGL001803, G4)
- *Carex aquatilis - Pedicularis groenlandica* Herbaceous Vegetation (CEGL001804, GU)
- *Carex aquatilis* Herbaceous Vegetation (CEGL001802, G5)
- *Carex aquatilis* var. *dives* Herbaceous Vegetation (CEGL001826, G4)
- *Carex capillaris - Polygonum viviparum* Herbaceous Vegetation (CEGL001872, GU)
- *Carex duriuscula* Herbaceous Vegetation (CEGL001874, GUQ)
- *Carex illota* Herbaceous Vegetation (CEGL001876, GUQ)
- *Carex lachenalii* Herbaceous Vegetation (CEGL001871, GU)
- *Carex microglochin* Herbaceous Vegetation (CEGL001877, GU)
- *Carex microptera* Herbaceous Vegetation (CEGL001792, G4)
- *Carex nebrascensis - Carex microptera* Herbaceous Vegetation (CEGL001815, G3G4)
- *Carex nebrascensis - Catabrosa aquatica* Herbaceous Vegetation (CEGL001814, G1?)
- *Carex nebrascensis* Herbaceous Vegetation (CEGL001813, G4)
- *Carex nebrascensis* Slope Herbaceous Vegetation (CEGL002890, GU)
- *Carex nigricans - Juncus drummondii* Herbaceous Vegetation (CEGL001818, GU)
- *Carex nigricans - Sibbaldia procumbens* Herbaceous Vegetation (CEGL005824, G4G5)
- *Carex nigricans* Herbaceous Vegetation (CEGL001816, G4)
- *Carex pellita* Herbaceous Vegetation (CEGL001809, G3)

- *Carex praegracilis - Carex aquatilis* Herbaceous Vegetation (CEGL001821, G3)
- *Carex praegracilis* Herbaceous Vegetation (CEGL002660, G3G4)
- *Carex pyrenaica* Herbaceous Vegetation (CEGL001860, GU)
- *Carex saxatilis* Herbaceous Vegetation (CEGL001769, G3)
- *Carex scirpoidea* ssp. *pseudoscirpoidea* Herbaceous Vegetation (CEGL001865, G3?)
- *Carex scopulorum - Caltha leptosepala* Herbaceous Vegetation (CEGL001823, G4)
- *Carex scopulorum - Elymus trachycaulus* Herbaceous Vegetation (CEGL001824, GU)
- *Carex scopulorum* Herbaceous Vegetation (CEGL001822, G5)
- *Carex simulata* Herbaceous Vegetation (CEGL001825, G4)
- *Carex spectabilis - Arnica X diversifolia* Herbaceous Vegetation (CEGL005867, G3G4)
- *Carex straminiformis* Herbaceous Vegetation (CEGL001793, G3?)
- *Carex utriculata* Herbaceous Vegetation (CEGL001562, G5)
- *Carex vernacula - Poa fendleriana* Herbaceous Vegetation (CEGL001869, G2G3)
- *Carex vesicaria* Herbaceous Vegetation (CEGL002661, G4Q)
- *Dasiphora fruticosa* ssp. *floribunda / Carex* spp. Shrubland (CEGL001106, G3?)
- *Dasiphora fruticosa* ssp. *floribunda / Deschampsia caespitosa* Shrubland (CEGL001107, G4)
- *Dasiphora fruticosa* ssp. *floribunda* Shrubland [Provisional] (CEGL001105, G5?)
- *Deschampsia caespitosa - Achillea millefolium* var. *occidentalis* Herbaceous Vegetation (CEGL001880, G5)
- *Deschampsia caespitosa - Caltha leptosepala* Herbaceous Vegetation (CEGL001882, G4)
- *Deschampsia caespitosa - Carex douglasii* Herbaceous Vegetation (CEGL001602, G2)
- *Deschampsia caespitosa - Carex microptera* Herbaceous Vegetation (CEGL001883, G2G3)
- *Deschampsia caespitosa - Carex nebrascensis* Herbaceous Vegetation (CEGL001601, G3?Q)
- *Deschampsia caespitosa - Carex* spp. Herbaceous Vegetation (CEGL001603, G4Q)
- *Deschampsia caespitosa - Geum rossii* Herbaceous Vegetation (CEGL001884, G5)
- *Deschampsia caespitosa - Ligusticum tenuifolium* Herbaceous Vegetation (CEGL001885, GU)
- *Deschampsia caespitosa - Luzula multiflora* Herbaceous Vegetation (CEGL001886, G2Q)
- *Deschampsia caespitosa - Mertensia ciliata* Herbaceous Vegetation (CEGL001887, GU)
- *Deschampsia caespitosa - Phleum alpinum* Herbaceous Vegetation (CEGL001888, G3Q)
- *Deschampsia caespitosa - Potentilla diversifolia* Herbaceous Vegetation (CEGL001889, G5)
- *Deschampsia caespitosa - Symphyotrichum foliaceum* Herbaceous Vegetation (CEGL001881, G2Q)
- *Deschampsia caespitosa* Herbaceous Vegetation (CEGL001599, G4)
- *Eleocharis acicularis* Herbaceous Vegetation (CEGL001832, G4?)
- *Eleocharis palustris - Distichlis spicata* Herbaceous Vegetation (CEGL001834, G2G4)
- *Eleocharis palustris - Juncus balticus* Herbaceous Vegetation (CEGL001835, G2G4)
- *Eleocharis palustris* Herbaceous Vegetation (CEGL001833, G5)
- *Eleocharis quinqueflora - Carex scopulorum* Herbaceous Vegetation (CEGL001837, G3G4)
- *Eleocharis quinqueflora* Herbaceous Vegetation (CEGL001836, G4)
- *Eleocharis rostellata* Herbaceous Vegetation (CEGL003428, G3)
- *Equisetum arvense* Herbaceous Vegetation (CEGL003314, G5)
- *Equisetum fluviatile* Herbaceous Vegetation (CEGL002746, G4)
- *Geum rossii - Polygonum bistortoides* Herbaceous Vegetation (CEGL001967, G4G5)
- *Geum rossii - Sibbaldia procumbens* Herbaceous Vegetation (CEGL001969, GU)
- *Glyceria borealis* Herbaceous Vegetation (CEGL001569, G4)
- *Glyceria grandis* Herbaceous Vegetation (CEGL003429, G2?)
- *Glyceria striata* Herbaceous Vegetation (CEGL000219, G3)
- *Heracleum maximum - Rudbeckia occidentalis* Herbaceous Vegetation (CEGL001940, G4)
- *Heracleum maximum* Herbaceous Vegetation (CEGL005857, G3G4)
- *Juncus balticus - Carex rossii* Herbaceous Vegetation (CEGL001839, G2G4)
- *Juncus balticus* Herbaceous Vegetation (CEGL001838, G5)
- *Juncus drummondii - Antennaria lanata* Herbaceous Vegetation (CEGL001904, G3?)
- *Juncus drummondii - Carex* spp. Herbaceous Vegetation (CEGL001905, G4)
- *Juncus parryi - Erigeron ursinus* Herbaceous Vegetation (CEGL001906, G2?)
- *Juncus parryi / Sibbaldia procumbens* Herbaceous Vegetation (CEGL005871, G3G4)
- *Phippsia algida* Herbaceous Vegetation (CEGL002892, GU)
- *Phleum alpinum - Carex aquatilis* Herbaceous Vegetation (CEGL001921, G2Q)
- *Phleum alpinum - Carex microptera* Herbaceous Vegetation (CEGL001922, G2Q)
- *Poa glauca* Herbaceous Vegetation (CEGL001926, GU)
- *Poa palustris* Herbaceous Vegetation (CEGL001659, GNA)
- *Primula parryi* Herbaceous Vegetation (CEGL001983, GNR)
- *Rhodiola rhodantha* Herbaceous Vegetation (CEGL001931, GU)
- *Rorippa alpina* Herbaceous Vegetation (CEGL002009, GU)

- *Saxifraga odontoloma* Herbaceous Vegetation (CEGL001985, GU)
- *Senecio triangularis - Mimulus guttatus* Herbaceous Vegetation (CEGL001988, G3?)
- *Senecio triangularis - Veratrum californicum* Herbaceous Vegetation (CEGL001989, G4)
- *Senecio triangularis* Herbaceous Vegetation (CEGL001987, G5?)
- *Trichophorum caespitosum - Carex livida* Herbaceous Vegetation (CEGL001842, G1)
- *Trollius laxus - Parnassia fimbriata* Herbaceous Vegetation (CEGL005858, G3?)
- *Valeriana sitchensis - Veratrum viride* Herbaceous Vegetation (CEGL001998, G4)

Alliances:

- *Betula nana* Seasonally Flooded Shrubland Alliance (A.995)
- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Calamagrostis stricta* Temporarily Flooded Herbaceous Alliance (A.2594)
- *Caltha leptosepala* Saturated Herbaceous Alliance (A.1698)
- *Camassia (cusickii, quamash)* Seasonally Flooded Herbaceous Alliance (A.2587)
- *Cardamine cordifolia* Saturated Herbaceous Alliance (A.1699)
- *Carex (lachenalii, capillaris, illota)* Seasonally Flooded Herbaceous Alliance (A.1424)
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex amplifolia* Saturated Herbaceous Alliance (A.2584)
- *Carex aperta* Saturated Herbaceous Alliance (A.1468)
- *Carex aquatilis* Seasonally Flooded Herbaceous Alliance (A.1404)
- *Carex aquatilis* var. *dives* Seasonally Flooded Herbaceous Alliance (A.1412)
- *Carex duriuscula* Herbaceous Alliance (A.1283)
- *Carex microglochin* Saturated Herbaceous Alliance (A.1470)
- *Carex microptera* Seasonally Flooded Herbaceous Alliance (A.1411)
- *Carex nebrascensis* Seasonally Flooded Herbaceous Alliance (A.1417)
- *Carex nigricans* Seasonally Flooded Herbaceous Alliance (A.1418)
- *Carex pellita* Seasonally Flooded Herbaceous Alliance (A.1414)
- *Carex praegracilis* Seasonally Flooded Herbaceous Alliance (A.1419)
- *Carex pyrenaica* Herbaceous Alliance (A.1320)
- *Carex saxatilis* Temporarily Flooded Herbaceous Alliance (A.1357)
- *Carex scirpoidea* ssp. *pseudoscirpoidea* Herbaceous Alliance (A.1306)
- *Carex scopulorum* Seasonally Flooded Herbaceous Alliance (A.1420)
- *Carex simulata* Saturated Herbaceous Alliance (A.1469)
- *Carex spectabilis* Herbaceous Alliance (A.1300)
- *Carex straminiformis* Herbaceous Alliance (A.1314)
- *Carex vernacula* Herbaceous Alliance (A.1309)
- *Carex vesicaria* Seasonally Flooded Herbaceous Alliance (A.2501)
- *Dasiphora fruticosa* Temporarily Flooded Shrubland Alliance (A.958)
- *Deschampsia caespitosa* Saturated Herbaceous Alliance (A.1456)
- *Deschampsia caespitosa* Seasonally Flooded Herbaceous Alliance (A.1408)
- *Deschampsia caespitosa* Temporarily Flooded Herbaceous Alliance (A.1355)
- *Eleocharis (quinqueflora, rostellata)* Saturated Herbaceous Alliance (A.1423)
- *Eleocharis acicularis* Seasonally Flooded Herbaceous Alliance (A.1421)
- *Eleocharis palustris* Seasonally Flooded Herbaceous Alliance (A.1422)
- *Equisetum (arvense, variegatum, hyemale)* Semipermanently Flooded Herbaceous Alliance (A.3539)
- *Equisetum fluviatile* Semipermanently Flooded Herbaceous Alliance (A.1678)
- *Geum rossii* Herbaceous Alliance (A.1645)
- *Glyceria (grandis, striata)* Seasonally Flooded Herbaceous Alliance (A.2578)
- *Glyceria borealis* Semipermanently Flooded Herbaceous Alliance (A.1445)
- *Heracleum maximum* Temporarily Flooded Herbaceous Alliance (A.1661)
- *Juncus balticus* Seasonally Flooded Herbaceous Alliance (A.1374)
- *Juncus drummondii* Herbaceous Alliance (A.1324)
- *Juncus parryi* Herbaceous Alliance (A.1325)
- *Phippsia algida* Saturated Herbaceous Alliance (A.2595)
- *Phleum alpinum* Temporarily Flooded Herbaceous Alliance (A.1360)
- *Poa glauca* Temporarily Flooded Herbaceous Alliance (A.1361)
- *Poa palustris* Semi-natural Seasonally Flooded Herbaceous Alliance (A.1409)
- *Primula parryi* Temporarily Flooded Herbaceous Alliance (A.1665)
- *Rhodiola rhodantha* Temporarily Flooded Herbaceous Alliance (A.1659)
- *Rorippa alpina* Saturated Herbaceous Alliance (A.1700)
- *Saxifraga odontoloma* Temporarily Flooded Herbaceous Alliance (A.1666)
- *Senecio triangularis* Semipermanently Flooded Herbaceous Alliance (A.1680)

- *Senecio triangularis* Temporarily Flooded Herbaceous Alliance (A.1667)
- *Trichophorum caespitosum* Semipermanently Flooded Herbaceous Alliance (A.1446)
- *Trollius laxus* Saturated Herbaceous Alliance (A.2631)
- *Valeriana sitchensis* Herbaceous Alliance (A.1611)

High-ranked species: Ptilagrostis kingii (G3?), Rana pretiosa (G2), Speyeria nokomis (G3)

Environment: Moisture for these wet meadow community types is acquired from groundwater, stream discharge, overland flow, overbank flow, and on-site precipitation. Salinity and alkalinity are generally low due to the frequent flushing of moisture through the meadow. Depending on the slope, topography, hydrology, soils and substrate, intermittent, ephemeral, or permanent pools may be present. These areas may support species more representative of purely aquatic environments. Standing water may be present during some or all of the growing season, with water tables typically remaining at or near the soil surface. Fluctuations of the water table throughout the growing season are not uncommon, however. On drier sites supporting the less mesic types, the late-season water table may be one meter or more below the surface.

Soils typically possess a high proportion of organic matter, but this may vary considerably depending on the frequency and magnitude of alluvial deposition (Kittel et. al. 1998). Organic composition of the soil may include a thin layer near the soil surface or accumulations of highly sapric material of up to 120 cm thick. Soils may exhibit gleying and/or mottling throughout the profile.

Wet meadow ecological systems provide important water filtration, flow attenuation, and wildlife habitat functions.

Dynamics: Associations in this ecological system are adapted to soils that may be flooded or saturated throughout the growing season. They may also occur on areas with soils that are only saturated early in the growing season, or intermittently. Typically these associations are tolerant of moderate-intensity ground fires and late-season livestock grazing (Kovalchik 1987). Most appear to be relatively stable types, although in some areas these may be impacted by intensive livestock grazing.

SOURCES

References: Canadian Rockies Ecoregional Plan 2002, Comer et al. 2002, Comer et al. 2003, Cooper 1986b, Crowe and Clausnitzer 1997, Kittel et al. 1999b, Komarkova 1976, Komarkova 1986, Kovalchik 1987, Kovalchik 1993, Manning and Padgett 1995, Meidinger and Pojar 1991, Nachlinger 1985, Nachlinger et al. 2001, Neely et al. 2001, Padgett et al. 1988a, Reed 1988, Sanderson and Kettler 1996, Tuhy et al. 2002

Version: 14 Dec 2004 **Stakeholders:** Canada, Midwest, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

103 CES200.998—TEMPERATE PACIFIC SUBALPINE-MONTANE WET MEADOW

Primary Division:

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)

Diagnostic Classifiers: Herbaceous; Muck; Graminoid; 30-180-day hydroperiod

Concept Summary: Montane and subalpine wet meadows occur in open wet depressions, basins and flats among montane and subalpine forests from California's Transverse and Peninsular ranges north to the Alaskan coastal forests at varying elevations depending on latitude. Sites are usually seasonally wet, often drying by late summer, and many occur in a tension zone between perennial wetlands and uplands, where water tables fluctuate in response to long-term climatic cycles. They may have surface water for part of the year, but depths rarely exceed a few centimeters. Soils are mostly mineral and may show typical hydric soil characteristics, and shallow organic soils may occur as inclusions. This system often occurs as a mosaic of several plant associations with varying dominant herbaceous species that may include *Camassia quamash, Carex bolanderi, Carex utriculata, Carex exsiccata, Dodecatheon jeffreyi, Glyceria striata (= Glyceria elata), Carex nigricans, Calamagrostis canadensis, Juncus nevadensis, Caltha leptosepala ssp. howellii, Veratrum californicum,* and *Scirpus* and/or *Schoenoplectus* spp. Trees occur peripherally or on elevated microsites and include *Picea engelmannii, Abies lasiocarpa, Abies amabilis, Tsuga mertensiana,* and *Chamaecyparis nootkatensis*. Common shrubs may include *Salix* spp., *Vaccinium uliginosum, Betula nana*, and *Vaccinium macrocarpon*. Wet meadows are tightly associated with snowmelt and typically are not subjected to high disturbance events such as flooding.

Comments: Rocky Mountain Alpine-Montane Wet Meadow (CES306.812) occurs to the east of the coastal and Sierran mountains, in the semi-arid interior regions of western North America. Boreal wet meadow systems occur further north and east in boreal regions where the climatic regime is generally colder than that of the Rockies or Pacific Northwest regions. Floristics of these three systems are somewhat similar, but there are differences related to biogeographic affinities of the species composing the vegetation.

DISTRIBUTION

Range: This system is found from California's Transverse and Peninsular ranges north to the Alaskan coastal forests at varying elevations depending on latitude.

