United States
Department of
Agriculture

**Forest
Service**

July 2008

Environmental Assessment

Ball Park Thin Project

Appendices ----- Volume 2

McKenzie River Ranger District
Willamette National Forest
Lane County, Oregon

Legal Locations: Within T14S, R5E, Sec. 24; T.14S, R.6E, Sec. 17-21, 28-30, 31-33; T.15S, R.6E, Sec. 3-6, 7-11, 14-18, 20-23; Willamette Meridian

For Information Contact: **Shadie Nimer, Project Leader**
McKenzie River Ranger District
57600 McKenzie Highway
McKenzie Bridge, Oregon 97413
541-822-7271

Appendices

Appendix A – Aquatic Conservation Strategy Consistency

Appendix B – Biological Assessment, Spring Chinook Salmon and Bull Trout

Appendix C – Biological Evaluation, Botany

Appendix D – Wildlife Biological Assessment, Biological Evaluation, Specialist Report

Appendix E – Soils Specialist Report

Appendix F – Fuels Specialist Report

Appendix G – Heritage Resources Specialist Report

APPENDIX A

An Evaluation of Activities Authorized by the Ball Park Thin Project Environmental Assessment for Consistency with the Aquatic Conservation Strategy

Introduction

The Aquatic Conservation Strategy was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands. A goal of this strategy is to maintain a "natural" disturbance regime. In addition, management activities must comply with nine objectives that are included in the strategy. A variety of tactics to accomplish these goals and objectives are incorporated into four primary components. These components are:

Riparian Reserves
Key Watersheds
Watershed Analysis
Watershed Restoration

These four components, along with Late Successional Reserves, are designed to operate together to maintain and restore the productivity and resiliency of riparian and aquatic ecosystems (Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl - USFS, BLM 1994, (ROD), pages B9-B12).

The Four Components

1. Riparian Reserves

The Northwest Forest Plan defined Riparian Reserves as “portions of watersheds where riparian-dependant resources receive primary emphasis and where special standards and guidelines apply” (ROD page B12). Riparian Reserves include those portions of a watershed directly coupled to streams and rivers, that is, the portions of a watershed required for maintaining hydrologic, geomorphic, and ecologic processes that directly affect standing and flowing water bodies such as lakes and ponds, wetlands, streams, stream processes, and fish habitats (ROD pgs. B-12 and B-13).

The Upper McKenzie Watershed Analysis (Willamette N.F. - 1995) (WA) recommended no adjustment of riparian reserve widths for Class 1-3 streams, and

suggested that riparian reserve widths could be decreased for Class 4 streams in the watershed.

During the analysis for the Ball Park Thin project, no reductions of riparian reserve widths along any streams were proposed.

2. Key Watersheds

The Northwest Forest Plan created an overlay of Key Watersheds that are intended to provide refugia for at-risk stocks of anadromous salmonids and resident fish species. Refugia are a cornerstone of the conservation strategy for these species, consisting of watersheds that provide high quality habitat or are expected to provide habitat. Two different levels of protection, or tiers, are identified, as well as non-Key watersheds (ROD page B19). In key watersheds, completion of a watershed analysis is required prior to most management activities. The Ball Park Thin project area falls exclusively within Key Watershed designated lands.

3. & 4. Watershed Analysis and Watershed Restoration

The Upper Mckenzie Watershed Analysis (WA) was prepared by the Mckenzie Ranger District in 1995. The watershed was characterized in terms of past and current conditions, and a synthesis discussion was provided to guide development of management proposals to maintain and restore watershed conditions

The Ball park Thin Project has incorporated information from the WA into the project design. Current vegetative landscape patterns reflect past management activities that did not consider what the landscape might look like under natural disturbance regimes. Many of the proposed projects seek to create vegetative patterns, late successional stand structures, and fuel loadings that would have been typical of this landscape under the natural fire disturbance regimes that historically occurred in the area.

Aquatic Conservation Strategy Objectives

The previous discussions highlighted the consistency of the Ball Park Thin Project with the four components of the Aquatic Conservation Strategy. This section will outline how the activities proposed in the action alternatives conform to the nine objectives of the ACS. The information presented is summarized from Chapters 2 and 3 of the Environmental Assessment, where greater detail can be found, if needed.

Objective #1

Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

Harvest and prescribed fire prescriptions for proposed units were developed so that the treatment would, to the extent possible, resemble the effects of the natural fire regime that historically occurred in the vicinity of each unit. The objectives for the treatments are to develop stand structures that will maintain existing habitat, while creating conditions resembling those that would occur in the presence of the historic natural fire regime.

This will provide a balance between the maintenance of existing habitat for species, populations, and communities, with opportunities to develop landscape scale features with distribution, diversity and complexity typical of landscapes that developed under fire regimes that historically occurred in the area. This includes aquatic and riparian elements of the landscape.

Objective #2

Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

Riparian reserves, as established by the Record of Decision for the Northwest Forest Plan and re-assessed in the upper McKenzie Watershed Analysis have been incorporated into the design of all treatment units where streams occur. Treatments are proposed within riparian reserves, where they have the potential to enhance functions such as the development of future large wood, stand structural diversity, vegetative species richness and diversity and other late successional characteristics. Road treatments include upgrade of stream crossings to accommodate 100 year flood events, so that these events can flow through the landscape unimpeded and without the risk of catastrophic fill failures. Where needed, these crossings will be retrofitted to permit passage of fish, amphibian, and other aquatic and riparian species to and from wetland habitat located both upstream and downstream from the crossing.

Objective #3

Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

All harvest treatments restrict the use of ground disturbing equipment in and around streams, and provide for retention of all vegetation that is contributing to the stability of banks and channels. Where aerial yarding methods are prescribed, full suspension is required when yarding over streams to prevent disturbance of stream banks and channels.

Roads are a known potential source of damage to stream habitat, where improper design or location, or inadequate maintenance results in failures or roadway erosion. The Ball Park Thin Project addresses this concern, by minimizing road construction in all

alternatives. The only new roads to be constructed are temporary roads located on stable locations, and all of these will be obliterated following harvest activities.

Maintenance of portions of the existing road network that are in poor repair, replacement of undersized or old culverts, drainage improvement, and application of aggregate where necessary, will reduce chronic, low amplitude sources of fine sediment from the existing transportation system, and the potential of crossing fill failures. This will reduce the possibility of gravels and cobbles becoming embedded in fine materials in the stream channel bottoms.

Objective #4 *and* Objective #5

Maintain and restore water quality necessary to support healthy riparian, aquatic and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities. *And*

Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

Project design elements intended to maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations, as discussed above under Objective 3 provide protection to water quality from the introduction of sediment into streams and resulting effects on stream turbidity. Many of the roadwork projects will reduce or eliminate existing sources of sediment induced turbidity.

Roads are a known potential source of damage to stream habitat, where improper design or location, or inadequate maintenance results in failures or roadway erosion. The Ball Park Thin Project addresses this concern, by minimizing road construction in all alternatives. The only new roads to be constructed are temporary roads located on stable locations, and all of these will be obliterated following harvest activities. No stream crossings are proposed.

Maintenance of portions of the existing road network that are in poor repair, replacement of undersized or old culverts, drainage improvement, and application of aggregate where necessary, will reduce chronic, low amplitude sources of fine sediment from the existing transportation system, and the potential of crossing fill failures. This will reduce the possibility of gravels and cobbles becoming embedded in fine materials in the stream channel bottoms.

In addition, where beneficial vegetative treatments are proposed within riparian reserves, effective stream shading in compliance with the Regional TMDL Implementation Strategy is retained so that stream temperatures are not impacted

Objective #6 *and* Objective #7

Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration and spatial distribution of peak, high, and low flows must be protected. ***And***

Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

Implementation of a landscape design that is intended to restore vegetative structures, landscape patterns, and disturbance regimes to a more natural condition will result in watershed conditions that more closely resemble those under which historic stream flow conditions developed.

In the short term, potential adverse effects on the timing, magnitude, duration, and spatial distribution of peak and high flows will be minimized by managing the planning sub-drainages within the analysis area to Aggregate Recovery Percentage (ARP) levels that comply with the Willamette National Forest Land and Resource Management Plan, (Willamette National Forest, 1990)

Floodplains and wetland areas were excluded from consideration for harvest activities and where treatment units occur adjacent to these features, ground based equipment that could impact the soil and result in altered ground water movement are restricted.

Objective #8

Maintain and restore the species compositions and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distribution of coarse woody debris sufficient to sustain physical complexity and stability.

Harvest and prescribed fire prescriptions for proposed units were developed so that the treatment would, to the extent possible, resemble the effects of the natural fire regime that historically occurred in the vicinity of each unit. The objectives for the treatments are to develop stand structures that will maintain existing habitat, while creating conditions resembling those that would occur in the presence of the historic natural fire regime.

This will provide a balance between the maintenance of existing habitat for species, populations, and communities, with opportunities to develop landscape scale features with distribution, diversity and complexity typical of landscapes that developed under fire regimes that historically occurred in the area. This will create conditions that favor

development species composition and structural diversity of plants across the landscape of the Ball Park Thin Project Area, including riparian areas and wetlands.

Stands in riparian reserves are proposed for treatment to encourage development of large wood and late successional stand structure, where possible to do so without risk to bank and channel stability, and where effective stream shade can be retained to provide thermal regulation.

Wetlands and floodplain areas that are critical to nutrient filtering are eliminated from treatment areas and use of ground disturbing equipment adjacent to them is restricted.

Use of low severity fire is restricted to portions of riparian reserves where the risk of adverse effects on ground cover and duff retention cannot impact water quality. However, portions of riparian reserves that will be treated are expected to develop a more diverse pattern of small openings and patches, and a richer vegetative species composition and diversity.

Objective #9

Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

Implementation of a landscape design that is intended to restore landscape processes, vegetative structures, and landscape patterns to more natural conditions, will restore the ability of the landscape to create a rich variety of habitats for native species.

In addition, this project complies with the Northwest Forest Plan, and all of its applicable standards and guidelines. Option 9 was expected to maintain and restore late-successional and old-growth forest ecosystems, and provide adequate viability levels for all late successional species including species listed in the FSEIS ROD Table C-3. The Watershed Analyses for the Upper McKenzie Watershed (Upper Mckenzie WA) did not identify any need for increased protection above the ROD recommendations. Adequate amounts of down woody debris will be retained on site. This project will not affect the amount or distribution of these habitats or species that use these habitats.

Project Consistency Worksheet

NLAA Thinning Sale Programmatic Consultation

The programmatic timber sale consultation process requires the completion of three parts:
A) Completion of a project description and including maps,
B) Completion of project consistency with PDC forms,
C) Certification by the preparer and each Level I team member.

Part A - Project Description and Maps

Date: April 8, 2008

Project Title: Ball Park Thin

NEPA Reference #: N/A

Administrative Unit: Willamette National Forest – McKenzie River Ranger District

HUC 5 Watershed(s) (name and number): Upper McKenzie River #1709000401

Planned Project Implementation Date: 2011-2013

ESA Species, Critical Habitat and Effect Determination:

ESA Species or Critical Habitat	Effect Determination (NE, NLAA)
Columbia River Bull Trout DPS	NLAA
Upper Willamette River Chinook Salmon ESU	NLAA
Columbia River Bull Trout Critical Habitat	NE
Upper Willamette River Chinook Salmon Critical Habitat	NLAA

EFH Effect Determination:

EFH	Effect Determination (NE, NAA)
Chinook Salmon	NAA

Maps:
Figure 1. Ball Park Vicinity Map
Figure 2. Ball Park Action Area
Figure 3. Bull Trout and Spring Chinook Listed Fish Habitat and Spring Chinook Critical Habitat Within the Ball Park Action Area
Figure 4. Culvert Replacements in the Ball Park Action Area
Figure 5. Culvert Replacements within 1 mile of LFH
Figure 6. Wet Season Haul Route in Close Proximity to LFH
Figure 7. Road Reconstruction within 200 feet of LFH
Figure 8. Ball Park Proposed Winter Falling/Yarding

Tables:
Table 1. General unit information and stand data.
Table 2. Unit harvest treatment information.
Table 3. Yarding and skyline corridor information.
Table 4. Aggregate and native surface haul route information.
Table 5. Stream culvert installation, replacement and decommissioning.
Table 6. New road construction/ reconstruction and road decommissioning.
Table 7. Road maintenance/renovation.
Table 8. Stream channel proximity to LFH/CH by unit.

Table 1. General unit information and stand data.

Unit	Total Size	RR Treated Area	SIZ[1] Treated Area	Proximity[2] to LFH/CH	Overland Proximity to LFH/CH[3]	Precip Zone[4]	Mean Tree Age	Mean Tree Diameter	Mean Tree Height
	Acres	Acres	Acres	Feet	Feet	DRZ, TSZ, or DSZ	Years	Inches	Feet
10	42	11	11	33,800	29,000	DSZ	55	15	71
20	42	4	4	29,800	25,400	DSZ	54	16	77
30	52	13	13	29,500	22,500	DSZ	45	12	62
40	40	6	6	27,200	24,400	TSZ	54	16	74
50	6	0	0	No Connection	21,500	TSZ	42	11	62
60	52	16	16	23,500	19,600	TSZ	40	15	85
70	39	9	9	23,200	20,700	TSZ	39	11	64
80	34	4	4	23,500	18,600	TSZ	49	12	66
110	44	13	13	18,900	16,800	TSZ	47	13	69
120	57	9	9	21,200	17,700	TSZ	35	13	60
130	18	0	0	19,200	15,000	TSZ	41	11	64
140	29	0	0	No Streams	13,700	TSZ	44	12	74
150	44	5	5	18,100	14,100	TSZ	47	11	64
160	46	0	0	18,400	15,800	TSZ	44	12	67
170	47	1	1	19,900	17,500	TSZ	35	13	70
190	39	0	0	No Streams	15,500	TSZ	47	12	64
200	5	0	0	No Streams	10,100	DSZ	33	12	49
210	10	0	0	11,100	9,200	TSZ	33	12	59
220	24	2	2	11,600	10,000	TSZ	45	16	86
230	11	0	0	No Streams	8,700	TSZ	33	12	58
240	43	1	1	9,800	7,500	TSZ	34	10	53
270	14	0	0	6,650	5,300	TSZ	34	12	66
280	9	5	5	6,400	5,700	TSZ	48	13	70
290	51	2	2	3,500	3,200	TSZ	45	13	77
310	52	1	1	13,400	10,700	TSZ	37	13	61
330	18	0	0	2,300	930	TSZ	34	13	63
360	19	6	6	100	100	TSZ	47	12	79
370	48	0	0	800	800	TSZ	44	12	74
390	82	3	3	260	260	TSZ	43	13	70
400	48	12	12	32,800	27,200	DSZ	54	14	77
Total	1065	123	123						

Notes: Shaded rows indicate stream channel proximity to LFH within 1 mile

[1] = SIZ - Stream Influence Zone, this is 1 SPT height distance from the stream

[2] = Proximity is the downstream distance through connecting stream channels to listed fish distribution or CH.

[3] = Proximity is the overground distance to LFH/CH from the closest point of the unit.

[4] = Dominant rain zone (DRZ), transient snow zone (TSZ), dominant snow zone (DSZ)

Table 2. Unit harvest treatment information.

Unit	Canopy Closure				Trees Per Acre				Relative Density				Basal Area			
	Unit		SIZ		Unit		SIZ		Unit		SIZ		Unit		SIZ	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
10	66	43	66	50	165	76	165	109	51	24	51	33	198	92	198	123
20	52	40	52	50	110	109	110	109	37	35	37	35	145	137	145	137
30	61	41	61	50	169	90	169	121	38	20	38	30	132	70	132	95
40	53	40	53	50	107	70	107	99	36	24	36	33	145	93	145	129
50	76	48	76	50	291	109	291	291	58	21	58	58	194	70	194	194
60	74	45	74	50	204	76	204	99	67	25	67	34	264	97	264	133
70	88	41	88	50	430	109	430	134	82	22	82	30	270	71	270	88
80	78	40	78	50	292	99	292	134	66	23	66	30	230	78	230	104
110	63	46	63	50	171	90	171	121	43	22	43	30	156	80	156	109
120	58	40	58	50	144	90	144	121	35	21	35	30	124	76	124	101
130	68	42	68	50	241	99	241	134	48	19	48	30	160	62	160	90
140	67	41	N/A	N/A	229	109	N/A	N/A	51	23	N/A	N/A	175	79	N/A	N/A
150	79	40	79	50	294	109	294	134	61	21	61	30	204	69	204	89
160	67	42	67	50	227	109	227	227	49	23	49	49	168	78	168	168
170	59	40	59	50	160	76	160	121	40	31	40	31	144	109	144	109
190	55	40	N/A	N/A	156	99	N/A	N/A	36	24	N/A	N/A	125	82	N/A	N/A
200	61	41	N/A	N/A	167	90	N/A	N/A	40	22	N/A	N/A	140	77	N/A	N/A
210	61	43	61	50	168	82	168	168	40	23	40	40	140	81	140	140
220	69	40	69	50	158	70	158	90	54	25	54	32	215	99	215	128
230	74	41	N/A	N/A	288	121	N/A	N/A	63	25	N/A	N/A	215	86	N/A	N/A
240	67	40	67	50	233	90	233	151	40	22	40	30	125	70	125	78
270	68	40	68	50	185	76	185	185	43	22	43	43	150	78	150	150
280	90	68	90	50	421	134	421	134	105	32	105	32	274	114	274	114
290	73	41	73	50	216	64	216	109	56	30	56	30	205	108	205	108
310	54	40	54	50	134	76	134	121	34	26	34	31	120	91	120	110
330	76	41	76	50	222	82	222	222	59	21	59	59	215	77	215	215
360	74	50	74	50	266	90	266	134	63	22	63	30	220	76	220	106
370	84	40	84	50	320	90	320	320	74	21	74	74	260	73	260	260
390	56	40	56	50	134	90	134	121	34	21	34	30	120	76	120	102
400	71	40	71	50	199	82	199	109	58	25	58	33	218	92	218	123

Note: Pre and post conditions only consider merchantable trees (>7" dbh).

N/A = No streams/SIZ in unit

Table 3. Yarding and skyline corridor information.

Unit	Acres by Yarding System		Skyline Corridors Across Streams			
			Perennial		Intermittent	
	Grd	Sky	Number of Crossings	Distance to LFH/CH (ft)	Number of Crossings	Distance to LFH/CH (ft)
10	12	30	17	33,800	3	33,800
20	0	42	0	N/A	3	29,800
30	0	52	34	29,500	4	29,500
40	0	40	2	27,200	2	27,200
50	6	0	0	N/A	0	N/A
60	52	0	0	N/A	0	N/A
70	13	26	5	23,200	0	N/A
80	34	0	0	N/A	0	N/A
110	0	44	23	18,900	3	18,900
120	57	0	0	N/A	0	N/A
130	18	0	0	N/A	0	N/A
140	24	5	0	N/A	0	N/A
150	36	8	4	18,100	0	N/A
160	36	10	0	N/A	4	18,400
170	37	10	5	19,900	7	19,900
190	20	19	0	N/A	0	N/A
200	5	0	0	N/A	0	N/A
210	10	0	0	N/A	0	N/A
220	24	0	0	N/A	0	N/A
230	11	0	0	N/A	0	N/A
240	43	0	0	N/A	0	N/A
270	14	0	0	N/A	0	N/A
280	0	9	0	N/A	0	N/A
290	51	0	0	N/A	0	N/A
310	27	25	2	13,400	3	13,400
330	0	18	0	N/A	1	2,300
360	16	3	0	N/A	0	N/A
370	38	10	0	N/A	0	N/A
390	22	60	0	N/A	1	260
400	0	48	13	32,800	0	N/A
Total	606	459	105		31	

Table 4. Aggregate and native surface haul route information.

Haul Route by road #	Season of Use[1]	Miles of Haul	Road Surface (A,N)	# of Loads	Number of Crossings Over:				Nearest Distance (ft) from Crossing To LFH by Type:		Road Length Within 100' of LFH/CH[2]
					LFH		Other Peren	Inter	Peren	Inter	
					Bridge	Culvert					
Timber and Rock Haul											
1500	D	3.50	A	180	0	0	4	16	27,200	22,400	0
1500-694	D	0.10	N	10	0	0	0	0	N/A	N/A	0
1500-700	D	1.70	A	249	0	0	3	4	16,000	16,100	0
1500-701	D	0.29	A	40	0	0	0	0	N/A	N/A	0
1500-703	D	0.20	A	40	0	0	0	0	N/A	N/A	0
1500-705	D	1.25	A	40	0	0	0	2	N/A	13,700	0
1500-708	D	0.15	A	25	0	0	0	0	N/A	N/A	0
1506	D	2.10	A	549	0	0	2	1	18,100	18,900	0
2654	YR	0.44	A	836	0	0	0	0	N/A	N/A	150
2654	D	9.86	A	2,885	0	0	16	15	600	450	0
2654-773	D	0.40	N	397	0	0	0	0	N/A	N/A	0
2654-776	D	0.10	N	5	0	0	0	0	N/A	N/A	0
2654-782	YR	2.66	A	600	0	0	0	2	N/A	2,600	0
2654-789	D	0.21	A	35	0	0	0	0	N/A	N/A	0
2654-790	D	0.70	A	220	0	0	1	0	19,100	N/A	0
2654-791	D	0.10	A	25	0	0	0	0	N/A	N/A	0
2654-792	D	0.45	A	217	0	0	1	0	23,800	N/A	0
2654-794	D	0.20	A	35	0	0	0	0	N/A	N/A	0
2654-795	D	0.40	N	336	0	0	1	0	24,800	N/A	0
2654-796	D	0.29	N	309	0	0	2	0	23,700	N/A	0
2654-797	D	0.80	A	120	0	0	1	1	31,400	31,700	0
2654-798	D	0.65	A	25	0	0	0	2	N/A	31,800	0
2654-801	D	0.10	N	30	0	0	0	0	N/A	N/A	0
2654-825	D	0.19	N	50	0	0	1	0	34,300	N/A	0
2655	YR	3.94	A	836	0	0	0	7	N/A	2,000	0
2655	D	1.10	A	225	0	0	1	3	35,800	35,800	0
2655-501	D	0.10	A	50	0	0	0	0	N/A	N/A	0
2655-503	YR	2.83	A	138	0	0	1	6	7,300	6,000	0
2655-507	YR	0.65	A	131	0	0	0	3	N/A	9,200	0
2655-509	YR	0.20	A	25	0	0	0	0	N/A	N/A	0
2655-512	D	0.20	N	5	0	0	0	0	N/A	N/A	0
2656	YR	1.12	A	549	0	0	3	3	18,100	18,900	0
	SUB-TOTAL	36.98									
Rock Haul Only											
1500	D	2.48	A	25	0	0	3	9	32,500	31,700	0
1500-690	D	0.19	A	90	0	0	0	1	N/A	26,900	0
1509	D	1.24	A	50	0	0	0	0	N/A	N/A	0
2653	D	2.16	A	40	0	0	0	1	N/A	4,700	0

2653-704	D	0.30	A	20	0	0	0	0	N/A	N/A	0
2653-708	D	0.20	A	20	0	0	0	0	N/A	N/A	0
2653-709	D	0.20	A	20	0	0	0	0	N/A	N/A	0
2653-714	D	0.16	A	20	0	0	0	0	N/A	N/A	0
2653-715	D	0.17	A	20	0	0	0	0	N/A	N/A	0
2653-720	D	0.40	A	20	0	0	0	1	N/A	6,400	0
	TOTAL	44.48			0	0	40	77			

Notes: Shaded rows indicate stream channel proximity to LFH within 1 mile

[1] Season of use: dry season only, year-round

[2] Road length within 100' of LFH is a measure of "drawbottom" roads used by haul route, does not include distance at crossings, which is already accounted for in the previous columns.

Table 5. Stream culvert installation, replacement and decommissioning.

Road Number	New Culvert Diameter	Streamflow[1]	Install/ Replace/ Decommission	Height of Fill to be Removed	Distance to LFH/CH
	Inches	Class	I/ R/ D	Feet	Feet
1500	30	P	R	15	27,100
	36	I	R	10	27,100
	30	I	R	15	27,000
	18	I	I	5	26,600
	18	I	R	5	28,100
	30	P	R	20	32,600
	18	I	R	5	31,700
	18	I	R	5	32,400
	18	I	R	5	32,400
	18	I	R	5	33,100
	18	I	R	5	33,300
	36	P	R	10	35,000
	18	I	R	5	34,500
	18	I	R	5	34,900
	18	I	R	5	39,600
1500-705	18	I	R	5	13,650
2654	18	I	R	5	450
	18	I	R	5	450
	18	I	R	5	3,100
	18	I	R	5	4,500
	18	I	R	5	10,900
	36	P	R	10	14,400
	18	I	R	5	14,400
	18	I	R	5	14,700
	18	I	R	5	14,400
	36	P	R	10	25,200
	18	I	R	5	31,900
	18	P	R	5	33,200
	18	I	R	5	33,800

	24	P	R	10	34,100
2654-796	24	P	R	15	23,600
2654-797	18	I	R	5	31,400
2655	36	I	R	10	3,500
	18	I	R	5	1,600
	18	I	R	5	4,200
	18	I	R	5	33,100
	18	I	R	5	33,200
	36	P	R	10	35,500
2655-507	18	I	I	5	9,200
	18	I	I	5	10,300
2656	36	P	R	15	18,400
	36	P	R	15	19,100
	36	P	R	15	19,000
	30	I	R	15	22,400
2654-795	84	P	D	15	28,000
	36	I	D	10	28,000
2654-812	36	I	D	10	28,800
TOTAL REPLACE		41			
TOTAL INSTALL		3			
TOTAL DECOMMISSION		3			

Notes: Shaded rows indicate stream channel proximity to LFH within 1 mile

Don't list ditch relief culverts here. List each stream crossing culvert separately

[1] = Streamflow: perennial or intermittent

Table 6. New road construction/ reconstruction and road decommissioning.

Surface-Type	Miles of New Road Construction			Miles of Road Reconstruction	Miles of Pre-existing Roads Decommissioned
	Permanent[1]	Semi-permanent[2]	Temporary[3]		
Natural	0.0	2.6	0.0	1.3	0.3
Aggregate	0.0	0.0	0.0	34.2	0.2
Paved	0.0	0.0	0.0	0.0	0.0
Total Miles	0.0	2.6	0.0	35.5	0.5

[1] Permanent – road will remain available for use after the sale ends

[2] Semi-permanent – road will be decommissioned at the end of the sale

[3] Temporary – road will be built and decommissioned within the same dry season

Construction – builds new road, reconstruction – improves existing unusable road to new road standards

Table 7. Road maintenance/renovation.