Divisions: 204:C, 206:C

TNC Ecoregions: 3:C, 4:C, 5:C, 12:C, 16:C, 69:C, 81:C

Subnations: AK, BC, CA, NV, OR, WA

CONCEPT

Associations:

- *Calamagrostis canadensis* Western Herbaceous Vegetation (CEGL001559, G4)
- *Carex amplifolia* Herbaceous Vegetation (CEGL003427, G3)
- *Carex aquatilis* Herbaceous Vegetation (CEGL001802, G5)
- *Carex lasiocarpa* Herbaceous Vegetation (CEGL001810, G4?)
- *Carex nebrascensis - Carex microptera* Herbaceous Vegetation (CEGL001815, G3G4)
- *Carex nebrascensis* Herbaceous Vegetation (CEGL001813, G4)
- *Carex nigricans - Erythronium montanum* Herbaceous Vegetation (CEGL001817, G4)
- *Carex nigricans - Luetkea pectinata* Herbaceous Vegetation (CEGL001819, G4)
- *Carex nigricans* Herbaceous Vegetation (CEGL001816, G4)
- *Carex scopulorum* Herbaceous Vegetation (CEGL001822, G5)
- *Carex simulata* Herbaceous Vegetation (CEGL001825, G4)
- *Deschampsia caespitosa* Herbaceous Vegetation (CEGL001599, G4)
- *Eleocharis acicularis* Herbaceous Vegetation (CEGL001832, G4?)
- *Eleocharis palustris* Herbaceous Vegetation (CEGL001833, G5)
- *Juncus balticus* Herbaceous Vegetation (CEGL001838, G5)
- *Senecio triangularis - Mimulus guttatus* Herbaceous Vegetation (CEGL001988, G3?)
- *Senecio triangularis - Veratrum californicum* Herbaceous Vegetation (CEGL001989, G4)
- *Vaccinium uliginosum / Deschampsia caespitosa* Dwarf-shrubland (CEGL001250, G2)
- *Veratrum californicum - Juncus nevadensis* Herbaceous Vegetation (CEGL001946, G3G4)

Alliances:

- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Carex amplifolia* Saturated Herbaceous Alliance (A.2584)
- *Carex aquatilis* Seasonally Flooded Herbaceous Alliance (A.1404)
- *Carex lasiocarpa* Seasonally Flooded Herbaceous Alliance (A.1415)
- *Carex nebrascensis* Seasonally Flooded Herbaceous Alliance (A.1417)
- *Carex nigricans* Seasonally Flooded Herbaceous Alliance (A.1418)
- *Carex scopulorum* Seasonally Flooded Herbaceous Alliance (A.1420)
- *Carex simulata* Saturated Herbaceous Alliance (A.1469)
- *Deschampsia caespitosa* Seasonally Flooded Herbaceous Alliance (A.1408)
- *Eleocharis acicularis* Seasonally Flooded Herbaceous Alliance (A.1421)
- *Eleocharis palustris* Seasonally Flooded Herbaceous Alliance (A.1422)
- *Juncus balticus* Seasonally Flooded Herbaceous Alliance (A.1374)
- *Senecio triangularis* Semipermanently Flooded Herbaceous Alliance (A.1680)
- *Senecio triangularis* Temporarily Flooded Herbaceous Alliance (A.1667)
- *Vaccinium uliginosum* Saturated Dwarf-shrubland Alliance (A.1123)
- *Veratrum californicum* Temporarily Flooded Herbaceous Alliance (A.1663)

High-ranked species: Antennaria pulchella (G3), Arnica chamissonis var. bernardina (G5T2T3), Astragalus lentiginosus var. kernensis (G5T3?), Bufo canorus (G2), Carex sartwelliana (G3?), Carex tiogana (G1), Castilleja lasiorhyncha (G2), Cinna bolanderi (G3), Claytonia palustris (G3), Crepis runcinata ssp. andersonii (G5T3?), Delphinium hesperium ssp. cuyamacae (G4T2), Epilobium howellii (G1), Gentiana plurisetosa (G3), Ivesia unguiculata (G3), Juncus duranii (G3), Juncus macrandrus (G3G4), Lilium pardalinum ssp. shastense (G5T3T4), Lilium parryi (G3), Limnanthes montana (G3?), Lophochlaena californica var. davyi (G5T3), Lotus oblongifolius var. cupreus (G5T2), Lupinus polyphyllus ssp. bernardianus (G5T2T3), Lupinus polyphyllus var. grandifolius (G5T3?), Madia yosemitana (G2G3), Mimulus biolettii (G2G3), Mimulus exiguus (G2), Mimulus filicaulis (G2), Mimulus grayi (G3), Mimulus inconspicuus (G3), Mimulus microphyllus (G3Q), Mimulus primuloides var. linearifolius (G4T2T3), Mimulus pulchellus (G2G3), Mimulus purpureus (G2), Navarretia peninsularis (G3?), Packera bernardina (G2), Parnassia cirrata (G2), Perideridia parishii ssp. parishii (G4T3T4), Phacelia orogenes (G3), Phalacroseris bolanderi (G3G4), Phalacroseris bolanderi var. bolanderi (G3G4T3?), Phalacroseris bolanderi var. coronata (G3G4T2T3), Plagiobothrys distantiflorus (G3?), Plagiobothrys tener var. subglaber (G4T1T3), Plebejus podarce (G3G4), Poa atropurpurea (G2), Potentilla glandulosa ssp. ewanii (G5T1), Raillardella pringlei (G2), Rana cascadae (G3G4), Rana pretiosa (G2), Ranunculus eschscholtzii var. oxynotus (G5T3?), Rudbeckia californica var. intermedia (G4T2?), Scirpus diffusus (G3G4), Sidalcea hirsuta (G3G4), Sidalcea oregana ssp. eximia (G5T1), Sidalcea oregana ssp. hydrophila (G5T2?), Sidalcea pedata (G1), Sidalcea ranunculacea (G3?), Taraxacum californicum (G2), Thelypodium stenopetalum (G1), Thermopsis californica var. semota (G3T2), Trichophorum clementis (G3), Trifolium barbigerum var. andrewsii (G5T3?), Trifolium bolanderi (G3), Trifolium polyodon (G1Q), Veratrum fimbriatum (G3), Viola adunca var. kirkii (G5T1T3), Zigadenus fontanus (G3)

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Version: 31 Mar 2005 **Stakeholders:** Canada, West

Concept Author: P. Comer **LeadResp:** West

105 CES206.952—MEDITERRANEAN CALIFORNIA SUBALPINE-MONTANE FEN

Primary Division: Mediterranean California (206)
Land Cover Class: Herbaceous Wetland
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Temperate [Temperate Oceanic]; Seepage-Fed Sloping; Muck; Circumneutral Water; Extreme (Mineral) Rich and Iron-Rich; Bog and Fen Mosaic
Concept Summary: This system is found in montane to subalpine elevations confined to specific environments defined by groundwater discharge, soil chemistry, and peat accumulation. This system includes extreme rich fens which are quite rare. Fens form at low points in the landscape or near slopes where groundwater intercepts the soil surface. Groundwater inflows maintain a fairly constant water level year-round, with water at or near the surface most of the time. Constant high water levels lead to accumulation of organic material. In addition to peat accumulation and perennially saturated soils, the extreme rich fens have distinct soil and water chemistry, with high levels of one or more minerals such as calcium and/or magnesium. They usually occur as a mosaic of several plant associations dominated by species of *Carex, Betula, Kobresia,* or *Schoenoplectus*. The surrounding landscape may be ringed with other wetland systems, e.g., riparian shrublands, or a variety of upland systems from grasslands to forests.

DISTRIBUTION

Range: These fens are found in montane to subalpine elevations of California mountains, in the Sierra Nevada, northwestern California coastal mountains, and possibly the Klamath - Siskiyou mountains.
Divisions: 206:C
TNC Ecoregions: 5:P, 12:P, 14:P
Subnations: CA, NV, OR

CONCEPT

Associations:
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Alliances:
High-ranked species: Campanula wilkinsiana (G2), Plebejus podarce (G3G4)

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995
Version: 14 Dec 2004 **Stakeholders:** West
Concept Author: P. Comer, T. Keeler-Wolf **LeadResp:** West

108 CES303.669—WESTERN GREAT PLAINS SALINE DEPRESSION WETLAND

Primary Division: Western Great Plains (303)
Land Cover Class: Herbaceous Wetland
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Concept Summary: This ecological system is very similar to Western Great Plains Open Freshwater Depression Wetland (CES303.675) and Western Great Plains Closed Depression Wetland (CES303.666). However, strongly saline soils cause both the shallow lakes and depressions and the surrounding areas to be more brackish. Salt encrustations can occur on the surface in some examples of this system, and the soils are severely affected and have poor structure. Species that typify this system are salt-tolerant and halophytic species such as *Distichlis spicata, Sporobolus airoides,* and *Hordeum jubatum*. During exceptionally wet years, an increase in precipitation can dilute the salt concentration in the soils of some examples of this system which may allow for less salt-tolerant species to occur. Communities found within this system may also occur in floodplains (i.e., more open depressions) but probably should not be considered a separate system unless they transition to areas outside the immediate floodplain.
Comments: Open and emergent saline marshes may be a separate system from saline wet meadows and prairies.

DISTRIBUTION

Range: This system can occur throughout the Western Great Plains, but is likely more prevalent in the south-central portions of the division.
Divisions: 303:C
TNC Ecoregions: 26:?, 27:C, 28:C, 33:C, 34:?
Subnations: CO, KS, MT, ND, NE, NM, OK, SD, TX, WY

CONCEPT

Associations:
- *Calamagrostis stricta - Carex sartwellii - Carex praegracilis - Plantago eriopoda* Saline Herbaceous Vegetation (CEGL002255, G2G3)
- *Distichlis spicata - (Hordeum jubatum, Poa arida, Sporobolus airoides)* Herbaceous Vegetation (CEGL002042, G3)
- *Distichlis spicata - Hordeum jubatum - (Poa arida, Iva annua)* Herbaceous Vegetation (CEGL002031, G2G3)
- *Distichlis spicata - Hordeum jubatum - Puccinellia nuttalliana - Suaeda calceoliformis* Herbaceous Vegetation (CEGL002273, G2G3)
- *Distichlis spicata - Schoenoplectus maritimus - Salicornia rubra* Herbaceous Vegetation (CEGL002043, G1G2)

- *Distichlis spicata - Spartina* spp. Herbaceous Vegetation (CEGL002275, G4)
- *Distichlis spicata* Herbaceous Vegetation (CEGL001770, G5)
- *Hordeum jubatum* Herbaceous Vegetation (CEGL001798, G4)
- *Pascopyrum smithii - Distichlis spicata* Herbaceous Vegetation (CEGL001580, G4)
- *Pascopyrum smithii - Hordeum jubatum* Herbaceous Vegetation (CEGL001582, G4)
- *Puccinellia nuttalliana* Herbaceous Vegetation (CEGL001799, G3?)
- *Salicornia rubra* Herbaceous Vegetation (CEGL001999, G2G3)
- *Sarcobatus vermiculatus / Distichlis spicata - (Puccinellia nuttalliana)* Shrub Herbaceous Vegetation (CEGL002146, GNR)
- *Sarcobatus vermiculatus / Pascopyrum smithii - (Elymus lanceolatus)* Shrub Herbaceous Vegetation (CEGL001508, G4)
- *Schoenoplectus americanus - Carex* spp. Herbaceous Vegetation (CEGL004144, GNR)
- *Schoenoplectus americanus* Great Plains Herbaceous Vegetation (CEGL002226, GNR)
- *Schoenoplectus maritimus - Schoenoplectus acutus - (Triglochin maritima)* Herbaceous Vegetation (CEGL002227, G3G5)
- *Schoenoplectus maritimus* Herbaceous Vegetation (CEGL001843, G4)
- *Schoenoplectus pungens - Suaeda calceoliformis* Alkaline Herbaceous Vegetation (CEGL002040, G3G4)
- *Schoenoplectus pungens* Herbaceous Vegetation (CEGL001587, G3G4)
- *Scolochloa festucacea* Herbaceous Vegetation (CEGL002260, G4G5)
- *Spartina pectinata - Schoenoplectus pungens* Herbaceous Vegetation (CEGL001478, G3?)
- *Sporobolus airoides* Monotype Herbaceous Vegetation (CEGL001688, GUQ)
- *Sporobolus airoides* Northern Plains Herbaceous Vegetation (CEGL002274, GNR)
- *Sporobolus airoides* Southern Plains Herbaceous Vegetation (CEGL001685, G3Q)
- *Stuckenia pectinata - Ruppia maritima* Herbaceous Vegetation (CEGL002004, G2?)
- *Stuckenia pectinata - Zannichellia palustris* Herbaceous Vegetation (CEGL002005, G3G4)
- *Typha* spp. - *Schoenoplectus* spp. - Mixed Herbs Great Plains Herbaceous Vegetation (CEGL002228, G4G5)
- *Typha* spp. Great Plains Herbaceous Vegetation (CEGL002389, G4G5)

Alliances:

- *Carex* spp. - *Plantago eriopoda* Temporarily Flooded Herbaceous Alliance (A.1350)
- *Distichlis spicata - (Hordeum jubatum)* Temporarily Flooded Herbaceous Alliance (A.1341)
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Hordeum jubatum* Temporarily Flooded Herbaceous Alliance (A.1358)
- *Pascopyrum smithii* Temporarily Flooded Herbaceous Alliance (A.1354)
- *Puccinellia nuttalliana* Intermittently Flooded Herbaceous Alliance (A.1335)
- *Salicornia rubra* Seasonally Flooded Herbaceous Alliance (A.1818)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrub Herbaceous Alliance (A.1554)
- *Sarcobatus vermiculatus* Shrub Herbaceous Alliance (A.1535)
- *Schoenoplectus americanus* Semipermanently Flooded Herbaceous Alliance (A.1432)
- *Schoenoplectus maritimus* Semipermanently Flooded Herbaceous Alliance (A.1444)
- *Schoenoplectus pungens* Semipermanently Flooded Herbaceous Alliance (A.1433)
- *Scolochloa festucacea* Seasonally Flooded Herbaceous Alliance (A.1401)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)
- *Sporobolus airoides* Herbaceous Alliance (A.1267)
- *Stuckenia pectinata* Permanently Flooded Herbaceous Alliance (A.1764)
- *Typha (angustifolia, latifolia) - (Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)

High-ranked species: Eleocharis wolfii (G3G4), Schoenoplectus hallii (G2)

Environment: This system is distinct from the freshwater depression systems by its brackish nature caused by strongly saline soils. Salt encrustations could occur near the surface in some examples of this system.

Vegetation: Salt-tolerant and halophytic species such as *Distichlis spicata*, *Sporobolus airoides*, and *Hordeum jubatum* typify the system.

Dynamics: Hydrology processes primarily drive this system. Increases in precipitation and/or runoff can dilute the salt concentration and allow for less salt tolerant species to occur. Conversion to agriculture and pastureland can also impact this system, especially when it alters the hydrology of the system.

SOURCES

References: Comer et al. 2003, Hoagland 2000, Lauver et al. 1999, Steinauer and Rolfsmeier 2000

Version: 14 Dec 2004 **Stakeholders:** Midwest, Southeast, West

Concept Author: S. Menard and K. Kindscher **LeadResp:** Midwest

109 CES302.746—CHIHUAHUAN-SONORAN DESERT BOTTOMLAND AND SWALE GRASSLAND

Primary Division: North American Warm Desert (302)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Lowland [Lowland]; Herbaceous; Swale; Toeslope/Valley Bottom; Depressional

Concept Summary: This ecological system occurs throughout the northern Chihuahuan Desert and adjacent Sky Islands and Sonoran Desert, as well as limited areas of the southern Great Plains and Edwards Plateau in relatively small depressions on broad mesas, plains and valley bottoms that receive runoff from adjacent areas. Water generally infiltrates relatively quickly. These depressions have deep, fine-textured soils that are neutral to slightly saline/alkaline. Vegetation is typically dominated by *Pleuraphis mutica* (tobosa swales) or other mesic graminoids such as *Pascopyrum smithii, Panicum obtusum, Sporobolus airoides,* or *Sporobolus wrightii*. With tobosa swales, sand-adapted species such as *Yucca elata* may grow at the swale's edge in the deep sandy alluvium that is deposited there from upland slopes. *Sporobolus airoides* and *Sporobolus wrightii* are more common in alkaline soils.