Road Number	Surface Type	Reconstruction Miles	Maintenance Miles	Number of Stream Crossings (perennial and intermittent)	Distance to LFH/CH from Nearest Crossing
1500	A	3.50	2.48	32	22,400
1500-690	A	0.00	0.19	1	26,900
1500-694	N	0.00	0.10	0	N/A
1500-700	A	1.70	0.00	7	16,000
1500-701	A	0.29	0.00	0	N/A
1500-703	A	0.00	0.20	0	N/A
1500-705	A	1.25	0.00	2	13,700
1500-708	A	0.00	0.15	0	N/A
1506	A	2.10	0.00	3	18,100
2654	A	10.30	0.00	31	450
2654-773	N	0.40	0.00	0	N/A
2654-776	N	0.00	0.10	0	N/A
2654-782	A	2.66	0.00	2	2,600
2654-789	A	0.21	0.00	0	N/A
2654-790	A	0.70	0.00	1	19,100
2654-791	A	0.00	0.10	0	N/A
2654-792	A	0.45	0.00	1	23,800
2654-794	A	0.00	0.20	0	N/A
2654-795	N	0.40	0.00	1	24,800
2654-796	N	0.29	0.00	2	23,700
2654-797	A	0.80	0.00	2	31,400
2654-798	A	0.65	0.00	2	31,800
2654-801	N	0.00	0.10	0	N/A
2654-825	N	0.19	0.00	1	34,300
2655	A	5.04	0.00	11	2,000
2655-501	A	0.00	0.10	0	N/A
2655-503	A	2.83	0.00	7	6,000
2655-507	A	0.65	0.00	3	9,200
2655-509	A	0.00	0.20	0	N/A
2655-512	N	0.00	0.20	0	N/A
2656	A	1.12	0.00	6	18,100
1509	A	0.00	1.24	0	N/A
2653	A	0.00	2.16	1	4,700
2653-704	A	0.00	0.30	0	N/A
2653-708	A	0.00	0.20	0	N/A
2653-709	A	0.00	0.20	0	N/A
2653-714	A	0.00	0.16	0	N/A
2653-715	A	0.00	0.17	0	N/A
2653-720	A	0.00	0.40	1	6,400
	TOTAL	35.53	8.95	117	

Notes: Shaded rows indicate stream channel proximity to LFH within 1 mile

Maintenance/Renovation/Reconstruction – includes blading, brushing, spot rocking, ditch cleaning

Part B - Project Consistency with Programmatic Design Criteria

In order for a project to be considered consistent with the effect determination reached under the programmatic consultation for low impact timber sales, it must be designed and implemented with specific project design criteria. Projects designed with exceptions to these criteria must independently describe how the effects associated with the planned exceptions still fall within the expected range of effects as described in the programmatic biological assessment. This form allows for the documentation that design criteria will be implemented, and provides for a process for identifying the exceptions and conducting the additional analysis to rationalize the conclusion that the effects are similar to those described in the programmatic biological assessment. Projects can not be covered by the programmatic consultation if they do not meet the criteria or if the exceptions are not properly analyzed.

Date: April 8, 2008

Project Name: Ball Park Thin

Admin Unit: Willamette National Forest – McKenzie River Ranger District

Part B – Project Consistency with Programmatic Design Criteria

Date: April 8, 2008 **Project Name:** Ball Park Thin **Admin Unit:** Willamette N.F.

A. General Criteria

The following general criteria must be met in order for a project to be eligible for coverage under this programmatic consultation:

A1. Projects must be consistent with the Standards and Guidelines found in the NW Forest Plan, and the appropriate action agency Best Management Practices for the protection of water quality.

Was PDC A1 met? ☒

A2. Timber harvest must only be planned in previously managed stands (e.g. previously harvested timber, stands planted after a fire, stands pre-commercially thinned). Stands that were planted after a fire or pre-commercially thinned are considered managed. This programmatic consultation does not cover regeneration harvest or fire salvage harvest.

Was PDC A2 met? ☒

A3. Stands to be harvested must be less than 80 years old.

Was PDC A3 met? ☒ **or varied?** ☐

A4. Timber harvest within riparian reserves must retain all legacy trees (trees left from previous harvest that are typically larger than the remaining trees in the stand), and be designed as "thin from below" to retain the dominant and/or co-dominant trees. Patch cuts (typically associated with a density management prescription), are allowed in riparian reserves, only if each resulting opening is one acre or less in size.

Was PDC A4 met? ☒

A5. Portions of these projects that occur within the NW Forest Plan Riparian Reserves must be implemented only if this work maintains or improves habitat for aquatic and riparian-dependent species.

Was PDC A5 met? ☒

A6. Streams within the project area must be protected with buffers as shown in Table 1. Within these buffers, tree felling or yarding is prohibited (with the exception of felling and yarding through skyline corridors, see specific PDC under Yarding). Stream buffers are measured from the edge of active channel (stream banks) on both sides of the stream. The minimum buffers must be expanded to include the following features, if applicable:

a. Slope break = the point of topographic change below which management will result in active erosion or introduction of material into the stream channel or floodplain area.
b. Floodprone area = area accessed by the stream during medium to large peak flow events, typically defined as 2 times the bankfull depth.
c. High water table area = wetlands, seasonally saturated soils, standing water, seeps, bogs, etc.

Table 1. Minimum Stream Protection Buffer Widths by Stream Type and Proximity to Listed Fish Habitat (LFH[1]).

Adjacent to LFH habitat	Within 1 mile of LFH	Greater than 1 mile upstream from LFH	
	Perennial and Intermittent Streams	Perennial Streams	Intermittent Streams
Maintain a minimum 100' wide buffer	Maintain a minimum 50' wide buffer	Maintain a minimum 50' wide buffer	Maintain a minimum 30' wide buffer

Was PDC A6 met? ☒ or varied? ☐ (variance only allowed on buffers greater than 1 mile upstream from LFH).

A7. Due to a risk of water contamination, fuel and other petroleum products must be stored, and refueling must occur at least 150 feet from any stream or other sensitive waterbodies.

Was PDC A7 met? ☒ or varied? ☐

A8. Unstable slopes (areas adjacent to streams with indicators of active erosion such as ravel on the surface or jack-strawed trees), or sensitive stream reaches (such as streams where the dominant channel substrate is sand), or channels with high residual impacts (i.e. bank erosion, downcutting, heavy fine sediment load) must be protected with a buffer of at least 100 feet wide from the edge of the edge of the unstable or sensitive area.

Was PDC A8 met? ☒ or varied? ☐

A9. Limit ground disturbing activities, such as mechanized falling, ground-based yarding, road construction/reconstruction/renovation, road decommissioning and landing construction, to the dry season (generally between May 15 and October 15) when the soil is more resistant to compaction and soil moisture is low.

Was PDC A9 met? ☐ or varied? ☒

A10. Changes in peak or base stream flows due to the implementation of this action must be insignificant or discountable (i.e. not measurable), based on hydrologic analysis.

Was PDC A10 met? ☒

B. Tree Felling:

B1. Trees must not be felled within the primary shade zone[2] associated with any perennial stream (with the exception of trees within skyline yarding corridors; see below).

Was PDC B1 met? ☒

B2. Thinning within the secondary shade zone on perennial streams may occur; however, at least 50% canopy closure must remain in this treated zone.

Was PDC B2 met? ☒ or varied? ☐

B3. Overlaying the above thinning criteria are these additional criteria as shown in Table 2.

Table 2. Thinning restrictions for streams near and upstream from LFH.

Stands of trees adjacent to LFH habitat, or adjacent to tributary streams within one stream mile of LFH habitat	Stands of trees adjacent to stream reaches that are greater than one mile upstream from LFH
Maintain a conifer RD[3] value of at least 30 in the stand area located between the protection buffer (Table 1) and one site potential tree height from the stream.	Maintain a conifer RD value of at least 30 within 100' from the stream.

[1] LFH = Listed Fish Habitat, defined as any stream reach potentially occupied by a ESA protected fish species, any stream reach designated as Critical Habitat, or any stream reach designated as Essential Fish Habitat.

[2] The primary shade zone is defined in the Northwest Forest Plan Temperature TMDL Implementation Strategies, USDA Forest Service and Bureau of Land Management, 2005.

[3] Relative density (RD) is defined as the basal area divided by the square root of the quadratic mean diameter

Was PDC B3 met? ☒

B4. Harvested trees that will be yarded must be felled away or parallel to the stream buffer. Trees that are inadvertently felled into the stream buffer, or trees felled to create yarding corridors within the stream buffer, must be left on site.

Was PDC B4 met? ☒

B5. Felling must not create openings greater than one acre in size.

Was PDC B5 met? ☒ or varied? ☐

B6. The distance separating a patch cut unit from LFH must be greater than the height of a site potential tree. The distance separating a patch cut unit from all other streams must be at least 100 feet.

Was PDC B6 met? ☒

C. Yarding

C1. Skyline or ground based yarding must not occur within the buffers associated with LFH. Skyline yarding over streams with LFH is acceptable if the logs can be fully suspended above the existing stream buffer tree canopy.

Was PDC C1 met? ☒

C2. Require full suspension when yarding logs over non-LFH stream channels and within their protection buffers (Table 1). Require full or one-end suspension when yarding in the remaining (outer) portion of the riparian reserve. Require full or one-end suspension with lateral skyline yarding, to the extent practicable.

Was PDC C2 met? ☒

C3. Limit the establishment of skyline yarding corridors over perennial streams to no more than five corridors per 1,000 lineal feet of stream. Individual corridor widths must not exceed 15 feet. Corridors will be spaced at least 100 feet apart (along the stream).

Was PDC C3 met? ☒

C4. The use of ground based yarding and felling equipment is prohibited:

a) on slopes exceeding 35%, and
b) within the stream protection buffers (Table 1).

Was PDC C4 met? ☒ or varied? ☐ No ground based yarding or felling equipment allowed ☐

C5. Prohibit the use of existing landings if they are:

a) within 200 feet of LFH,
b) within 200 feet of a non-LFH stream, if the potentially affected stream reach is within 0.5 miles of LFH, or
c) within 100 feet of any stream channel.

Was PDC C5 met? ☒ or varied? ☐

C6. If an existing landing within 200 feet of a stream is used, erosion control measures must be installed prior to use to prevent soil movement downslope from the landing. The landing must be rehabilitated (compacted soils fractured, seeded) after use.

Was PDC C6 met? ☒ or varied? ☐

C7. Existing landings planned for use between Oct 16 and May 14, must be surfaced with aggregate material.

Was PDC C7 met? ☒ or varied? ☐

C8. Use existing landings and skid trails to the maximum extent possible. The maximum extent of soil compaction (defined as management-caused crowding of soil particles which causes a decrease in soil porosity, and an increase in soil density) due to skid trails, corridors, and landings associated with activities in the proposed action must not be more

than 10% of the harvest unit area (i.e., regardless of the extent of existing soil compaction, not more than 10% of the harvest area may be compacted as a result of activities associated with the proposed action).

Was PDC C8 met? ☒ or varied? ☐

C9. Skid trails must not be constructed through areas with a high water table, or be located in areas that will channel water onto unstable headwall areas.

Was PDC C9 met? ☒

C10. All primary skid roads (defined as more than 5 passes by a machine) used for ground-based operations will be designated on the ground to limit extent of soil compaction.

Was PDC C10 met? ☒ or varied? ☐

C11. Where practicable, ground-based machines will place logging slash on skid trails to create slash mats for machines to walk on. These mats act as a buffer for soils during logging.

Was PDC C11 met? ☒ or varied? ☐

D. New Road and Landing Construction

No new road or landing construction, skip to E. ☐

D1. Prohibit the construction of new roads or landings within 500 feet of LFH or within 200 feet of any other stream.

Was PDC D1 met? ☐ or varied? ☒

D2. Only allow new construction on or near stable ridgetop locations, or on stable, relatively flat topography. Do not allow sidecast road construction when the hill slope exceeds 30%.

Was PDC D2 met? ☒ or varied? ☐

D3. Require an aggregate or paved surface for all new roads or landings that will be used in the wet season (generally Oct 16 to May 14).

Was PDC D3 met? ☒

D4. New road construction must not increase the stream drainage network (i.e. new roads will be outsloped, or the outflow of new ditch relief culverts or other drainage structures will not drain to streams).

Was PDC D4 met? ☒

D5. New cross drains discharge to stable slopes where the outflow will quickly infiltrate the soil and not develop a channel to a stream.

Was PDC D5 met? ☒

D6. There must be no net increase in the length of the permanent road network. Permanent roads are those that will remain as a system road after the project has been completed. The effect of new permanent road construction must be offset by the obliteration or decommissioning of an equivalent or greater length of existing road during the period of project implementation.

Was PDC D6 met? ☒ or varied? ☐

D7. When constructing new roads, the width of the compacted surface and ditch line must not be wider than 24 feet, and must be full bench construction.

Was PDC D7 met? ☒ or varied? ☐

D8. Implement erosion control measures to prevent offsite movement of disturbed or exposed soil associated with new road and landing construction (including cutbanks, fills, ditches, etc.) on road segments that have the potential to directly or indirectly deliver sediment to any stream channel. Erosion control measures include silt fences, straw bales, matting, mulch, slash, water bars, grass seed [or other products], etc. This work will occur prior to the wet season.

Was PDC D8 met? ☒

E. Road Renovation, Reconstruction, and Maintenance

E1. Limit scheduled soil disturbing timber sale road maintenance activities to the dry season (generally between May 15 and October 15), unless the road segment has no hydrologic connection.

Was PDC E1 met? ☒

E2. Do not implement scheduled road renovation or reconstruction within 200 feet of LFH.

Was PDC E2 met? ☐ **or varied?** ☒

E3. For road renovation and reconstruction, the width of the compacted surface and ditch line must not be wider than 24 feet. Road work on existing roads that are wider than 24 feet must not result in an increase in the road width.

Was PDC E3 met? ☒ **or varied?** ☐

E4. (Omitted in final review)

Was PDC E4 met? ☐ **or varied?** ☐

E5. Implement erosion control measures to prevent offsite movement of disturbed or exposed soil associated with road renovation and reconstruction (including cutbanks, fills, ditches, etc.) on road segments that have the potential to directly or indirectly deliver sediment to any stream channel. Erosion control measures include silt fences, straw bales, matting, mulch, slash, water bars, grass seed [or other products], etc. This work will occur prior to the wet season.

Was PDC E5 met? ☒

E6. Existing vegetation in **ditchlines that discharge to streams** must not be removed unless an effective sediment trap is installed and maintained until vegetation is reestablished.

Was PDC E6 met? ☒

E7. Do not grade material removed from ditchlines onto the road surface where the road surfaces are hydrologically connected to a stream. Remove and store this material and all other waste materials in a stable site which is not hydrologically connected to any stream.

Was PDC E7 met? ☒ **or varied?** ☐

E8. The installation of cross drain culverts must result in a culvert which drains to a stable hill slope with porous soils, allowing for water infiltration, with a low probability of erosion, and subsequent new channel formation that connects to an existing stream.

Was PDC E8 met? ☒

E9. Woody material removed from stream channels during culvert maintenance must be retained in the stream network. Typically this would entail repositioning wood located upstream from a culvert to a location downstream of the culvert. This activity is prohibited in LFH.

Was PDC E9 met? ☒ **or varied?** ☐

E10. Close and waterbar native surfaced roads prior to the wet season (Oct 16 and May 14) and between operating seasons to prevent use and reduce erosion.

Was PDC E10 met? ☒ **or varied?** ☐ **No natural surface roads** ☐

E11. Dust abatement is limited to the application of water only. Do not draft water from LFH. Use a screen on the drafting hose when drafting from other fishbearing streams.

Was PDC E11 met? ☒ **No dust abatement** ☐

E12. Pumping of water for use in road maintenance must allow for the retention of at least 90% of the original stream flow below the pumping site. . Do not draft water from LFH. Use a screen on the drafting hose when drafting from other fishbearing streams.

Was PDC E12 met? ☒ or varied? ☐

E13. New aggregate surfacing must use durable rock (AASHTO T210), and have no more than 15% fines (#200 sieve).

Was PDC E13 met? ☒ or varied? ☐

E14. At the termination of the sale, native surfaced roads must have drainage structures (e.g., waterbars) installed, and the road closed to prevent use, if the road is hydrologically connected to any stream,.

Was PDC E14 met? ☒ or varied? ☐ **No natural surface roads ☐**

Culvert or Bridge Replacement PDCs **No culvert or bridge replacement, skip to F ☐**

E15. Prohibit the replacement of culverts or bridges if the crossing is located:

a) on LFH,
b) on a perennial stream less than one mile upstream from LFH, or
c) on an intermittent stream less than 0.5 miles upstream from LFH.

Was PDC E15 met? ☐ or varied? ☒

E16. All new replacement culverts and bridges at stream crossings must be designed to pass at least a 100-year flood streamflow.

Was PDC E16 met? ☒

E17. Instream work must be completed during the ODFW instream work window.

Was PDC E17 met? ☒ or varied? ☐

E18. Continuous stream flow must be maintained downstream from the installation site. Replacements over streams with intermittent flow must only occur when the stream is not flowing.

Was PDC E18 met? ☒ or varied? ☐

E19. Require the complete excavation of overburden (road fill material) at each culvert replacement site prior to extracting the existing culvert.

Was PDC E19 met? ☒

E20. Replacements bridges must consist of a single span with the abutments located outside of bankfull width.

Was PDC E20 met? ☐ or varied? ☐ **No bridge replacement ☒**

E21. Abutment work areas must be isolated from any flowing water.

Was PDC E21 met? ☐ or varied? ☐ **No bridge replacement ☒**

E22. Heavy machinery is prohibited from entering the active channel area of the stream.

Was PDC E22 met? ☒ or varied? ☐

E23. Concrete will not be poured if any of the uncured concrete or contaminated wash water might enter a stream channel.

Was PDC E23 met? ☐ or varied? ☐ **No concrete use planned ☒**

F. Rock Quarry Operation **No rock quarry operation planned, skip to G ☐**

F1. Quarry operations (including interrelated activities) will not cause sediment and contaminant delivery mechanisms to any stream channel.

Was PDC F1 met? ☒

F2. Quarries located in riparian reserves will only be operated during the dry season (generally May 15 to Oct 15).

Was PDC F2 met? ☒ or varied? ☐

F3. For quarries located within one mile of LFH, do not allow any disturbance within 200 feet of any stream channel.

Was PDC F3 met? ☒ or varied? ☐

G. Road Decommissioning and Closure **No road decommissioning or closure, skip H ☐**

G1. Do not decommission roads that are within 500 feet of LFH.

Was PDC G1 met? ☒ or varied? ☐

G2. Remove all culverts, stream crossings, and cross-drains from roads that will be decommissioned (i.e. taken of the road network and will not be used again).

Was PDC G2 met? ☒ or varied? ☐

G3. Reduce the fill material over culverts left in place on roads scheduled for closure.

Was PDC G3 met? ☒ or varied? ☐

G4. Decommissioned roads must be effectively closed to all vehicle traffic.

Was PDC G4 met? ☒ or varied? ☐

G5. Closed roads must have waterbars or other water drainage features installed.

Was PDC G5 met? ☒

G6. Culverts to be removed on perennial streams must be at least one mile upstream from LFH and removals on intermittent streams must be at least 0.5 miles upstream from LFH.

Was PDC G6 met? ☒ or varied? ☐

G7. Instream work must be completed during the ODFW instream work window.

Was PDC G7 met? ☒ or varied? ☐

G8. On perennial streams, continuous stream flow must be maintained around the culvert removal site.

Was PDC G8 met? ☒

G9. Excavations to remove stream culverts would be matched to the approximate bed elevation and bank-full stream width of the existing streambed. Cuts must match natural bank slopes.

Was PDC G9 met? ☒ or varied? ☐

G10. At culvert removal sites, the road must have waterbars or other drainage features constructed to route surface water away from the newly excavated slopes.

Was PDC G10 met? ☒

G11.De-compact the decommissioned road bed on natural and aggregate surfaced roads, and use seed or other materials to establish effective ground cover prior to the wet season.

Was PDC G11 met? ☒ or varied? ☐

H. Timber Transport

There are no restrictions on the transport of timber over paved roads.

H1. Avoid haul routes that require travel over unstable road segments, if road use or failure would result in sediment delivery to any stream.

Was PDC H1 met? ☒

H2. Timber transport operations will be stopped immediately if road use is causing rutting of the road surface, ponding of water on the road, failure of any drainage structure, or any other action occurs which increases the sediment delivery to a stream. Actively implement restorative work to reduce or eliminate the erosion. The road surface must be repaired before haul can resume.

Was PDC H2 met? ☒

Dry Season Haul:

H3. Timber transport on aggregate surfaced and natural surfaced roads is allowed during the dry season (generally May 15 to Oct. 15) if the following criteria are met:

a) The approach and crossing of each LFH stream is paved or has a high quality, well drained, and recently maintained aggregate surface.

Was PDC H3a met? ☒

b) Approaches and crossings for all other streams: The ditch lines draining to these streams are densely vegetated or have other effective sediment retaining structures in place.

Was PDC H3b met? ☒ **or varied?** ☐

c) The fill slopes on all haul route stream crossings will be vegetated or otherwise stabilized such that road surface sediments are retained prior to entering the stream channel.

Was PDC H3c met? ☒ **or varied?** ☐

d) Adequate cross drainage has been installed so that there is less than 200 feet of road draining to any stream/road crossing.

Was PDC H3d met? ☐ **or varied?** ☒

Wet Season Haul: **No wet season haul, skip to I** ☐

H4. Bridges on the haul routes do not discharge runoff directly to stream (i.e., no scuppers).

Was PDC H4 met? ☐ **or varied?** ☒

H5. Timber transport is not allowed on native surfaced roads during the wet season (Oct 16 to May 14).

Was PDC H5 met? ☒ **or varied?** ☐

H6. Timber transport is allowed during the wet season (Oct 16 to May 14) on aggregate surfaced roads if the following criteria are met:

a) Aggregate surfaced haul routes must not cross LFH, or cross other streams that are within 1,000 feet from LFH. The haul route must not be closer than 500 feet of LFH at any given point.

Was PDC H6a met? ☐ **or varied?** ☒

b) Haul routes must be inspected weekly, or more frequently if weather conditions warrant. Inspections will focus on road surface condition, drainage maintenance, and sources of soil erosion and sediment delivery to streams.

Was PDC H6b met? ☒ **or varied?** ☐

c) Do not allow timber haul during periods of daily alternating freezing and thawing periods over a several day period. Haul is allowed on completely frozen or snow covered roads.

Was PDC H6c met? ☒ **or varied?** ☐

d) Hauling is not allowed when conditions exist (e.g. during intense or prolonged rainfall), that may cause generation of road related runoff to streams.

Was PDC H6d met? ☒ or varied? ☐

e) Spot rocking and/or sediment traps would be employed to reduce potential sediment inputs to streams. Sediment traps would be inspected weekly during the wet season and entrained soil would be removed when the traps have filled to ¾ capacity. Dispose of these materials in a stable site which is not hydrologically connected to any stream.

Was PDC H6e met? ☒ or varied? ☐

I. Fuels Treatment

No fuels treatments, end ☐

I1. Fuels treatment of any kind is prohibited within the stream protection buffers (Table 1).

Was PDC I1 met? ☒

I2. Lop and scatter fuels treatment is allowed outside of the protection buffers.

Was PDC I2 met? ☒ or varied? ☐

I3. Hand piling of fuels intended for burning is prohibited closer than 100 feet from any stream channel.

Was PDC I3 met? ☒ or varied? ☐

I4. Mechanical fuels treatment, or the mechanical construction of fire control line is prohibited closer than 500 feet of LFH or closer than 200 feet from any other stream channel.

Was PDC I4 met? ☒ or varied? ☐ **No mechanical fuels treatment/fireline construction ☐**

I5. Prohibit the construction of hand-built fire lines where water could be channeled into areas of instability, headwalls or streams. Construct waterbars on fire line to reduce soil erosion.

Was PDC I5 met? ☒ or varied? ☐

Project Consistency Worksheet

NLAA Thinning Sale Programmatic Consultation

Part C - PDC Variance Factor Analysis

Describe here why the proposed site specific PDC will not have an effect greater than that described in the programmatic using proximity, probability and magnitude as appropriate. Include discussion of other factors (nature, duration, timing, distribution and frequency), if applicable, that may help support define discountable or insignificant effects. Completion of this form is required for all PDCs that are varied; the analysis must be done for each indicator that is potentially affected by the PDC (see Appendix F).

VARIANCE #1

Original Element and PDC: *General Criteria – A9*: "Limit ground disturbing activities, such as mechanized falling, ground-based yarding, road construction/ reconstruction/ renovation, road decommissioning and landing construction, to the dry season (generally between May 15 and October 15) when the soil is more resistant to compaction and soil moisture is low."

Proposed PDC: The Forest Service would like to maintain the flexibility to conduct mechanized falling and ground-based yarding outside of the dry season. All other activities listed would occur during the dry season. Yarding and falling would be allowed in the winter if there is at least 10 inches of compacted snow under the track of yarding equipment in units within one mile of LFH (Units 290, 330, 360, 370, 390) and at least 6 inches of compacted snow under the track of yarding equipment in all other units scheduled for winter logging (Units 200, 210, 230, 240, 270). Yarding and falling would also be allowed outside of the riparian reserves when there is at least 6 inches of frozen soil in all these units (Figure 8). Operations would be suspended when these conditions cease to exist.

Analyze all indicators for which there is a casual mechanism. Identify those indicators which are there is no casual mechanism and explain why.

Indicator(s): Appendix F of the thinning programmatic BA (crosswalk for project design criteria and habitat indicators) lists two indicators applicable to this general criteria – [1] Suspended Sediment/ Turbidity and [2] Substrate Character and Embeddedness. Effects to all other indicators were considered, but it was determined that there was no causal mechanism that may result in effects.

[1] Suspended Sediment/ Turbidity and [2] Substrate Character and Embeddedness

Proximity: Yarding and falling in the winter could occur in Units 200, 210, 230, 240, 270, 290, 330, 360, 370 and 390 (units from which wet season haul may occur). The only units that have streams with hydrologic connection to LFH/CH are 240, 270, 290, 330, 360, 370 and 390 (Figure 3). Table 8 (a subset of Table 1) shows proximity through connecting stream channels of each unit to LFH/spring Chinook CH. Units 290, 330, 360, 370 and 390 are within 1.0 mile of LFH/CH. No-cut buffers for each unit are in accordance with PDC A6.

Table 8. Stream channel proximity to LFH/CH by unit.

Unit	Acres	Proximity to LFH/CH
240	43	9,800
270	14	6,650
290	51	3,500

330	18	2,300
360	19	100
370	48	800
390	82	260

Probability: Yarding outside of the dry season, but requiring snow cover or frozen ground has been shown to adequately protect the soil structure, resulting in the same or less compaction than yarding in the dry season (Rashin et. al. 2006). This practice was followed on the Willow timber sale (Unit 2) in the Upper McKenzie Watershed during the winter of 2006. Implementation and effectiveness monitoring conducted during and after the activity showed minimal to no effect on soil compaction or erosion and found no increase in stream turbidity.

Currently, activities in Unit 6 of the Andy timber sale in the Upper McKenzie Watershed are being monitored. On February 13 and February 26, 2008, two test holes were dug to gage the depth of snow remaining below equipment tracks. The two depths measured 10 and 20 inches of residual snow. Total snow depth was estimated to range from 30 to 36 inches. Snow density was good due to high water content, and was compacting well beneath the equipment and maintaining its integrity as evidenced by multiple passes over the same point. The only soil observed on the snow surface was from equipment sprung saplings that had uprooted, and brought soil to the surface (several in about 5 acres). We did not observe equipment tracks making contact with duff or mineral soil.

Unit 360 is proposed for winter logging and is 100 feet from Deer Creek – the nearest unit to LFH (Figure 6). The portion of the unit closest to Deer Creek – the west side – is an average of 5% slope and will be ground-based. Similarly, Units 330, 370 and 390 are an average 0 – 5% slope in ground-based portions leading to tributary streams. Nearly immeasurable soil disturbance is expected in these units from winter logging. With gentle slopes, there is near zero probability for transport of sediment to LFH.