DISTRIBUTION

Range: Northern Chihuahuan Desert and adjacent Sky Islands and Sonoran Desert, as well as limited areas of the southern Great Plains and Edwards Plateau.
Divisions: 302:C, 303:C
TNC Ecoregions: 22:C, 23:C, 24:C, 28:C, 29:C
Subnations: AZ, MXCH, MXSO, NM, TX

CONCEPT

Associations:
- *Panicum obtusum - Helianthus ciliaris* Herbaceous Vegetation (CEGL001574, G1)
- *Panicum obtusum - Panicum hirsutum* Herbaceous Vegetation (CEGL001576, GNRQ)
- *Pleuraphis mutica - Bouteloua gracilis* Herbaceous Vegetation (CEGL001638, GNRQ)
- *Pleuraphis mutica - Buchloe dactyloides* Herbaceous Vegetation (CEGL002272, G4?)
- *Pleuraphis mutica - Panicum obtusum* Herbaceous Vegetation (CEGL001639, G3)
- *Pleuraphis mutica - Scleropogon brevifolius* Herbaceous Vegetation (CEGL001640, G5)
- *Pleuraphis mutica* Monotype Herbaceous Vegetation (CEGL001637, G5?)
- *Sporobolus airoides - Distichlis spicata* Herbaceous Vegetation (CEGL001687, G4?)
- *Sporobolus airoides - Scleropogon brevifolius* Herbaceous Vegetation (CEGL001692, G5)
- *Sporobolus airoides* Monotype Herbaceous Vegetation (CEGL001688, GUQ)
- *Sporobolus airoides* Sod Herbaceous Vegetation [Placeholder] (CEGL001791, GNR)
- *Sporobolus airoides* Southern Plains Herbaceous Vegetation (CEGL001685, G3Q)
- *Sporobolus wrightii - Panicum hallii* Herbaceous Vegetation (CEGL001485, GNRQ)
- *Sporobolus wrightii - Panicum obtusum* Herbaceous Vegetation (CEGL001486, G2)

Alliances:
- *Panicum obtusum* Herbaceous Alliance (A.1238)
- *Pleuraphis mutica* Herbaceous Alliance (A.1249)
- *Pleuraphis mutica* Intermittently Flooded Herbaceous Alliance (A.1330)
- *Sporobolus airoides* Herbaceous Alliance (A.1267)
- *Sporobolus airoides* Intermittently Flooded Herbaceous Alliance (A.1331)
- *Sporobolus airoides* Sod Herbaceous Alliance (A.1241)
- *Sporobolus wrightii* Herbaceous Alliance (A.1205)

SOURCES

References: Brown 1982, Comer et al. 2003, Dick-Peddie 1993, MacMahon and Wagner 1985, Muldavin et al. 2000b
Version: 14 Dec 2004 **Stakeholders:** Latin America, Southeast, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

112 CES305.797—MADREAN PINYON-JUNIPER WOODLAND

Primary Division: Sierra Madre (305)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Lower Montane]; Tropical/Subtropical [Tropical Xeric]; Shallow Soil; Xeric; F-Patch/Medium Intensity; Needle-Leaved Tree; Evergreen Sclerophyllous Shrub; Pinus cembroides, Juniperus deppeana
Concept Summary: This system occurs on foothills, mountains and plateaus in the Sierra Madre Occidentale and Sierra Madre Orientale in Mexico, Trans-Pecos Texas, southern New Mexico and Arizona, generally south of the Mogollon Rim. Substrates are variable, but soils are generally dry and rocky. The presence of *Pinus cembroides, Pinus discolor*, or other Madrean trees and shrubs is diagnostic of this woodland system. *Juniperus coahuilensis, Juniperus deppeana, Juniperus pinchotii, Juniperus monosperma*, and/or *Pinus edulis* may be present to dominant. Madrean oaks such as *Quercus arizonica, Quercus emoryi, Quercus grisea*, or *Quercus mohriana* may be codominant. *Pinus ponderosa* is absent or sparse. If present, understory layers are variable and may be dominated by shrubs or graminoids.

DISTRIBUTION

Range: Sierra Madre Occidentale and Sierra Madre Orientale in Mexico, Trans-Pecos Texas, southern New Mexico and Arizona, generally south of the Mogollon Rim.

Divisions: 305:C
TNC Ecoregions: 22:C, 24:C, 30:C
Subnations: AZ, NM, TX

CONCEPT

Associations:
- *Juniperus coahuilensis / Bouteloua curtipendula - Bouteloua gracilis* Woodland (CEGL004584, G3?)
- *Juniperus coahuilensis / Bouteloua eriopoda* Woodland (CEGL000700, GU)
- *Juniperus coahuilensis / Canotia holacantha* Woodland (CEGL000701, G3)
- *Juniperus coahuilensis / Quercus turbinella* Woodland (CEGL000702, G4)
- *Juniperus deppeana - Juniperus monosperma - Quercus grisea / Rhus trilobata* Woodland (CEGL000696, G5)
- *Juniperus deppeana - Juniperus monosperma / Cercocarpus montanus - Ceanothus greggii* Woodland (CEGL000695, G5)
- *Juniperus deppeana / Arctostaphylos pungens* Woodland (CEGL000692, G4)
- *Juniperus deppeana / Muhlenbergia emersleyi* Woodland (CEGL000697, G4)
- *Juniperus deppeana / Panicum obtusum* Woodland (CEGL000698, GNR)
- *Juniperus monosperma - Quercus mohriana* Woodland (CEGL002120, GNR)
- *Juniperus monosperma / Agave lechuguilla* Woodland (CEGL000703, G4)
- *Juniperus monosperma / Larrea tridentata* Woodland (CEGL000717, G5)
- *Juniperus monosperma / Nolina microcarpa - Agave lechuguilla* Woodland (CEGL000718, G4)
- *Juniperus monosperma / Prosopis glandulosa* Woodland (CEGL000719, G5)
- *Juniperus pinchotii / Bouteloua curtipendula - Bouteloua hirsuta* Woodland (CEGL004940, GNR)
- *Juniperus pinchotii / Bouteloua gracilis* Woodland (CEGL002122, G4)
- *Pinus (discolor, cembroides) / Quercus arizonica / Muhlenbergia emersleyi* Woodland (CEGL000769, G3)
- *Pinus cembroides - Quercus gravesii - Juniperus flaccida / Salvia regla / Piptochaetium fimbriatum* Forest (CEGL004600, G2?)
- *Pinus cembroides - Quercus grisea - Juniperus flaccida / Salvia regla / Muhlenbergia emersleyi* Woodland (CEGL004596, G2?)
- *Pinus cembroides - Quercus grisea - Quercus emoryi - Juniperus flaccida / Salvia regla / Bouteloua curtipendula* Woodland (CEGL004597, G2?)
- *Pinus cembroides - Quercus grisea - Quercus emoryi / Mimosa dysocarpa / Bouteloua gracilis* Woodland (CEGL004598, G2?)
- *Pinus cembroides - Quercus grisea / Agave lechuguilla / Bouteloua curtipendula* Woodland (CEGL003551, G2?)
- *Pinus cembroides - Quercus grisea / Muhlenbergia montana - Piptochaetium pringlei* Woodland (CEGL004599, G2?)
- *Pinus discolor / Muhlenbergia emersleyi* Woodland (CEGL000767, G5)
- *Pinus discolor / Piptochaetium fimbriatum* Woodland (CEGL000768, G2)
- *Pinus discolor / Quercus gambelii* Woodland (CEGL000770, G1)
- *Pinus discolor / Quercus hypoleucoides* Woodland (CEGL000771, G2)
- *Pinus discolor / Quercus rugosa* Woodland (CEGL000772, G1)
- *Pinus discolor / Quercus toumeyi* Woodland (CEGL000773, G2)
- *Pinus edulis - Quercus arizonica / Rhus trilobata* Woodland (CEGL000790, G5?)
- *Pinus remota / Juniperus pinchotii - Quercus mohriana* Woodland (CEGL004585, G2G3)

Alliances:
- *Juniperus coahuilensis* Woodland Alliance (A.503)
- *Juniperus deppeana* Woodland Alliance (A.534)
- *Juniperus monosperma* Woodland Alliance (A.504)
- *Juniperus pinchotii* Woodland Alliance (A.505)
- *Pinus cembroides - Quercus gravesii* Forest Alliance (A.392)
- *Pinus cembroides* Woodland Alliance (A.510)
- *Pinus discolor* Woodland Alliance (A.538)
- *Pinus edulis - (Juniperus* spp.) Woodland Alliance (A.516)
- *Pinus remota* Woodland Alliance (A.523)

SOURCES

References: Comer et al. 2003
Version: 05 Oct 2004 **Stakeholders:** Latin America, Southeast, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

113 CES302.736—CHIHUAHUAN SANDY PLAINS SEMI-DESERT GRASSLAND

Primary Division: North American Warm Desert (302)
Land Cover Class: Herbaceous
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Herbaceous; Sand Soil Texture; Graminoid

Concept Summary: This ecological system occurs across the Chihuahuan Desert and extends into the southern Great Plains where soils have a high sand content. These dry grasslands or steppe are found on sandy plains and sandstone mesas. The graminoid layer is dominated or codominated by *Achnatherum hymenoides, Bouteloua eriopoda, Bouteloua hirsuta, Hesperostipa neomexicana, Pleuraphis jamesii, Sporobolus cryptandrus, Sporobolus airoides*, or *Sporobolus flexuosus*. Typically, there are found scattered desert shrubs and stem succulents such as *Ephedra torreyana, Ephedra trifurca, Fallugia paradoxa, Prosopis glandulosa, Yucca elata*, and *Yucca torreyi* that are characteristic of the Chihuahuan Desert.

DISTRIBUTION

Range: Chihuahuan Desert extending into the southern Great Plains where soils have a high sand content.
Divisions: 302:C
TNC Ecoregions: 22:C, 24:C, 28:C
Subnations: AZ, MXCH, NM, TX

CONCEPT

Associations:
- *Ephedra torreyana / Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001731, G2)
- *Ephedra trifurca / Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001732, G2)
- *Sporobolus flexuosus - Paspalum setaceum* Herbaceous Vegetation (CEGL001694, G1G2)
- *Sporobolus flexuosus - Sporobolus contractus* Herbaceous Vegetation (CEGL001696, GNRQ)
- *Yucca elata / Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001735, G2)

Alliances:
- *Bouteloua eriopoda* Xeromorphic Shrub Herbaceous Alliance (A.1553)
- *Sporobolus flexuosus* Herbaceous Alliance (A.1268)

SOURCES

References: Comer et al. 2003, Dick-Peddie 1993, Muldavin et al. 2000b, Muldavin et al. 2002
Version: 05 Oct 2004 **Stakeholders:** Latin America, Southeast, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

114 CES302.757—SONORA-MOJAVE SEMI-DESERT CHAPARRAL

Primary Division: North American Warm Desert (302)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Shrubland (Shrub-dominated); Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Intermediate Disturbance Interval; F-Patch/High Intensity; Evergreen Sclerophyllous Shrub
Concept Summary: This ecological system is composed of evergreen shrublands on sideslopes transitioning from low-elevation desert landscapes up into woodlands of the western Mojave and Sonoran deserts. It extends from northeast Kern County, California, into Baja Norte. Associated species include *Quercus john-tuckeri, Quercus cornelius-mulleri, Quercus berberidifolia, Arctostaphylos patula, Arctostaphylos pungens, Arctostaphylos glauca, Rhus ovata, Cercocarpus montanus var. glaber (= Cercocarpus betuloides), Ceanothus greggii, Garrya flavescens, Juniperus californica*, and *Nolina parryi*.

DISTRIBUTION

Range: Western Mojave and Sonoran deserts.
Divisions: 302:C
TNC Ecoregions: 17:C, 23:C
Subnations: AZ, CA, MXBC, MXSO, NV

CONCEPT

Associations:
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Alliances:

SOURCES

References: Barbour and Major 1988, Brown 1982, Comer et al. 2003, Holland and Keil 1995, MacMahon 1988, Thomas et al. 2004
Version: 11 Nov 2003 **Stakeholders:** Latin America, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

115 CES301.730—MADREAN JUNIPER SAVANNA

Primary Division: Madrean Semidesert (301)
Land Cover Class: Steppe/Savanna
Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Lower Montane]; Woody-Herbaceous; Tropical/Subtropical [Tropical Xeric]; Evergreen Sclerophyllous Tree; Succulent Shrub; Juniperus coahuilensis, J. deppeana, J. pinchotii
Concept Summary: This Madrean ecological system occurs in lower foothills and plains of southeastern Arizona, southern New Mexico extending into west Texas and Mexico. These savannas have widely spaced mature juniper trees and moderate to high cover of graminoids (>25% cover). The presence of Madrean *Juniperus* spp. such as *Juniperus coahuilensis*, *Juniperus pinchotii*, and/or *Juniperus deppeana* is diagnostic. *Juniperus monosperma* may be present in some stands; *Juniperus deppeana* has a broader range than this Madrean system and extends north into southern stands of Southern Rocky Mountain Juniper Woodland and Savanna (CES306.834). Stands of *Juniperus pinchotii* may be short and resemble a shrubland. Graminoid species are a mix of those found in Western Great Plains Shortgrass Prairie (CES303.672) and Apacherian-Chihuahuan Semi-Desert Grassland and Steppe (CES302.735), with *Bouteloua gracilis* and *Pleuraphis jamesii* being most common. In addition, these areas include succulents such as species of *Yucca*, *Opuntia*, and *Agave*. Juniper savanna expansion into grasslands has been documented in the last century.

DISTRIBUTION

Range: Southeastern Arizona, southern New Mexico extending into west Texas and Mexico.
Divisions: 301:C
TNC Ecoregions: 22:C, 24:C, 30:P
Subnations: AZ, NM, TX

CONCEPT

Associations:
- *Juniperus deppeana / Bouteloua gracilis* Woodland (CEGL000693, G5)
- *Juniperus deppeana / Bouteloua hirsuta* Woodland (CEGL000694, G3)
- *Juniperus deppeana / Muhlenbergia emersleyi* Woodland (CEGL000697, G4)
- *Juniperus deppeana / Panicum obtusum* Woodland (CEGL000698, GNR)
- *Juniperus deppeana / Schizachyrium cirratum* Woodland (CEGL000699, G4)
- *Juniperus monosperma / Bouteloua eriopoda* Woodland (CEGL000709, GNR)
- *Quercus mohriana - Juniperus pinchotii / Bouteloua curtipendula* Shrubland (CEGL002173, G4)

Alliances:
- *Juniperus deppeana* Woodland Alliance (A.534)
- *Juniperus monosperma* Woodland Alliance (A.504)
- *Quercus mohriana* Shrubland Alliance (A.782)

SOURCES

References: Barbour and Billings 2000, Brown et al. 1979, Brown et al. 1998, Comer et al. 2003, Dick-Peddie 1993
Version: 10 Nov 2003 **Stakeholders:** Latin America, Southeast, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

116 CES302.017—CHIHUAHUAN MIXED SALT DESERT SCRUB

Primary Division: North American Warm Desert (302)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Tropical/Subtropical [Tropical Xeric]; Temperate [Temperate Xeric]; Atriplex spp.
Concept Summary: This system includes extensive open-canopied shrublands of typically saline basins in the Chihuahuan Desert. Stands often occur on alluvial flats and around playas. Substrates are generally fine-textured, saline soils. Vegetation is typically composed of one or more *Atriplex* species such as *Atriplex canescens*, *Atriplex obovata*, or *Atriplex polycarpa* along with species of *Allenrolfea*, *Flourensia*, *Salicornia*, *Suaeda*, or other halophytic plants. Graminoid species may include *Sporobolus airoides*, *Pleuraphis mutica*, or *Distichlis spicata* at varying densities.

DISTRIBUTION

Range: Saline basins in the Chihuahuan Desert.
Divisions: 302:C
TNC Ecoregions: 22:C, 24:C, 28:C, 29:P, 30:P
Subnations: AZ, MXCH, MXCO, MXDU, MXNU, MXSO, NM, TX

CONCEPT

Associations:
- *Atriplex canescens / Parthenium confertum* Shrubland (CEGL001290, GNRQ)
- *Atriplex canescens / Sporobolus airoides* Shrubland (CEGL001291, G5?)
- *Atriplex canescens / Sporobolus wrightii* Shrubland (CEGL001292, GNRQ)

- *Atriplex obovata / Tidestromia carnosa* Dwarf-shrubland (CEGL004575, G2?)
- *Atriplex polycarpa / Pleuraphis mutica* Shrubland (CEGL001319, GU)
- *Distichlis spicata* Herbaceous Vegetation (CEGL001770, G5)
- *Flourensia cernua / Achnatherum eminens* Shrubland (CEGL001338, GNRQ)
- *Flourensia cernua / Bouteloua curtipendula* Shrubland (CEGL001336, GNRQ)
- *Flourensia cernua / Pleuraphis mutica* Shrubland (CEGL001541, G4)
- *Flourensia cernua / Sporobolus airoides* Shrubland (CEGL001337, GNRQ)

Alliances:

- *Atriplex canescens* Shrubland Alliance (A.869)
- *Atriplex obovata* Dwarf-shrubland Alliance (A.1108)
- *Atriplex polycarpa* Shrubland Alliance (A.873)
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Flourensia cernua* Shrubland Alliance (A.861)

SOURCES

References: Brown 1982, Comer et al. 2003, Dick-Peddie 1993, Muldavin et al. 2000b, Muldavin et al. 2002, Shreve and Wiggins 1964
Version: 24 Mar 2003 **Stakeholders:** Latin America, Southeast, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

117 CES302.031—COAHUILAN CHAPARRAL

Primary Division: North American Warm Desert (302)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Lower Montane]; Shrubland (Shrub-dominated); Shallow Soil; Xeric; F-Patch/High Intensity
Concept Summary: This ecological system occurs in mountains across southeastern New Mexico (Guadalupe Mountains) and Trans-Pecos Texas (Chisos Mountains). It often dominants along the mid-elevation transition from the Chihuahuan Desert into mountains (1700-2500 m). It occurs on foothills, mountain slopes and canyons in drier habitats below the encinal and pine woodlands and is often associated with more xeric and coarse-textured substrates such as limestone, basalt or alluvium, especially in transition areas with more mesic woodlands. The moderate to dense shrub canopy includes many shrub oak species such as *Quercus intricata, Quercus pringlei, Quercus invaginata, Quercus laceyi, Quercus grisea, Quercus emoryi, Quercus toumeyi*, several widespread chaparral species such as *Arctostaphylos pungens, Ceanothus greggii, Fallugia paradoxa*, and *Garrya wrightii*, and species characteristic of this system such as *Arbutus arizonica, Arbutus xalapensis (= Arbutus texana), Fraxinus greggii, Fendlera rigida (= Fendlera linearis), Garrya ovata, Purshia mexicana (= ssp. mexicana), Rhus virens var. choriophylla (= Rhus choriophylla)*, and endemics *Salvia lycioides (= Salvia ramosissima), Salvia roemeriana*, and *Salvia regla*. Most chaparral species are fire-adapted, resprouting vigorously after burning or producing fire-resistant seeds. Stands occurring within montane woodlands are seral and a result of recent fires.

DISTRIBUTION

Range: Mountains across southeastern New Mexico and Trans-Pecos Texas. It often dominants along the mid-elevation transition from the Chihuahuan Desert into mountains (1700-2500 m).
Divisions: 301:P, 302:C, 305:P, 306:C
TNC Ecoregions: 21:P, 22:P, 24:P
Subnations: MXCH, MXCO, NM, TX?