Research and effectiveness monitoring of ground activities during the winter has shown that operating on continuous snowpack or frozen ground can minimize soil disturbance and compaction, and is often favorable to dry season operations. Based on monitoring data and professional experience, we feel that 10 inches of compacted snow is more than sufficient to ensure little to no soil disturbance. In addition, the streams within the Ball Park Thin units are adequately buffered to protect any potential, but unlikely to occur, accelerated soil erosion from the unit. The probability that sediment will be delivered to LFH/CH is extremely low, similar to or less than the level described in the low-risk thinning programmatic consultation. Therefore, the probability that either the **Suspended Sediment/Turbidity** indicator and/or the **Substrate Character and Embeddedness** will be affected is **discountable**.

Project Element and Indicator Summaries: It is probable that the variance to PDC A9 will not result in any increased chance of sediment transport to LFH/CH. Effects to these indicators are expected to be equal to or less than those described in the programmatic consultation documents.

Conclusion: The effects of the proposed action on ESA listed spring Chinook salmon and bull trout and their Critical Habitat due to this modification of the PDC, are discountable, unlikely to occur, and are consistent with the effects considered in the programmatic consultation documents.

VARIANCE #2

Original Element and PDC: *New Road and Landing Construction - D1*: "Prohibit the construction of new roads or landings within 500 feet of LFH or within 200 feet of any other stream.

Proposed PDC: Two semi-permanent spur roads will be constructed across two intermittent streams more than 500 feet from LFH – one in Unit 370 and one in Unit 290 (Figure 3).

Indicator: Analyze all indicators for which there is a casual mechanism. Identify those indicators which are there is no casual mechanism and explain why.

Indicator(s): Appendix F of the thinning programmatic BA (crosswalk for project design criteria and habitat indicators) lists five indicators applicable to this general criteria – [1] Suspended

Sediment/ Turbidity, [2] Substrate Character and Embeddedness, [3] Floodplain Connectivity, [4] Road Density and Location and [5] Riparian Reserves. Effects to all other indicators were considered, but it was determined that there was no causal mechanism that may result in effects.

Proximity: Two semi-permanent spur roads will be constructed across two intermittent streams. One is in Unit 370 and is 1,400 feet from LFH. The other is in Unit 290 and is 4,000 feet from LFH.

[1] Suspended Sediment/ Turbidity and [2] Substrate Character and Embeddedness

Probability: These two semi-permanent roads are both situated in existing plantations on flat or nearly flat ground near ridge tops, at the headwaters of very small intermittent streams. Downstream from the proposed road locations, both streams re-enter mature forests that provide an abundant supply of large wood to these streams. Large wood in these streams combine with boulder-cobble substrate to result in very large storage capacity for fine sediment.

Standard mitigation will include both construction and removal of these roads during dry conditions when these streams are not flowing water. During the short life of these roads (less than two years), disturbed soils created by construction or removal activities will be re-vegetated. During periods when the roads are not actually in use, they will be water-barred to prevent concentration of surface run-off and sediment.

Past experience with installation and removal of this type of road with the inclusion of required mitigation is that a minimal amount of sediment (approximately 0.5 cubic yards; Kretzing, pers. com.) will be introduced into the dry stream channel at time of construction and again at the time of removal. The relatively small amounts of sediment that will be produced by these activities will be easily stored by downstream portions of these intermittent streams before reaching LFH.

Due to the site-specific conditions of the two semi-permanent spur roads and intermittent stream crossings in addition to the mitigation measures, the likelihood of transporting sediment to LFH/CH is very low. Therefore, the probability that either the **Suspended Sediment/Turbidity** indicator and/or the **Substrate Character and Embeddedness** will be affected is **discountable**.

Project Element and Indicator Summaries: It is probable that the variance to PDC D1 will not result in any increased chance of sediment transport to LFH/CH. Effects to these indicators are expected to be equal to or less than those described in the programmatic consultation documents.

[3] Floodplain Connectivity, [4] Road Density and Location and [5] Riparian Reserves.

Probability: These small intermittent streams do not have meaningful floodplains at the proposed road locations. With the absence of floodplains associated with these small streams at the proposed crossing locations, impacts to floodplain connectivity are not anticipated. The proposed roads are situated in existing plantations and will be removed after two years. As a result of the short duration of their use, they are not expected to have a lasting impact on Riparian Reserves, and their use will facilitate treatments that will accelerate the restoration of late successional stand structures within the Riparian Reserves of these streams.

Project Element and Indicator Summaries: It is probable that the variance to PDC D1 will not result in any change to floodplain connectivity, permanent road density or riparian reserves. Effects to these indicators are expected to be equal to or less than those described in the programmatic consultation documents.

Conclusion: The effects of the proposed action on ESA listed spring Chinook salmon and bull trout and their Critical Habitat due to this modification of the PDC, are discountable, unlikely to occur, and are consistent with the effects considered in the programmatic consultation documents.

VARIANCE #3
Original Element and PDC: ***Road Renovation, Reconstruction and Maintenance – E15***:
"Prohibit the placement of culverts or bridges if the crossing is located:
a) on LFH; b) on a perennial stream less than one mile upstream from LFH; or c) on an intermittent stream less than 0.5 miles upstream from LFH. "

Proposed PDC: There are 3 culverts on intermittent streams within 0.5 miles of LFH that need to be replaced (Figures 4 and 5).

Analyze all indicators for which there is a casual mechanism. Identify those indicators which are there is no casual mechanism and explain why.

Indicator(s): Appendix F of the thinning programmatic BA (crosswalk for project design criteria and habitat indicators) lists two indicators applicable to this general criteria – [1] Suspended Sediment/ Turbidity and [2] Substrate Character and Embeddedness. Effects to all other indicators were considered, but it was determined that there was no causal mechanism that may result in effects.

[1] Sediment/ Turbidity and [2] Substrate Character and Embeddedness

Proximity: Two of the three culvert replacements on intermittent streams are 450' from LFH and one is 1,600' from LFH (Figures 4 and 5). All other culvert replacements are over 0.5 miles from LFH.

Probability: All three of the intermittent streams will be completely dry when culvert replacements occur. Approximately 0.5 cubic yards of sediment per crossing is expected to be mobilized (Kretzing, pers. com.). The stream 1,600 feet from LFH, empties into Trail Bridge Reservoir. Any potential mobilized sediment will settle out and will have negligible effect on ESA listed species or their habitat.

The two intermittent streams within 450 feet of LFH have a slightly higher probability of transporting fine sediment to listed fish habitat (Deer Creek). However, such increases are likely to be of local extent and of short duration. The 450 feet of each channel is

sufficiently complex to store mobilized sediment due to the presence of instream wood and channel roughness. These streams predominantly consist of boulder/cobble substrate and are relatively low gradient. To minimize potential effects, we will seed exposed soil to stabilize sediment before fall runoff begins. Due to channel conditions, the probability of transporting sediment to LFH/CH is very low.

Although there is very little potential to transport sediment from culvert replacements to LFH, sediment and turbidity increases are expected to be negligible in comparison to current levels. The two culvert replacements nearest LFH have the potential to mobilize a total of 1.0 cubic yard of sediment (Kretzing, pers. comm.). Based on average sediment yields of streams in the Pacific Northwest (Dunne and Leopold 1978), Deer Creek sub-watershed has an annual sediment yield of 8,200 cubic yards. This includes considerable sediment input from natural earth flow processes and an extensive existing road network. The vast majority of the annual sediment yield occurs during episodic events in the wet season, the same time any sediment yield from the culvert replacements would occur. Even if 100% of the estimated sediment yield (1 cubic yard) made it to LFH, it would only be an estimated 0.01 – 0.02% increase above current levels*. This level of increase above existing conditions is considered negligible.

Not only is the probability that measurable sediment, generated by the two culvert replacements, will reach LFH very low, but the probability of any sediment intercepting a redd or causing take on any lifestage of Chinook or bull trout is near zero or zero. Stillwater Sciences conducted snorkel surveys during relicensing studies (2004-2005). They did not observe any juvenile Chinook in Deer Creek. They did see sub-adult bull trout in Deer Creek, presumably foraging. The Forest Service has conducted redd surveys in lower Deer Creek, but no spawning Chinook have been documented. Typically, the flows are much too low in the Fall for adult Chinook to access the stream. Temperature is likely an impeding factor as well. The average temperature of lower Deer Creek is approximately 19 degrees Celsius during the spawning season, and the McKenzie River is around 10 degrees Celsius. Based on field monitoring and observation and professional judgement, adult Chinook likely bypass Deer Creek as a potential spawning area and head up the McKenzie River.

Because culvert replacements will take place when streams are dry, areas with disturbed soil will be re-vegetated before fall runoff, the likelihood of transporting sediment to LFH/CH is very low. If any amount of sediment is transported to LFH, it will be of local extent and of short duration, and is considered negligible compared to existing levels. In addition, because there is no documented Chinook or bull trout spawning and likely very little rearing, there is virtually zero probability that take will occur. Therefore, any negative effects to the **Suspended Sediment/Turbidity** and/or the **Substrate Character and Embeddedness** indicators are expected to be **of discountable probability.**

Project Element and Indicator Summaries: It is probable that the variance to PDC E15 will not result in any measurable increase in sediment to LFH/CH. Effects to these indicators are expected to be equal to or less than those described in the programmatic consultation documents.

Conclusion: The effects of the proposed action on ESA listed spring Chinook salmon and bull trout and their Critical Habitat due to this modification of the PDC, are discountable, unlikely to occur, and are consistent with the effects considered in the programmatic consultation documents.

**Considering 50 – 100% of the estimated average annual sediment yield occurs during the wet season, then 1 cubic yard of generated sediment would be approximately 0.01 – 0.02% increase.*

VARIANCE #4

Original Element and PDC: ***Timber Transport – Dry Season Haul – H3d:*** "Timber transport on aggregate surfaced and natural surfaced roads is allowed during the dry season (generally May 15 to Oct. 15) if the following criteria are met: d) Adequate cross drainage has been installed so that there is less than 200 feet of road draining to any stream/road crossing. "

Proposed PDC: Forest Service roads throughout the Ball Park action area, to be used for timber and rock haul, have cross drains that range from 200-500 feet from the nearest stream crossings. The existing road location, slope, surface and ditchline condition and drainage features are such that the cross drain spacing will adequately protect water quality.

Analyze all indicators for which there is a casual mechanism. Identify those indicators which are there is no casual mechanism and explain why.

Indicator(s): Appendix F of the thinning programmatic BA (crosswalk for project design criteria and habitat indicators) lists two indicators applicable to this general criteria – [1] Suspended Sediment/ Turbidity and [2] Substrate Character and Embeddedness. Effects to all other indicators were considered, but it was determined that there was no causal mechanism that may result in effects.

[1] Suspended Sediment/ Turbidity and [2] Substrate Character and Embeddedness

Proximity: There are 34 perennial and 63 intermittent stream crossings along the entire length of the haul route – most are several miles from LFH. There are 15 intermittent stream crossings within 1 mile of LFH/spring Chinook CH. There are only 2 perennial streams within 1 mile of LFH/CH that will likely be flowing during dry season haul – approximately 600 feet and 1,000 feet (Fritz Creek) from LFH/CH. On all roads, the existing cross drains have been installed approximately 200-500 feet above each stream crossing.

Probability: Where constructed cross drains are over 200 feet from stream crossings, the existing roadway between structures are designed and maintained so that they are self-draining to the outslope side of the road and eliminate concentration of sediment-carrying runoff. Most roads, including Road 2654 that parallels Deer Creek and Road 2655 that crosses into the Smith River 6th Field Sub-watershed (Figure 4), are low gradient roads with well vegetated ditchlines. Prior to the timber sale, all roads will be surfaced with high quality aggregate.

Field reconnaissance and years of field observation of haul roads throughout the Deer Creek sub-watershed, with cross drains more than 200 feet from stream crossings, has shown little evidence of surface transport of fine sediment to streams in all weather and seasonal conditions. The self-draining roads reduce the amount of water delivered to ditchlines, and the water that does get captured quickly infiltrates the soil before reaching the stream crossing. Any amount of surface erosion that occurs is adequately captured by vegetated ditchlines. With increased traffic in the wet season, there may be more fines generated, but there will be no increase in the amount of runoff. Since water currently is dissipated before reaching stream crossings, no increased sediment is expected to occur in streams.

Due to the existing road locations, slope, surface and ditchline conditions at the only 2 perennial streams within 1 mile of LFH, the likelihood of transporting sediment to LFH/CH is very low. Therefore, the probability that either the **Suspended Sediment/Turbidity** indicator and/or the **Substrate Character and Embeddedness** will be affected is **discountable**.

Project Element and Indicator Summaries: It is probable that the variance to PDC H3d will not result in any increased chance of sediment transport to LFH/CH. Effects to these indicators are expected to be equal to or less than those described in the programmatic consultation documents.

Conclusion: The effects of the proposed action on ESA listed spring Chinook salmon and bull trout and their Critical Habitat due to this modification of the PDC, are discountable, unlikely to occur, and are consistent with the effects considered in the programmatic consultation documents.

VARIANCE #5
Original Element and PDC: ***Timber Transport – Wet Season Haul – H4***: "Bridges on the haul routes do not discharge runoff directly to streams (i.e., no scuppers). "

Proposed PDC: There is one bridge on the proposed wet season haul route that has scuppers. The Forest Service would like the flexibility to haul over this bridge with the scuppers plugged (Figure 6). Included in the contract will be standard provisions that require the contractor to monitor and suspend haul if sediment transport to streams is observed, and require them to implement erosion control measures to contain sediment (BT 6.6 and BT 6.02).

Indicator: Analyze all indicators for which there is a casual mechanism. Identify those indicators which are there is no casual mechanism and explain why.

Indicator(s): Appendix F of the thinning programmatic BA (crosswalk for project design criteria and habitat indicators) lists three indicators applicable to this general criteria – **[1] Suspended Sediment/ Turbidity, [2] Substrate Character and Embeddedness and [3] Chemical Contaminants/Nutrients.** Effects to all other indicators were considered, but it was determined that there was no causal mechanism that may result in effects.

Proximity: This bridge crosses LFH/spring Chinook CH at the lower end of Deer Creek on Road 2654 (Figure 6).

[1] Suspended Sediment/ Turbidity, [2] Substrate Character and Embeddedness and [3] Chemical Contaminants/Nutrients

Probability: The bridge is concrete and the road on the west side of the bridge is paved all the way to Highway 126. The apron on this side is sloped away from the bridge at <1% grade. The road on the east side of the bridge is high quality aggregate, with an apron sloping toward the bridge at <1% grade. The side slopes are densely vegetated and there is no evidence of surface transport of fine sediment to streams. The ditchlines adequately capture any amount of surface erosion.

As a precautionary measure, the scuppers on the bridge will be plugged. Drainage will occur on the downslope side of the bridge toward the paved side (west side). The road is arched, so any potential runoff will occur in both ditches, which are densely vegetated.

Due to the existing condition of the adjacent aggregate road surface, the plugging of scuppers, and ditchline conditions, the likelihood of transporting sediment or chemical contaminants to LFH/CH is very low. Therefore, the probability that either the **Suspended Sediment/Turbidity** indicator, the **Substrate Character and Embeddedness** and/or **Chemical Contaminants/Nutrients** will be affected is **discountable**.

Project Element and Indicator Summaries: It is probable that the variance to PDC H4 will not result in any increased chance of sediment transport to LFH/CH. Effects to these indicators are expected to be equal to or less than those described in the programmatic consultation documents.

Conclusion: The effects of the proposed action on ESA listed spring Chinook salmon and bull trout and their Critical Habitat due to this modification of the PDC, are discountable, unlikely to occur, and are consistent with the effects considered in the programmatic consultation documents.

VARIANCE #6

Original Element and PDC: ***Timber Transport – Wet Season Haul – H6a***: "Aggregate surfaced haul routes must not cross LFH, or cross other streams that are within 1,000 feet from LFH. The haul route must not be closer than 500 feet of LFH at any given point. "

Proposed PDC: There is approximately 5,400 feet of proposed wet season haul route that is closer than 500 feet of LFH/spring Chinook CH (Figure 6). The Forest Service would like the flexibility to haul on this section.

Indicator: Analyze all indicators for which there is a casual mechanism. Identify those indicators which are there is no casual mechanism and explain why.

Indicator(s): Appendix F of the thinning programmatic BA (crosswalk for project design criteria and habitat indicators) lists two indicators applicable to this general criteria – **[1] Suspended Sediment/ Turbidity and [2] Substrate Character and Embeddedness.** Effects to all other indicators were considered, but it was determined that there was no causal mechanism that may result in effects.

[1] Suspended Sediment/ Turbidity and [2] Substrate Character and Embeddedness

Proximity: Approximately 5,400 feet of proposed wet season haul route is closer than 500 feet of LFH/spring Chinook CH near the lower end of Deer Creek - two small segments of Road 2654 and Road 2654-782. Within these road segments there are no stream crossings.

Probability: Both of these road segments are required to be surfaced with high quality aggregate prior to haul and are nearly flat (1- 3% slope). The roads are located on relatively flat terraces with gentle slopes leading down to Deer Creek LFH (Figure 6). The roads are crowned and the ditchlines are well vegetated and adequately capture any amount of surface erosion. Between the road and LFH/CH is vegetated side slope with proper drainage. In addition, this terrain consists of highly porous, alluvial materials that readily infiltrate roadway runoff within a short distance of the road.

Due to road and side slope conditions and infiltrative soils, the likelihood of transporting sediment to LFH/CH is extremely low. Therefore, the probability that either the **Suspended Sediment/Turbidity** indicator and/or the **Substrate Character and Embeddedness** will be affected is **discountable**.

Project Element and Indicator Summaries: It is probable that the variance to PDC H6a will not result in any increased chance of sediment transport to LFH/CH. Effects to

these indicators are expected to be equal to or less than those described in the programmatic consultation documents.

Conclusion: The effects of the proposed action on ESA listed spring Chinook salmon and bull trout and their Critical Habitat due to this modification of the PDC, are discountable, unlikely to occur, and are consistent with the effects considered in the programmatic consultation documents.

VARIANCE #7
Original Element and PDC: ***Road Reconstruction, Renovation and Maintenance – E2***: "Do not implement scheduled road renovation or reconstruction within 200 feet of LFH. "

Proposed PDC: There is approximately 800 feet of proposed haul road, closer than 200 feet of LFH/ Chinook CH, which is scheduled for reconstruction (Figure 7). The Forest Service would like the flexibility to undergo reconstruction on these sections.

Indicator: Analyze all indicators for which there is a casual mechanism. Identify those indicators which are there is no casual mechanism and explain why.

Indicator(s): Appendix F of the thinning programmatic BA (crosswalk for project design criteria and habitat indicators) lists four indicators applicable to this general criteria – **[1] Suspended Sediment/ Turbidity, [2] Substrate Character and Embeddedness, [3] Temperature and [4] Large Woody Debris.** Effects to all other indicators were considered, but it was determined that there was no causal mechanism that may result in effects.

Proximity: Approximately 800 feet of proposed haul road is closer than 200 feet of LFH/ Chinook CH and is scheduled for reconstruction (Figure 7). Road 2654-782 has two small segments – 450 and 200 feet – that are within 200 feet of Deer Creek (Figure 7). Approximately 150 feet of Road 2654 is within 200 feet of LFH. Within these three road segments there is no hydrologic connection to Deer Creek.

[1] Suspended Sediment/ Turbidity and [2] Substrate Character and Embeddedness

Probability: Road reconstruction will occur only in the dry season. These road segments are nearly flat (1-3% grade) and are located on flat terraces with gentle slopes leading down to Deer Creek (Figure 7). The roads are crowned and the ditchlines are well vegetated and adequately capture any amount of surface erosion. Between the road and LFH is heavily vegetated side slope with proper drainage. In addition, this terrain consists of highly porous, alluvial materials that readily infiltrate roadway runoff within a short distance of the road.

Due to road location, side slope conditions and no hydrologic connection with Deer Creek, the likelihood of transporting sediment to LFH/CH is extremely low. Therefore, the probability that either the **Suspended Sediment/Turbidity** indicator and/or the **Substrate Character and Embeddedness** will be affected is **discountable**.

Project Element and Indicator Summaries: It is probable that the variance to PDC E2 will not result in any increased chance of sediment transport to LFH/CH. Effects to these indicators are expected to be equal to or less than those described in the programmatic consultation documents.

[3] Temperature

Probability: Road reconstruction and maintenance on these three road segments will include relocating trees and shrubs that occur within the existing road prism or that have fallen over the road (i.e. no overstory trees will be cut). Within 200 feet of LFH, all woody debris will be retained on-site. Because there are no streams or hydrologic connection within these road segments, removal of these trees and shrubs will not affect existing shade over streams. Therefore, there is **discountable** probability of affecting temperature in reaches where listed fish occur.

Project Element and Indicator Summaries: It is probable that the variance to PDC E2 will not result in any increase in stream temperature. Effects to this indicator is expected to be equal to or less than those described in the programmatic consultation.

[4] Large Woody Debris

Probability: Any trees or shrubs that reside or have fallen within the road prism, within 200 feet of LFH, will be moved and retained on-site. Because all woody debris will be retained, there is **discountable** probability of affecting the **Large Woody Debris** indicator in reaches where listed fish occur.

Project Element and Indicator Summaries: It is probable that the variance to PDC E2 will not result in any decrease in large woody debris. Effects to this indicator are expected to be equal to or less than those described in the programmatic consultation.

Conclusion: The effects of the proposed action on ESA listed spring Chinook salmon and bull trout and their Critical Habitat due to this modification of the PDC, are discountable, unlikely to occur, and are consistent with the effects considered in the programmatic consultation.

Literature Cited

Dunne, Thomas and Luna B. Leopold. 1978. Water in Environmental Planning. San Francisco: W. H. Freeman and Company.

Kretzing, Dave. District Hydrologist. Personal communication. McKenzie River Ranger District. McKenzie Bridge, Oregon.

Rashin et. al. 2006. Effectiveness of Timber Harvest Practices for Controlling Sediment Related Water Quality Impacts – Journal of the American Water Resources Association October 2006.

Stillwater Sciences. 2006. Fish population distribution and abundance at the Carmen-Smith Hydroelectric Project, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Part D - Project Certification

Project Title: Ball Park Thin

Administrative Unit: Willamette National Forest – McKenzie River Ranger District

Biologist Certification: I have reviewed the above project and have determined that it meets the terms of the TS Programmatic Biological Assessment, and that the appropriate determination of effect for this project is "May Affect, Not Likely to Adversely Affect" the ESA listed fish and/or critical habitat as listed in the project description.

I have also concluded that the effect to any EFH for any species protected by the MSA does not exceed the May Affect threshold.

Fish Biologist (preparer): Kate M. Meyer **Date:** April 8, 2008

Level 1 Team Certification (Sign Below): **Date:**

We have reviewed this project information and find that it is consistent with the programmatic timber sale consultation Biological Assessment and Letter of Concurrence

Chuck Westfall 3/25/08

Traci J Hickman 4-7-2008

Robert Lundquist 4-8-2008

(Robert Markle) 4-8-2008

John K Casteel 4/8/08

Walt E L 4/8/08 Willamette NF

Brad Gehrke 4/8/08

Figure 1. Ball Park Vicinity Map

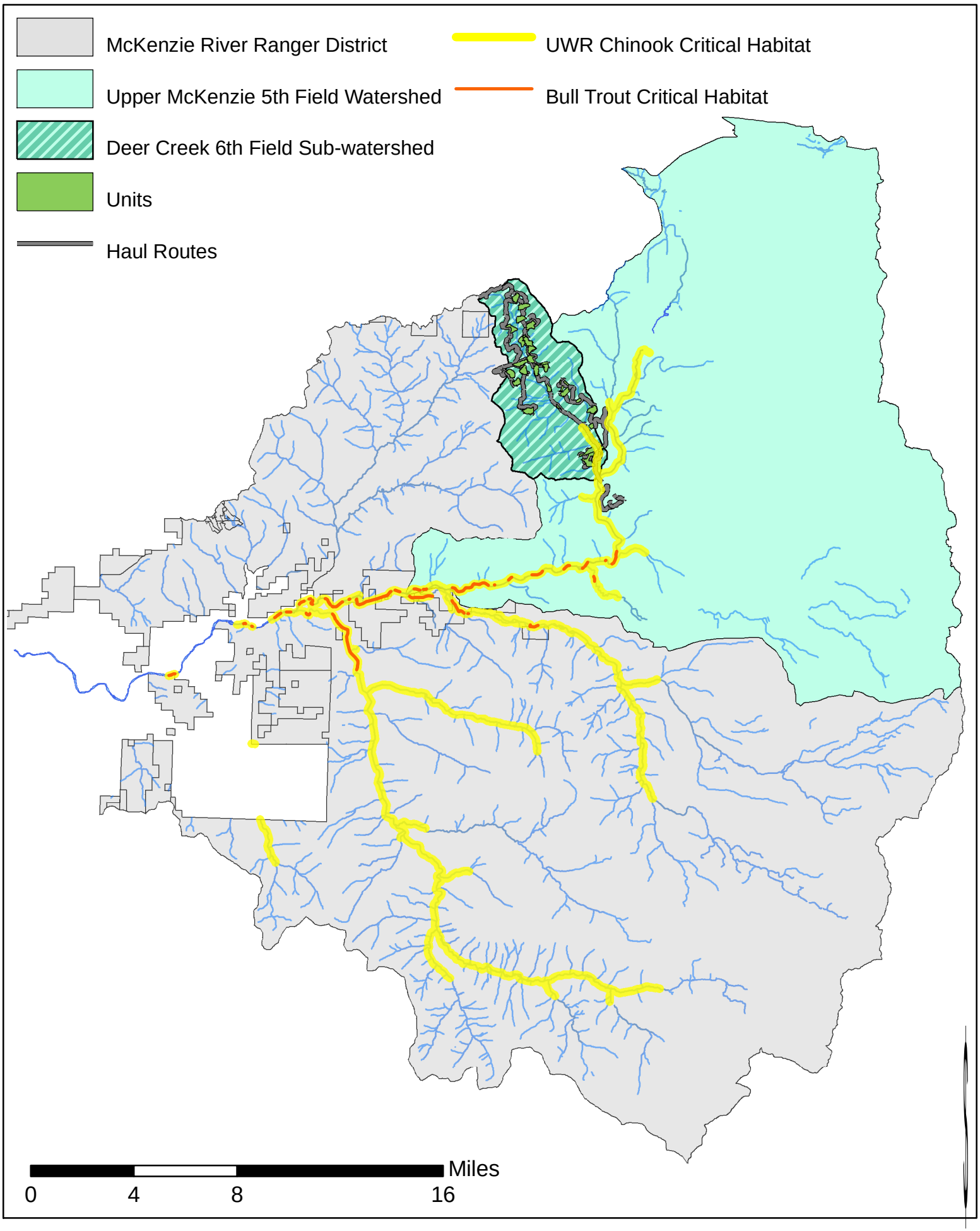


Figure 2. Ball Park Action Area

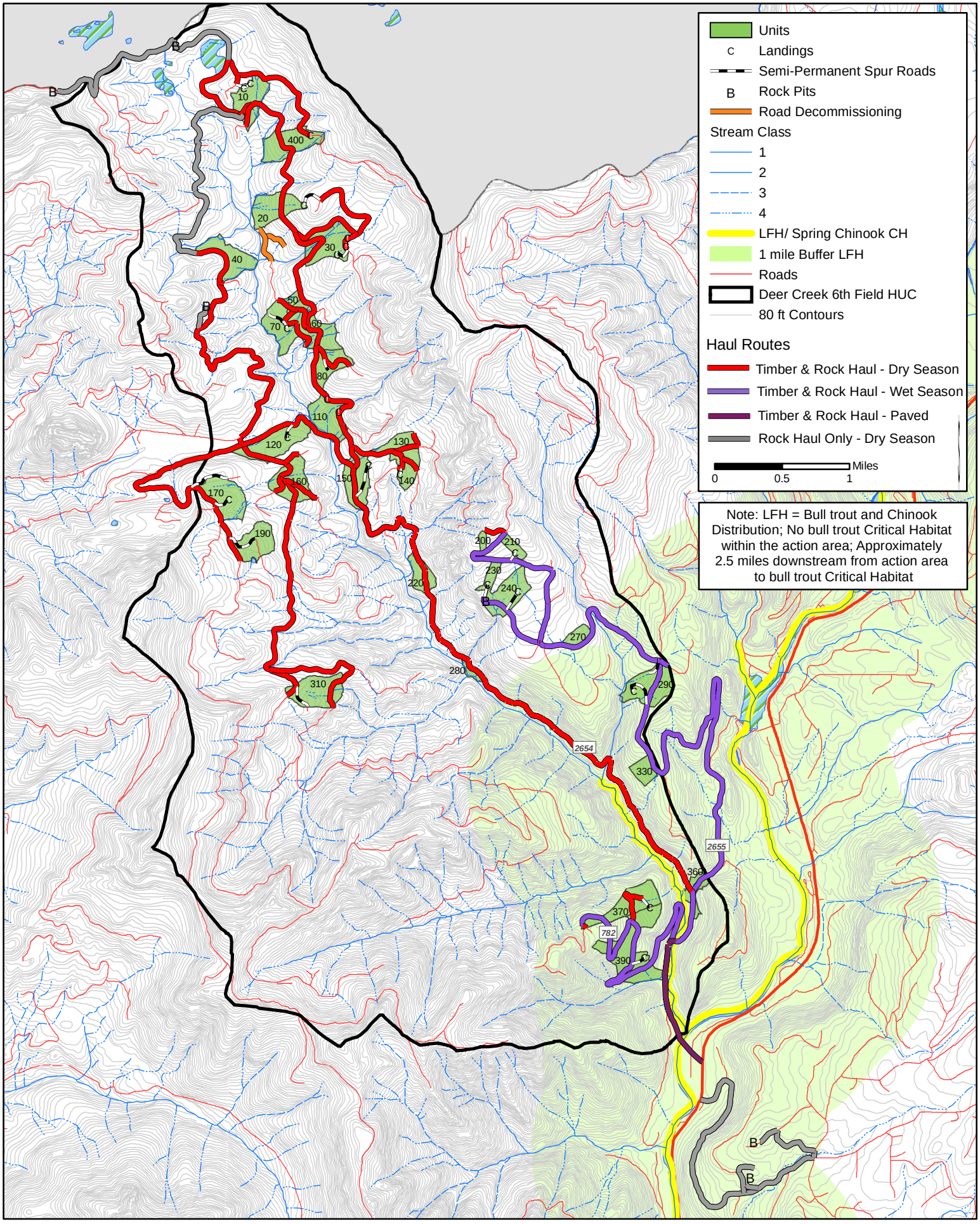


Figure 3. Bull Trout and Spring Chinook Habitat and Spring Chinook Critical Habitat Within the Ball Park Action Area

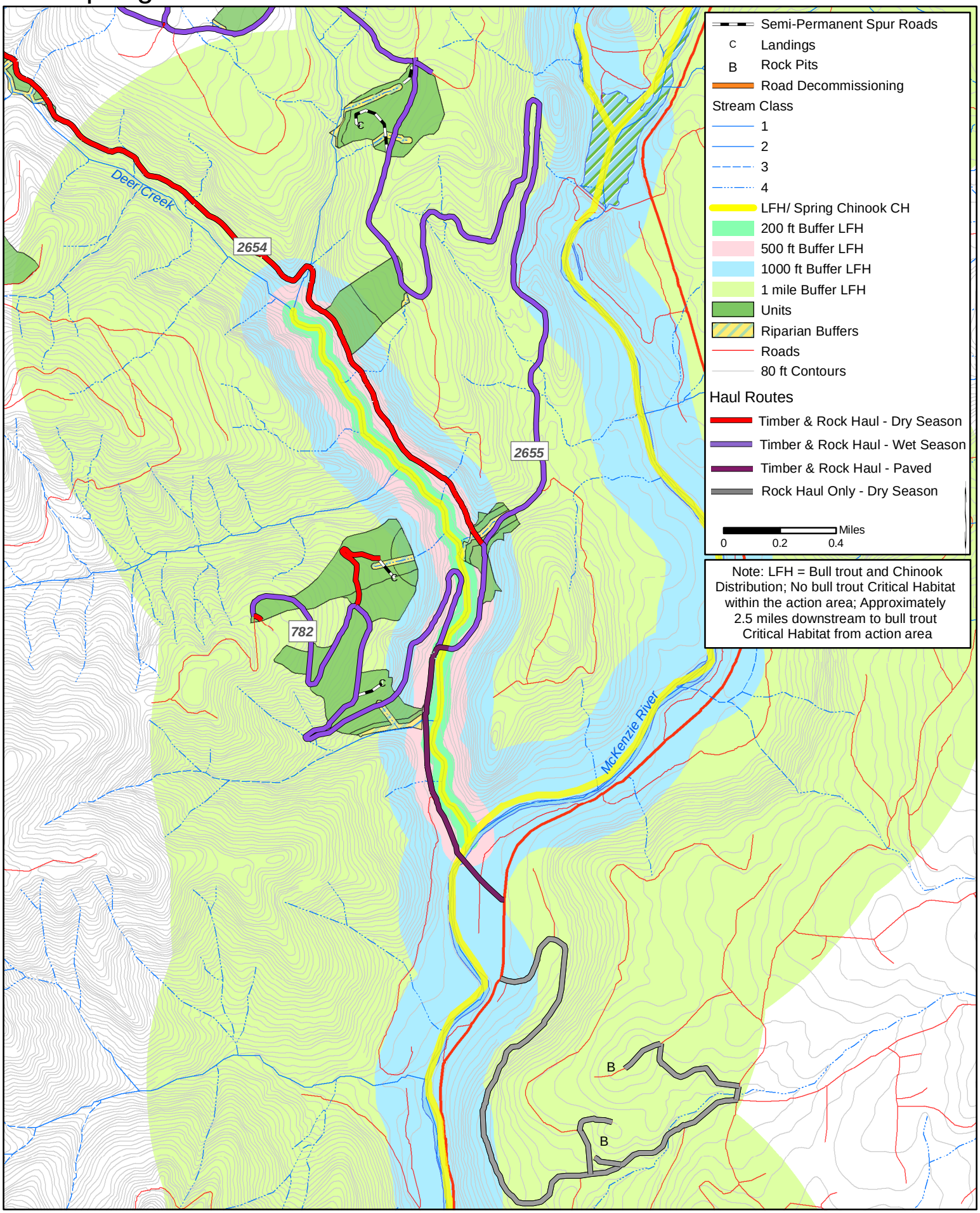


Figure 4. Culvert Replacement, Installation and Decommissioning

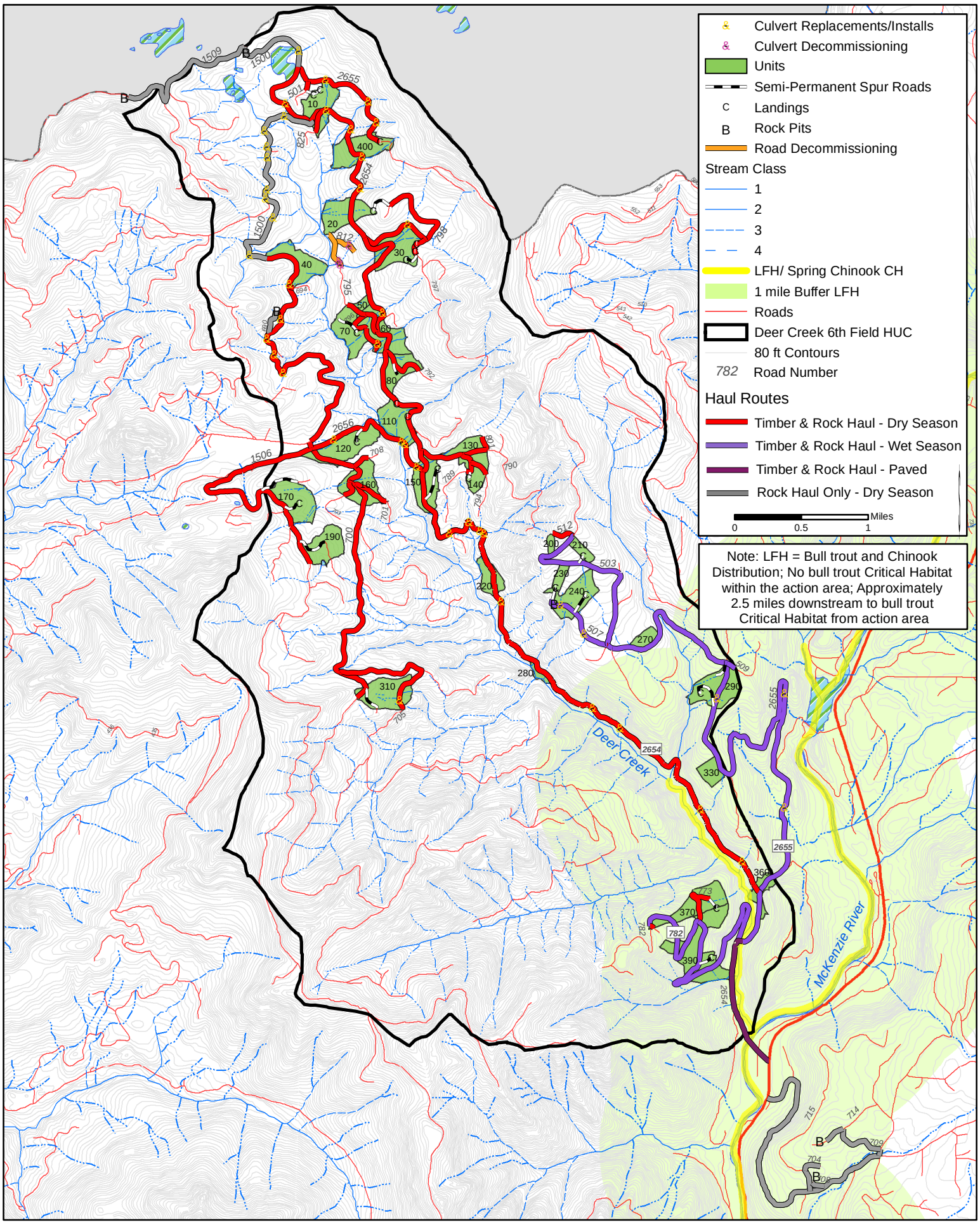


Figure 5. Culvert Replacements Near Listed Fish Habitat

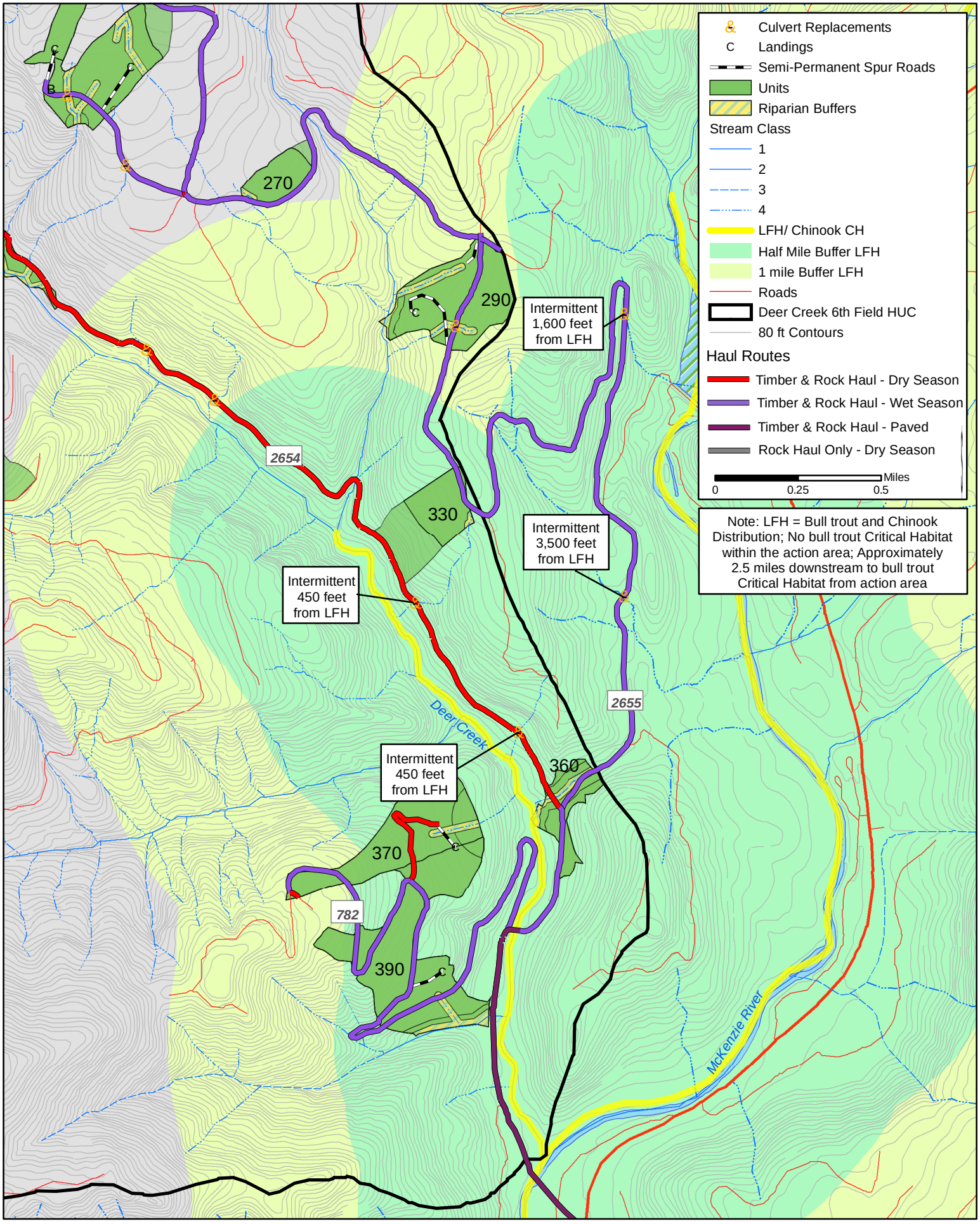


Figure 6. Wet Season Haul Route in Close Proximity to LFH

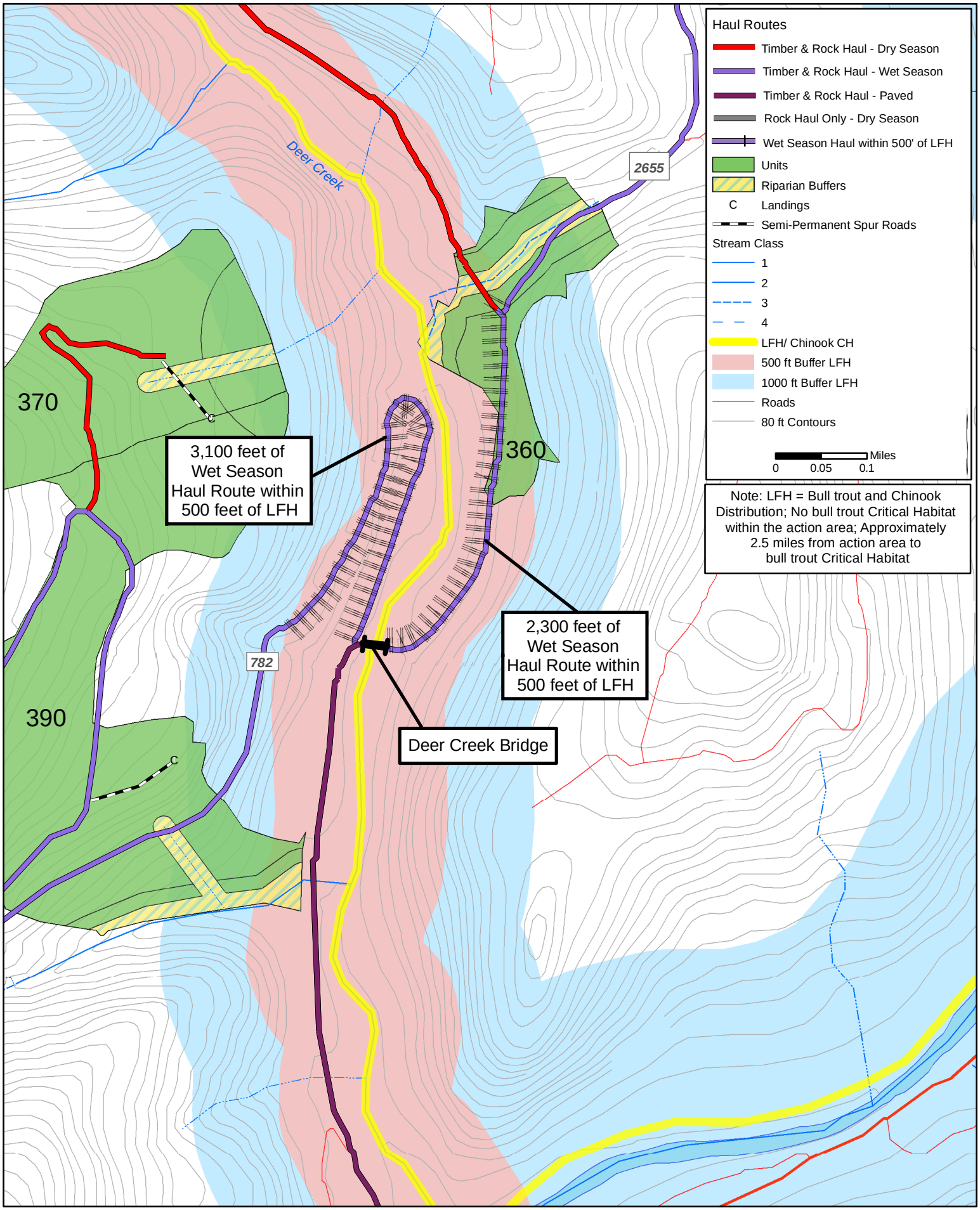


Figure 7. Road Reconstruction within 200 feet of LFH

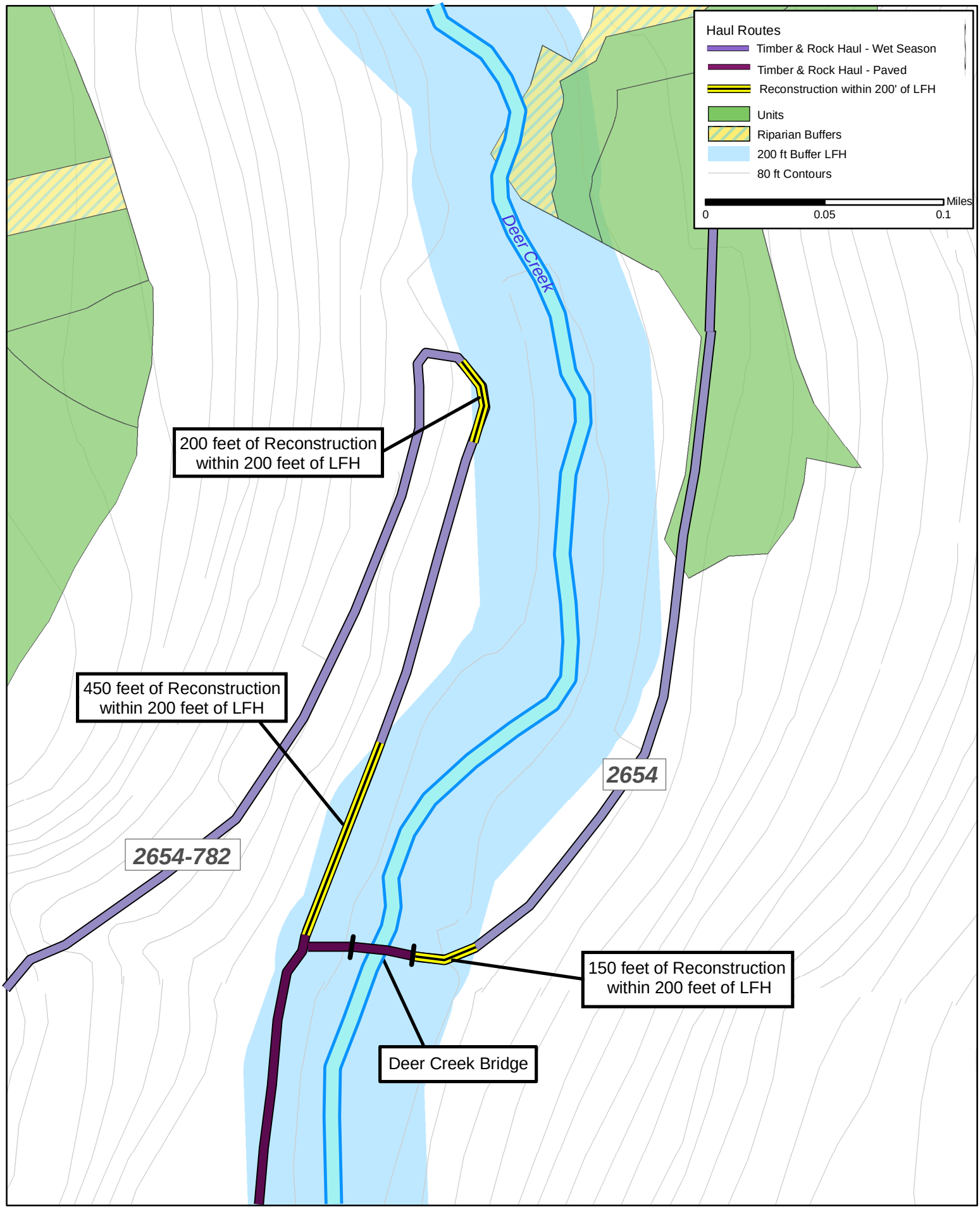
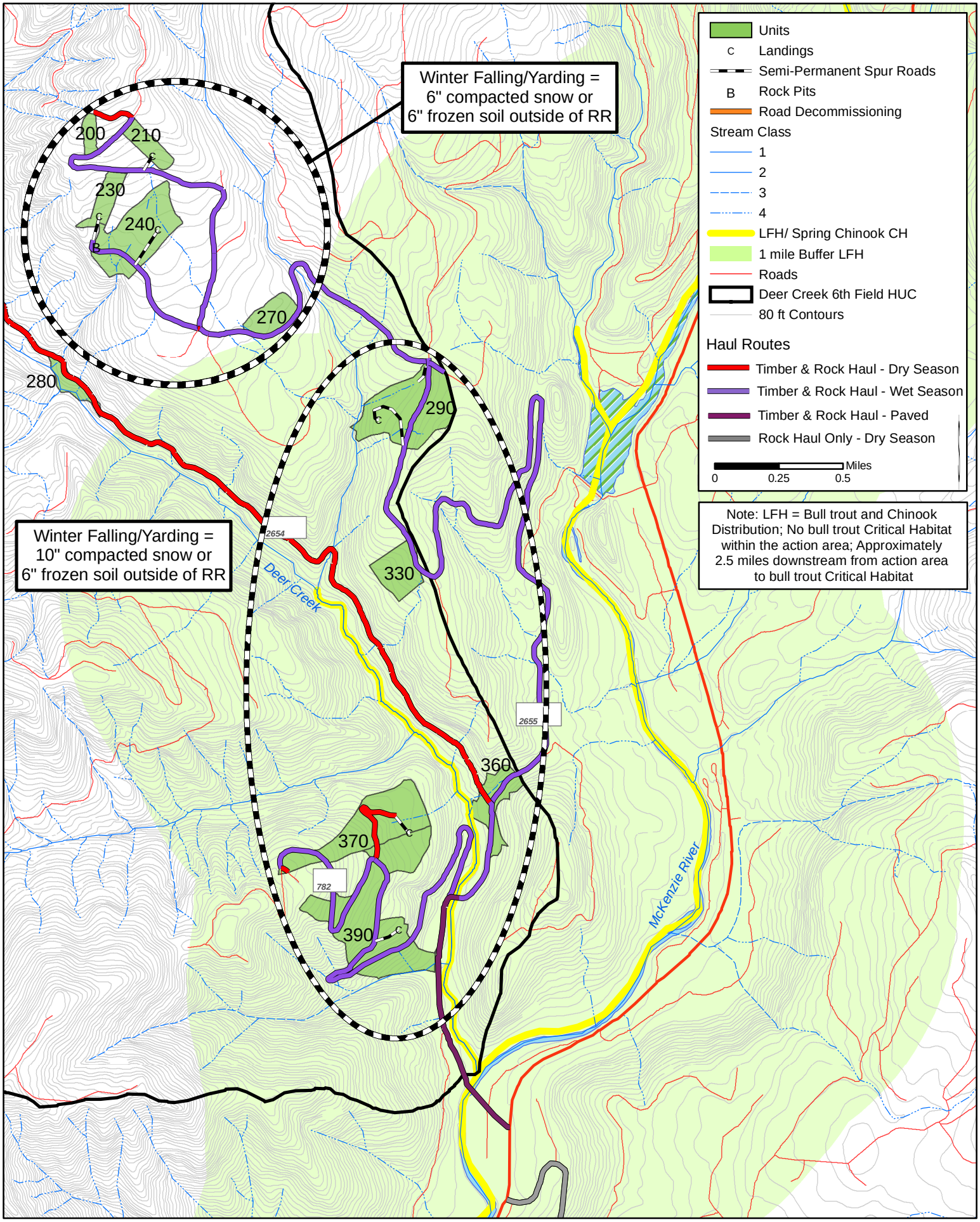


Figure 8. Ball Park Proposed Winter Falling/Yarding



File Code: 2670 **Date:** May 5 , 2008
Route To:

Subject: Botanical Resource Report-Ball Park Thin Project

To: Ball Park Thin Team Leader/Analysis Files

I. Introduction

Purpose:

The purpose of this report is to review the Ball Park Thin project in sufficient detail as to determine whether the proposed action will result in a trend toward Federal listing of any sensitive botanical species.

Forest management activities that may impact populations of or alter habitat for PETS (proposed, endangered, threatened, or sensitive) species require a Biological Evaluation (FSM 2671.44) to be completed. The Biological Evaluation process (FSM 2672.43) is used to assist in determining the possible effects the proposed management activities have on:

A. Species listed or proposed to be listed as endangered (E) or threatened (T) by the U.S. Fish and Wildlife Service (FWS).

B. Species listed as sensitive (S) by the USDA Forest Service, Region 6. There are 73 plants listed on the Regional Forester's Sensitive Botanical List that are documented or suspected to occur on the Willamette National Forest (Attachment 1).

II. Description of the Proposed Project

Location:
The Ball Park Thin Project area is within the Deer Creek Subwatershed (6^{th} field) of the Upper McKenzie Watershed (5^{th} field) on the McKenzie River Ranger District. The project area consists of 14,508 acres located northwest of the McKenzie River, east of the H. J. Andrews Experimental Forest, and south of the District boundary that is adjacent to the Sweet Home District. Major drainages include Deer Creek, Budworm Creek, Fritz Creek, and Carpenter Creek.