CONCEPT

Associations:

- *Rhus virens* var. *choriophylla / Cercocarpus montanus* var. *paucidentatus* Shrubland (CEGL001123, G3)

Alliances:

- *Rhus virens* var. *choriophylla* Shrubland Alliance (A.922)

SOURCES

References: Brown 1982, Comer et al. 2003, Dick-Peddie 1993, Muldavin et al. 1994a, Muldavin et al. 2000c
Version: 11 Nov 2003 **Stakeholders:** Latin America, Southeast, West
Concept Author: K. Schulz and P. Comer **LeadResp:** West

120 CES303.678—WESTERN GREAT PLAINS FLOODPLAIN

Primary Division: Western Great Plains (303)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Linear
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)

Concept Summary: This system is found in the floodplains of medium and large rivers of the Western Great Plains. Alluvial soils and periodic, intermediate flooding (every 5-25 years) typify this system. Dominant communities within this system range from floodplain forests to wet meadows to gravel/sand flats; however, they are linked by underlying soils and the flooding regime. Dominant species include *Populus deltoides* and *Salix* spp. Grass cover underneath the trees is an important part of this system and is a mix of tallgrass species, including *Panicum virgatum* and *Andropogon gerardii*. *Tamarix* spp. and less desirable grasses and forbs can invade degraded areas within the floodplains, especially in the western portion of the province. These areas are often subjected to heavy grazing and/or agriculture and can be heavily degraded. Another factor is that groundwater depletion and lack of fire have created additional species changes. In most cases, the majority of the wet meadow and prairie communities may be extremely degraded or extirpated from the system.
Comments: Need to review if there needs to be another split of this system into a Central Great Plains Floodplain system and a Southern Great Plains floodplain system. Will need to review in conjunction with Northwestern Great Plains Floodplain (CES303.676).

DISTRIBUTION

Range: This system is found along major river floodplains in the southern and central portions of the Western Great Plains division.
Divisions: 205:C, 303:C
TNC Ecoregions: 27:C, 28:C, 29:P, 32:C, 33:C, 37:C
Subnations: CO, KS, NE, OK, SD, TX

CONCEPT

Associations:
- *Carex nebrascensis* Herbaceous Vegetation (CEGL001813, G4)
- *Ericameria nauseosa / Pseudoroegneria spicata* Shrubland (CEGL001330, G3Q)
- *Juglans microcarpa - Brickellia laciniata / Indigofera lindheimeriana* Edwards Plateau Shrubland (CEGL004932, G2?)
- *Justicia americana - Bacopa monnieri* Edwards Plateau Herbaceous Vegetation (CEGL004926, G3)
- *Panicum virgatum - Andropogon glomeratus - Cladium mariscus* ssp. *jamaicense* Herbaceous Vegetation (CEGL004928, G2G3)
- *Platanus occidentalis - (Salix nigra) / Juglans microcarpa - Baccharis salicifolia* Woodland (CEGL004930, G2G3)
- *Platanus occidentalis - Juglans major* Woodland (CEGL004929, G2?)
- *Platanus occidentalis - Salix nigra* Forest (CEGL002093, G5?)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Distichlis spicata* Woodland (CEGL000939, G2)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Salix exigua* Woodland (CEGL002685, G3)
- *Populus deltoides - (Salix amygdaloides) / Salix (exigua, interior)* Woodland (CEGL000659, G3G4)
- *Populus deltoides - Salix nigra* Woodland (CEGL004919, G3G4Q)
- *Populus deltoides - Ulmus americana - Celtis laevigata* Forest (CEGL002096, G3)
- *Populus deltoides / Carex pellita* Woodland (CEGL002649, G2)
- *Populus deltoides / Muhlenbergia asperifolia* Forest (CEGL000678, G3)
- *Populus deltoides / Panicum virgatum - Schizachyrium scoparium* Woodland (CEGL001454, G2)
- Riverine Gravel Flats Great Plains Sparse Vegetation (CEGL005223, GNR)
- Riverine Sand Flats - Bars Sparse Vegetation (CEGL002049, G4G5)
- *Salix exigua* / Mesic Graminoids Shrubland (CEGL001203, G5)
- *Salix nigra* Forest (CEGL002103, G4)
- *Schoenoplectus acutus - Typha latifolia - (Schoenoplectus tabernaemontani)* Sandhills Herbaceous Vegetation (CEGL002030, G4)
- *Schoenoplectus pungens - Suaeda calceoliformis* Alkaline Herbaceous Vegetation (CEGL002040, G3G4)
- *Schoenoplectus tabernaemontani - Typha* spp. - (*Sparganium* spp., *Juncus* spp.) Herbaceous Vegetation (CEGL002026, G4G5)
- *Spartina pectinata - Eleocharis* spp. - *Carex* spp. Herbaceous Vegetation (CEGL002223, G2G4)
- *Sporobolus airoides* Southern Plains Herbaceous Vegetation (CEGL001685, G3Q)
- *Symphoricarpos occidentalis* Shrubland (CEGL001131, G4G5)
- *Taxodium distichum - Platanus occidentalis* Edwards Plateau Forest (CEGL002104, G2)
- *Typha (angustifolia, domingensis, latifolia) - Schoenoplectus americanus* Herbaceous Vegetation (CEGL002032, G3G4)
- *Typha (latifolia, angustifolia)* Western Herbaceous Vegetation (CEGL002010, G5)
- *Ulmus (americana, rubra) - Quercus muehlenbergii* Forest (CEGL002091, GNR)
- *Ulmus americana - Celtis (laevigata, occidentalis) - Fraxinus pennsylvanica* Forest (CEGL002090, G3?)
- *Ulmus crassifolia - Celtis laevigata / Ilex decidua / Elymus virginicus* Forest (CEGL008468, G3?)

Alliances:
- *Carex nebrascensis* Seasonally Flooded Herbaceous Alliance (A.1417)
- *Celtis laevigata - Ulmus crassifolia* Temporarily Flooded Forest Alliance (A.283)
- *Ericameria nauseosa* Shrubland Alliance (A.835)
- *Fraxinus pennsylvanica - Ulmus americana - Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Juglans microcarpa* Temporarily Flooded Shrubland Alliance (A.945)
- *Justicia americana* Temporarily Flooded Herbaceous Alliance (A.1657)
- *Panicum virgatum* Temporarily Flooded Herbaceous Alliance (A.1343)
- *Platanus occidentalis - (Fraxinus pennsylvanica, Celtis laevigata, Acer saccharinum)* Temporarily Flooded Forest Alliance (A.288)
- *Platanus occidentalis - Juglans (major, microcarpa)* Temporarily Flooded Woodland Alliance (A.2018)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)

- *Populus deltoides* Temporarily Flooded Woodland Alliance (A.636)
- *Populus deltoides* ssp. *wislizeni* Temporarily Flooded Forest Alliance (A.312)
- *Salix (exigua, interior)* Temporarily Flooded Shrubland Alliance (A.947)
- *Salix nigra* Temporarily Flooded Forest Alliance (A.297)
- *Schoenoplectus pungens* Semipermanently Flooded Herbaceous Alliance (A.1433)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)
- *Sporobolus airoides* Herbaceous Alliance (A.1267)
- *Symphoricarpos occidentalis* Temporarily Flooded Shrubland Alliance (A.961)
- *Taxodium distichum - (Platanus occidentalis)* Temporarily Flooded Forest Alliance (A.298)
- *Typha (angustifolia, latifolia) - (Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Typha* spp. - (*Schoenoplectus* spp., *Juncus* spp.) Seasonally Flooded Herbaceous Alliance (A.1394)
- Cobble/Gravel Shore Sparsely Vegetated Alliance (A.1850)
- Sand Flats Temporarily Flooded Sparsely Vegetated Alliance (A.1864)

Environment: This system is found primarily along floodplains of medium and large rivers. Soils are primarily alluvial and range from sandy to dense clays.

Vegetation: Dominant woody species occurring within this system include *Populus deltoides* and *Salix* spp. Understory species constitute an important component of this system and include a mixture of tallgrass prairie species such as including *Panicum virgatum* and *Andropogon gerardii*. Sparsely vegetated areas such as gravel and sand flats are also included within this system.

Dynamics: Periodic and intermediate flooding (i.e., every 5-25 years) constitutes the major process influencing this system. Grazing and conversion to agriculture can significantly impact this system and can lead to the degradation or extirpation of the majority of prairie and wet meadow communities from this system.

SOURCES

References: Comer et al. 2003, Lauver et al. 1999, Steinauer and Rolfsmeier 2000

Version: 05 Mar 2003 **Stakeholders:** Midwest, Southeast, West

Concept Author: S. Menard and K. Kindscher **LeadResp:** Midwest

128 CES304.794—WYOMING BASINS LOW SAGEBRUSH SHRUBLAND

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill, Lowland]; Shrubland (Shrub-dominated); Hill(s); Ridge/Summit/Upper Slope; Sideslope; Shallow Soil; Silt Soil Texture; Clay Soil Texture; Aridic; W-Landscape/High Intensity; Low Artemisia spp.

Concept Summary: This ecological system is composed of sagebrush dwarf-shrublands that occur in a variety of dry habitats throughout the basins of central and southern Wyoming. *Artemisia tripartita ssp. rupicola*-dominated dwarf-shrublands typically occur on wind-swept ridges and south and west aspect slopes above 2135 m in central and southeastern Wyoming. Substrates are shallow, fine-textured soils. *Artemisia nova*-dominated dwarf-shrublands occur on shallow, coarse-textured, calcareous substrates at lower elevations. Other shrubs and dwarf-shrubs present may include *Purshia tridentata* and other species of *Artemisia*. Common graminoids include *Festuca idahoensis, Koeleria macrantha, Pseudoroegneria spicata*, and *Poa secunda*. Many forbs also occur and may dominate the herbaceous vegetation.

DISTRIBUTION

Range: Throughout the basins of central and southern Wyoming.

Divisions: 304:C

TNC Ecoregions: 10:C

Subnations: CO, MT, WY

CONCEPT

Associations:

- *Artemisia nova / Pseudoroegneria spicata* Shrubland (CEGL001424, G4G5)
- *Artemisia tripartita* ssp. *rupicola / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001540, G3)

Alliances:

- *Artemisia nova* Shrubland Alliance (A.1105)
- *Artemisia tripartita* ssp. *rupicola* Shrub Herbaceous Alliance (A.2556)

SOURCES

References: Comer et al. 2003, Jones 1992b, Knight 1994, Knight et al. 1987

Version: 20 Feb 2003 **Stakeholders:** West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

129 CES302.035—SONORAN MID-ELEVATION DESERT SCRUB

Primary Division: North American Warm Desert (302)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Lower Montane]; Shrubland (Shrub-dominated); Alkaline Soil
Concept Summary: This transitional desert scrub system occurs along the northern edge of the Sonoran Desert in an elevational band along the lower slopes of the Mogollon Rim/Central Highlands region between 750 and 1300 m. Stands occur in the Bradshaw, Hualapai, and Superstition mountains, among other desert ranges, and are found above Sonoran Paloverde-Mixed Cacti Desert Scrub (CES302.761) and below Mogollon Chaparral (CES302.741). Sites range from a narrow strip on steep slopes to very broad areas such as the Verde Valley. Climate is too dry for chaparral species to be abundant, and freezing temperatures during winter are too frequent and prolonged for many of the frost-sensitive species that are characteristic of Sonoran Paloverde-Mixed Cacti Desert Scrub (CES302.761), such as *Carnegia gigantea, Parkinsonia microphylla, Prosopis* spp., *Olneya tesota, Ferocactus* sp., and *Opuntia bigelovii*. Substrates are generally rocky soils derived from parent materials such as limestone, granitic rocks or rhyolite. The vegetation is typically composed of an open shrub layer of *Larrea tridentata, Ericameria linearifolia,* or *Eriogonum fasciculatum* with taller shrub such as *Canotia holacantha* (limestone or granite) or *Simmondsia chinensis* (rhyolite). The herbaceous layer is generally sparse.
Comments: Includes Brown's (1982) Jojoba-Mixed Scrub and Creosotebush-Crucifixion-thorn Series.

DISTRIBUTION

Range: Occurs along the northern edge of the Sonoran Desert in an elevational band along the lower slopes of the Mogollon Rim/Central Highlands region between 750-1300 m.
Divisions: 302:C, 306:P
TNC Ecoregions: 22:P, 23:C
Subnations: AZ, MXSO

CONCEPT

Associations:
- *Ambrosia deltoidea / Simmondsia chinensis* Shrubland (CEGL000953, G4)

Alliances:
- *Ambrosia deltoidea* Shrubland Alliance (A.852)

SPATIAL CHARACTERISTICS

Adjacent Ecological System Comments: It is found above Sonoran Paloverde-Mixed Cacti Desert Scrub (CES302.761) and below Mogollon Chaparral (CES302.741).

SOURCES

References: Brown 1982, Comer et al. 2003
Version: 05 Oct 2004 **Stakeholders:** Latin America, West
Concept Author: K. Pohs, K. Schulz, P. Comer **LeadResp:** West

132 CES303.673—WESTERN GREAT PLAINS TALLGRASS PRAIRIE

Primary Division: Western Great Plains (303)
Land Cover Class: Herbaceous
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Concept Summary: This system can be found throughout the Western Great Plains Division. It is found primarily in areas where soil characteristics allow for mesic conditions more typical of the Eastern Great Plains Division and thus are able to sustain tallgrass species. This system may be small patches interspersed within Northwestern Great Plains Mixedgrass Prairie (CES303.674) or Western Great Plains Shortgrass Prairie (CES303.672) and may also be associated with upland terraces above a floodplain system where these more mesic conditions persist. Soils are primarily loamy Mollisols that are moderately deep and rich. Those areas that contain more sandy soils should be considered part of Western Great Plains Sand Prairie (CES303.670). This system is dominated primarily by *Andropogon gerardii* and may also include *Sorghastrum nutans, Schizachyrium scoparium, Pascopyrum smithii, Hesperostipa spartea,* and *Sporobolus heterolepis*. *Andropogon gerardii* often dominates the lowland regions, although *Pascopyrum smithii* can be prolific if conditions are favorable. Forbs in varying density may also be present. The primary dynamics for this system include fire, climate and grazing. Fire suppression in these areas has allowed for the invasion of woody species such as *Juniperus virginiana* and *Prunus* spp. Grazing also has contributed to these changes and likewise led to a decrease of this system as overgrazing favors shortgrass and mixedgrass systems. Conversion to agriculture likewise has probably decreased the range of this system. Thus, this system likely only occurs in small patches and in scattered locations throughout the division. Large-patch occurrences are mostly isolated to slopes and swales of rolling uplands where either grazing or cultivation are more problematic.

DISTRIBUTION

Range: This system occurs throughout the Western Great Plains Division, however, grazing and conversion to agriculture have likely decreased its natural range.
Divisions: 303:C
TNC Ecoregions: 26:C, 27:C, 28:?, 33:C, 34:C
Subnations: CO, KS, MT, ND, NE, OK, TX?

CONCEPT

Associations:
- *Andropogon gerardii - Panicum virgatum - Schizachyrium scoparium - (Tradescantia tharpii)* Herbaceous Vegetation (CEGL005231, G3?)
- *Andropogon gerardii - Schizachyrium scoparium* Northern Plains Herbaceous Vegetation (CEGL002205, G3G5)
- *Andropogon gerardii - Schizachyrium scoparium* Western Great Plains Herbaceous Vegetation (CEGL001463, G2?)
- *Andropogon gerardii - Sorghastrum nutans* Western Great Plains Herbaceous Vegetation (CEGL001464, G2)
- *Andropogon gerardii - Sporobolus heterolepis - Schizachyrium scoparium - Pascopyrum smithii* Herbaceous Vegetation (CEGL002376, G2)
- *Andropogon gerardii - Sporobolus heterolepis* Western Foothills Herbaceous Vegetation (CEGL001465, G2)
- *Cornus drummondii - (Rhus glabra, Prunus* spp.) Shrubland (CEGL005219, GNA)
- *Quercus fusiformis - (Quercus stellata) / Schizachyrium scoparium* Granite Woodland (CEGL004937, G2?)
- *Spartina pectinata* Western Herbaceous Vegetation (CEGL001476, G3?)

Alliances:
- *Andropogon gerardii - (Sorghastrum nutans)* Herbaceous Alliance (A.1192)
- *Cornus drummondii* Shrubland Alliance (A.3558)
- *Quercus fusiformis* Woodland Alliance (A.477)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)

Environment: This system is found primarily on loam, moderately deep, and rich Mollisols throughout the Western Great Plains Division. These soils tend to be more mesic and deep than the majority of soils within the Western Great Plains and are more typical of the Eastern Great Plains Division.
Vegetation: The mesic, deep soils allow for dominance by *Andropogon gerardii*. Other species such as *Sorghastrum nutans, Schizachyrium scoparium, Pascopyrum smithii, Hesperostipa spartea,* and *Sporobolus heterolepis* can also be present. In more lowland areas, *Pascopyrum smithii* can become more prevalent. Fire suppression can lead to the invasion of these areas by woody species such as *Juniperus virginiana* and *Prunus* spp.
Dynamics: Fire, climate and grazing constitute the primary dynamic processes impacting this system. Fire suppression can allow for the invasion of woody species such as *Juniperus virginiana* and *Prunus* spp. into the prairie matrix. Overgrazing tends to favor shortgrass and mixedgrass species and can cause the conversion of this system to the Western Great Plains shortgrass or mixedgrass systems. Also, invasion by introduced species such as *Bromus inermis* can become more severe as grazing pressure increases. Likewise, conversion to agriculture has degraded or extirpated many examples of this system.

SPATIAL CHARACTERISTICS

Adjacent Ecological System Comments: This system may be small patches interspersed within Northwestern Great Plains Mixedgrass Prairie (CES303.674) or Western Great Plains Shortgrass Prairie (CES303.672) and may also be associated with upland terraces above a floodplain system where these more mesic conditions persist.

SOURCES

References: Barbour and Billings 1988, Comer et al. 2003, Weaver 1954
Version: 05 Mar 2003 **Stakeholders:** Midwest, Southeast, West
Concept Author: S. Menard and K. Kindscher **LeadResp:** Midwest

133 CES306.836—NORTHERN ROCKY MOUNTAIN MONTANE GRASSLAND

Primary Division: Rocky Mountain (306)
Land Cover Class: Herbaceous
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Herbaceous; Loam Soil Texture; Silt Soil Texture; Ustic; Graminoid; Cool-season bunch grasses
Concept Summary: This ecological system of the northern Rocky Mountains is found at mid- to low-montane elevations in the mountains of northeastern Wyoming and Montana, west through Idaho into the Blue Mountains of Oregon, and north into the Okanagan and the Canadian Rockies. These dry grasslands are small meadows to large open parks surrounded by conifer trees but lack tree cover within them. Generally, the soil textures are much finer, and soils are often deeper under grasslands than in the neighboring forests. These northern montane grasslands represent a shift in the precipitation regime from summer monsoons and cold snowy winters found in the southern Rockies to predominantly dry summers and winter rains. Montane grasslands are very similar and intergrade with their subalpine counterparts but are separated here to represent those species that do not occur at higher altitudes. The implied fire regime in montane grasslands is more frequent than the subalpine grassland system particularly in parkland and valleys near ponderosa pine systems.

Occurrences have a moderately dense graminoid layer of cool-season, medium-tall bunch grasses dominated by *Festuca campestris, Pseudoroegneria spicata, Festuca idahoensis, Leymus cinereus, Elymus trachycaulus, Bromus inermis ssp. pumpellianus (= Bromus pumpellianus), Achnatherum richardsonii(= Stipa richardsonii), Achnatherum occidentale (= Stipa occidentalis), Koeleria macrantha*, and other graminoids such as *Carex filifolia* and *Danthonia intermedia*. Common associated forbs include *Geum triflorum, Galium boreale, Campanula rotundifolia, Antennaria microphylla*, *Geranium viscosissimum*, and *Potentilla gracilis*. Shrub cover is generally nonexistent in southern examples but can be adjacent in neighboring wetlands or riparian areas. In British Columbia, individual, stunted *Pinus contorta* and *Populus tremuloides* trees and *Amelanchier alnifolia, Symphoricarpos albus, Rosa acicularis*, or *Juniperus communis* shrubs may appear in these grasslands. These are sites where one might expect to see either *Artemisia tripartita* or *Artemisia tridentata ssp. vaseyana* within the forest zones.

DISTRIBUTION

Range: This system is found at montane elevation in the mountains of northeastern Wyoming and Montana west through Idaho into the Blue Mountains of Oregon and north into the Okanagan and the Canadian Rockies.
Divisions: 204:P, 306:C
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 68:C
Subnations: AB, BC, ID, MT, OR, UT, WA, WY

CONCEPT

Associations:
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Alliances:
Dynamics: *Festuca campestris* is highly palatable throughout the grazing season. Summer overgrazing for 2 to 3 years can result in the loss of *Festuca campestris* in the stand. Although a light stocking rate for 32 years did not affect range condition, a modest increase in stocking rate led to a marked decline in range condition. The major change was a measurable reduction in basal area of *Festuca campestris*. Long-term heavy grazing on moister sites can result in a shift to a Kentucky bluegrass - timothy type. *Pseudoroegneria spicata* shows an inconsistent reaction to grazing, increasing on some grazed sites while decreasing on others. It seems to recover more quickly from overgrazing than *Festuca campestris*. It tolerates dormant-period grazing well but is sensitive to defoliation during the growing season. Light spring use or fall grazing can help retain plant vigor. It is particularly sensitive to defoliation in late spring. Exotic species threatening this ecological system through invasion and potential complete replacement of native species include *Bromus japonicus, Potentilla recta, Euphorbia esula*, and all manner of knapweed, especially *Centaurea biebersteinii (= Centaurea maculosa)*.

SOURCES

References: Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Ecosystems Working Group 1998, Marriott 2000, McLean 1970, Meidinger and Pojar 1991, Mueggler and Harris 1969, Mueggler and Stewart 1980, Tisdale 1947, Tisdale 1982
Version: 09 Feb 2005 **Stakeholders:** Canada, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

134 CES204.100—NORTH PACIFIC MONTANE GRASSLAND

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Herbaceous
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Herbaceous; Temperate [Temperate Oceanic]; Mesotrophic Soil; Shallow Soil; Intermediate Disturbance Interval; F-Patch/Low Intensity
Concept Summary: This system includes open dry meadows and grasslands on the west side of the Cascades Mountains and northern Sierra Nevada. They occur in montane elevations up to 3500 m (10,600 feet). Soils tend to be deeper and more well-drained than the surrounding forest soils. Soils can resemble prairie soils in that the A-horizon is dark brown, relatively high in organic matter, slightly acid, and usually well-drained. Dominant species include *Elymus* spp., *Festuca idahoensis*, and *Nassella cernua*. These large-patch grasslands are intermixed with matrix stands of red fir, lodgepole pine, and dry-mesic mixed conifer forests and woodlands.
Comments: Upon review, Washington Heritage ecologists determined this system does not occur in Washington.

DISTRIBUTION

Range: West side of the Cascades Mountains and northern Sierra Nevada, in montane elevations up to 3500 m (10,600 feet).
Divisions: 204:C, 206:C
TNC Ecoregions: 5:P, 12:C, 81:C
Subnations: CA, NV, OR

CONCEPT

Associations:
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Alliances:

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995
Version: 24 Mar 2003 **Stakeholders:** West
Concept Author: P. Comer, G. Kittel **LeadResp:** West

135 CES304.083—COLUMBIA PLATEAU STEPPE AND GRASSLAND

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Steppe/Savanna
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Foothill, Lowland]; Sideslope; Very Shallow Soil; Landslide; Xeromorphic Shrub; Graminoid
Concept Summary: These grasslands are similar floristically to Inter-Mountain Basins Big Sagebrush Steppe (CES304.778) but are defined by a more frequent fire regime and the absence or low cover of shrubs over large areas, occasionally entire landforms. These are extensive grasslands, not grass-dominated patches within the sagebrush shrub-steppe ecological system. This system occurs throughout much of the Columbia Plateau and is found at slightly higher elevations farther south. Soils are variable, ranging from relatively deep, fine-textured often with coarse fragments, and non-saline often with a microphytic crust, to stony volcanic-derived clays to alluvial sands. This grassland is dominated by perennial bunch grasses and forbs (>25% cover) sometimes with a sparse (<10% cover) shrub layer; *Chrysothamnus viscidiflorus, Ericameria nauseosa, Tetradymia* spp., or *Artemisia* spp. may be present in disturbed stands. Associated graminoids include *Achnatherum hymenoides, Elymus elymoides, Elymus lanceolatus ssp. lanceolatus, Hesperostipa comata, Festuca idahoensis, Koeleria macrantha, Poa secunda*, and *Pseudoroegneria spicata*. Common forbs are *Phlox hoodii, Arenaria* spp., and *Astragalus* spp. Areas with deeper soils are rare because of conversion to other land uses. The rapid fire-return regime of this ecological system maintains a grassland by retarding shrub invasion, and landscape isolation and fragmentation limit seed dispersal of native shrub species. Fire frequency is presumed to be less than 20 years. Through isolation from a seed source, combined with repeated burning, these are "permanently" converted to grassland.
Comments: How this differs from Palouse Prairie Grassland (CES304.792) is unclear.

DISTRIBUTION

Range: This system occurs throughout the Columbia Plateau region, from north-central Idaho, south and west into Washington, Oregon, southern Idaho, and northern Nevada. Whether it also occurs in northeastern California, in the western ranges of Wyoming, or the central Wyoming Basins is unclear.
Divisions: 304:C, 306:C
TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:P, 11:C
Subnations: CA?, ID, MT?, NV, OR, UT?, WA, WY?

CONCEPT

Associations:
•
Alliances:
Dynamics: The natural fire regime of this ecological system likely maintains a patchy distribution of shrubs so the general aspect of the vegetation is a grassland. Shrubs may increase following heavy grazing and/or with fire suppression, particularly in moist portions in the northern Columbia Plateau where it forms a landscape mosaic pattern with shallow-soil scabland shrublands. Microphytic crust is very important in this ecological system.

SOURCES

References: Daubenmire 1970, Western Ecology Working Group n.d.
Version: 01 Sep 2005 **Stakeholders:** West
Concept Author: R. Crawford **LeadResp:** West

136 CES304.793—SOUTHERN COLORADO PLATEAU SAND SHRUBLAND

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Foothill, Lowland]; Woody-Herbaceous; Temperate [Temperate Xeric]; Alkaline Soil; Aridic; Very Short Disturbance Interval; G-Landscape/High Intensity
Concept Summary: This large-patch ecological system is found on the south-central Colorado Plateau in northeastern Arizona extending into southern and central Utah. It occurs on windswept mesas, broad basins and plains at low to moderate elevations (1300-1800 m). Substrates are stabilized sandsheets or shallow to moderately deep sandy soils that may form small hummocks or small coppice dunes. This semi-arid, open shrubland is typically dominated by short shrubs (10-30 % cover) with a sparse graminoid layer. The woody layer is often a mixture of shrubs and dwarf-shrubs. Characteristic species include *Ephedra cutleri, Ephedra torreyana, Ephedra viridis*, and *Artemisia filifolia*. *Coleogyne ramosissima* is typically not present. *Poliomintha incana, Parryella filifolia, Quercus havardii var. tuckeri*, or

Ericameria nauseosa may be present to dominant locally. *Ephedra cutleri* and *Ephedra viridis* often assume a distinctive matty growth form. Characteristic grasses include *Achnatherum hymenoides, Bouteloua gracilis, Hesperostipa comata*, and *Pleuraphis jamesii*. The general aspect of occurrences is an open low shrubland but may include small blowouts and dunes. Occasionally grasses may be moderately abundant locally and form a distinct layer. Disturbance may be important in maintaining the woody component. Eolian processes are evident, such as pediceled plants, occasional blowouts or small dunes, but the generally higher vegetative cover and less prominent geomorphic features distinguish this system from Inter-Mountain Basins Active and Stabilized Dune (CES304.775).

DISTRIBUTION

Range: This system occurs in sandy plains and mesas on the south-central Colorado Plateau in northeastern Arizona extending into southern and central Utah.
Divisions: 304:C
TNC Ecoregions: 19:C
Subnations: AZ, CO?, NM?, UT

CONCEPT

Associations:
- *Artemisia filifolia - Ephedra (torreyana, viridis)* Shrubland (CEGL002786, GNR)
- *Ephedra cutleri* Shrubland [Provisional] (CEGL005804, GNR)
- *Ephedra torreyana - Achnatherum hymenoides* Hummock Shrubland (CEGL005802, GNR)
- *Ephedra torreyana / Bouteloua eriopoda* Shrub Herbaceous Vegetation (CEGL001731, G2)
- *Ephedra viridis / Achnatherum hymenoides - Bouteloua gracilis* Shrub Herbaceous Vegetation (CEGL001648, G2G4)
- *Ephedra viridis / Achnatherum hymenoides - Sporobolus cryptandrus* Shrub Herbaceous Vegetation (CEGL001649, G2G4)
- *Ephedra viridis / Bromus tectorum* Semi-natural Shrubland (CEGL002355, GNR)
- *Ephedra viridis / Pleuraphis rigida* Shrubland (CEGL001257, G3)
- *Ericameria nauseosa* Sand Deposit Sparse Shrubland (CEGL002980, GNR)
- *Poliomintha incana / (Pleuraphis jamesii)* Shrubland (CEGL002930, GNR)

Alliances:
- *Achnatherum hymenoides* Shrub Herbaceous Alliance (A.1543)
- *Artemisia filifolia* Shrubland Alliance (A.816)
- *Bouteloua eriopoda* Xeromorphic Shrub Herbaceous Alliance (A.1553)
- *Ephedra cutleri* Shrubland Alliance [Provisional] (A.2644)
- *Ephedra torreyana* Shrubland Alliance (A.2572)
- *Ephedra viridis* Shrubland Alliance (A.858)
- *Ericameria nauseosa* Shrubland Alliance (A.835)
- *Poliomintha incana* Shrubland Alliance (A.862)

SOURCES

References: AZGAP unpubl. data 2004, UTGAP unpubl. data 2004, Western Ecology Working Group n.d.
Version: 08 Sep 2004 **Stakeholders:** West
Concept Author: K. Pohs, K. Schulz, J. Kirby **LeadResp:** West

137 CES304.993—COLUMBIA BASIN FOOTHILL AND CANYON DRY GRASSLAND

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Herbaceous
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Foothill, Lowland]; Sideslope; Very Shallow Soil; Landslide; Graminoid
Concept Summary: These grasslands are similar floristically to Columbia Basin Palouse Prairie (CES304.792) but are distinguished by landform, soil, and process characteristics. They occur in the canyons and valleys of the Columbia Basin, particularly along the Snake River canyon, the lower foothill slopes of the Blue Mountains, and along the main stem of the Columbia River in eastern Washington. Occurrences are found on steep open slopes, from 90 to 1525 m (300-5000 feet) elevation. Annual precipitation is low, ranging from 4 to 10 cm. Settings are primarily long, steep slopes of 100 m to well over 400 m, with soils derived from residuum and having patchy, thin, wind-blown surface deposits. Slope failures are a common process. Fire frequency is presumed to be less than 20 years. The vegetation is dominated by patchy graminoid cover, cacti, and some forbs. *Pseudoroegneria spicata*, *Festuca idahoensis*, and *Opuntia polyacantha* are common species. Deciduous shrubs *Symphoricarpos* spp., *Physocarpus malvaceus*, *Holodiscus discolor*, and *Ribes* spp. are infrequent native species that may increase with fire exclusion.

DISTRIBUTION

Range: Occurs in the canyons and valleys of the Columbia Basin, particularly along the Snake River canyon, the lower foothill slopes of the Blue Mountains, and along the main stem of the Columbia River in eastern Washington, on steep open slopes, from 90 to 1525 m (300-5000 feet) elevation.
Divisions: 304:C, 306:C

TNC Ecoregions: 6:C, 8:C, 68:P
Subnations: ID, OR, WA

CONCEPT

Associations:
- *Aristida purpurea* var. *longiseta - Poa secunda* Herbaceous Vegetation (CEGL001781, G3)
- *Aristida purpurea* var. *longiseta - Pseudoroegneria spicata - Sporobolus cryptandrus* Herbaceous Vegetation (CEGL001589, G2)
- *Aristida purpurea* var. *longiseta - Sporobolus cryptandrus* Herbaceous Vegetation (CEGL001515, G1)
- *Pseudoroegneria spicata - Festuca idahoensis* Canyon Herbaceous Vegetation (CEGL001669, G3)
- *Pseudoroegneria spicata - Opuntia polyacantha - (Poa secunda)* Herbaceous Vegetation (CEGL001673, G3)
- *Sporobolus cryptandrus - Poa secunda* Herbaceous Vegetation (CEGL001516, G2)

Alliances:
- *Poa secunda* Herbaceous Alliance (A.1291)
- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)
- *Sporobolus cryptandrus* Herbaceous Alliance (A.1252)

SOURCES

References: Comer et al. 2003, Hall 1973, Johnson and Clausnitzer 1992, Johnson and Simon 1985, Tisdale 1986, Tisdale and Bramble-Brodahl 1983
Version: 08 Sep 2004 **Stakeholders:** West
Concept Author: R. Crawford, J. Kagan, M. Reid **LeadResp:** West

141 CES304.792—COLUMBIA BASIN PALOUSE PRAIRIE

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Herbaceous
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Herbaceous; Loess deposit (undifferentiated); Deep Soil; Mineral: W/ A-Horizon >10 cm; Graminoid; Cool-season bunch grasses; Long (>500 yrs) Persistence
Concept Summary: This once-extensive grassland system occurs in southern British Columbia, eastern Washington and Oregon. In much of its range it is characterized by rolling topography composed of loess hills and plains over basalt plains. The climate of this region has warm-hot, dry summers and cool, wet winters. Annual precipitation is high, 15-30 inches. The soils are typically deep, well-developed, and old. The cool-season bunch grasses that dominate the vegetation are adapted to this winter precipitation. Characteristic species are *Pseudoroegneria spicata* and *Festuca idahoensis* with *Hesperostipa comata, Achnatherum scribneri, Leymus condensatus, Leymus cinereus, Koeleria macrantha, Pascopyrum smithii,* or *Poa secunda*. Shrubs commonly found include *Amelanchier alnifolia, Rosa* spp., *Eriogonum* spp., *Symphoricarpos albus,* and *Crataegus douglasii*. Excessive grazing, past land use and invasion by introduced annual species have resulted in a massive conversion to agriculture or shrub-steppe and annual grasslands dominated by *Artemisia* spp. and *Bromus tectorum* or *Poa pratensis*. Remnant grasslands are now typically restricted to steep and rocky sites.