Legal description of the project: T.14S, R.6E, Sec. 20,28-30,32,33; T.15S, R.6E, Sec. 3-6, 8-11, 14-16,22,23; Willamette Meridian; Lane and Linn Counties, Oregon.

Proposed Action:
The McKenzie River Ranger District proposes to conduct activities on approximately 1,160 acres of the Bridge Project Area. The proposed activity acres include timber harvest (1064), fuel treatments (91), and rock quarry/borrow pits use (5). The timber

harvest would yield a gross estimate of 13.1 million board feet (MMBF) of wood products. This proposal, represented in Alternative B in this EA, would include heavy thinning on 663 acres, wildlife forage thinning on 129 acres, and riparian thinning on 122 acres. The timber sales from this proposal would likely be sold over a three year time span, beginning in fiscal year 2009.

III. Existing Environment and Survey Results

Regulatory Framework/Management Direction-Sensitive Plants/Rare and Uncommon Species

Forest Service Manual (FSM) 2670 direction is to ensure the viability of sensitive botanical species and to preclude actions that will contribute to the federal listing of a species. To ensure compliance with this direction, a biological evaluation is required for forest management activities that may alter habitat for proposed, endangered, threatened or sensitive species (*FSM 2671.44*) in order to determine the possible effects of the proposed activities on these species.

Amendment 158 to the Willamette Land and Resource Management Plan (USDA, 1990) adds four Conservation Strategies as amendments to the Forest Plan. The Conservation Strategies are for*: Aster gormanii, Ophioglossum pusillum, Cimicifuga elata and Frasera umpquaensis*. Conservation strategies include management plan and monitoring requirements as well as background material on status and distribution of the species.

Existing Condition-Sensitive/Rare and Uncommon Botanical Species

Current management direction mandates conservation of several categories of rare plants on the Willamette National Forest (Attachment 1). The Endangered Species Act mandates protection of federally listed Threatened and Endangered species. No federally listed Threatened and Endangered, or Proposed plants occur in the project area. Sensitive species are protected by USDA Forest Service regulations and manual direction (FSM 2672.4).

Numerous sensitive plants on the Regional Forester's Sensitive Species list have potential to occur in the Ball Park Thin project area, which encompasses a wide range of western Cascade forest habitats. Prefield reviews are conducted to determine which species from the Regional Forester's List for the Willamette National Forest are known from the project area or have suitable habitat present and potentially occur in the project area.

Prefield review for the Ball Park Thin project indicated a known population of *Romanzoffia thompsonii* in the project area. Surveys conducted during the summer of 2007 also documented the occurrence of other Region 6 sensitive species. (see Table 1).

Table 1. Sensitive Species in the Ball Park Thin Project Area

Proposed Units	Sensitive Species	Buffer
280	*Nephroma occultum*	180 ft.

Proposed Units	Sensitive Species	Buffer
80	*Rhizomnium nudum*	360 ft.
280	*Romanzoffia thompsonii*	360 ft.

Existing Condition-Special Habitats

Special habitats are non-forested habitats that are limited in size and distribution across the landscape. It is important to consider the biological diversity and ecosystem function of these small, scattered habitats for a number of reasons. Special habitats often play important roles for not only for full-time wildlife residents of the sites, but also for those who use them seasonally, or for only a portion of their life cycles. Numerous factors contribute to the creation or maintenance of special habitats. Among such factors, topography and hydrology often determine the microclimatic conditions at these sites.

Numerous special habitats were located in the Ball Park Thin project area during summer 2007 surveys. They range in size from one-half acre up to 6 acres. The special habitats documented in the Ball Park Thin project area and the buffer sizes recommended in the Willamette National Forest Special Habitat Management Guide are listed in Table 2.

Table 2. Special Habitats in the Ball Park Thin Project Area

Proposed Units	Special Habitat	Buffer
390	Rock outcrop	180 ft.
380	Rock outcrop	180 ft.
130	Swamp	1 acre
140	Wet meadow	1 acre
150	Seep	1 acre
180	Rock outcrop	180 ft.
170	Wet meadow	1 acre
240	Rock outcrop	180 ft.

Existing Condition-Invasive Plants

Invasive plants on the Willamette National Forest are categorized as potential invaders, new invaders and established invaders and control strategies will differ, depending on species' classification.

- **Potential invaders** are those species located in adjacent National Forest or other lands that have a high probability of being detected on the Forest in the foreseeable future (next 15 years) because potential habitat exists here.
- **New invaders** are those weed species just entering the National Forest or whose populations are possible to eradicate.

- **Established infestations** include weed species that are so widespread on the Forest they are not likely to eradicate. Some species, such as blackberry, can have both new invader populations that are less than 10 plants and are outliers as well as established infestations such as those that are found bordering streams at lower elevations.

Four species of “new invader” plants are documented in the Ball Park Thin project area. Some new invader species have greater potential to out-compete native plants and are more difficult to control than others are, however all of them are capable of adverse ecological impacts. The new invader species known to occur in the Ball Park Thin project area are listed below in Table 3:

- False brome (*Brachypodium sylvaticum*)-False brome is a perennial grass species of Eurasian origin. It has short bunches of bright green leaves that persist into fall and early winter. False brome can quickly become the dominant plant species in forest understories and in streamside corridors, demonstrating both shade-tolerance and moisture tolerance. Once established, false brome is spread by road maintenance equipment. From the road shoulder, the species can move into forested stands, especially those with openings such as thinned timber sale units. Seed is short-lived, so treatments for 3 years or less can exhaust the seed bank. Small populations may be manually controlled but large populations require herbicide application to eradicate because the populations, once established, can grow exponentially in short periods of time.

- Spotted knapweed (*Centaurea maculosa*)-Biennial or short-lived perennial with a stout taproot. Can have one or more stems, branched 1-3 feet tall. Produces purpleish-pink ray flowers. Introduced from Eurasia as contaminant of alfalfa and clover seed. Early spring growth makes spotted knapweed competitive for soil moisture and nutrients.

- Dalmatian toadflax (*Linaria dalmatica*)-Perennial, 1 to 2 feet tall, reproducing by seed and underground root stock. Flowers are 1 inch long with bearded, orange throat. Native of Eurasia, introduced to the United States in 1800’s as an ornamental. Extensive root system makes control difficult.

- Deptford pink (*Dianthus armeria)* is a species of *Dianthus* ("pink") native to most f Europe, from Portugal north to southern Scotland and southern Finland, and east to Ukraine and the Caucasus. It is a herbaceous annual or biennial plant growing to 60 cm tall. The leaves are hairy, dark green, slender, up to 5 cm long. The flowers are 8–15 mm diameter, with five petals, bright reddish-pink; they are produced in small clusters at the top of the stems from early to late summer.

Table 3. Invasive Plants in the Ball Park Thin Project Area

Invasive Species	Proposed Units	Recommended treatments (in addition to Ch. 2 mitigation measures, design criteria, and BMPs)
False brome (*Brachypodium sylvaticum*)	360	Mechanical Chemial
Spotted knapweed (*Centaurea maculosa*)	30, 130, 140	Mechanical Chemial
Dalmatian toadflax (*Linaria dalmatica*)	40	Manual/Mechanical/Chemical
Deptford pink (*Dianthus armeria.*)	360	Mechanical Chemial

Manual=hand pulling/digging before seed production
Mechanical=mowing/cutting just after flowering has ended, *but* before seed matures

Chemical=use of one or more herbicides approved for application in the Willamette National Forest Integrated Weed Management EA (March 2007)

Proposed actions may introduce or spread invasive and non-native plants. In most cases, the risk of worsening Forest invasive plant populations can be minimized through proper inventory and project design. Implementation equipment and disturbance from yarding, road maintenance, and fuels treatments resulting from either alternative can provide an opportunity for invasive plants to establish and out-compete native vegetation.

Many invasive plants are shade-intolerant, so canopy closure can be particularly effective at
minimizing weed establishment. Forest and Regional (USDA, 2004) policy recommends revegetation of disturbed sites with native species from *local genetic stock.*

Since most of the Forest's invasive plant infestations occur along road shoulders, road maintenance represents a particular risk for inadvertently spreading weeds. Road maintenance activities across the Forest risk the spread of new invader species from one watershed to another. Activities such as grading, brushing and mowing, culvert upgrades, and ditch cleaning can contribute to the spread of invasive plants along road corridors by transporting seeds and vegetative material from infested sites to un-infested areas.

To mitigate the spread of existing invasive plants and reduce the risk of introducing other invasive species into the Ball Park Thin project area, the following measures will be used:

- Off road or ground disturbing equipment will be washed prior to entering National Forest land. Equipment will be free of all seed and debris that may

contain plant seeds such as soil and vegetation.

- Material brought in for construction, such as fill soil, gravel, and straw will be free of vegetative material and invasive plant seed.

- Monitoring for changes in existing populations or new occurrences of invasive plants in the project area.

- Retain barriers of undisturbed vegetation between weed infested areas and project areas.

- Treat existing infestations prior to project implementation to minimize seed spread.

- Clean equipment prior to coming on to the Forest and potentially between projects or sites, depending on the occupancy of weeds at the affected areas. Use appropriate clauses 154 to ensure contractors whose vehicles operate off the road surface are cleaning vehicles appropriately. See Appendix 1 for contract clauses (WO-C6.36 & WO-CT6.36).

- Work in weed-free areas prior to moving to weed-infested areas.

- Avoid putting landings, yarding stations, staging and equipment storage areas, in weed infested areas. Provide timber and other contractors with a map of infestations in the prework process. Weed infestations will be identified on the sale map.

- Revegetate site as soon as possible (during the appropriate planting or seeding window) following disturbance. Revegetation may include topsoil replacement, site prep such as ripping, planting, seeding, fertilizing and weed-fee mulching as necessary. Monitor sites and reseed or replant as necessary.

IV. Impacts of the Proposed Project

Alternative A (No-Action) - Sensitive/Rare and Uncommon Species
Direct and Indirect Effects
This alternative would have no direct or indirect effect on sensitive plants or rare botanical species. There would be no ground-disturbance or disturbance of the microclimate with this alternative.
Selecting Alternative A may have potential adverse effects on certain species of sensitive fungi. Without management action, downed wood accumulation would likely increase over time. Landscapes with heavy fuel loads are at greater risk of high-intensity, stand replacing fires. As a result, high intensity fire is more likely to sterilize the soil, thus

destroying fungal spores and mycelium found in organic mater on the surface and uppermost soil horizons.

Alternatives B and C - Sensitive/Rare and Uncommon Species
Direct and Indirect Effects
No direct or indirect effects on sensitive plants or rare botanical species are expected with either alternative. All known sensitive plant occurrences have been mapped and would be protected with the *no-disturbance* buffers identified in Table 2 in order to maintain the viability of the populations. The buffers would maintain the microclimate for those species requiring cover or moisture retention and aid in protecting other species from physical damage during project implementation. This buffer applies to all harvest activities, ground disturbing activities, and fuels treatments.

Indirectly, canopy removal would have the most impact fungi that are sensitive to microclimatic change. Subsequent slash pile/fuels treatments have potential to affect some fungi species in the Ball Park Thin project area. Without knowing the presence or absence of these fungi, a reasonable assumption is that there may be some localized effects to them from timber felling, yarding and fuels treatments. However, these actions have a low risk of adverse effects to sensitive fungi and are not likely to cause a trend toward federal listing of a particular species.

Of the action alternatives, Alternative B has the least risk of potential adverse effects to known sensitive plants or suitable habitat for those *potentially* occurring in the Ball Park Thin project area because it proposes lower frequency of group select thinning in potential habitat. For further information on botanical resources, see the botanical resource report in Appendix C of the Ball Park ThinEA.

Cumulative Effects - Sensitive/Rare and Uncommon Species
The analysis area for sensitive and rare botanical species cumulative effects is the Ball Park Thin Project area. There are no planned activities adjacent to the analysis area, therefore actions beyond this analysis area would have no effect on sensitive species, or other rare botanical species potentially located in the Ball Park Thin analysis area.

Implementation of the proposed action or any action alternatives would have no cumulative effect on sensitive plants in the project area because of the buffer and no-disturbance mitigation. Based on the analysis of this project there would be no incremental change to existing populations of sensitive species or other botanical species in the project area due to selecting any alternative detailed in the Ball Park Thin EA. Despite limitations in survey reliability, the risk of the proposed project activities endangering the viability of sensitive fungi species is low.

Alternative A (No Action) - Special habitats
Direct and Indirect Effects
Selecting the No-Action alternative would allow for the same level of special habitat management annually programmed. This alternative would have no adverse effect on special habitats.

Alternatives B and C - Special Habitats
Direct and Indirect Effects
The action alternatives would have no direct or indirect impact on special habitats. Special habitats would also be buffered from harvest and ground disturbing activities. These buffers would maintain the microclimate, hydrology, and prevent damage to the areas during project implementation.
The main direct impacts to special habitats from the proposed actions are removal of overstory and ground disturbance. Without the buffer and no-disturbance mitigation, reduced cover could potentially decrease humidity and increase temperature earlier in the growing season, thus altering habitat viability. By comparison, Alternative C proposes higher frequency group select thinning than Alternative B; therefore, it poses the highest risk of adverse impacts to special habitats in the Ball Park Thin project area.

Cumulative Effects - Special Habitats
The analysis area for special habitat cumulative effects is the Ball Park Thin Project area. This area was chosen because activities outside the analysis area would have no effect on special habitats located within the project analysis area.

Implementation of the proposed action or any action alternatives would have no cumulative effect on special habitats in the project area because of the buffer and no-disturbance mitigation. Based on the analysis of this project there will be no incremental change to existing populations of special habitats in the project area as a result of selecting any alternative detailed in the Ball Park Thin EA.

Alternative A (No Action) - Invasive Plants
Direct and Indirect Effects
Selecting Alternative A would allow the same level of invasive plant control as currently programmed. New and potential invader plant populations documented in the Ball Park Thin project area would remain highest priority in receiving treatment and monitoring. The No-Action alternative would not provide further opportunities to contain or control invasive plant populations. It would also not reduce the current rate of spread of these species within the project area.

Alternatives B and C - Invasive Plants
Direct and Indirect Effects
Alternatives B and C both would have congruent direct impacts on invasive plants because both propose similar acres of harvest or fuel treatments and miles of road maintenance. The ground disturbance caused from implementation may provide suitable conditions for invasive plants to establish or out-compete native vegetation.

Most of the invasive plant populations in the Ball Park Thin project area are established along roads and are mainly spread by vehicular traffic. However, false brome occurs adjacent to units proposed for harvest, ground-based yarding, and under-burning fuels treatments.

With mitigation measures identified in Chapter 2, selecting either of the alternatives would result in moderate risk of further spreading or introducing invasive plants. With mitigation measures, the proposed actions would have a low risk of spreading invasive plants onto adjacent properties by hauling across ownership boundaries.
Alternatives B and C both would have similar direct impacts on invasive plants because both propose similar acres of harvest or fuel treatments and miles of road maintenance. Additionally, both action alternatives propose similar acreage in terms of harvest systems. The ground disturbance caused from implementation may provide suitable conditions for invasive plants to establish or out-compete native vegetation. However, if one considers the potential ground disturbance resulting from harvest activities and an additional difference of 10% in canopy retention between the action alternatives, Alternative B poses the least risk of impacts to invasive plants.

False brome and Deptford pink occur on roads adjacent to units proposed for harvest, ground-based yarding, and under-burning fuels treatments. These populations should be treated prior to implementing any action alternative, subsequently treated and monitored for at least three years.
With mitigation measures identified in Chapter 2, selecting either of the alternatives would result in moderate risk of further spreading or introducing invasive plants. With mitigation measures, the proposed actions would have a low risk of spreading invasive plants onto adjacent properties by hauling across ownership boundaries.

Cumulative Effects - Invasive Plants
The entire Ball Park Thin project area is the area done for the cumulative effects analysis associated with ground-disturbance activities and adjacent roads. This analysis addresses known distribution of invasive plants and likely travel routes for the proposed projects.

Past management activities in the last 50 years include road construction, road maintenance, and timber harvest. Included in these activities are the Eugene Water and Electric Board (EWEB) power line corridor as well as the vegetation management activities associated with it. Because of the design criteria and mitigation measures, there is no expected increase of cumulative effects on invasive plants.

With the exception of false brome, the other new invader plants documented in the project area are considered shade-intolerant and generally confined to roadsides and open areas. One of many ecological advantages of invasive or non-native plants is the lack of native competition to keep populations balanced. More so, prolific propagation and the ability to disperse large amounts of seed is probably the greatest advantage invasive plants have in native ecosystems.

Even without past or present management actions, invasive plants would still be present from natural and biological vectors. Invasive plants are present on the properties of adjacent landowners and along the Highway 126 corridor. However, past harvest and road maintenance activities within the Ball Park Thin project area have provided additional opportunities for establishment and spread of invasive plants. Some management actions, such as harvest and yarding, result in short-term disturbance

conducive for invasive plant establishment. The effects of these actions are greatest at the on-set of implementation and often decrease over time and with stand succession.

Other management activities, like road construction or maintenance, often result in longer-term effects to invasive plant infestations. This is because roads serve dual functions by acting as suitable ground for the establishment of invasive plants and by providing the plants access to a host of potential vectors.

Implementing any of the alternatives detailed in the Ball Park Thin EA would have a non-measurable cumulative effect on invasive plants because both action alternatives propose to decommission 0.5 miles of road and the No-Action alternative proposes no road management all.

V. Determination/Conclusion

Risk Determination - Sensitive Plants/Rare and Uncommon Species
It is my determination that implementation of this project will have **no impact** on sensitive botanical species known to occur in the Ball Park Thin project area because of the no-disturbance buffers. Because of the no-disturbance buffer and mitigation, the likelihood of adverse effects to sensitive plants in the Ball Park Thin project area is low.

For unknown fungi, implementation of this project "**may impact** individuals or habitat, **but will not** likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species".

Risk Determination - Special Habitats
It is my determination there is low to moderate risk of adverse impacts to special habitats in the Ball Park Thin project area from proposed actions with the no-disturbance buffer and mitigation.

Unit	Risk Assessment	Connected Actions and Rationale	Mitigation Measures Relative to Unit (prior to implementation)
390 Rock outcrop	Low	-proposed fuels treatments	-avoid fuel treatments in special habitat
380 Rock outcrop	Low	-proposed fuels treatments	-avoid fuel treatments in special habitat
130 Swamp	Moderate	-known new invader site -proposed fuels underburn	manual/mechanical/chemical control of CEMA and CYSC -avoid fuels treatments in special habitat

140 Wet meadow	Moderate	-known new invader site -proposed fuels underburn	manual/mechanical/chemical control of CEMA and CYSC -avoid fuels treatments in special habitat
150 Seep	Moderate	-proposed harvest and fuels treatments	-potential Rhizomnium habitat -avoid harvest and fuels treatments in special habitat
180 Rock outcrop	NA	Dropped in EA	NA
170 Wet meadow	Moderate	- proposed harvest and fuels treatments	- avoid harvest and fuels treatments in special habitat
240 Rock outcrop	Moderate	- proposed harvest and fuels treatments	- documented established invader species - avoid harvest and fuels treatments in special habitat

Risk Determination - Invasive Plants

The risk of adverse effects to invasive plants in the Ball Park Thin project area is **moderate**. With the specific mitigation measures, design criteria, and best management practices outlined in the Ball Park Thin EA and this report, risk of further spread by invasive species may be minimized. To mitigate the spread of existing invasive plants and reduce the risk of introducing other invasive species into the Ball Park Thin project area, the following measures will be used:

- Off road or ground disturbing equipment will be washed prior to entering National Forest land. Equipment will be free of all seed and debris that may contain plant seeds such as soil and vegetation.

- Material brought in for construction, such as fill soil, gravel, and straw will be free of vegetative material and invasive plant seed.

- Monitoring for changes in existing populations or new occurrences of invasive plants in the project area.

- Retain barriers of undisturbed vegetation between weed infested areas and project areas.

- Treat existing infestations prior to project implementation to minimize seed spread.

- Clean equipment prior to coming on to the Forest and potentially between projects or sites, depending on the occupancy of weeds at the affected areas. Use

appropriate clauses 154 to ensure contractors whose vehicles operate off the road surface are cleaning vehicles appropriately. See Appendix 1 for contract clauses (WO-C6.36 & WO-CT6.36).

- Work in weed-free areas prior to moving to weed-infested areas.

- Avoid putting landings, yarding stations, staging and equipment storage areas, in weed infested areas. Provide timber and other contractors with a map of infestations in the prework process. Weed infestations will be identified on the sale map.

- Revegetate site as soon as possible (during the appropriate planting or seeding window) following disturbance. Revegetation may include topsoil replacement, site prep such as ripping, planting, seeding, fertilizing and weed-fee mulching as necessary. Monitor sites and reseed or replant as necessary.

Prepared by: _/s/Burtchell Thomas_____ Date: May 5 , 2008
Burtchell Thomas, Botanist
McKenzie River Ranger District

Attachment 1: Summary of Potential Habitat and Presence for Sensitive Botanical Species

Species	**Prefield Review**	**Species Presence**
Agoseris elata	habitat present	No
Arabis hastatula	habitat not present	No
Arnica viscosa	habitat not present	No
Asplenium septentrionale	habitat not present	No
Aster gormanii	habitat not present	No
Boletus pulcherrimus	habitat present	No
Botrychium minganense	habitat not present	No
Botrychium montanum	habitat present	No
Botrychium pumicola	habitat not present	No
Bridgeoporus nobillisimus	habitat not present	No
Calamagrostis breweri	habitat not present	No
Carex livida	habitat not present	No
Carex scirpoidea var. *stenochlaena*	habitat not present	No
Castilleja rupicola	habitat not present	No

Chaenotheca subroscida	habitat not present	No
Cimicifuga elata	habitat present	No
Coptis trifolia	habitat present	No
Cordyceps capitata	habitat not present	No
Corydalis aqua-gelidae	habitat not present	No
Cortinarius barlowensis	habitat present	No
Cudonia monticola	habitat not present	No
Dermatocarpon luridum	habitat not present	No
Eucephalis(Aster) vialis	habitat present	No
Frasera umpquaensis	habitat not present	No
Gentiana newberryi	habitat not present	No
Gomphus kaufmanii	habitat present	No
Gyromitra californica	habitat present	No
Hypogymnia duplicata	habitat present	No
Iliamna latibracteata	habitat not present	No
Leptogium burnetiae var. hirsutum	habitat present	No
Leptogium cyanescens	habitat present	No
Leucogaster citrinus	habitat present	No
Lewisia columbiana var. columbiana	habitat not present	No
Lobaria linita	habitat not present	No
Lupinus sulphureus var. kincaidii	habitat not present	No
Lycopodiella inundata	habitat not present	No
Lycopodium complanatum	habitat not present	No
Montia howellii	habitat not present	No
Mycenia monticola	habitat not present	No
Nephroma occultum	habitat present	Yes (Unit 280)
Ophioglossum pusillum	habitat present	No
Pannaria rubiginosa	habitat present	No
Pellaea andromedaefolia	habitat not present	No
Peltigera neckeri	habitat present	No
Peltigera pacifica	habitat present	No
Phaecollybia attenuata	habitat present	No
Phaeocollybia dissiliens	habitat present	No
Phaeocollybia pseudofestiva	habitat present	No
Phaeocollybia sipei	habitat present	No
Pilophorus nigricaulis	habitat not present	No
Polystichum californicum	habitat not present	No
Potentilla villosa	habitat not present	No
Pseudocyphellaria rainierensis	habitat present	No

Ramalina pollinaria	habitat not present	No
Ramaria amyloidea	habitat present	No
Ramaria aurantiisiccescens	habitat present	No
Ramaria gelatinaurantia	habitat present	No
Ramaria largentii	habitat present	No
Rhizomnium nudum	habitat present	Yes (Unit 80)
Romanzoffia thompsonii	habitat present	Yes (Unit 280)
Scheuchzeria palustris var. Americana	habitat not present	No
Schistostega pennata	habitat not present	No
Scouleria marginata	habitat not present	No
Sisyrinchium sarmentosum	habitat present	No
Sowerbyella rhenana	habitat not present	No
Tetraphis geniculata	habitat not present	No
Thorluna disimilis	habitat not present	No
Usnea longissima	habitat not present	No
Utricularia minor	habitat not present	No
Wolffia borealis	habitat not present	No
Wolffia columbiana	habitat not present	No

ATTACHMENT 2: **Regional Forester's Sensitive Botanical Species List for the Willamette National Forest FY 2008.** Species of federal, state and local importance are included on the R-6 list.

Species	Occurrence on WNF	ONHP Status	State Status	Federal Status	Habitat Types
Agoseris elata	S	2			MM,DM
Arabis hastatula	D	1		SofC	RO
Arnica viscosa	S	2			RS
Asplenium septentrionale	S	2			RO
Aster gormanii	D	1			RS
Boletus pulcherrimus	D	1			CF
Botrychium minganense	D	2			RZ,CF
Botrychium montanum	D	2			RZ,CF
Botrychium pumicola	S	1	LT		HV
Bridgeoporus nobilissimus	D	1			CF
Calamagrostis breweri	D	2			MM,RZ
Carex livida	S	2			WM
Carex scirpoidea var. stenochlaena	D	2			RO
Castilleja rupicola	D	2			RO
Chaenotheca subroscida	D	3			CF
Cimicifuga elata	D	1	C		CF
Coptis trifolia	S	2			WM,CF
Cordyceps capitata	D	unlisted			CF
Corydalis aqua-gelidae	D	1	C		RZ,CF
Cudonia monticola	D	not listed			CF
Dermatocarpon luridum	S	3			RZ on rock
Eucephalis (Aster) vialis	S	1	LT	SofC	CF
Frasera umpquaensis	D	1	C		MM
Gentiana newberryi	D	2			MM
Gomphus kaufmanii	D	3			CF
Gyromitra californica	D	2			CF
Hypogymnia duplicata	S	3			CF
Iliamna latibracteata	S	2			CF,RZ
Leptogium burnetiae var. hirsutum	S	3			CF
Leptogium cyanescens	D	3			CF
Leucogaster citrinus	D	3			CF
Lewisia columbiana var. columbiana	D	2			RS
Lobaria linita	D	2			RO

Species	Occurrence on WNF	ONHP Status	State Status	Federal Status	Habitat Types
Lupinus sulphureus var. kincaidii	S	1	LT	LT	MM,DM
Lycopodiella inundata	D	2			WM
Lycopodium complanatum	D	2			CF
Montia howellii	D	4	C		RZ
Mycenia monticola	D	not listed			CF
Nephroma occultum	D	4			CF
Ophioglossum pusillum	D	2			WM
Pannaria rubiginosa	D	2			CF
Pellaea andromedaefolia	S	2			RO
Peltigera neckeri	D	not listed			CF
Peltigera pacifica	D	not listed			CF
Phaeocollybia attenuata	D	4			CF
P. dissiliens	D	3			CF
P. pseudofestiva	D	3			CF
P. sipei	D	3			CF
Pilophorus nigricaulis	D	2			RO
Polystichum californicum	D	2			RO
Potentilla villosa	D	2			RS, RO
Pseudocyphellaria rainierensis	D	4			CF,RZ
Ramalina pollinaria	D	2			CF, RZ
Ramaria amyloidea	D	2			CF
R. aurantiisiccescens	D	4			CF
R. gelatiniaurantia	D	3			CF
R. largentii	D	3			CF
Rhizomnium nudum	D	2			CF
Romanzoffia thompsonii	D	1			RS
Scheuchzeria palustris var. americana	D	2			WM
Schistostega pennata	D	2			CF
Scouleria marginata	S	3			RZ
Sisyrinchium sarmentosum	S	1	C	SofC	MM,DM
Sowerbyella rhenana	D	3			CF
Tetraphis geniculata	S	2			CF
Thorluna disimilis	D	2			CF
Usnea longissima	D	3			CF,RZ
Utricularia minor	D	2			SW
Wolffia borealis	S	2			SW

Wolffia columbiana	S	2	SW

Occurrence on Willamette National Forest:

S = Suspected
D = Documented

Oregon Natural Heritage Program (ORNHP):

1 = Taxa threatened or endangered throughout range.
2 = Taxa threatened or endangered in Oregon but more common or stable elsewhere.
3 = Species for which more information is needed before status can be determined, but which may be threatened or endangered (Review).
4 = Species of concern not currently threatened or endangered (Watch).