DISTRIBUTION

Range: Occurs in southern British Columbia, eastern Washington and Oregon.
Divisions: 304:C, 306:P
TNC Ecoregions: 6:C, 8:P
Subnations: BC?, ID, OR, WA

CONCEPT

Associations:
- *(Balsamorhiza serrata) - Poa secunda* Herbaceous Vegetation (CEGL001782, G2)
- *Elymus lanceolatus - Hesperostipa comata* Herbaceous Vegetation (CEGL001746, G1)
- *Eriogonum compositum / Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001784, G2)
- *Eriogonum douglasii / Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001785, G4)
- *Eriogonum sphaerocephalum / Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001448, G3)
- *Eriogonum thymoides / Poa secunda* Dwarf-shrub Herbaceous Vegetation (CEGL001449, G3)
- *Festuca idahoensis - Eriogonum caespitosum* Herbaceous Vegetation (CEGL001615, G2?Q)
- *Festuca idahoensis - Eriogonum heracleoides* Herbaceous Vegetation (CEGL001616, G2)
- *Festuca idahoensis - Hieracium cynoglossoides* Herbaceous Vegetation (CEGL001619, G1G2)
- *Festuca idahoensis - Koeleria macrantha* Herbaceous Vegetation (CEGL001620, G3Q)
- *Festuca idahoensis - Symphoricarpos albus* Herbaceous Vegetation (CEGL001509, G1)
- *Hesperostipa comata - Poa secunda* Herbaceous Vegetation (CEGL001704, G1)
- *Leymus cinereus* Herbaceous Vegetation (CEGL001479, G2G3Q)
- *Pseudoroegneria spicata - Balsamorhiza sagittata - Poa secunda* Herbaceous Vegetation (CEGL001662, G3)
- *Pseudoroegneria spicata - Eriogonum heracleoides* Herbaceous Vegetation (CEGL001668, G2Q)

- *Pseudoroegneria spicata - Festuca idahoensis* Palouse Herbaceous Vegetation (CEGL001670, G1G2)
- *Pseudoroegneria spicata - Hesperostipa comata* Herbaceous Vegetation (CEGL001679, G4)
- *Pseudoroegneria spicata - Poa secunda* Herbaceous Vegetation (CEGL001677, G4?)
- *Pseudoroegneria spicata - Poa secunda* Lithosolic Herbaceous Vegetation (CEGL001678, G3)
- *Rosa nutkana - Festuca idahoensis* Herbaceous Vegetation (CEGL001626, G1G2Q)
- *Symphoricarpos albus - Rosa nutkana* Shrubland (CEGL001130, G3)

Alliances:

- *Elymus lanceolatus* Herbaceous Alliance (A.1242)
- *Festuca idahoensis* Herbaceous Alliance (A.1251)
- *Hesperostipa comata* Bunch Herbaceous Alliance (A.1270)
- *Leymus cinereus* Herbaceous Alliance (A.1204)
- *Poa secunda* Dwarf-shrub Herbaceous Alliance (A.1568)
- *Poa secunda* Herbaceous Alliance (A.1291)
- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)
- *Symphoricarpos albus* Shrubland Alliance (A.925)

SOURCES

References: Comer et al. 2003, Daubenmire 1988, Tisdale 1982
Version: 07 Feb 2005 **Stakeholders:** Canada, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

142 CES304.084—COLUMBIA PLATEAU SILVER SAGEBRUSH SEASONALLY FLOODED SHRUB-STEPPE

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland
Diagnostic Classifiers: Montane [Upper Montane, Montane, Lower Montane]; Lowland [Lowland]; Playa; Temperate [Temperate Xeric]; Depressional; Impermeable Layer; Intermittent Flooding
Concept Summary: This ecological system includes sagebrush communities occurring at lowland and montane elevations in the Columbia Plateau-northern Great Basin region, east almost to the Great Plains. These are generally depressional wetlands or non-alkaline playas, occurring as small- or occasionally large-patch communities, in a sagebrush or montane forest matrix. Climate is generally semi-arid, although it can be cool in montane areas. This system occurs in poorly drained depressional wetlands, the largest characterized as playas, the smaller as vernal pools, or along seasonal stream channels in valley bottoms or mountain meadows. *Artemisia cana ssp. bolanderi* or *Artemisia cana ssp. viscidula* are dominant, with *Artemisia tridentata ssp. tridentata, Artemisia tridentata ssp. wyomingensis,* or *Artemisia tridentata ssp. vaseyana* occasionally codominant. Understory graminoids and forbs are characteristic, with *Poa secunda (= Poa nevadensis), Poa cusickii, Muhlenbergia filiformis, Muhlenbergia richardsonis,* and *Leymus cinereus* dominant at the drier sites; *Eleocharis palustris, Deschampsia caespitosa,* and *Carex* species dominate at wetter or higher-elevation sites.

DISTRIBUTION

Range: This ecological system includes sagebrush communities occurring at lowland and montane elevations in the Columbia Plateau-northern Great Basin region, east almost to the Great Plains.
Divisions: 304:C, 306:C
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 12:C, 18:C, 19:C, 20:C
Subnations: CA, CO?, ID, MT, NV, OR, UT?, WA?, WY

CONCEPT

Associations:

- *Artemisia cana (*ssp. *bolanderi,* ssp. *viscidula) - Artemisia tridentata* ssp. *vaseyana / Poa cusickii* Shrub Herbaceous Vegetation [Provisional] (CEGL001549, G2)
- *Artemisia cana (*ssp. *bolanderi,* ssp. *viscidula) / Leymus cinereus* Shrubland (CEGL001460, G1)
- *Artemisia cana (*ssp. *bolanderi,* ssp. *viscidula) / Poa fendleriana* ssp. *fendleriana* Shrub Herbaceous Vegetation (CEGL001551, G2)
- *Artemisia cana* (ssp. *bolanderi,* ssp. *viscidula) / Poa pratensis* Semi-natural Shrubland (CEGL002988, GNA)
- *Artemisia cana (*ssp. *bolanderi,* ssp. *viscidula) / Poa secunda* Shrubland (CEGL001548, G2)
- *Artemisia cana* ssp. *bolanderi / Eleocharis palustris* Shrubland (CEGL002987, GU)
- *Artemisia cana* ssp. *bolanderi / Iris missouriensis - Juncus balticus* Shrubland (CEGL003475, GNR)
- *Artemisia cana* ssp. *bolanderi / Muhlenbergia richardsonis* Shrub Herbaceous Vegetation (CEGL001743, G3)
- *Artemisia cana* ssp. *viscidula* - (*Salix* spp.) / *Festuca idahoensis* Shrubland (CEGL001075, G3)
- *Artemisia cana* ssp. *viscidula / Deschampsia caespitosa* Shrubland (CEGL001074, G2G3)
- *Artemisia cana* ssp. *viscidula / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001552, G3?)
- *Artemisia cana* ssp. *viscidula / Festuca ovina* Shrubland (CEGL001076, G4G5)
- *Artemisia cana* ssp. *viscidula / Festuca thurberi* Shrubland (CEGL001071, G2G3)
- *Artemisia cana* ssp. *viscidula / Purshia tridentata* Shrubland (CEGL001073, G3)

Alliances:
- *Artemisia cana* (ssp. *bolanderi*, ssp. *viscidula*) Shrub Herbaceous Alliance (A.1531)
- *Artemisia cana* (ssp. *bolanderi*, ssp. *viscidula*) Shrubland Alliance (A.2557)

SOURCES

References: Western Ecology Working Group n.d.
Version: 08 Sep 2004 **Stakeholders:** West
Concept Author: J. Kagan **LeadResp:** West

149 CES304.777—INTER-MOUNTAIN BASINS BIG SAGEBRUSH SHRUBLAND SPP. TRIDENTATA

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Toeslope/Valley Bottom; Deep Soil; Aridic; Artemisia tridentata ssp. tridentata
Concept Summary: This ecological system occurs throughout much of the western U.S., typically in broad basins between mountain ranges, plains and foothills between 1500 and 2300 m elevation. Soils are typically deep, well-drained and non-saline. These shrublands are dominated by *Artemisia tridentata ssp. tridentata*. Scattered *Juniperus* spp., *Sarcobatus vermiculatus*, and *Atriplex* spp. may be present in some stands. *Ericameria nauseosa, Chrysothamnus viscidiflorus, Purshia tridentata*, or *Symphoricarpos oreophilus* may codominate disturbed stands. Perennial herbaceous components typically contribute less than 25% vegetative cover. Common graminoid species include *Achnatherum hymenoides, Bouteloua gracilis, Elymus lanceolatus, Festuca idahoensis, Hesperostipa comata, Leymus cinereus, Pleuraphis jamesii, Pascopyrum smithii, Poa secunda*, or *Pseudoroegneria spicata*.

DISTRIBUTION

Range: Occurs throughout much of the western U.S., typically in broad basins between mountain ranges, plains and foothills between 1500-2300 m elevation.
Divisions: 303:C, 304:C, 306:C
TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 26:C, 27:C
Subnations: CA, CO, ID, MT, NV, OR, UT, WA, WY

CONCEPT

Associations:
- *Artemisia tridentata (*ssp. *tridentata*, ssp. *xericensis) / Pseudoroegneria spicata - Poa secunda* Shrub Herbaceous Vegetation (CEGL001019, G1)
- *Artemisia tridentata (*ssp. *tridentata*, ssp. *xericensis) / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001018, G2G4)
- *Artemisia tridentata* ssp. *tridentata - Grayia spinosa* Shrubland (CEGL001004, G5)
- *Artemisia tridentata* ssp. *tridentata / Distichlis spicata* Shrubland (CEGL001000, G5)
- *Artemisia tridentata* ssp. *tridentata / Festuca idahoensis* Shrubland (CEGL001014, G4?)
- *Artemisia tridentata* ssp. *tridentata / Hesperostipa comata* Shrubland (CEGL002966, G4?)
- *Artemisia tridentata* ssp. *tridentata / Leymus cinereus* Shrubland (CEGL001016, G2)
- *Artemisia tridentata* ssp. *tridentata / Pascopyrum smithii - (Elymus lanceolatus)* Shrubland (CEGL001017, G3?)
- *Artemisia tridentata* ssp. *tridentata / Pleuraphis jamesii* Shrubland (CEGL001015, G2G4)
- *Artemisia tridentata* ssp. *tridentata / Poa secunda* Shrubland (CEGL001008, G3G5)

Alliances:
- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrub Herbaceous Alliance (A.1522)
- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrubland Alliance (A.830)

SOURCES

References: Barbour and Billings 1988, Barbour and Major 1977, Comer et al. 2003, Holland and Keil 1995, West 1983a
Version: 05 Oct 2004 **Stakeholders:** Midwest, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

150 CES304.778—INTER-MOUNTAIN BASINS BIG SAGEBRUSH STEPPE SPP. TRIDENTATA

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Steppe/Savanna
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Lowland]; Deep Soil; Aridic; Xeromorphic Shrub; Bunch grasses; Artemisia tridentata ssp. tridentata

Concept Summary: This widespread matrix-forming ecological system occurs throughout much of the Columbia Plateau and northern Great Basin and Wyoming and is found at slightly higher elevations farther south. Soils are typically deep and non-saline, often with a microphytic crust. This shrub-steppe is dominated by perennial grasses and forbs (>25% cover) with *Artemisia tridentata ssp. tridentata and Artemisia tridentata ssp. xericensis,* dominating or codominating the open to moderately dense (10-40% cover) shrub layer. *Atriplex confertifolia, Chrysothamnus viscidiflorus, Ericameria nauseosa, Tetradymia* spp., or *Artemisia frigida* may be common especially in disturbed stands. Associated graminoids include *Achnatherum hymenoides, Calamagrostis montanensis, Elymus lanceolatus ssp. lanceolatus, Festuca idahoensis, Festuca campestris, Koeleria macrantha, Poa secunda,* and *Pseudoroegneria spicata*. Common forbs are *Phlox hoodii, Arenaria* spp., and *Astragalus* spp. Areas with deeper soils more commonly support *Artemisia tridentata ssp. tridentata* but have largely been converted for other land uses. The natural fire regime of this ecological system likely maintains a patchy distribution of shrubs, so the general aspect of the vegetation is a grassland. Shrubs may increase following heavy grazing and/or with fire suppression, particularly in moist portions of the northern Columbia Plateau where it forms a landscape mosaic pattern with shallow-soil scabland shrublands. Where fire frequency has allowed for shifts to a native grassland condition, maintained without significant shrub invasion over a 50- to 70-year interval, the area would be considered Columbia Basin Foothill and Canyon Dry Grassland (CES304.993).

DISTRIBUTION

Range: Occurs throughout much of the Columbia Plateau and northern Great Basin and Wyoming, and is found at slightly higher elevations further south.
Divisions: 304:C, 306:C
TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 20:C, 26:C
Subnations: BC, CA, CO, ID, MT, NV, OR, UT, WA, WY

CONCEPT

Associations:
- *Artemisia tridentata (*ssp. *tridentata,* ssp. *xericensis) / Pseudoroegneria spicata - Poa secunda* Shrub Herbaceous Vegetation (CEGL001019, G1)
- *Artemisia tridentata (*ssp. *tridentata,* ssp. *xericensis) / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001018, G2G4)
- *Artemisia tridentata* ssp. *tridentata - Grayia spinosa* Shrubland (CEGL001004, G5)
- *Artemisia tridentata* ssp. *tridentata / Distichlis spicata* Shrubland (CEGL001000, G5)
- *Artemisia tridentata* ssp. *tridentata / Festuca idahoensis* Shrubland (CEGL001014, G4?)
- *Artemisia tridentata* ssp. *tridentata / Hesperostipa comata* Shrubland (CEGL002966, G4?)
- *Artemisia tridentata* ssp. *tridentata / Leymus cinereus* Shrubland (CEGL001016, G2)
- *Artemisia tridentata* ssp. *tridentata / Pascopyrum smithii - (Elymus lanceolatus)* Shrubland (CEGL001017, G3?)
- *Artemisia tridentata* ssp. *tridentata / Pleuraphis jamesii* Shrubland (CEGL001015, G2G4)
- *Artemisia tridentata* ssp. *tridentata / Poa secunda* Shrubland (CEGL001008, G3G5)

Alliances:
- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrub Herbaceous Alliance (A.1522)
- *Artemisia tridentata* (ssp. *tridentata*, ssp. *xericensis*) Shrubland Alliance (A.830)

Dynamics: The natural fire regime of this ecological system likely maintains patchy distribution of shrubs, so the general aspect of the vegetation is a grassland. Shrubs may increase following heavy grazing and/or with fire suppression, particularly in moist portions of the northern Columbia Plateau where it forms a landscape mosaic pattern with shallow-soil scabland shrublands. Microphytic crust is very important in this ecological system.

SOURCES

References: Barbour and Major 1977, Barbour and Major 1988, Comer et al. 2003, Daubenmire 1970, Ecosystems Working Group 1998, Knight 1994, Mueggler and Stewart 1980, West 1983c
Version: 08 Sep 2004 **Stakeholders:** Canada, Midwest, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

151 CES306.994—NORTHERN ROCKY MOUNTAIN LOWER MONTANE-FOOTHILL DECIDUOUS SHRUBLAND

Primary Division: Rocky Mountain (306)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Shrubland (Shrub-dominated); Very Shallow Soil; Broad-Leaved Deciduous Shrub; Moderate (100-500 yrs) Persistence
Concept Summary: This shrubland ecological system is found in the lower montane and foothill regions around the Columbia Basin, and north and east into the northern Rockies. These shrublands typically occur below treeline, within the matrix of surrounding low-elevation grasslands and sagebrush shrublands. The shrublands are usually found on steep slopes of canyons and in areas with some soil development, either loess deposits or volcanic clays; they occur on all aspects. Fire, flooding and erosion all impact these shrublands, but they typically will persist on sites for long periods. These communities develop near talus slopes as garlands, at the heads of dry drainages, and toeslopes in

the moist shrub-steppe and steppe zones. *Physocarpus malvaceus, Prunus emarginata, Prunus virginiana, Rosa* spp., *Spiraea betulifolia, Symphoricarpos albus,* and *Holodiscus discolor* are the most common dominant shrubs. In moist areas *Crataegus douglasii* can be common. *Festuca idahoensis, Festuca campestris, Calamagrostis rubescens, Carex geyeri, Koeleria macrantha, Pseudoroegneria spicata,* and *Poa secunda* are the most important grasses. *Achnatherum thurberianum* and *Leymus cinereus* can be locally important. *Poa pratensis* and *Phleum pratense* are common introduced grasses. *Geum triflorum, Potentilla gracilis, Lomatium triternatum, Balsamorhiza sagittata,* and species of *Eriogonum, Phlox,* and *Erigeron* are important forbs.

DISTRIBUTION

Range: This system is found in the lower montane and foothill regions around the Columbia Basin, and north and east into the northern Rockies.
Divisions: 304:C, 306:C
TNC Ecoregions: 6:C, 7:C, 8:C, 68:C
Subnations: AB, BC, ID, MT, OR, WA

CONCEPT

Associations:
- *Amelanchier alnifolia* / (Mixed Grass, Forb) Shrubland (CEGL005885, GNR)
- *Crataegus douglasii / Rosa woodsii* Shrubland (CEGL001095, G2)
- *Holodiscus discolor* Shrubland [Placeholder] (CEGL003053, G4?)
- *Menziesia ferruginea / Xerophyllum tenax* Shrubland (CEGL005888, G3G4)
- *Physocarpus malvaceus - Symphoricarpos albus* Shrubland (CEGL001171, G3)
- *Prunus virginiana - (Prunus americana)* Shrubland (CEGL001108, G4Q)
- *Rhamnus alnifolia* Shrubland (CEGL001132, G3)
- *Rhus glabra / Aristida purpurea* var. *longiseta* Shrub Herbaceous Vegetation (CEGL001507, G1)
- *Rhus glabra / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001122, G2)
- *Ribes lacustre / Chamerion angustifolium* Shrubland [Provisional] (CEGL005889, G2?)
- *Rosa woodsii* Shrubland (CEGL001126, G5)
- *Spiraea betulifolia* Shrubland (CEGL005835, G3?)
- *Spiraea douglasii* Shrubland (CEGL001129, G5)
- *Symphoricarpos albus - Rosa nutkana* Shrubland (CEGL001130, G3)
- *Symphoricarpos albus* Shrubland (CEGL005890, G4?)
- *Vaccinium membranaceum / Xerophyllum tenax* Shrubland (CEGL005891, G3?)