Oregon State Status:

LT = Threatened
LE = Endangered
C = Candidate

Federal Status: These plant species were originally published as CANDIDATE THREATENED (CT) in the Smithsonian Report, **Federal Register**, July 1, 1975, or as PROPOSED ENDANGERED (PE) in a later report, **Federal Register**, June 16, 1976. The latest **Federal Register** consulted was dated September 30, 1993. Updated listings appear periodically in the Notice of Review (USFWS); the status of several species is categorized as follows:

LE = Listed as an Endangered Species
LT = Listed as a Threatened Species
PE = Proposed as an Endangered Species
PT = Proposed as a Threatened Species
C = Candidate for Listing as Threatened or Endangered
Sof C = Species of Concern; taxa for which additional information is needed to support proposal to list under the ESA.

Habitat Types:

MM = Mesic meadows
WM = Wet meadows
DM = Dry meadows
RZ = Riparian zones, floodplains
CF = Coniferous forest
RS = Rocky slopes, scree
RO = Rock outcrops, cliffs
DW = Dry open woods
HV = High volcanic areas
SW = Standing water

ATTACHMENT 3: **Field reconnaissance survey levels for determining presence potential for TES species.**

Level A: Aerial photo interpretation and review of existing site records. Determination of the potential for a listed species to occur within the proposed project area. No field surveys completed.

- Low potential: Less than 40% potential for listed species inhabiting the project area.
- Moderate potential: 40-60% potential for a listed species inhabiting the proposed project area.
- High potential: Greater than 60% potential for listed species inhabiting the proposed project area.

Level B: Single entry survey of probable habitats. Areas are identified by photos and existing field knowledge. Field surveys are conducted during the season most favorable for species identification.

- Low intensity: Selected habitat surveys (approximately 5-10% of area) are conducted with a single entry for listed species inhabiting the proposed project area.
- Moderate intensity: Selected habitat surveys (approximately 10-40% of area) are conducted with a single entry for listed species inhabiting the proposed project area.
- High intensity: Selected habitat surveys (approximately 40-60% of area) are conducted with a single entry for listed species inhabiting the proposed project area.

Level C: Multiple entry surveys are conducted for listed species likely to inhabit the proposed project area.

- Low intensity: Selected habitat surveys (approximately 5-10% of area) are conducted with repeated entries for

	listed species inhabiting the proposed project area.
Moderate intensity:	Selected habitat surveys (approximately 10-60% of area) are conducted with repeated entries for listed species inhabiting the proposed project area.
High intensity:	Selected habitat surveys (approximately 60-80% of area) are conducted with repeated entries for listed species inhabiting the proposed project area.

ATTACHMENT 4:

Conclusions Of Effects For Use In Biological Evaluations and Assessments
USDA Forest Service - Regions 1, 4, and 6
August, 1995

Listed Species:

1. No Effect
   Occurs when a project or activity will not have any "effect", on a listed species, or critical habitat.

2. May Affect - Likely to Adversely Affect (LAA)
   If the determination in the biological assessment is that the project May Affect - Likely to Adversely Affect a listed species or critical habitat, formal consultation must be initiated (50 CFR 402.12). Formal consultation must be requested in writing through the Forest Supervisor (FSM 2670.44) to the appropriate FWS Field Supervisor, or NOAA Fisheries office.

3. May Affect - Not Likely to Adversely Affect (NLAA)
   If it is determined in the biological assessment that there are "effects" to a listed species or critical habitat, but that those effects are not likely to adversely affect listed species or critical habitat, then written concurrence by the FWS or NOAA Fisheries is required to conclude informal consultation (50 CFR 402.13).

4. Beneficial Effect
   Written concurrence is also required from the FWS or NOAA Fisheries if a beneficial effect determination is made.
   Requests for written concurrence must be initiated in writing from the Forest Supervisor to the State Field Supervisor (FWS or NOAA).

Proposed Species:
Whenever serious adverse effects are predicted for a proposed species or proposed critical habitat, conferencing is required with the FWS or NOAA Fisheries.

1. No Effect

When there are "no effects" to proposed species, conferencing is not required with FWS or NOAA.

2. Not Likely to Jeopardize the Continued Existence of the Species or Result in Destruction or Adverse Modification of Proposed Critical Habitat

This conclusion is used where there are effects or cumulative effects, but where such effects would not have the consequence of losing key populations or adversely affecting "proposed critical habitat". No conferencing is required with FWS or NOAA if this conclusion is made. However, for any proposed activity that would receive a "Likely To Adversely Affect" conclusion if the species were to be listed, conferencing may be initiated.

3. Likely to Jeopardize the Continued Existence of the Species or Result in Destruction or Adverse Modification of Proposed Critical Habitat

This conclusion must be determined if there are significant effects that could jeopardize the continued existence of the species, result in adverse modification or destruction of proposed critical habitat, and/or result in irreversible or irretrievable commitments of resources that could foreclose options to avoid jeopardy, should the species be listed. If this is the conclusion, conferencing with FWS or NMFS is required.

Sensitive Species:

1. No Impact (NI)

A determination of "No Impact" for sensitive species occurs when a project or activity will have no environmental effects on habitat, individuals, a population or a species.

2. May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species (MIIH)

Activities or actions that have effects that are immeasurable, minor or are consistent with Conservation Strategies would receive this conclusion. For populations that are small - or vulnerable - each individual may be important for short and long-term viability.

3. Will Impact Individuals or Habitat With a Consequence That the Action May Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species (WIFV)

Loss of individuals or habitat can be considered significant when the potential effect may be:

1. Contributing to a trend toward Federal listing (C-1 or C-2 species);
2. Results in a significantly increased risk of loss of viability for a species; or,
3. Results in a significantly increased risk of loss of viability for a significant population (stock).

4. Beneficial Impact (BI)

Projects or activities that are designed to benefit, or that measurably benefit a sensitive species should receive this conclusion.

ATTACHMENT 5:

Conclusions Of Effects For Use In Biological Evaluations and Assessments
USDA Forest Service - Regions 1, 4, and 6
August, 1995

Listed Species:

1. No Effect

Occurs when a project or activity will not have any "effect", on a listed species, or critical habitat.

2. May Affect - Likely to Adversely Affect (LAA)

If the determination in the biological assessment is that the project May Affect - Likely to Adversely Affect a listed species or critical habitat, formal consultation must be initiated (50 CFR 402.12). Formal consultation must be requested in writing through the Forest Supervisor (FSM 2670.44) to the appropriate FWS Field Supervisor, or NOAA Fisheries office.

3. May Affect - Not Likely to Adversely Affect (NLAA)

If it is determined in the biological assessment that there are "effects" to a listed species or critical habitat, but that those effects are not likely to adversely affect listed species or critical habitat, then written concurrence by the FWS or NOAA Fisheries is required to conclude informal consultation (50 CFR 402.13).

4. Beneficial Effect

Written concurrence is also required from the FWS or NOAA Fisheries if a beneficial effect determination is made.

Requests for written concurrence must be initiated in writing from the Forest Supervisor to the State Field Supervisor (FWS or NOAA).

Proposed Species:
Whenever serious adverse effects are predicted for a proposed species or proposed critical habitat, conferencing is required with the FWS or NOAA Fisheries.

1. No Effect

When there are "no effects" to proposed species, conferencing is not required with FWS or NOAA.

2. Not Likely to Jeopardize the Continued Existence of the Species or Result in Destruction or Adverse Modification of Proposed Critical Habitat

This conclusion is used where there are effects or cumulative effects, but where such effects would not have the consequence of losing key populations or adversely affecting "proposed critical habitat". No conferencing is required with FWS or NOAA if this conclusion is made. However, for any proposed activity that would receive a "Likely To Adversely Affect" conclusion if the species were to be listed, conferencing may be initiated.

3. Likely to Jeopardize the Continued Existence of the Species or Result in Destruction or Adverse Modification of Proposed Critical Habitat

This conclusion must be determined if there are significant effects that could jeopardize the continued existence of the species, result in adverse modification or destruction of proposed critical habitat, and/or result in irreversible or irretrievable commitments of resources that could foreclose options to avoid jeopardy, should the species be listed. If this is the conclusion, conferencing with FWS or NMFS is required.

Sensitive Species:

1. No Impact (NI)

A determination of "No Impact" for sensitive species occurs when a project or activity will have no environmental effects on habitat, individuals, a population or a species.

2. May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species (MIIH)

Activities or actions that have effects that are immeasurable, minor or are consistent with Conservation Strategies would receive this conclusion. For populations that are small - or vulnerable - each individual may be important for short and long-term viability.

3. Will Impact Individuals or Habitat With a Consequence That the Action May Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species (WIFV)

Loss of individuals or habitat can be considered significant when the potential effect may be:

4. Contributing to a trend toward Federal listing (C-1 or C-2 species);
5. Results in a significantly increased risk of loss of viability for a species; or,
6. Results in a significantly increased risk of loss of viability for a significant population (stock).

4. Beneficial Impact (BI)

Projects or activities that are designed to benefit, or that measurably benefit a sensitive species should receive this conclusion.

File Code:	2670 Threatened, Endangered, and Sensitive Wildlife	**Date:**	May 14, 2008
Route To:	Project Files		
Subject:	Terrestrial Fauna Biological Evaluation (BE) for: Ball Park Thin Project		

SUMMARY OF DETERMINATIONS

Determinations:

The following summarizes effect or impact determinations to species currently listed as threatened, endangered, or sensitive (TES) that may have suitable habitat identified, and have either documented or suspected occurrence within the project area. **There are no recognized effects or impacts to TES species from No Action.**

Activities associated with the proposed project **may affect, but are not likely to adversely affect** the northern spotted owl. A full discussion of effects can be found in the Biological Assessment dated February 29, 2008 that was submitted to the U.S. Fish and Wildlife Service.

Activities associated with the proposed project should have **no impact** on individuals of the following regionally listed sensitive species or their habitat:

Peregrine Falcon
Harlequin Duck
Baird's Shrew
Pacific Shrew
Wolverine
Pacific Fisher
Cascade Torrent Salamander
Crater Lake Tightcoil

Activities associated with the proposed project **may impact** individuals of the following regionally listed sensitive species or their habitat, but also **may benefit** future development of habitat:

Pacific Fringe-tailed Bat
Oregon Slender Salamander

Cumulative effects of this project in conjunction with other reasonably foreseeable projects in and adjacent to the project area are not expected to jeopardize the continued existence of any TES species as a result of modification of their essential habitat; nor would they likely contribute to a trend towards Federal listing or cause a loss of viability to populations of species designated as R-6 Sensitive or as Management Indicator Species on the Willamette National Forest. Maintenance and/or recovery of late successional habitat serving as current or potential dispersal corridors surrounding the project area will ensure ongoing opportunities for occupancy and movement of terrestrial TES wildlife species that may occur in vicinity of this project and are dependent on such habitat.

SUMMARY OF SEASONAL RESTRICTIONS/RECOMMENDATIONS

Implementing the following recommendations would ensure effects or impacts to listed species from proposed activities would be no greater than those addressed in this document, and also would mitigate those impacts.

Spotted Owl

- Impose seasonal restriction on activities associated with project that generate above-ambient noise levels which may disturb spotted owls during the critical nesting period between March 1 and July 15.

Harlequin Duck

- Impose seasonal restriction on activities associated with project that generate above-ambient noise levels which may disturb nesting harlequin ducks during the critical nesting period between April 30 and July 30.

Pacific Shrew, Pacific Fisher, and Oregon Slender Salamander

- Protect large down woody material within the project area to the greatest extent feasible during logging, subsequent underburning, and natural fuels underburning activities. At least 240 lineal feet per acre of decay class I and II material greater than 18" diameter would be retained within all harvest units. Full tree length down wood material is preferable to maximize wildlife habitat value; lengths less than 20 feet will not count towards this total. Where the preferred size of material is not available, 240 lineal feet per acre of the largest diameter leave trees would be retained.

Pacific Fringe-tailed Bat

- Protect decadent trees and snags >12"dbh (roosting habitat) within the project area to the greatest extent feasible.

Crater Lake Tightcoil

- Ensure that measures identified to prevent habitat disturbance within 10 meters of perennially wet areas are implemented during project activities.

Table 1. Seasonal Restrictions to Protect Northern Spotted Owl, Harlequin Ducks, and Cavity Nesters

Unit/Area	Seasonal restriction for logging equipment or other heavy equipment	Seasonal restriction burning	Seasonal restriction on blasting
130 lower 150 feet near Hardy Creek	Yes, April 1-July 30 bottom 150 feet near Hardy Creek	Yes, April 1-July 30 bottom 150 feet near Hardy Creek	NA
280	No	Yes, March 1-July 15	NA
360 west of FS Road 2654	Yes, March 30-July 15	Yes, March 1-July 15	NA

Unit/Area	Seasonal restriction for logging equipment or other heavy equipment	Seasonal restriction burning	Seasonal restriction on blasting
370 east of FS Road 2654-773 and below 2654	Yes, March 1-July 15	Yes, March 1-July 15	NA
390 northeast of FS Road 2654 in the north part of the unit at the junction of the 2654-773	Yes, March 1-July 15	Yes, March 1-July 15	NA
Latiwi Rockpit	Yes, March 1-July 15	NA	Yes March 1-July 15
Dogwood Rockpit	No	NA	Yes, March 1-July 15
Boulder Rockpit	No	NA	Yes, March 1-July 15
Boulder Phase II Rockpit	No	NA	Yes, March 1-July 15
Haul Route Hazard Tree Falling	Yes, April 1-June 30	NA	NA

Introduction

This document addresses potential effects to proposed, threatened, endangered or sensitive (TES) fauna listed in the Region 6 Regional Forester's Federally Listed or Proposed, and Sensitive Species Lists (dated July 21, 2004) with documented or suspected occurrences on the Willamette National Forest from activities associated with a habitat restoration project. Biological evaluations of potential effects to threatened, endangered and sensitive fish and flora are in separate documents prepared by this project's Fish Biologist and Botanist. This evaluation, required by the Interagency Cooperative Regulations (Federal Register, January 4, 1978), ensures compliance with the provisions of the Endangered Species Act (ESA) of 1973, P.L. 93-205 (87Stat. 884), as amended. A review of potential effects to non-TES wildlife species from this project proposal is presented in a separate Wildlife Specialist Report.

Project Location and Description

The McKenzie River Ranger District proposes to conduct activities on approximately 1,160 acres of the Ball Park Project Area. The proposed activity acres include timber harvest (1064), natural fuels underburns (49), and rock quarry/borrow pits use (5). The timber harvest would yield a gross estimate of 13.1 million board feet (MMBF) of wood products. This proposal, represented in Alternative B in this EA, would include canopy thinning on 663 acres, wildlife forage thinning on 129 acres, and riparian thinning on 122 acres. The timber sales from this proposal would likely be sold over a three year time span, beginning in fiscal year 2009.

The Ball Park Thin Project area is within the Deer Creek Subwatershed (6^{th} field) of the Upper McKenzie Watershed (5^{th} field) on the McKenzie River Ranger District. The project area consists of

14,508 acres located northwest of the McKenzie River, east of the HJ Andrews Experimental Forest, and south of the District boundary that is adjacent to the Sweet Home District. Major drainages include Deer Creek, Budworm Creek, Fritz Creek, and Carpenter Creek.

Legal description of the project: T.14S, R.6E, Sec. 20,28-30,32,33; T.15S, R.6E, Sec. 3-6, 8-11, 14-16,22,23; Willamette Meridian; Lane and Linn Counties, Oregon.

The Willamette National Forest Land and Resource Management Plan shows land allocations in the project area as: 4-Research Natural Area, 5a- Special Interest Area, 6d McKenzie River Wild and Scenic, 9c- Wildlife Marten Area, 9d- Special Wildlife Habitat Area, and 14a-General Forest. Northwest Forest Plan land allocations are Late Successional Reserve, Administratively Withdrawn, Congressionally Withdrawn, Adaptive Management Area, and Matrix.

Alternatives:
The Ball Park Thin Project will be analyzed in an Environmental Assessment that reviews three alternatives – a No Action alternative and two Action Alternatives. The Action Alternatives involve activities described above.

Action Alternative: The influence of proposed activities on terrestrial wildlife is considered in the context of whether or not suitable habitat may be modified, or if a species may be present at or near sites where physical disturbance may occur, or be sensitive to and thereby influenced by anthropogenic activities occurring during implementation of this project. Habitat disturbance that may affect some terrestrial wildlife species could occur as a result of this project. That potential is addressed later in this report.

No Action Alternative: There is no rationale to suggest the No Action alternative would affect or impact any terrestrial wildlife species based on their ecological requirements and current habitat conditions in the project area. Considering the No Action Alternative would have no effect/impact on terrestrial wildlife species is based on the following assumption - taking no action would not affect current habitat or wildlife species that may be present as either evolves without human management. The dynamic nature of habitat suitability that may be subject to an unknown frequency and variety of stochastic events is considered beyond the scope of this evaluation. Only potential effects or impacts of the Action Alternative will be discussed further in this document.

WATERSHED ANALYSIS / ADDITIONAL DOCUMENT SUPPORT

Proposed activities respond positively to recommendations made that address vegetation and wildlife in the Upper McKenzie Watershed Analysis.

MANAGEMENT DIRECTION COMPLIANCE

The alternative selected for management of the Willamette National Forest includes a strategy that provides Management Requirements (MRs) exceeding the minimum MRs established for Management Indicator Species (MIS) as presented in the Willamette Forest Plan FEIS Appendices - Volume 1 (USDA 1990, pp B-79 through 82). Maintenance of the MRs ensures the viability of MIS and the other species they represent. The MRs have been further enhanced for most MIS species (i.e. those species dependent on old growth and mature conifer habitat, and dead and defective tree habitat) under the Forest Plan S&Gs as amended by the Northwest Forest Plan.

The proposed action associated with this project complies with current forest Standards and Guidelines (S&Gs) pertaining to MIS and other rare and uncommon species management. This proposal also complies with other S&Gs established in the Willamette National Forest Land and Resource Management Plan (1990) as amended by the Northwest Forest Plan Records of Decision (ROD) (1994, 2001, and 2004).

TES SPECIES – REVIEW AND ASSESSMENT

The Biological Evaluation (BE) is a 6-step process that identifies known or suspected threatened, endangered, and sensitive (TES) or Proposed wildlife species that may be associated with a project area, and evaluates impacts the project may have to those species. The six steps are as follows:

1. Prefield review of existing information.
2. Field reconnaissance of the project area to document evidence of a species or habitat.
3. Assessment of whether known or suspected populations of TES or Proposed species will be affected by the project.
4. Analysis of the significance of the project's effects on local and entire populations of TES or Proposed species.
5. If step 4 cannot be completed due to lack of information, a biological investigation is done.*
6. Conferencing or informal/formal consultation with the U.S. Fish & Wildlife Service (USFWS) is initiated at the appropriate stage as outlined in FSM 2673.2-1, or is otherwise arranged through formal channels.

* Step 5 pertains only to listed species and will not be indicated except when applicable.

A summary of ecological requirements for Federally listed[1] or proposed[2] species, and animal species on the Regional Forester's Sensitive Species List[3] for species with documented or suspected occurrence in the the Willamette National Forest is displayed in Table 1.

A summary of the BE process showing **effects determinations**[4] for Federally listed or proposed species, and **impact determinations**[5] for animal species on the Regional Forester's Sensitive Species List for species with known or potential occurrence in the project area is displayed in Table 2.

1 Species listed based on the USDA Forest Service Pacific Northwest Region Federally Listed or Proposed Species list (updated 7/21/04) having documented or suspected occurrence on the Willamette National Forest.

2 When a species is proposed for listing under the Endangered Species Act of 1973 (with amendments), a notice is published in the Federal Register, a daily publication of the Federal Government. The Federal Register is available on the internet at the following site: http://www.access.gpo.gov/nara/nara005.html

3 Species listed based on the USDA Forest Service Regional Forester's Sensitive Animal List (updated 7/21/04) (USDA 2004a,b) having documented or suspected occurrence on the Willamette National Forest.

4 The criteria for effects determinations can be found in the *Endangered Species Act Consultation Handbook: Procedures for Conducting Section 7 Consultations and Conferences* (USFS and NMFS 1998).

5 Impact determinations are required for all species listed under the Regional Forester's Sensitive Species List (Forest Service Manual 2670.32, 2670.5). Direct, indirect, and cumulative effects should be considered. For a discussion of cumulative effects analysis, see the document *Considering Cumulative Effects under the National Environmental Policy Act* (Council on Environmental Quality 1997).

Table 1. Summary of Ecological Requirements for Animal Species on the Regional Forester's Federally Listed and Sensitive Species Lists for species with documented or suspected occurrence on the Willamette National Forest (July 21, 2004).

Species	Habitat
Northern Spotted Owl ***Strix occidentalis*** ***Status: Federally Threatened***	Occur primarily in the interior of older timber stands with structure required for food, cover, nest sites, and protection from weather and predation. Reproductive habitat = forest w/ canopy closure 60 – 80%; multi-layered, multi-species canopy dominated by large overstory trees (> 30"dbh); abundant large trees w/ deformities (e.g. large cavities, broken tops, dwarf-mistletoe infections, decadence); abundant large snags/down logs; and sufficient open flying space below the canopy. Foraging habitat = forest w/ > 2 canopy layers; overstory trees > 21" DBH; abundant snags/down wood; and a 60-80% canopy closure. Dispersal habitat = forest w/ > 11" DBH trees and > 40% canopy closure. Numerous sightings and occupied territories recorded on the McKenzie River RD.
Northern Bald Eagle ***Haliaeetus leucocephalus*** ***Status: Federally Threatened***	Use scattered old-growth conifer trees in proximity to open water near rivers, lakes, and reservoirs with plentiful prey. Feed primarily on fish, but will also eat waterfowl and carrion. One active nest currently on the McKenzie River RD, with two additional territories that were historically occupied or suspected at Clear Lake and Lost Lake.
Least Bittern ***Ixobrychus exilis***	Freshwater or brackish marshes with tall vegetation that it stalks through to find prey. Eats small fish, frogs, insects, small mammals, and sometimes bird eggs and chicks. Nests are small platform of sticks and live or dead vegetation, placed in cattails, bulrushes, or bushes 8-14" above water. Sightings of individuals at Fern Ridge and Salem. No confirmed sightings on the McKenzie River RD.
Bufflehead ***Bucephala albeola***	Summers on wooded lakes and rivers, winters on lakes and coastal waters. Nesting normally occurs near lakes in tree cavities 5-50 feet high. Dives underwater and eats small mollusks, fish, snail, and crustaceans. Also eats aquatic insects. Winter sightings common along reservoirs, and nesting activity suspected at sites associated with numerous high elevation lakes on the McKenzie River RD.
Harlequin Duck ***Histrionicus histrionicus***	During nesting (April-June) adults require fast-flowing water with midstream loafing sites nearby, dense shrub or timber/shrub mosaic vegetation on the bank, and an absence of human disturbance. Nest on ground under the shelter of vegetation, rocks, or large woody debris in close proximity to water. Broods prefer low gradient streams with adequate macro invertebrate abundance. Breeding and foraging known to occur along portions of the Main stem and South fork of the McKenzie River, as well as Lookout and French Pete Creeks.
American Peregrine Falcon ***Falcon peregrinus anatum***	Preferred nesting sites are sheer cliffs usually 75 ft. or more in height having horizontal ledges or small caves. Foraging is associated with a variety of open and forested habitats, however is most closely associated with riparian settings. Numerous potential nest sites and occupied territories occur on the McKenzie River RD.
Yellow Rail ***Coturnicops noveboracensis***	Feeds in shallow water, eating snails, insects, and some seeds and grasses. Summers on wet meadows, marshes; winters on grasslands, fields, and coastal marshes. No documented occurrence in potential habitat on McKenzie River RD.
Black Swift ***Cypseloides niger***	Found near wet cliffs in mountainous regions. Feeds on-the-wing, eating flying insects. Nests in small colonies on ledges or mountain crevices associated with waterfalls. Historical summer records in the Santiam Pass area, Linn County, which suggests breeding in that area of the McKenzie River RD.

Baird's Shrew ***Sorex bairdii permiliensis***	Poorly understood but generally considered a non-riparian associate. In 1986 two specimens were trapped from an open Douglas-fir forested area with numerous rotting logs in Polk Co. It has also been trapped on McKenzie River RD in the Mill Creek area and in the Blue River watershed.
Pacific Shrew ***Sorex pacificus cascadensis***	Poorly understood, but considered a riparian associate generally found in moist areas along class III-IV streams with abundant vegetation and down material. Occasionally found in adjacent conifer forest with moist abundant decaying logs and brush. Nests made of grasses, mosses, lichens, or leaves. Feed on slugs, snails, insects, and sometimes vegetation. No known locations on McKenzie River RD.
Pacific Fisher ***Martes pennanti***	Considered a riparian associate but found in a wide variety of densely forested habitats at low to mid-elevations. Diet consists of small and medium-sized forest mammals (porcupines, snowshoe hares, tree squirrels, mice, and voles most common). Also eats carrion, and will seasonally eat birds, bird eggs, amphibians, fish, and insects. Uses ground burrows, tree cavities, witches brooms or other clumped growth, or occasionally bird or small mammal nests as resting sites. Tree cavities are used by most maternal females with young and ground burrows are used mostly in winter. Data suggests they do better in areas with minimized fragmentation of old growth, second-growth, and riparian areas. Areas with abundant down and standing woody material important. A few sightings recorded on the McKenzie River RD.
California Wolverine ***Gulo gulo***	Found primarily in wilderness or remote country with limited human activity. High elevation areas appear to be preferred in summer, which may effectively separate wolverines and intensive human disturbance in most areas. In winter wolverines may move to lower elevations that are snowbound and/or have very limited human activity. They are capable of foraging widely (30-40 km) on a daily basis, and do not significantly use young, dense stands of timber or clearcuts. The majority of activity occurs in large expanses of scattered mature timber, with some use of ecotonal areas such as small timber pockets, and rocky, broken areas of timbered benches. Heavy use of openings w/ good winter populations of big game, a principal source of carrion which makes up much of the wolverine's diet. They also feed on marmots, snowshoe hares, various rodents, insects, insect larvae, eggs, and berries. Several unconfirmed observations mostly in wilderness areas.
Pacific Fringe-tailed Bat ***Myotis thysanodes vespertinu***	Occurs in Oregon, however habitat use is poorly documented. Three captured in 1971 were associated with young coniferous forest. They are known to use caves, mines, rock crevices, and buildings as both day and night roosts. Nothing is known about habits in winter. Diet of moths, leafhoppers, lacewings, daddy-longlegs, crickets, flies, true bugs, and spiders. Occurrence has been documented on McKenzie River RD.
Oregon Slender Salamander ***Batrachoseps wrighti***	Inhabits forested areas, especially old-growth Douglas-fir and younger stands with abundant downed large logs. They lay their eggs under thick bark, inside a crevice in a log, or in talus. Juveniles and adults live under thick bark, inside partially decayed logs, or in debris piles around the bases of large snags. They also occur in moist talus w/ abundant woody debris. Sightings have been documented at lower elevation sites on McKenzie River RD.
Cascade Torrent Salamander ***Rhyacotriton cascadae***	Live in very cold, clear springs, seeps, headwater streams, and waterfall splash zones. Forage in moist forests adjacent to these areas. Eggs are laid in rock crevices in seeps. Larvae and adults live in gravel or under small cobbles in silt-free, very shallow water that is flowing or seeping. Adults may be found under debris on streambanks or in streamside forests and talus during rainy periods. Documented in the Blue River landscape area.

Foothill Yellow-legged Frog ***Rana boylii***	Live in sections of low-gradient streams with exposed bedrock or rock and gravel substrates. Attach eggs to the bottom of quiet scour-pools or riffles in gentle-gradient streams, often where there is only slight flow from the main river. Hatchlings cling to egg masses initially and then to rocks. Nearest known sightings on private lands adjacent to the Sweet Home RD to the north.
Oregon Spotted Frog ***Rana pretiosa***	Favor lakes and slow moving streams associated w/ permanent water source w/ soft and muddy bottom. A marsh specialist w/ strong preference/requirement for warmer waters; more aquatic than other frogs; often found in water or water's edge floating on the surface or resting on aquatic vegetation. Diet is invertebrates caught above and below the surface. Early breeders: egg masses are typically deposited on top of one another in a communal fashion, not attached to vegetation, and deposited in warmer shallow water, making them susceptible to mortality due to freezing or drying. Documented populations on the McKenzie River RD in the Mink Lake basin area of the Three Sisters Wilderness.
Northwestern Pond turtle ***Clemmys marmorata marmorata***	Inhabit marshes, sloughs, moderately deep ponds, slow moving portions of creeks and rivers. Observed in altered habitats including reservoirs, abandoned gravel pits, stock ponds, and sewage treatment plants. Occur from sea level to about 1,830 meters. Require basking sites, such as partially submerged logs, vegetation mats, rocks and mud banks, and may even climb a short way onto tree branches that dip into the water. They use uplands for egg laying, overwintering, and dispersal. They may move up to 500 meters and possibly more for overwintering where they burrow into leaf litter or soil. Nest distances from the water course range from 3 meters to over 402 meters. Sparse vegetation, usually short grasses or forbs characterize most nesting areas. Documented sites along McKenzie River on private ground.
Mardon Skipper ***Polites mardon***	A small, tawny-orange butterfly currently known to exist in geographically disjunct areas in Washington, Oregon, and California. In the southern Washington Cascades, the mardon skipper is found in open, fescue grasslands within Ponderosa pine savanna/woodland habitat at elevations ranging from 1900' to 5100'. South Cascade sites vary in size from small, ½ acre or less meadows, to large grassland complexes, and site conditions range from dry, open ridgetops, to areas associated with wetlands or riparian habitats. Within these environments a variety of nectar source plants are important. The short, open stature of native fescue bunchgrass allows mardon skippers to access nectar and oviposition plants. There are no known populations on the Willamette NF.
Crater Lake Tightcoil ***Pristiloma arcticum crateris***	Sparsely distributed throughout Oregon Cascades above 2000' elevation associated with perennially wet environment in mature conifer forests and meadows among vegetation or under rocks and down woody material. Suitable locations within 10 meters of open water generally in areas under snow for extended periods during winter. One documented site on Middle Fork RD along with a few sites on Mt Hood, Deschutes, Umpqua, Winema, and Rogue River National Forests. No documented sites on the McKenzie River RD.

Table 2. Biological Evaluation process for Willamette TES (or Proposed) fauna associated with potential effects from the Ball Park Thin Project Action Alternative B.

	STEP 1	***STEP 2***	**STEP 3**	**STEP 4**	**STEP 6**
	Prefield Review	*Field Reconn.*	*Risk Assessment*	*Analysis of Significance*	*USFWS Review*
SPECIES	**Habitat Present (B,R,F,D)***	**Occupancy Status**	**Conflicts? Action Alt B**	**Effects / Impacts Action Alt B**	**Consul-tation? BA[1]/BO[2]**
Northern Spotted Owl Strix occidentalis caurina	B,R,F,D	Occupied	Potential Conflict	NLAA with seasonal restrictions	1/10/2008/ 02/07/2008
Northern Bald Eagle Haliaeetus leucocephalus	No			NE	
Least Bittern Ixobrychus exilis	No			NI	
Bufflehead Bucephala albeola	No			NI	
Harlequin Duck Histrionicus histrionicus	B,R,F,D	Unknown	No Conflict	NI with seasonal restriction	
American Peregrine Falcon ***Falcon peregrinus anatum***	F,D	Unknown	No Conflict	NI	
Yellow Rail ***Coturnicops noveboracensis***	No			NI	
Black Swift ***Cypseloides niger***	No			NI	
Baird's Shrew ***Sorex bairdii permiliensis***	B, R, F, D	Unknown	No Conflict	NI	
Pacific Shrew ***Sorex pacificus cascadensis***	B, R, F, D	Unknown	No Conflict	NI	
Wolverine ***Gulo gulo***	F,D	Unknown	No Conflict	NI	
Fisher ***Martes pennanti***	B, R, F, D	Unknown	No Conflict	NI	
Pacific Fringe-tailed Bat ***M. thysanodes vespertinu***	R,F	Unknown	No Conflict	NLCT, BI	
OR Slender Salamander ***Batrachoseps wrighti***	B,R,F,D	Unknown	No Conflict	NLCT, BI	
Cascade Torrent Salamander ***Rhyacotriton cascadae***	B, R, F, D	Unknown	No Conflict	NI	
Foothill Yellow-legged Frog ***Rana boylii***	No			NI	
Oregon Spotted Frog ***Rana pretiosa***	No			NI	
Northwestern Pond Turtle ***C. marmorata marmorata***	No			NI	
Mardon Skipper ***Polites mardon***	No			NI	
Crater Lake Tightcoil ***Pristiloma arcticum crateris***	B,R,F,D	Unknown	No Conflict	NI	

* B = breeding (nesting/denning) habitat, R = roosting/cover habitat, F = foraging habitat, D = dispersal habitat

[1] Date of Biological Assessment (BA) Consultation initiated with USFWS
[2] Date Biological Opinion (BO) or Concurrence issued from USFWS
NA = not applicable

NE = **N**o **E**ffect
BE = **B**eneficial **E**ffect
NLAA[a] = May Affect, **N**ot **L**ikely to **A**dversely **A**ffect
LAA[b] = **May** Affect, **L**ikely to **A**dversely **A**ffect
NI = **N**o **I**mpact.
NLCT = May impact individuals or their habitat, but the action will **N**ot **L**ikely **C**ontribute to a **T**rend towards Federal Listing or loss of viability to the population or species.
MCT[c] = May impact individuals or their habitat, with a consequence that the action **M**ay **C**ontribute to a **T**rend towards Federal Listing or a loss of viability to the population or species.
BI = **B**eneficial **I**mpact

a A **NLAA** determination requires *informal consultation* with the U.S. Fish and Wildlife Service.
b For *listed* species, a **LAA** determination requires *formal consultation* with the U.S. Fish and Wildlife Service. For *proposed* species, a LAA determination requires *conferencing* with the U.S. Fish and Wildlife Service (WO Amendment 2600-91-3, Forest Service Manual 2671.45, March 31, 1991).
c A **MCT** determination may require that an Environmental Impact Statement be written.

AFFECTED WILDLIFE – Discussion/Determinations/Recommendations

A discussion of the affects of the proposed project on TES species follows. **If it was determined that suitable habitat for a species does not occur in the proposed project area** (Table 2), **it is concluded that the proposed action would have no potential to effect or impact those listed TES species**, and the species will not be discussed further in this document. **A No Action proposal is expected to have no effect on federally listed threatened, endangered, or proposed species, and is also expected to have no impact on sensitive species identified by the Regional Forester.** References used to support discussion, determinations, and recommendations are listed at the end of this document (Appendix 1).

1) Northern Spotted Owl (*Strix occidentalis caurina*)

Status: Federal: Threatened
State: Threatened
FS R-6: Sensitive
Willamette National Forest: Identified as Management Indicator Species (MIS)

Determination: May affect, not likely to adversely affect northern spotted owls and designated critical habitat. A full discussion of effects can be found in the Biological Assessment dated February 29, 2008 that was submitted to the U.S. Fish and Wildlife Service.

Status Background: It has been reported that in some regards the northern spotted owl is the most studied raptor in the world (Blakesley 2004), yet prior to the early 1970s little was known about this species in the Pacific Northwest. Knowledge and interest quickly accumulated throughout the 1970s and in 1977 management guidelines for spotted owls on public land in Oregon were established. Driven by concerns over habitat loss, the USFWS conducted their first status review of the species in 1982. In 1987 a petition was submitted to list the spotted owl as endangered under the Federal ESA. The USFWS considered listing the species unwarranted at the time, however that decision was later reversed and the owl was officially listed as threatened under the Federal ESA in 1990.

Since that time a DRAFT Recovery Plan was released (USDI 1992), and the Northwest Forest Plan was

implemented (1994) and subsequently amended (USDA et al. 2001, 2004) in efforts to most appropriately manage Federal land within the range of the northern spotted owl with the welfare of this and other late-successional species in mind.

Habitat and Ecology: The northern spotted owl is a species strongly associated with old-growth forests containing a component of large diameter Douglas-fir. These forest stands commonly provide a variety of structural features such as large diameter trees having central cavities, dense canopies with a high level of vertical and horizontal diversity, and an abundance of snags and down logs (Thomas et al. 1990). Stands with all these characteristics provide the best suitable (nesting, roosting, foraging) habitat for spotted owls. However, all of the above characteristics may not need to be present for spotted owls to make use of an area as nesting, roosting or foraging habitat. The owl's affinity to old-growth forest types may result from adaptation and niche partitioning of this species to foraging on prey commonly present in such stands under lack of predation pressure and interspecies competition typical of more open areas (USDI 1992). Nevertheless, spotted owls have been known to forage short distances into harvested openings from a forested edge if a prey is available (Carey 2004).

Dispersal-only habitat for the northern spotted owl generally consists of mid seral stage stands between 40 and 80 years of age with canopy closures of 40 percent or greater and trees with a mean diameter of 11 inches or greater. Older stands lacking structural development that supports nesting may be considered dispersal habitat, however in some cases may provide roosting or foraging opportunities for the species. Spotted owls generally use dispersal habitat to move between blocks of suitable habitat or, for juveniles, to disperse from natal territories (Forsman et al. 2002, USDI 2004a).

The reader is referred to the following documents for a more comprehensive and account of the biology, ecology, and status of the northern spotted owl: A Conservation Strategy for the Northern Spotted Owl (Thomas et al. 1990); Recovery Plan for the Northern Spotted Owl - (USDI 1992); Northern Spotted Owl Five-year Review Summary and Evaluation (USDI 2004a); Status and trends in demography of northern spotted owls, 1985 – 2003 (Anthony et al. 2004); Scientific evaluation of the status of the northern spotted owl - SEI Report (Courtney et al. 2004).

Pre-field Review: This project is consistent with current standards established for projects that could affect the northern spotted owl. These standards were established for the Willamette Province and are listed in both the Programmatic Biological Assessment (BA) (USDA Forest Service 2008) and the subsequent USFWS Letter of Concurrence (LOC) (USDI 2008) for projects which may disturb the northern spotted owl or designated critical habitat.

Effects not specifically discussed in this document pertaining to new threats to the spotted owl (USDI 2004a, Anthony et al. 2004, Courtney et al. 2004) such as wildfire, west Nile virus, and barred owls are of a cumulative nature considered beyond the scope of this individual project.

Field Reconnaissance: Past surveys for spotted owls have documented ten spotted owl activity centers within 1.2 miles of project units. All ten spotted owl activity centers have established, 100-acre late successional reserves. No project units are within Late Successional Reserves. No units are proposed within a designated Critical Habitat Unit. Post treatment stand conditions with the proposed Alternative B will maintain an average 40% canopy cover and functionality of dispersal habitat.

No suitable breeding habitat is proposed for removal with the Ball Park Thin project. Noise-generating activities from harvest and prescribed burning with this project that may disturb spotted owls during the critical breeding season (March 1 – July 15) will be restricted from occurring.

Risk Assessment:
Project Effects: There are no recognized direct or indirect effects to suitable spotted owl habitat from activities associated with this project as proposed. Effects to individual spotted owls that may be present in adjacent suitable habitat are limited to some potential for disturbance from noise-generating activities during the non-critical portion of the breeding season.

Cumulative Effects: The changing trend in timber management occurring within the past decade, and projected for the future, should positively influence occupancy of suitable habitat for northern spotted owls as previously harvested stands within the Deer Creek and other adjacent watersheds redevelops, and as more emphasis is placed on recruitment of key structural components missing from harvested stands as well as retention of key structural components present in unharvested stands and restoration/maintenance of special habitats as key components of biodiversity at a landscape level.

Current Standards and Guidelines governing management of the surrounding landscape provide direction that should provide for long-term maintenance of amount and distribution of suitable spotted owl habitat. Because of the location of harvest and non-harvest allocations, it is unlikely that cumulative effects would influence the ability of local populations to persist, or become established, by eliminating demographic linkages beyond the species' dispersal capabilities.

Analysis of Significance: The Ball Park Thin project does not propose any activity that would remove suitable spotted owl habitat. However this project does propose stand treatment activities that would remove dispersal habitat within ten known spotted owl home ranges, and four of these are located within 0.5 miles. Of these, three sites have less than optimal suitable habitat. The stands proposed for treatment in these home ranges are even-aged, previously managed stands which currently function as dispersal habitat. Since habitat functionality will be maintained, this treatment ***may affect, but is not likely to adversely affect*** spotted owls due to habitat modification. It is determined that implementing the Action Alternative **may affect, but is not likely to adversely affect northern spotted owls or its designated critical habitat.**

Communication with U.S. Fish and Wildlife Service: Informal consultation for effects from proposed activities was submitted in a BA dated February 29, 2008. A Letter of Concurrence dated April 4, 2008 was received from the U.S. Fish and Wildlife Service (FWS *reference*: 13420-2007-I-0038).

Recommendations: Impose seasonal restriction on project activities in close proximity to known locations of spotted owls that could generate above-ambient noise levels during the spotted owl critical nesting period between March 1 and July 15.

2) Harlequin Duck (*Histrionicus histrionicus*)
Status Federal: Sensitive)
State: Sensitive

Determination: No impact to Harlequin Ducks or their habitat.

Status Background: The majority of documented harlequin duck use on the McKenzie River Ranger District occurs in the McKenzie River floodplain and its Class 1 tributaries. Surveys have been conducted on the McKenzie River yearly since 1992. Nests are extremely difficult to find without the use of radio telemetry. No nests or sightings have been documented on Deer Creek within the project area, however, habitat is suitable.

Habitat: During nesting (April-June) adults require fast-flowing water with midstream loafing sites nearby, dense shrub or timber/shrub mosaic vegetation on the bank, and an absence of human disturbance. Nests are typically found on the ground under the shelter of vegetation, rocks, or large woody material in close proximity to water. Broods prefer low gradient streams with adequate macro invertebrate abundance.

Pre-field review: Habitat quality for harlequin ducks in this area is expected to be moderate to high. ere are no threats to water quality in Deer Creek or its tributaries. Human disturbance in riparian habitat may occur and could disturb harlequin ducks that may use the area.

Field reconnaissance: Breeding and foraging habitat are known to occur along portions of the Main stem and South Fork of the McKenzie River, as well as on Lookout Creek.

Risk Assessment:
Project Effects: No suitable harlequin duck nesting habitat will be modified by this project. Due to the location and timing of proposed activities there should be no direct or indirect effects to harlequin ducks from disturbance that would influence breeding, foraging, or dispersal behavior.

Cumulative Effects:
Current Standards and Guidelines governing management of the landscape in watersheds surrounding the project area provide direction that should provide for long-term maintenance of amount and distribution of suitable habitat for Harlequin ducks. Riparian buffers and seasonal restrictions as needed will ensure protection for potential nest sites.

Analysis of Significance: The Ball Park Thin Project does not propose any activity that would modify suitable harlequin duck nesting habitat, and activities that could result in disturbance to harlequin ducks by influencing either breeding or foraging behavior are not expected to occur due to spatial and temporal factors. It is therefore determined this projct should have **no impact on harlequin ducks and their habitat.**

Communication with U.S. Fish and Wildlife Service: Not required.

Recommendations: A seasonal operating restriction is recommended for logging and burning within the lower 150 feet of unit 130 due to proximity to potential harlequin duck habitat that cannot be effectively surveyed.

3) American Peregrine Falcon (*Falco peregrinus anatum*)
Status Federal: None (Delisted 8/99)
State: Endangered
FS R-6: Sensitive, Identified as Management Indicator Species (MIS)

Determination: No impact to peregrine falcons or their habitat.

Status Background: Following a global population depression and the near total disappearance of the American peregrine falcon (*Falco peregrinus anatum*) from habitat throughout much of the United

States, largely as a result of environmental contamination and widespread use of DDT (Cade et al. 1988, USFWS 2003), the peregrine was listed as endangered in 1970 under the Endangered Species Conservation Act of 1969 (precursor to the ESA) and subsequently listed under the ESA in 1973. After meeting a variety of objectives listed in regional recovery plans, the peregrine was removed from the ESA list of endangered species on August 25, 1999. Since that time monitoring results suggest that population growth has continued throughout the lower 48 states (USFWS 2003).

Habitat: In the Pacific states, preferred peregrine falcon nesting sites are sheer cliffs 150 ft. or more in height with horizontal ledges (USFWS 1982). On the Willamette National Forest, cliffs with potential for nesting by peregrine falcons include those that are at least 75 feet high, have horizontal ledges, ledges with overhangs or cave-like openings, sheer faces inaccessible to ground predators and within ½ mile of riparian habitat (USDA 2000). Peregrine falcons feed almost exclusively on birds, many of which may be associated with riparian zones, large bodies of water or an abundance of snag habitat. Peregrine falcons feed on small birds that are present in drier, open areas, particularly where hardwood shrubs and trees are abundant. Some avian prey species select for closed coniferous forest. Peregrine falcons can forage widely for prey and will hunt over closed coniferous forest canopies as well as in open areas and over hardwood patches - wherever prey is abundant (Cade et al. 1988).

Pre-field review: Some high quality suitable peregrine nesting habitat exists within the Ball Park Thin Project area near Bunchgrass Mountain. Other lower suitable habitat quality cliffs are in the lower part of the drainage. within or immediately adjacent to the project area. The Ball Park Thin project area is within 3 miles of a known peregrine nest site, and it includes part of the tertiary management zone for that site (OE-82).

Additional highly suitable peregrine falcon habitat is present at Wolf Rock just to the west of the Ball Park Thin Project area. Peregrine falcons have been seen here various times since the late 1990s and numerous protocol surveys have been conducted, sometimes using more than one observer. No nests have ever been detected.

As a result of annual site monitoring, adult and young peregrines from the nearby nest site are known to forage for avian prey in and near the project area. Young peregrines may linger in the project area while dispersing from a nest site. The Ball Park Thin project would not modify or disturb any suitable peregrine nesting habitat. All proposed activities would occur at a sufficient distance from nesting habitat such that any disturbance potential would be avoided (Pagel 1992, USDA 2002).

Field reconnaissance: The peregrine nest site nearest to the project area has been monitored annually throughout the breeding season since its discovery in 2000. This site has been occupied annually since that time, and has successfully fledged young during half of these years. One protocol survey of potential peregrine nesting habitat at Bunchgrass Mountain within the Ball Park Thin project area was conducted in 2007 and no peregrine falcons were detected.

Formal breeding bird surveys have not been conducted within the planning area. The complete range of avian prey species for peregrine falcons that may currently occur in habitat throughout the project area is unknown, but is expected to be typical for habitat associated with this area (O'Neil et al. 2001).

Risk Assessment:
Project Effects: No suitable peregrine nesting habitat would be modified with this project. Due to the location and timing of proposed activities there should be no direct or indirect effects to peregrines from disturbance that would influence breeding, foraging, or dispersal behavior.

Removal of trees and prescribed burning may modify or disturb habitat suitable for use by some potential peregrine prey species. Tree cutting and prescribed burning would typically occur outside the breeding seasons for most prey species that could be using affected habitat. Modification or disturbance activities are considered relatively insignificant considering the overall amount of foraging habitat within management zones established for known peregrine nest sites (approximately 26,000 acres).

Cumulative Effects: This project reflects an overall focus on previously clearcut areas that are now being thinned to improve forest stand structural diversity. Current management standards are placing more emphasis on recruitment of key structural components missing from harvested stands which is expected to benefit peregrine falcon prey habitat. Fire that will occur both after thinning and as proposed in mature unmanaged stands is expected to increase both large snag and large down wood habitat that would benefit peregrine falcon prey habitat, as well as overall landscape level biodiversity.

Analysis of Significance: The Ball Park Thin Project does not propose any activity that would modify suitable peregrine falcon nesting habitat. It is therefore determined this projct should have **no impact on peregrine falcons and their habitat.**

Communication with U.S. Fish and Wildlife Service: Not required.
Recommendations: None warranted.

4) Baird's Shrew (*Sorex bairdii permiliensis)*
Status Federal: None
State: None
FS R-6: Sensitive

Determination: The proposed Ball Park Thin Project is not expected to impact Baird's shrew or its' habitat.

Habitat: This species of shrew has been found in traps set in an open Douglas-fir forested area with numerous rotting logs (Verts and Carraway 1998). More specific habitat requirements are lacking. They are active diurnally.

Pre-field review: Baird's Shrew is endemic to Oregon (Verts and Carraway 1998). This species occurs in the Coast Range from Portland south to Lane County. It also occurs along the west slope of the Cascade Range from the Columbia River south to central Lane County.

Field reconnaissance: No locations of Baird's Shrew are known from the Ball Park Thin Project area. Habitat for Baird's Shrew occurs in abundance.

Risk Assessment: Project Effects: Implementation of the Ball Park Thin project does not pose a risk to long-term viability of Baird's Shrew populations. If this species of shrew depends on dead wood, the management recommendations to leave greater than 240 lineal feet of large down wood per acre would ensure habitat requirements of this shrew are met.
Cumulative effects: None

Analysis of Significance: The Ball Park Thin project would improve down wood habitat conditions and may thus provide a minor benefit to the Baird's Shrew, if it occurs in the area.

Recommendations: Leave large down woody material as prescribed. If it is not present after logging is completed, trees should be falled until the prescription has been met.

Communications with U.S. Fish and Wildlife Service: Not required

5) Pacific Shrew (*Sorex pacificus cascadensis*)

Status Federal: None
State: None
FS R-6: Sensitive

Determination: The proposed Ball Park Thin Project is not expected to impact the Pacific Shrew or its' habitat.

Habitat: This species of shrew is often found in moist forested areas with fallen decaying logs and brushy vegetation (Verts and Carraway 1998)(Ingles 1965).

Pre-field review: This species of shrew is endemic to Oregon (Verts and Carraway 1998). It is distributed as two distinct populations: one in the Coast Range from Cascade Head, Tillamook Co., south to Coos Bay, and the other in the Cascade Range from northeastern Linn Co. to southern Jackson Co. Pacific shrews appear to be adapted for capturing, killing, and eviscerating hard-bodied insects (Verts and Carraway 1998). Internal organs of insects composed 28.6% by volume of the diet (Verts and Carraway 1998). Other prey items are unidentified insect larvae, slugs and snails, beetle larvae, and unidentified invertebrates. Numerous dead specimens of the insect *Omus audouini* (Coleoptera) were considered to have been cached by Pacific shrews.

Field reconnaissance: No locations of the Pacific Shrew are known from the Trapper Project area. Habitat for this shrew occurs in abundance.

Risk Assessment: Project Effects: Implementation of the Ball Park Thin project does not pose a risk to long-term viability of Pacific Shrew populations. If this species of shrew depends on dead wood, the management recommendations to leave greater than 240 lineal feet of large down wood per acre would ensure habitat requirements of this shrew are met.
Cumulative effects: None

Analysis of Significance: The Ball Park Thin project would improve down wood habitat conditions and may thus provide a minor benefit to the Pacific Shrew, if it occurs in the area.

Recommendations: Leave large down woody material as prescribed. If it is not present after logging is completed, trees should be falled until the prescription has been met.

Communications with U.S. Fish and Wildlife Service: Not required

6) Wolverine (*Gulo gulo*)
Status: Federal: None
State: Threatened

FS R-6: Sensitive

Determination: No impact to wolverine or its' habitat.

Status Background: The Ball Park Thin Project is recognized historic and current range for the wolverine (*Gulo gulo (luscus)*) which was petitioned for federal listing under the Endangered Species Act (ESA) in July 2000. On October 21, 2003 the U.S. Fish and Wildlife Service (FWS) issued a 90-day Finding for a Petition To List as Endangered or Threatened Wolverine in the Contiguous United States. In that finding it was determined that the petition did "not provide substantial information indicating that listing may be warranted". An earlier (1994) petition to list the wolverine was found to be "not warranted" by FWS.

Taxonomy can lead to confusion when assessing the status of this species and its historic or current potential occurrence in these watersheds. Sighting records frequently include the name "California Wolverine". However, the validity of such a nominal subspecies has been questioned or is not recognized throughout much of the published literature devoted to addressing this species (Banci 1994, Johnson and O'Neil 2001, NatureServe 2005, Verts and Carraway 1998). Therefore further references to wolverine in this document are intended to be interpreted as *Gulo gulo*.

Records show that the wolverine has been listed on the Regional Forester's Sensitive Animal List for at least the past fifteen years. The wolverine was one of the original species classified as threatened by the Oregon Fish and Wildlife Commission in 1975. The status of the species was reviewed in 1988 (Marshall 1988) and as a result of that review wolverine are currently listed as threatened under the Oregon Endangered Species Act.

Habitat and Ecology: A large block of literature has been published in the past decade pertaining to the biology, ecology, and management of wolverine (Banci 1994, Claar et al. 1999, Copeland 1996, Heinemeyer et al. 2001, O'Neil et al. 2001, Verts and Carraway 1998). This is not meant to suggest that all aspects of the ecological relationships between this species and its environment are well understood. On the contrary, some relationships such as responses to human disturbance are just beginning to be understood based on a scientific rather than anecdotal context (Joslin and Youmans 1999; Rowland et al. 2003). The following is a gross summary of wolverine ecology considered pertinent to the presence of this species in vicinity of the project area. The reader is strongly encouraged to refer to the literature for a more thorough understanding of this species.

The wolverine has been referenced as the largest-bodied terrestrial mustlelid (Banci 1994) with a body weight three to four times greater than the fisher despite having a similar overall body length. Its' robust appearance allows adults to be described as resembling a small bear.