Alliances:
- *Amelanchier alnifolia* Shrubland Alliance (A.913)
- *Crataegus douglasii* Shrubland Alliance (A.917)
- *Holodiscus discolor* Shrubland Alliance (A.901)
- *Menziesia ferruginea* Shrubland Alliance (A.2633)
- *Physocarpus malvaceus* Shrubland Alliance (A.928)
- *Prunus virginiana* Shrubland Alliance (A.919)
- *Rhamnus alnifolia* Temporarily Flooded Shrubland Alliance (A.962)
- *Rhus glabra* Shrub Herbaceous Alliance (A.1536)
- *Ribes lacustre* Temporarily Flooded Shrubland Alliance (A.970)
- *Rosa woodsii* Temporarily Flooded Shrubland Alliance (A.959)
- *Spiraea betulifolia* Shrubland Alliance (A.2636)
- *Spiraea douglasii* Seasonally Flooded Shrubland Alliance (A.997)
- *Symphoricarpos albus* Shrubland Alliance (A.925)
- *Vaccinium membranaceum* Shrubland Alliance (A.2632)

SOURCES

References: Comer et al. 2003, Ecosystems Working Group 1998, Franklin and Dyrness 1973, Hall 1973, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Poulton 1955, Tisdale 1986
Version: 01 Sep 2005 **Stakeholders:** Canada, West
Concept Author: M. Reid, J. Kagan **LeadResp:** West

154 CES304.080—COLUMBIA PLATEAU LOW SAGEBRUSH STEPPE

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Steppe/Savanna
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Foothill, Lowland]; Shrubland (Shrub-dominated); Ridge/Summit/Upper Slope; Sideslope; Shallow Soil; Silt Soil Texture; Clay Soil Texture; Aridic; W-Landscape/High Intensity; Low Artemisia spp.

Concept Summary: This matrix ecological system is composed of sagebrush dwarf-shrub-steppe that occurs in a variety of shallow-soil habitats throughout eastern Oregon, northern Nevada and southern Idaho. *Artemisia arbuscula ssp. arbuscula* and close relatives (*Artemisia arbuscula ssp. longiloba* and occasionally *Artemisia nova*) form stands that typically occur on mountain ridges and flanks and broad terraces, ranging from 1000 to 3000 m in elevation. Substrates are shallow, fine-textured soils, poorly drained clays, shallow-soiled areas, almost always very stony, characterized by recent rhyolite or basalt. Other shrubs and dwarf-shrubs present may include *Purshia tridentata, Eriogonum* spp., and other species of *Artemisia*. Common graminoids include *Festuca idahoensis, Koeleria macrantha, Pseudoroegneria spicata*, and *Poa secunda*. Many forbs also occur and may dominate the herbaceous vegetation, especially at the higher elevations. Isolated individuals of *Juniperus occidentalis* (western juniper) and *Cercocarpus ledifolius* (mountain-mahogany) can often be found in this system.

DISTRIBUTION

Range: This system is found throughout the basins of eastern Oregon and southern Idaho, south into northern Nevada and northeastern California.
Divisions: 304:C
TNC Ecoregions: 6:C, 11:C
Subnations: CA, ID, MT?, NV, OR, WY?

CONCEPT

Associations:
- *Artemisia arbuscula* ssp. *arbuscula - Artemisia tridentata* ssp. *vaseyana / Festuca idahoensis* Shrubland [Provisional] (CEGL002982, GNR)
- *Artemisia arbuscula* ssp. *arbuscula - Purshia tridentata / Pseudoroegneria spicata - Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001518, G2G3)
- *Artemisia arbuscula* ssp. *arbuscula / Achnatherum thurberianum* Shrub Herbaceous Vegetation (CEGL001413, G4G5)
- *Artemisia arbuscula* ssp. *arbuscula / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001409, G5)
- *Artemisia arbuscula* ssp. *arbuscula / Leymus salinus* ssp. *salmonis* Shrub Herbaceous Vegetation (CEGL001410, G1G2Q)
- *Artemisia arbuscula* ssp. *arbuscula / Poa secunda* Shrub Herbaceous Vegetation (CEGL001411, G5)
- *Artemisia arbuscula* ssp. *arbuscula / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001412, G5)
- *Artemisia arbuscula* ssp. *longiloba / Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001522, G3)
- *Artemisia arbuscula* ssp. *longiloba / Pascopyrum smithii* Shrub Herbaceous Vegetation (CEGL001415, GU)
- *Artemisia arbuscula* ssp. *longiloba / Poa secunda* Shrub Herbaceous Vegetation (CEGL001523, G3Q)
- *Artemisia arbuscula* ssp. *longiloba / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001416, GNR)
- *Artemisia arbuscula* ssp. *longiloba* Shrubland (CEGL001414, G4G5)

Alliances:
- *Artemisia arbuscula* ssp. *arbuscula* Shrub Herbaceous Alliance (A.1566)
- *Artemisia arbuscula* ssp. *arbuscula* Shrubland Alliance (A.2547)
- *Artemisia arbuscula* ssp. *longiloba* Shrub Herbaceous Alliance (A.2552)
- *Artemisia arbuscula* ssp. *longiloba* Shrubland Alliance (A.2549)

SOURCES

References: West 1983a, Western Ecology Working Group n.d.
Version: 08 Sep 2004 **Stakeholders:** West
Concept Author: J. Kagan **LeadResp:** West

161 CES206.947—MEDITERRANEAN CALIFORNIA ALKALI MARSH

Primary Division: Mediterranean California (206)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Mediterranean [Mediterranean Xeric-Oceanic]; Depressional; Alkaline Water; Saline Water Chemistry; Shallow (<15 cm) Water; Caliche Layer
Concept Summary: These highly variable systems occur in scattered locations throughout the California Central Valley and along California's south coast extending into Baja Norte, all at elevations below 300 m (1000 feet). They are found in old lake beds or in floodplains of major river systems where seasonal water inputs are limited, and often include some groundwater seepage. High rates of evaporation lead to alkaline water and soil conditions, with layers of salt encrusted soils often accumulating near seeps. These are highly variable in plant composition, but often include *Distichlis spicata, Juncus balticus, Anemopsis californica, Schoenoplectus americanus (= Scirpus americanus), Atriplex* spp., *Triglochin maritima*, and *Cirsium* spp. Endemic plant species include *Puccinellia howellii*.

DISTRIBUTION

Range: Scattered locations throughout the California Central Valley and along California's south coast extending into Baja Norte, all at elevations below 300 m (1000 feet).
Divisions: 206:C
TNC Ecoregions: 13:C, 16:C

Subnations: CA, MXBC

CONCEPT

Associations:

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Alliances:

High-ranked species: Frankenia salina (G3G4), Myosurus sessilis (G2), Puccinellia parishii (G2), Sorex ornatus relictus (G5T1), Spergularia macrotheca var. longistyla (G5T3T4)

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Version: 17 Mar 2003 **Stakeholders:** Latin America, West

Concept Author: P. Comer, T. Keeler-Wolf **LeadResp:** West

168 CES204.854—NORTH PACIFIC AVALANCHE CHUTE SHRUBLAND

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Montane]; Shrubland (Shrub-dominated); Avalanche

Concept Summary: This tall shrubland system occurs throughout mountainous regions of the Pacific Northwest, from the southern Cascades and Coast Ranges north to south-central Alaska. This system occurs on sideslopes of mountains on glacial till or colluvium. These habitats range from moderately xeric to wet and occur on snow avalanche chutes at montane elevations. In the mountains of Washington, talus sites and snow avalanche chutes very often coincide spatially. On the west side of the Cascades, the major dominant species are *Acer circinatum, Alnus viridis ssp. sinuata, Rubus parviflorus*, and small trees, especially *Chamaecyparis nootkatensis*. Forbs, grasses, or other shrubs can also be locally dominant. *Prunus virginiana, Amelanchier alnifolia, Vaccinium membranaceum* or *Vaccinium scoparium*, and *Fragaria* spp. are common species on drier avalanche tracks on the east side of the Cascades (Ecosystems Working Group 1998). The main feature of this system is that it occurs on steep, frequently disturbed (snow avalanches) slopes. Avalanche chutes can be quite long, extending from the subalpine into the montane and foothill toeslopes.

DISTRIBUTION

Range: This system occurs throughout mountainous regions of the Pacific Northwest, from the southern Cascades and Coast Ranges north to south-central Alaska.

Divisions: 204:C

TNC Ecoregions: 1:C, 3:C, 4:C, 69:C, 70:C, 81:C

Subnations: AK, BC, OR, WA

CONCEPT

Associations:

- *Alnus viridis* ssp. *sinuata / Acer circinatum* Shrubland (CEGL001155, G4G5)
- *Chamaecyparis nootkatensis / Oplopanax horridus* Forest (CEGL000349, G3)

Alliances:

- *Alnus viridis* ssp. *sinuata* Temporarily Flooded Shrubland Alliance (A.966)
- *Chamaecyparis nootkatensis* Temporarily Flooded Forest Alliance (A.178)

SOURCES

References: Boggs 2000, Comer et al. 2003, Ecosystems Working Group 1998, Franklin and Dyrness 1973, Viereck et al. 1992

Version: 31 Mar 2005 **Stakeholders:** Canada, West

Concept Author: K. Boggs and G. Kittel **LeadResp:** West

169 CES204.063—NORTH PACIFIC BOG AND FEN

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)

Diagnostic Classifiers: Lowland [Foothill]; Shrubland (Shrub-dominated); Temperate [Temperate Oceanic]; Depressional; Organic Peat (>40 cm); Sphagnum spp.

Concept Summary: This wetland system occurs in peatlands along the Pacific coast from southeastern Alaska to northern California, in and west of the coastal mountain summits but including the Puget Sound lowlands. Elevations are mostly under 457 m (1500 feet), and annual precipitation ranges from 890-3050 mm (35-120 inches). These wetlands are relatively abundant in Alaska and British Columbia but diminish rapidly in size and number farther south. They occur in river valleys, around lakes and marshes, or on slopes. In Alaska , they occur within ponded basins or low-gradient (<3%) slopes with an elevated water table on glacial drift, moraines, distal glacial outwash plains, and

uplifted tidal marshes. Organic soils are characterized by an abundance of sodium cations from oceanic precipitation. Poor fens and bogs are often intermixed except in a few calcareous areas in Alaska and British Columbia where rich fen vegetation may dominate. *Sphagnum* characterizes poor fens and bogs (pH <5.5), and the two are lumped here, while "brown mosses" and sedges characterize rich fens (pH >5.5). Mire profiles in Alaska and British Columbia may be flat, raised (domed), or sloping, but most occurrences in Washington and Oregon are flat with only localized hummock development. Vegetation is usually a mix of conifer-dominated swamp, shrub swamp, and open sphagnum or sedge mire, often with small lakes and ponds interspersed. Vegetation includes many species common to boreal continental bogs and fens, such as *Ledum groenlandicum, Vaccinium uliginosum, Myrica gale, Andromeda polifolia, Vaccinium oxycoccos, Equisetum fluviatile, Comarum palustre,* and *Drosera rotundifolia*. However, it is also distinguished from boreal continental bogs and fens by the presence of Pacific coastal species, including *Chamaecyparis nootkatensis, Pinus contorta var. contorta, Picea sitchensis, Tsuga heterophylla, Ledum glandulosum, Thuja plicata, Gaultheria shallon, Spiraea douglasii, Carex aquatilis var. dives, Carex lyngbyei, Carex obnupta, Carex pluriflora, Darlingtonia californica, Sphagnum pacificum, Sphagnum henryense,* and *Sphagnum mendocinum*.
Comments: This system is distinguished and split from Boreal Depressional Bog (CES103.871) and Boreal Fen (CES103.872). The communities comprising this system are not well-described or classified. It looks like the "muskeg" of southeastern Alaska and northern British Columbia are included here. We had talked about separating that out because it is so extensive in the hypermaritime there, covering large areas of landscape. How distinct is the hypermaritime muskeg of that area from bogs and fens from central Vancouver Island south?

DISTRIBUTION

Range: This system occurs along the Pacific Coast from southeastern Alaska to northern California, west of the coastal mountain summits but including the Puget Sound lowlands. Occurrences diminish rapidly in size and number south of British Columbia.
Divisions: 204:C, 206:P
TNC Ecoregions: 1:C, 2:C, 3:C, 69:C, 70:C, 81:C
Subnations: AK, BC, OR, WA

CONCEPT

Associations:
- *Carex aquatilis* var. *dives* Herbaceous Vegetation (CEGL001826, G4)
- *Carex cusickii - (Menyanthes trifoliata)* Herbaceous Vegetation (CEGL003332, G2G3)
- *Carex limosa* Herbaceous Vegetation (CEGL001811, G2)
- *Dulichium arundinaceum* Seasonally Flooded Herbaceous Vegetation (CEGL001831, G3)
- *Eriophorum chamissonis / Sphagnum* spp. Herbaceous Vegetation (CEGL003333, G4)
- *Kalmia microphylla - Ledum groenlandicum / Xerophyllum tenax* Shrubland (CEGL003359, G1)
- *Ledum glandulosum - Gaultheria shallon / Carex obnupta* Shrubland (CEGL003437, G2)
- *Ledum glandulosum / Carex obnupta / Sphagnum* spp. Shrubland (CEGL003434, G2)
- *Ledum glandulosum / Darlingtonia californica / Sphagnum* spp. Shrubland (CEGL003435, G2)
- *Ledum glandulosum / Sanguisorba officinalis / Sphagnum* spp. Shrubland (CEGL003436, G1G2)
- *Ledum groenlandicum - Kalmia microphylla / Sphagnum* spp. Shrubland (CEGL003414, G4)
- *Ledum groenlandicum - Myrica gale / Sphagnum* spp. Shrubland (CEGL003335, G2)
- *Malus fusca* Shrubland (CEGL003385, G3)
- *Myrica gale / Carex (aquatilis* var. *dives, utriculata)* Shrubland (CEGL003376, G3)
- *Pinus contorta - (Chamaecyparis nootkatensis) / Gaultheria shallon* Woodland (CEGL003205, G4G5)
- *Pinus contorta / Carex aquatilis* var. *dives* Woodland (CEGL003203, G3)
- *Pinus contorta / Empetrum nigrum* Woodland (CEGL003202, G5)
- *Pinus contorta / Trichophorum caespitosum* Woodland (CEGL003204, G4G5)
- *Pinus contorta / Vaccinium ovalifolium* Woodland (CEGL003206, G3)
- *Pinus contorta* var. *contorta / Ledum groenlandicum / Sphagnum* spp. Woodland (CEGL003337, G3)
- *Pinus monticola / Ledum groenlandicum / Sphagnum* spp. Woodland (CEGL003360, G1)
- *Rhynchospora alba - (Vaccinium oxycoccos) / Sphagnum tenellum* Herbaceous Vegetation [Provisional] (CEGL003338, G3)
- *Spiraea douglasii / Carex aquatilis* var. *dives* Shrubland (CEGL003415, G4)
- *Spiraea douglasii / Sphagnum* spp. Shrubland (CEGL003416, G3)
- *Spiraea douglasii* Shrubland (CEGL001129, G5)
- *Tsuga heterophylla - (Thuja plicata) / Ledum groenlandicum / Sphagnum* spp. Forest (CEGL003339, G3)
- *Tsuga heterophylla - (Thuja plicata) / Sphagnum* spp. Forest (CEGL003417, G1)
- *Tsuga heterophylla / Ledum glandulosum / Carex obnupta - Lysichiton americanus* Forest (CEGL000477, G1)

Alliances:
- *Carex aquatilis* var. *dives* Seasonally Flooded Herbaceous Alliance (A.1412)
- *Carex cusickii* Saturated Herbaceous Alliance (A.2580)
- *Carex limosa* Seasonally Flooded Herbaceous Alliance (A.1416)
- *Dulichium arundinaceum* Seasonally Flooded Herbaceous Alliance (A.1398)
- *Eriophorum* spp. Saturated Herbaceous Alliance (A.2624)
- *Ledum glandulosum* Saturated Shrubland Alliance (A.2514)
- *Ledum groenlandicum* Saturated Shrubland Alliance (A.2626)
- *Malus fusca* Seasonally Flooded Shrubland Alliance (A.2577)

- *Myrica gale* Seasonally Flooded Shrubland Alliance (A.3512)
- *Pinus contorta* Saturated Woodland Alliance (A.577)
- *Pinus monticola* Saturated Woodland Alliance (A.2593)
- *Spiraea douglasii* Seasonally Flooded Shrubland Alliance (A.997)
- *Tsuga heterophylla* Saturated Forest Alliance (A.203)

Dynamics: In Alaska, species that dominate the early stages of succession in newly formed ponded basins include *Equisetum variegatum, Equisetum fluviatile* (swamp horsetail), and *Comarum palustre* (marsh fivefinger). *Sphagnum* species (peatmoss) invade the surface and help in forming peat. Acidic and nutrient-poor-tolerant vascular species eventually dominate the sites, such as *Myrica gale* (sweet gale), *Empetrum nigrum* (crowberry), *Vaccinium uliginosum* (bog blueberry), *Andromeda polifolia* (bog-rosemary), and *Vaccinium oxycoccos (= Oxycoccus microcarpus)* (cranberry). The late-successional stage of a peatland supports various community types, depending on the pH, waterflow, and nutrient status of a site such as the *Myrica gale / Empetrum nigrum* (sweet gale / crowberry) and *Picea sitchensis / Sphagnum* plant associations. Peat buildup, patterned ground, and changes in water table are recurrent aspects of peatland development rather than unidirectional successional events. It is unlikely that any of the late-seral peatland communities are stable in the sense of climax vegetation.

SOURCES

References: Comer et al. 2003
Version: 26 May 2005 **Stakeholders:** Canada, West
Concept Author: J.C. Christy **LeadResp:** West

182 CES204.093—NORTH PACIFIC MONTANE MASSIVE BEDROCK, CLIFF AND TALUS

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Barren
Spatial Scale & Pattern: Large patch, Small patch
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland
Diagnostic Classifiers: Canyon; Cliff (Substrate); Talus (Substrate); Rock Outcrops/Barrens/Glades; Temperate [Temperate Oceanic]
Concept Summary: This ecological system is found from foothill to subalpine elevations and includes barren and sparsely vegetated landscapes (generally <10% plant cover) of steep cliff faces, narrow canyons, and larger rock outcrops of various igneous, sedimentary, and metamorphic bedrock types. Also included are unstable scree and talus that typically occur below cliff faces. The dominant process is drought and other extreme growing conditions created by exposed rock or unstable slopes typically associated with steep slopes. Fractures in the rock surface and less steep or more stable slopes may be occupied by small patches of dense vegetation, typically scattered trees and/or shrubs. Characteristic trees includes *Chamaecyparis nootkatensis, Tsuga* spp., *Thuja plicata, Pseudotsuga menziesii*, or *Abies* spp. There may be scattered shrubs present, such as *Acer circinatum, Alnus* spp., and *Ribes* spp. Soil development is limited as is herbaceous cover. Mosses or lichens may be very dense, well-developed and display cover well over 10%.
Comments: This system was distinguished from montane cliffs and barrens in the Rockies based on a change in floristic division and the apparent abundance of nonvascular cover on rocks compared to drier divisions.

DISTRIBUTION

Range: This system occurs from northern California (north of Sierra Nevada Cliff and Canyon (CES206.901)) to southeastern Alaska.
Divisions: 204:C
TNC Ecoregions: 1:C, 2:C, 3:C, 4:C, 5:P, 69:C, 81:C
Subnations: AK, BC, OR, WA

CONCEPT

Associations:
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Alliances:

SOURCES

References: Western Ecology Working Group n.d.
Version: 30 Mar 2005 **Stakeholders:** Canada, West
Concept Author: R. Crawford **LeadResp:** West

192 CES306.806—NORTHERN ROCKY MOUNTAIN SUBALPINE-UPPER MONTANE GRASSLAND

Primary Division: Rocky Mountain (306)
Land Cover Class: Herbaceous
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Upper Montane]; Herbaceous; Deep Soil; Ustic; Intermediate Disturbance Interval; Graminoid; Tussock-forming grasses
Concept Summary: This is an upper montane to subalpine, high-elevation, lush grassland system dominated by perennial grasses and forbs on dry sites, particularly south-facing slopes. It is most extensive in the Canadian Rockies portion of the Rocky Mountain cordillera,

extending south into western Montana, eastern Oregon, eastern Washington and Idaho. Subalpine dry grasslands are small meadows to large open parks surrounded by conifer trees but lack tree cover within them. In general, soil textures are much finer, and soils are often deeper under grasslands than in the neighboring forests. Grasslands, although composed primarily of tussock-forming species, do exhibit a dense sod that makes root penetration difficult for tree species. Disturbance such as fire also plays a role in maintaining these open grassy areas. Typical dominant species include *Leymus innovatus (= Elymus innovatus), Koeleria macrantha, Festuca campestris, Festuca idahoensis, Festuca viridula, Achnatherum occidentale (= Stipa occidentalis), Achnatherum richardsonii (= Stipa richardsonii), Bromus inermis ssp. pumpellianus (= Bromus pumpellianus), Elymus trachycaulus, Phleum alpinum, Trisetum spicatum*, and a variety of Carices, such as *Carex hoodii, Carex obtusata*, and *Carex scirpoidea*. Important forbs include *Lupinus argenteus var. laxiflorus, Potentilla diversifolia, Potentilla flabellifolia, Fragaria virginiana*, and *Chamerion angustifolium (= Epilobium angustifolium)*. This system is similar to Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland CES306.040) but is found at higher elevations and is more often composed of *Festuca* spp. and *Achnatherum* and/or *Hesperostipa* spp. (= *Stipa* spp.) with additional floristic components of more subalpine taxa.

DISTRIBUTION

Range: It is most extensive in the Canadian Rockies portion of the Rocky Mountain cordillera, extending south into western Montana eastern Oregon, eastern Washington and Idaho.
Divisions: 306:C
TNC Ecoregions: 4:P, 7:C, 8:C, 9:P, 68:C
Subnations: AB, BC, ID, MT, OR, WA, WY

CONCEPT

Associations:
- *Calamagrostis rubescens* Herbaceous Vegetation (CEGL005862, G3G4?)
- *Carex hoodii - Festuca idahoensis* Herbaceous Vegetation (CEGL001595, G2)
- *Festuca campestris* Herbaceous Vegetation [Provisional] (CEGL001627, G3Q)
- *Festuca idahoensis - (Festuca campestris) / Potentilla diversifolia* Herbaceous Vegetation (CEGL001623, G3)
- *Festuca idahoensis - Carex obtusata* Herbaceous Vegetation (CEGL001611, G3Q)
- *Festuca idahoensis - Carex scirpoidea* Herbaceous Vegetation (CEGL001899, G2Q)
- *Festuca idahoensis - Danthonia intermedia* Herbaceous Vegetation (CEGL001612, G3?Q)
- *Festuca idahoensis - Elymus trachycaulus* Herbaceous Vegetation (CEGL001614, G4)
- *Festuca viridula - Carex hoodii* Herbaceous Vegetation (CEGL001596, G3)
- *Festuca viridula - Festuca idahoensis* Herbaceous Vegetation (CEGL001633, G2?Q)
- *Festuca viridula - Lupinus argenteus* var. *laxiflorus* Herbaceous Vegetation (CEGL001634, G3Q)
- *Festuca viridula - Potentilla flabellifolia* Herbaceous Vegetation (CEGL001636, GNRQ)
- *Phleum alpinum - Elymus trachycaulus* Herbaceous Vegetation (CEGL001923, G2Q)

Alliances:
- *Calamagrostis rubescens* Herbaceous Alliance (A.2637)
- *Carex hoodii* Herbaceous Alliance (A.1253)
- *Festuca campestris* Herbaceous Alliance (A.1255)
- *Festuca idahoensis* Alpine Herbaceous Alliance (A.1313)
- *Festuca idahoensis* Herbaceous Alliance (A.1251)
- *Festuca viridula* Herbaceous Alliance (A.1257)
- *Phleum alpinum* Herbaceous Alliance (A.1310)

SOURCES

References: Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1995, Johnson 2004
Version: 07 Sep 2005 **Stakeholders:** Canada, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

199 CES200.877—TEMPERATE PACIFIC FRESHWATER EMERGENT MARSH

Primary Division:
Land Cover Class: Herbaceous Wetland
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Herbaceous; Temperate [Temperate Continental]; Depressional [Pond]
Concept Summary: Freshwater marshes are found at all elevations below timberline throughout the temperate Pacific Coast and mountains of western North America. In the Pacific Northwest, they are mostly small patch, confined to limited areas in suitable floodplain or basin topography. They are mostly semipermanently flooded, but some marshes have seasonal hydrologic flooding. Water is at or above the surface for most of the growing season. Soils are muck or mineral, and water is high-nutrient. By definition, freshwater marshes are dominated by emergent herbaceous species, mostly graminoids (*Carex, Scirpus* and/or *Schoenoplectus, Eleocharis, Juncus, Typha latifolia*) but also some forbs. Occurrences of this system typically are found in a mosaic with other wetland systems. It is often found along the borders of ponds, lakes or reservoirs that have more open basins and a permanent water source throughout all or most of the year. Some of the specific communities will also be found in the floodplain systems where more extensive bottomlands remain. Common emergent and

floating vegetation includes species of *Scirpus* and/or *Schoenoplectus, Typha, Eleocharis, Sparganium, Sagittaria, Bidens, Cicuta, Rorippa, Mimulus,* and *Phalaris*. In relatively deep water, there may be occurrences of the freshwater aquatic bed system, where there are floating-leaved genera such as *Lemna, Potamogeton, Polygonum, Nuphar, Hydrocotyle,* and *Brasenia*. A consistent source of freshwater is essential to the function of these systems.

DISTRIBUTION

Range: This system occurs throughout the temperate Pacific Coast and coastal mountains of western North America, from southern coastal California north into coastal areas of British Columbia and Alaska.
Divisions: 204:C, 206:C
TNC Ecoregions: 1:C, 2:C, 3:C, 4:C, 12:P, 13:C, 14:C, 15:C, 16:C, 69:C, 70:C, 81:C
Subnations: AK, BC, CA, OR, WA

CONCEPT

Associations:
- *Bidens cernua* Herbaceous Vegetation [Provisional] (CEGL003324, G3)
- *Carex exsiccata* Herbaceous Vegetation [Provisional] (CEGL003312, G2G3)
- *Carex obnupta - Argentina egedii* ssp. *egedii* Herbaceous Vegetation (CEGL001820, G4)
- *Carex obnupta - Juncus patens* Herbaceous Vegetation (CEGL003379, G3)
- *Carex obnupta* Herbaceous Vegetation (CEGL003313, G4)
- *Carex utriculata* Herbaceous Vegetation (CEGL001562, G5)
- *Dulichium arundinaceum* Seasonally Flooded Herbaceous Vegetation (CEGL001831, G3)
- *Equisetum fluviatile* Herbaceous Vegetation (CEGL002746, G4)
- *Juncus balticus - Carex obnupta* Herbaceous Vegetation [Provisional] (CEGL003413, G4)
- *Juncus effusus* var. *brunneus* Pacific Coast Herbaceous Vegetation (CEGL003317, G5)
- *Oenanthe sarmentosa* Herbaceous Vegetation [Provisional] (CEGL003319, G4)
- *Paspalum distichum* Herbaceous Vegetation [Provisional] (CEGL003320, G3)
- *Sagittaria latifolia* Herbaceous Vegetation [Provisional] (CEGL003321, G3)
- *Schoenoplectus acutus* Herbaceous Vegetation (CEGL001840, G5)
- *Schoenoplectus tabernaemontani* Temperate Herbaceous Vegetation (CEGL002623, G5)
- *Scirpus microcarpus* Herbaceous Vegetation (CEGL003322, G4)
- *Sparganium angustifolium* Herbaceous Vegetation (CEGL001990, G4)
- *Sparganium eurycarpum* Herbaceous Vegetation (CEGL003323, G4)
- *Typha (latifolia, angustifolia)* Western Herbaceous Vegetation (CEGL002010, G5)

Alliances:
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex obnupta* Seasonally Flooded Herbaceous Alliance (A.2582)
- *Dulichium arundinaceum* Seasonally Flooded Herbaceous Alliance (A.1398)
- *Equisetum fluviatile* Semipermanently Flooded Herbaceous Alliance (A.1678)
- *Juncus effusus* Seasonally Flooded Herbaceous Alliance (A.1375)
- *Schoenoplectus acutus - (Schoenoplectus tabernaemontani)* Semipermanently Flooded Herbaceous Alliance (A.1443)
- *Scirpus microcarpus* Herbaceous Alliance (A.2619)
- *Sparganium angustifolium* Permanently Flooded Herbaceous Alliance (A.1760)
- *Sparganium eurycarpum* Permanently Flooded Herbaceous Alliance (A.2598)
- *Typha (angustifolia, latifolia) - (Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)

High-ranked species: Agelaius tricolor (G2G3), Alopecurus aequalis var. sonomensis (G5T1Q), Bacopa eisenii (G3?), Calamagrostis crassiglumis (G3Q), Calystegia sepium ssp. binghamiae (G5TH), Campanula californica (G3), Carex albida (G1), Carex hirtissima (G2?Q), Carex saliniformis (G2), Cicuta maculata var. bolanderi (G5T3T4), Cirsium crassicaule (G2), Cirsium hydrophilum (G1), Cirsium hydrophilum var. hydrophilum (G1T1), Claytonia palustris (G3), Eleocharis flavescens var. thermalis (G5T2T3Q), Helianthus nuttallii ssp. parishii (G5TH), Iva hayesiana (G3?), Pleuropogon hooverianus (G1), Potentilla hickmanii (G1), Rana cascadae (G3G4), Rana pretiosa (G2), Rhynchospora californica (G1), Rorippa gambelii (G1), Sagittaria sanfordii (G3), Sidalcea calycosa ssp. rhizomata (G5T2), Sidalcea stipularis (G1), Thamnophis gigas (G2G3), Zigadenus fontanus (G3)

SOURCES

References: Chappell and Christy 2004, Comer et al. 2003, Holland and Keil 1995, Viereck et al. 1992
Version: 09 Feb 2005 **Stakeholders:** Canada, West
Concept Author: C. Chappell and G. Kittel **LeadResp:** West

NLCD CLASSES

211 N11—OPEN WATER

Source: NLCD draft legend, 2004
Description: All areas of open water, generally with less than 25% cover of vegetation or soil.

221 N21—DEVELOPED, OPEN SPACE

Source: NLCD draft legend, 2004
Description: *Open Space:* Includes areas with a mixture of some construction materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20 percent of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed sesttings for recreation, erosion control, or aesthetic purposes.

222 N22—DEVELOPED, LOW INTENSITY

Source: NLCD draft legend, 2004
Description: *Developed, Low intensity*: Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-49 percent of total cover. These areas most commonly include single-family housing units.

223 N23—DEVELOPED, MEDIUM INTENSITY

Source: NLCD draft legend, 2004
Description: *Developed, Medium Intensity*: Includes areas with a mixture of constructed materials and vegetation. Impervious surface accoutns for 50-79 percent of the total cover. These areas most commonly include single-family housing units.

224 N24—DEVELOPED, HIGH INTENSITY

Source: NLCD draft legend, 2004
Description: *Developed, High Intensity*: Includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80 to 100 percent of the total cover.

231 N31—BARREN LAND (NON-SPECIFIC)

Source: NLCD draft legend, 2004
Description: (Rock/Sand/Clay)-Barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulation of earthen material. Generally, vegetation accounts for less than 15% of total cover.

242 N42—EVERGREEN FOREST

Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75 percent of the tree species maintain their leaves all year. Canopy is never without green foliage.

244 N44—EARLY SHRUB/TREE

Source: Oregon GAP Analysis / Oregon Natural Heritage Program
Description: Captures the range of successional conditions following timber harvest. Site preparation following timber harvest is a ground scarification and burning of slash and large woody debris, followed by seeding of a mix of annual grasses to retard soil erosion and planting conifer seedlings. As the stand matures there may be a phase where resprouting shrub vegetation, or dormant shrub seeds germinated by prescription fire, dominate the overstory canopy layer. Later in the successional phase the conifer saplings (< 5-inches in mean
diameter) have emerged through the shrub canopy and formed continuous canopies. **Composition:** A variety of shrubs and forbs can be present in this cover type based on regional flora and site history.

261 N61—ORCHARDS/VINYARDS

Source: NLCD draft legend, 2004
Description: Areas of high structure cropland such as orchards and vineyards. Agriculture crops account for greater than 20 percent of total vegetation.

280 N80—AGRICULTURE – IRRIGATED AND NONIRRIGATED

Source: NLCD draft legend, 2004
Description: Agriculture—unable to make distinction between N81 and N82.

281 N81—AGRICULTURE – PASTURE/HAY

Source: NLCD draft legend, 2004
Description: Areas of grasses, legumes, or grass-legume mixtures planted for lifestock grazing or the production of see or hay crops, typically on a perennial cycle. Pasture/hay accounts for greater than 20 percent of total vegetation.

291 N91—RIPARIAN

Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75 percent of the tree species maintain their leaves all year. Canopy is never without green foliage.

DISTURBED CLASSES

301 D01—NON-SPECIFIC DISTURBED

Source: SWReGAP/NatureServe
Description: Generic Human Alteration, not alteration type specified

302 D02—RECENTLY BURNED

Source: SWReGAP/NatureServe
Description: Burned vegetation visible on imagery for time of image acquisition (1999-2003).

303 D03—RECENTLY MINED OR QUARRIED

Source: SWReGAP/NatureServe
Description: 2 hectare or greater, open pit mining or quarries visible on imagery.

304 D04—INVASIVE SOUTHWEST RIPARIAN WOODLAND AND SHRUBLAND

Source: SWReGAP/NatureServe
Description: Tamarix spp. Semi-Natural Temporarily Flooded Shrubland Alliance (A842), or Elaegnus angustifolus Semi-Natural Woodland Alliance (A3566).

306 D06—INVASIVE PERENNIAL GRASSLAND

Source: SWReGAP/NatureServe
Description: Pennisetum spp., Bromus inermis, Poa pratensis, Eragrostis lehmannianna, Thinopyrum intermedium (A2567), Pennisetum spp., Bromus inermis, Poa pratensis, Eragrostis lehmannianna, Thinopyrum intermedium (A3561), or Poa pratensis Semi-Natural Herbaceous Alliance (A1382). Includes Agropyron cristatum.

307 D07—INVASIVE PERENNIAL FORBLAND

Source: SWReGAP/NatureServe
Description: Melilotus officinalis?, M. albus? Centaurea spp.?

308 D08—INVASIVE ANNUAL GRASSLAND

Source: SWReGAP/NatureServe
Description: Avena spp., Bromus spp., Schismus spp.

309 D09—INVASIVE ANNUAL AND BIENNIAL FORBLAND

Source: SWReGAP/NatureServe
Description: Salsola spp., Kochia scoparia, Halogeton glomeratum

310 D10—RECENTLY LOGGED AREAS

Source: SWReGAP/NatureServe
Description: 2 hecatare or greater, areas clear-cut or greater than 50% thinned

311 D11—RECENTLY CHAINED PINYON-JUNIPER AREAS

Source: SWReGAP/NatureServe

Description: 2 hectare or greater, areas of chained P-J

313 D13—Recently Disturbed Areas with Ruderal Vegetation

Source: SWReGAP/NatureServe
Description: Disturbed "old field" areas dominated most commonly by annual weed species.

314 D14—Altered (Disturbed, Oil Wells)

Source: SWReGAP/NatureServe
Description: Disturbed vegetation in proximity to dispersed oil wells

315 D15—Conservation Reserve Program (CRP) Lands

Source: SWReGAP/NatureServe
Description: Known CRP lands

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