O'Neil et al. (2001) list the wolverine in Oregon as associated with 26 forest structural conditions, 11 habitat types, 17 habitat elements, and as serving 5 key ecological functions within the identified associations. Overall data do not support any statistical association between the species and a particular vegetative community – a fact reflected by O'Neil in attaching a low confidence to all associations listed for structural conditions and habitat types. Forested habitats used by wolverines appear to vary geographically and seasonally in areas where they have been studied (Claar et al. 1999). Habitat preferences have been linked to areas based on the availability of food and low human occurrence. The most specific habitat need of wolverines may be for female denning habitat secure from human disturbance (Copeland 1996) throughout the breeding season, which can range from November through April (Banci 1994).

The current definition and subsequent identification of suitable wolverine habitat has evolved largely from Copeland's (1996) study of a wolverine population in central Idaho. Because of a widely published concern regarding the sensitivity of wolverines to human disturbance at natal den sites (Banci 1994, Claar et al. 1999, Copeland 1996, Krebs and Lewis 1999, Lyon et al. 1994, Youmans 1999a), there seems to be scientific consensus that identification of female denning habitat is key to managing for this species where it is likely (or known) to occur. Following that logic the Willamette National Forest created a GIS layer in 1998 based on criteria provided by the Regional Office in an effort to identify potential denning habitat. Habitat generally described as areas having a northerly aspect for higher elevation cirque landscape features with a large boulder/talus component and a relatively open canopy was mapped across the Forest.

Wolverines are generally described as opportunistic omnivores in summer and primarily scavengers in winter with extremely large home ranges in proportion to their body size. Adult wolverine home range sizes average 148mi^2 for females and 610mi^2 for males (Copeland 1996). They are capable of foraging widely (30-40 km) on a daily basis, and do not significantly use young, dense stands of timber or clearcuts (Banci 1994). Virtually all studies that have investigated food habits for the species have shown wolverine to be closely associated with a dependency upon the availability of large mammal carrion to balance its energy budget during critical periods of its lifecycle.

Pre-field Review: Habitat conditions during the reference era in watersheds surrounding the project area favored the likelihood of occupancy by wolverine as it is located well within the historic range for this species, and would have been relatively free from human disturbance – especially during the breeding season. Then, as now, population densities would be expected to have been low given our current understanding of wolverine ecology.

The USDA Forest Service Fiscal Year 1958 Annual Wildlife Statistical Report for the Willamette National Forest lists the wolverine as having occasional abundance and a stationary population trend. Suitable denning habitat existed within a wolverine's daily movement range at numerous locations surrounding the project area, and if wolverine were indeed present during that time the species would likely have occupied habitat in the area. Then, as now, the function of habitat associated with this project would have been to support year-round foraging and dispersal activities.

Maj and Garton (1994) mapped observation records for wolverine from 1961 through 1982, which show a cluster of sightings located within easy dispersal range of the Ball Park Project area. They also mapped records from 1983 through 1993, which show a sharp decline for sightings in the same location. Occurrence and breeding status data presented by O'Neil et al. (2001) show that wolverine both occurs and breeds in Oregon. A review of reported wolverine sightings on the Willamette National Forest conducted in May 2001 revealed 33 records of sightings between 1965 and 1999 on or adjacent to the Forest boundary, including sightings in watersheds where this project is located. There is no current verification that this species occupies habitat in the area, and late-winter aerial surveys around denning habitat conducted from 1998 through 2001 did not detect wolverines within any adjacent watershed.

An issue regarding the reliability of current and historical presence of species such as the wolverine based on anecdotal records considered to be unverifiable has been raised (Aubry and Lewis 2003; McKelvey et al. 2002; McKelvey et al. 2000). The issue is associated with using such observational data combined with verifiable records to arrive at conservation actions and management recommendations. While some investigators believe combining such occurrence records results in scientific and legal vulnerability, others apparently do not (Rowland et al. 2003). Based on historic and

current information, this analysis assumes the potential for wolverine to use habitat associated with this project for one or more of its' biological requirements.

Field Reconnaissance: The Ball Park Thin project is located adjacent to prominent landscape features providing a westerly extension of upper elevation habitat connected to a vast remote area of the Western Oregon Cascades. Rocky outcrops associated with some potential habitat are visible from various locations within the project area. Most potential denning habitat is considered to be relatively free of human disturbance from winter recreation activities throughout much of the breeding season. However, inter activities such as cross country skiing and snowmobiling can be expected to occur periodically in surrounding areas. Although currently small in scale, these types of winter recreation do have potential to disturb wolverine – particularly a female that may be using nearby denning habitat. This project or surrounding areas are open to a variety of human recreation activities throughout the remainder of the year. Activities such as hunting, hiking, horse back riding, and pleasure driving are considered to have less potential to disturb any wolverine that may be simply foraging or dispersing through nearby habitat.

The project area is recognized for its importance in providing habitat supporting local big game populations. Deer and elk are frequently observed during field visits to the project area. Improved forage habitat for big game would be created under this project's Action Alternative. Refer to this project's EA and wildlife report for a further discussion of potential effects to big game habitat.

Habitat directly associated with the Ball Park Thin Project is considered to be suitable as foraging and dispersal habitat for wolverine.

Risk Assessment:
Project Effects: This project proposes no activities that would result in modification or disturbance of potential natal denning habitat. Project activities that are proposed should not compromise foraging or dispersal opportunities for any individual to any estimable extent. For these reasons there are no recognized direct or indirect effects to this species associated with the project proposal.

Cumulative Effects: If security of natal denning habitat from human disturbance is critical for the persistence of wolverine in an area, the ability of this species to occupy otherwise suitable habitat in this area has likely been compromised by activities not associated with this project. Road building has allowed a variety of motorized and non-motorized winter recreation to extend into many areas surrounding the project area, that were not historically readily accessible. Cumulative effects associated with human disturbance in the form of winter recreation have negatively influenced suitability of areas to support denning activity. Past, present, and ongoing winter activities in areas such as the Deer Creek area are examples of areas where suitability may have been compromised.

If access to areas where wolverine may depend on larger mammals as a food source during critical times of the year is another factor influencing the persistence of this species in an area, wolverine have likely benefited from past harvest activity that has resulted in a wider distribution of forage habitat for big game. During the past decade however, harvest practices have changed and this positive contribution is waning rapidly as forage units regenerate into hiding cover.

The cumulative effect of this project on natural forage habitat as it pertains directly to big game and indirectly to wolverine will be positive in the short-term until canopies close back in, but not measurable on a landscape scale.

Analysis of Significance: This project does not propose any activity that would modify or otherwise disturb potential wolverine denning habitat. Considering the wide-ranging nature of daily movements associated with wolverine foraging and/or dispersal behavior along with the low likelihood of occurrence and timing of proposed activities, this project should not result in disturbance to the species. It is therefore determined this project should have **no impact to wolverines or their habitat.**

Communication with U.S. Fish and Wildlife Service: Not required.

Recommendations: None warranted.

7) Fisher (*Martes pennanti*)

Status: Federal: None
State: None
FS R-6: Sensitive

Determination: No impact to individuals or habitat for Pacific Fisher.

Habitat: This species inhabits widespread, continuous-canopy forests at relatively low elevations, and is most abundant in mountainous regions. It is less abundant in foothill regions. Fishers occupy a wide variety of densely forested habitats at low to mid-elevations (100-1800m). Typical habitats include subalpine Pacific fir (26%), western hemlock (54%), and Sitka spruce (20%). Aubry and Lewis (2003) suggest that habitat for Fishers can be enhanced by minimizing forest fragmentation, both in remaining old growth and second growth; maintaining a high degree of forest floor structural diversity in intensively managed plantations; preserving large snags and live trees with dead tops; maintaining continuous canopies in riparian areas; and protecting swamps and other forest wetlands.

Pre-field review: Pacific Fishers inhabit the boreal forest region in the southern half of Canada with extensions into the United States in the Rocky Mountains, Cascade, Coast, and Sierra Nevada Ranges. Of the three specimens on deposit in systematic collections, two are from Lane County. One sighting of medium confidence has occurred on the McKenzie River Ranger District in the French Pete drainage. No Pacific Fishers have ever been documented in the Ball Park Thin Project area.

Field reconnaissance: Habitat for Pacific Fishers exists in the Ball Park Thin Project area to varying degrees. The highest quality habitat with the least amount of human disturbance is found at the higher elevations near Bunchgrass Mountain, as well as the Cadenza Creek 9D Special Wildlife Habitat Area.

Risk Assessment: Project Effects: Implementation of the Ball Park Thin project does not pose a risk to long-term viability of Pacific Fisher populations. The management recommendation to leave greater than 240 lineal feet of large down wood per acre would ensure habitat requirements of this species are met.
Cumulative effects: None

Analysis of Significance: The Ball Park Thin project would improve down wood habitat conditions and may thus provide a minor benefit to Pacific Fishers, if they occur in the area.

Recommendations: Retain down log habitat as described in the prescription. If it is not present after logging is completed, trees should be falled until the prescription has been met. Implement road closures as planned, as soon as possible after logging is completed.

Communications with U.S. Fish and Wildlife Service: Not required

8) Pacific Fringe-tailed Bat (*Myotis thysanodes vespertinu*)
Status: Federal: None
State: None
FS R-6: Sensitive

Determination: May impact individuals and habitat for Pacific Fringe-tailed bats. Also may benefit Pacific Fringe-tailed habitat.

Status Background: The Pacific fringe-tailed bat was added to the Regional Forester's sensitive animal list in November 2000 based on the Natural Heritage Ranking for the species. This species is one of the three named sub-species of fringed myotis (*Myotis thysanodes*), which is among bat species whose specific habitat needs are addressed under a Northwest Forest Plan Standard and Guideline (2001 ROD pp 37-38).

Habitat: This bat is considered a riparian associate species that has been associated with mixed-conifer forests having relatively dry moisture regimes in the Coast Range and southern Cascade Range of Oregon (NatureServe 2005, O'Neil et al. 2001). Other scattered locations occur in the Washington Cascades and into California and the desert Southwest. They may occur from near sea level to above 4000' in Oregon and use a wide range of habitats – from forested to non-forested (Hayes 2003, Verts and Carraway 1998). Foraging behavior specific to this species is poorly documented, however they have been described as aerial foragers and hovering gleaners (O'Neil et al. 2001). Maternity sites, hibernacula, and most documented individual roost sites for fringed myotis occur in rock crevices, caves, or human-made structures. However Weller and Zabel (2001) recently published data that show a significant amount of individual roosting occurring in trees/snags when this species occurs in or near forested habitat. Structures associated with live trees or snags have since been recognized as the primary roost structures for this species when it occurs in/near forested habitat and features associated with caves, mines, bridges or buildings may serve as primary roost structures in non-forested habitat (Hayes 2003). Knowledge of roosting behavior is almost exclusively based on data obtained during the breeding season for this species which likely extends from May through August (O'Neil et al. 2001).

Pre-field Review: Despite an overall lack of survey data and poorly documented habitat requirements and life-history accounts for this species, its presence has been documented on the McKenzie River Ranger District (Ormsbee pers com., Verts and Carraway 1998). Single individuals of the Pacific Fringe-tailed Bat may use available forage and roost habitat throughout the summer and early fall in or adjacent to areas where the proposed Ball Park Thin project would occur.

Field Reconnaissance: Formal bat surveys within the project area have not been conducted. There are no caves, mines, or abandoned wooden bridges and buildings that would serve as suitable hibernacula, nor are there known roost sites associated with other structures within 250 feet that would be affected by proposed activities. Some snags and decadent trees occurring adjacent to proposed treatment areas contain features suitable for roosting use by bats – including *Myotis thysanodes*.

The current composition of habitat throughout the project area consisting of a mixture of older and young forested habitat, as well as open non-forested (meadows and rock outcrops) habitat creates a moderate amount of edge habitat, increasing the potential that individuals may use the area for foraging and either day or night roosting. Bats are known to use edge habitat more frequently than forests or open habitat, which is likely a function of avoiding dense clutter associated with forest habitat and areas where prey abundance may be reduced in open habitat (Hayes 2003).

Risk Assessment: Project Effects: None or only very few potential roosting trees/snags that may be used by bats would be lost within project harvest units, because they currently contain little to no snag habitat. Some individual larger snags may be burned/lost within the proposed fire underburn units. Other larger trees within proposed fire underburn units may be modified such that they eventually would develop into roosting habitat. Loss of hazard trees larger than 12" diameter along the haul route may also impact individual roost trees/snags used by this species. Project activities should not compromise roosting or foraging opportunities for any individuals to any estimable extent, and therefore should not result in any direct effect to Pacific fringe-tailed bats.

Cumulative Effects: Current Standards and Guidelines governing management of the landscape in watersheds surrounding the project area provide direction that should provide for long-term maintenance of the amount and distribution of suitable habitat for *Myotis thysanodes*. Because of the range and location of land allocations in this area, it is unlikely that cumulative effects would influence the ability of local populations to persist, or become established, by eliminating demographic linkages beyond the species' dispersal capabilities. Cumulative effects of this project on roosting or forage habitat as it pertains directly to this species would be immeasurable on a landscape scale.

Analysis of Significance: There is no known threat to hibernacula or maternity roosts from activities proposed under the Ball Park Thin Project. Suitable roosting habitat adjacent to project areas should not be affected by this proposal. Activities that could result in disturbance to this species by influencing either roosting or foraging behavior are expected to be minor when other habitat within the project area is considered. It is therefore determined this project **may impact Pacific fringe-tailed bats and their habitat. Snag creation due to fire underburning or within harvest units may benefit habitat for this species.**

Communication with U.S. Fish and Wildlife Service: Not required.

Recommendations: Protect decadent trees and snags >12"dbh (roosting habitat) adjacent to the project area to the greatest extent feasible while conducting project activities.

9) Oregon Slender Salamander (*Batrachoseps wrighti*)

Status: Federal: None
State: None

FS R-6: Sensitive

Determination: May impact Oregon Slender Salamander and its' habitat.

Status Background: The Oregon Slender Salamander was added to the Regional Forester's sensitive animal list in November 2000 based on the Natural Heritage Ranking for the species.

Habitat: This salamander is found under loose bark and moss in mature and second growth Douglas fir forests. It also burrows under rocks or logs of moist hardwood forests within coniferous forest landscapes. During the fall and spring when conditions are moist, the Oregon slender salamander is found near the surface, but it retreats underground in late spring and summer.

Pre-field Review: This species is found on the west slope of the Cascades from the Columbia River to Southern Lane County. No individuals are known to occur within the Ball Park Thin Project area.

Field Reconnaissance: Formal surveys within the project area have not been conducted. Presence of this species is suspected to occur within mature/old-growth areas of the Ball Park Thin project area where large decayed down wood exists. The older plantations proposed for thinning are judged to be poor quality habitat for Oregon Slender Salamander.

Risk Assessment: Project Effects: Logging associated with the Ball Park Thin project would not remove any existing large down wood. Proposed underburning within some units after logging may decrease habitat suitability. The natural fuels underburn in mature forest stands may impact Oregon Slender Salamander habitat. The prescribed fire is proposed to occur within spring or late fall before rains, and thus, existing large down wood is expected to be only minimally impacted. The patchy nature and higher moisture retention surrounding large logs may allow salamanders that may use this area to survive.

Cumulative Effects: It is expected that habitat connectivity for this species will continue to allow viable local populations to exist. Cumulative effects of this project as it pertains directly to this species would be immeasurable on a landscape scale.

Analysis of Significance: There is no known threat to any known Oregon Slender Salamander individuals from activities proposed under the Ball Park Thin Project. Activities that could result in disturbance to individuals of this species are expected to be minor when other habitat within the project area is considered. It is therefore determined this project **may impact Oregon Slender Salamanders and their habitat.**

Communication with U.S. Fish and Wildlife Service: Not required.

Recommendations: Retain down log habitat as described in the prescription. If it is not present after logging is completed, trees should be falled until the prescription has been met.

10) Cascade Torrent Salamander (*Rhyacotriton cascadae*)

Status: Federal: None
State: None
FS R-6: Sensitive

Determination: No impact to Cascade Torrent Salamander and its' habitat.

Status Background: The Cascade Torrent Salamander was added to the Regional Forester's sensitive animal list in November 2000 based on the Natural Heritage Ranking for the species.

Habitat: The Cascade Torrent Salamander can be found under rocks bathed in a constant flow of cold water, in cool rocky streams, lakes and seeps, usually within conifer or alder forests. It is dependent on nearly continuous access to cold water. During wet weather it can be found moving around in forests away from streams.

Pre-field Review: This salamander inhabits the Cascade mountains of southern Washington and northern Oregon with a disjunct population in the southern Oregon Cascades. No individuals are known to occur within the Ball Park Thin Project area.

Field Reconnaissance: Formal surveys within the project area have not been conducted. Presence of this species is suspected to occur within creeks of the Ball Park Thin project area, as well as within upslope areas during wet weather. Cascade Torrent Salamanders have been found in the adjacent Blue River Watershed, but have not been located in the Ball Park Project Area.

Risk Assessment: Project Effects: Logging associated with the Ball Park Thin project would not remove any existing large down wood. Cascade Torrent Salamanders would not be using areas outside creeks during proposed post-harvest or natural fuels underburning treatments, therefore this project would not impact this species

Cumulative Effects: No cumulative effects are anticipated because this project would not impact this species. It is expected that habitat connectivity for this species will continue to allow viable local populations to exist.

Analysis of Significance: There is no known threat to any known Cascade Torrent Salamander

individuals from activities proposed under the Ball Park Thin Project. It is therefore determined this

project **will not impact Cascade Torrent Salamanders or their habitat.**

Communication with U.S. Fish and Wildlife Service: Not required.

Recommendations: Retain down log habitat as described in the prescription. If it is not present after logging is completed, trees should be falled until the prescription has been met. Some of this material should be created over or directly adjacent to streams if possible.

11) Crater Lake Tightcoil (*Pristiloma arcticum crateris*)
Status: Federal: None
State: ODFW none / Natural Heritage S1
FS R-6: Sensitive / Survey and Manage Species

Determination: No impact to individuals or habitat for Crater Lake Tightcoil.

Status Background: The Crater Lake tightcoil had been listed as a Survey and Manage species since the 1994 Northwest Forest Plan ROD (USDA, USDI 1994). Under the 2001 ROD (USDA, USDI 2001) it was classified as a Category B species. The species was changed to a Category A species following the 2002 Annual Species Review where it remains considered rare, and for which pre-disturbance surveys are practical if habitat is present. It was added to the Regional Forester's sensitive animal list in July 2004.

The species is endemic to Oregon, and known to occur above 2000 feet elevation throughout the Oregon Cascades from the Mt Hood National Forest south to the Winema National Forest. As of August 2005 specimens had been confirmed at approximately 160 sites from very limited locations across this range (Duncan 2004, NatureServe 2005). In May 2005 a specimen that has since been confirmed to be *Pristiloma arcticum crateris* was collected on the Middle Fork Ranger District which is located south of the McKenzie River Ranger District.

Habitat and Ecology: *Pristiloma arcticum crateris* "may be found in perennially moist situations in mature conifer forests and meadows among rushes, mosses and other surface vegetation or under rocks and woody debris within 10 m. of open water in wetlands, springs, seeps and streams, generally in areas which remain under snow for long periods in the winter. Essential habitat components include uncompacted soil, litter, logs, and other woody debris in a perennially wet environment"(Duncan 2004).

This species is among many organisms functioning as primary and secondary consumers that contribute to soil building and dissemination of spores and microbes. Having very limited dispersal capabilities on their own, they may be assisted in dispersal by other vectors capable of transporting mud that may contain eggs or adults across distances into suitable habitat (Duncan et al. 2004). An example of such dispersal could be individuals in mud transported on the hoof of a deer or elk.

Loss or degradation of suitable wetland habitat has been identified as the major threat to this species.

Pre-field Review: Based on habitat described in an established survey protocol for this species (Duncan et al. 2003) it is considered that suitable habitat for Crater Lake Tightcoil exists within portions of the project area.

Field Reconnaissance: Based on the three evaluation criteria to determine the need to conduct a survey, surveys for Crater Lake Tightcoil are not considered to be required for this project. This consideration is made because each of the three criteria necessary to trigger a survey would not be met for the following reason: perennially wet habitat associated with creeks in portions of the project area will be protected by a 10 meter buffer against all disturbance activities including prescribed burning. For this reason the persistence of the species if present in the project area should not be compromised.

Risk Assessment:

Project Effects: Because measures will be taken to protect suitable habitat for this species against disturbance or modification from effects associated with proposed activities, there are no recognized direct or indirect effects to this species or its habitat from the project.

Cumulative Effects: Because measures will be taken to protect suitable habitat for this species against disturbance or modification from effects associated with proposed activities, there are no recognized cumulative effects to this species or its habitat from the project.

Analysis of Significance: Suitable habitat for the Crater Lake Tightcoil exists throughout the Ball Park Thin Project area, however measures will be taken to protect this habitat where it occurs against disturbance or modification from effects associated with proposed activities, therefore there should be **no impact to Crater Lake Tightcoil or its habitat** from this proposal.

Communication with U.S. Fish and Wildlife Service: Not required.

Recommendations: Ensure that measures identified to prevent habitat disturbance within 10 meters of perennially wet areas are implemented during project activities.

12) Mardon Skipper (*Polites mardon*)
Status: Federal: Candidate
State: ODFW- none/Heritage-S2
FS R-6: Sensitive

Determination: No impact to individuals or habitat for Mardon Skipper.

Status Background: The mardon skipper *(Polites mardon)* was added to the Regional Forester's sensitive animal list in September 2002 based on its status as a candidate species under the federal ESA. The mardon skipper is a butterfly in the family Hesperiidae (skippers) and the subfamily Hesperiinae (grass skippers). It was first described in the late 1800's from specimens taken in Thurston County, Washington (Potter et al. 1999). Subspecific distinctions within *Polites mardon* have recently been considered, resulting in a proposal to rename the Washington population *Polites mardon mardo*n, and the Oregon and California populations, *Polites mardon klamathensi*s (NatureServe 2005, Potter et al. 1999, Pyle 2002).

The mardon skipper is a small, tawny-orange butterfly currently found at only four, small, geographically disjunct areas in Washington, Oregon, and California (USDI 2004b). Grasslands of the Puget Sounds prairies in Washington State, where the species appears to be critically imperiled (NatureServe 2005), and Washington's southern Cascades are believed to support just a few hundred individuals. Much less has been documented for Oregon and California sites, however recent surveys have confirmed presence of mardon skippers at previously unknown locations. The species has been documented at three new sites in southern Oregon and one new site in southern Washington as a result of 2005 surveys (Seitz pers. com.).

Habitat and Ecology: In the southern Washington Cascades, the mardon skipper is found in open, fescue grasslands within Ponderosa pine savanna/woodland habitat at elevations ranging from 1900' to 5100'. South Cascade sites vary in size from small, ½ acre or less, meadows, to large grassland complexes. Site conditions range from dry, open ridgetops, to areas associated with wetlands or riparian habitats. Within these environments a variety of nectar source plants are important. The short, open

stature of native fescue bunchgrass stands allows mardon skippers to access nectar and oviposition plants (Potter et al. 2002).

Fire historically played an important role in maintaining grassland plant communities. Mardon skippers were likely more widespread and abundant prior to large-scale loss of their open, fescue dominated,

grassland habitat (NatureServe 2005, USDI 2004b). Much of this type of habitat in National Forests upon which mardon skippers depend are threatened today by forest encroachment along with invasion by native and non-native plants.

Pre-field Review: Mardon skipper butterflies have not been documented at sites on the Willamette National Forest. The species is known to occur within habitat types similar to those associated with this project area (Potter et al. 1999). Based on knowledge of habitat associated with where the species was historically, and is currently known to occur, it can be surmised that suitable habitat for this species exists within the project area as well as surrounding meadows.

Field Reconnaissance: Suitable habitat for Mardon skipper exists within the Ball Park Thin project area in meadow habitat at Bunchgrass Mountain. Protocol surveys were conducted in 2007, however no Mardon skippers were found.

Risk Assessment:
Project Effects: This project does not propose activities in suitable Mardon skipper habitat; therefore there would be no impact.

Cumulative Effects: No cumulative effects are anticipated.

Analysis of Significance: No impacts are anticipated.

Communication with U.S. Fish and Wildlife Service: Not required.

Recommendations: Consider enlisting the expertise of a group such as local Chapter of the Xerces Society or North American Butterfly Association in repeating the surveys for mardon skipper in meadows within the project area.

This document was prepared by: /s/ Ruby Seitz Date: May 14, 2008

Ruby Seitz
Wildlife Biologist
McKenzie River Ranger District
Willamette National Forest

Appendix 1: Literature referenced during this biological evaluation to arrive at determinations regarding potential effects/impacts from proposed projects and activities.

Anthony, R., R.L. Knight, G.T. Allen, B.R. McClelland, and J.I. Hodges. 1982. Habitat use by nesting and roosting bald eagles in the Pacific Northwest. Trans. of the 47th N. Amer. Wildl. and Nat. Res. Conf., Washington, DC.

Anthony, R.G., M.A. O'connell, M.M. Pollock, and J.G. Hallett. 2003. Associations of mammals with riparian ecosystems in Pacific Northwest forests. pp. 510-563 *in:* C.J. Zabel and R.G. Anthony, eds. Mammal community dynamics: management and conservation in the coniferous forests of Western North America. Cambridge University Press. 2003.

Anthony, R.G., E.D. Forsman, A.B. Franklin, D.R. Anderson, K.P. Burnham, G.C. White, C.J. Schwarz, J. Nichols, J.E. Hines, G.S. Olson, S.H. Ackers, S. Andrews, B.L. Biswell, P.C. Carlson, L.V. Diller, K.M. Dugger, K.E. Fehring, T.L. Fleming, R.P. Gerhardt, S.A. Gremel, R.J. Gutierrez, P.J. Happe, D.R. Herter, J.M. Higley, R.B. Horn, L.L. Irwin, P.J. Loschl, J.A. Reid, S.G. Sovern. 2004. Status and trends in demography of northern spotted owls, 1985 – 2003. September 2004.

Aubry, K.B. and P.A. Hall. 1991. Terrestrial amphibian communities in the southern Washington Cascade Range. pp. 326-338 *in:* Ruggiero, Leonard F.; Aubry, Keith B.; Carey, Andrew B.; Huff, Mark H., tech. coords. Wildlife and vegetation of unmanaged Douglas-fir forests. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon, General Technical Report PNW-GTR-285, May 1991.

Aubry, K.B. and J.C. Lewis. 2003. Extirpation and reintroduction of fishers (*Martes pennanti*) in Oregon: implications for their conservation in the Pacific states. Biological Conservation 114 (2003) 79-90.

Banci, V. 1994. Wolverine. Pages 99-127. *in* L.R. Ruggiero, K.B. Aubry, S.W. Buskirk, L.J. Lyon and W.J. Zielinski, eds. The scientific basis for conserving forest carnivores: American marten, fisher, lynx and wolverine in western United States. USDA Forest Service Gen. Tech. Rep. RM-254. 184 pp.

Blakesley, J. 2004. Chapter five: habitat associations. *in* Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutierrez, J.M. Marzluff, L. Sztukowski. 2004. Scientific evaluation of the status of the northern spotted owl (SEI Report). Sustainable Ecosystems Institute, Portland OR. September 2004.

Blaustein, A.R., J.J. Beatty, D.H. Olson, and R.M. Storm. 1995. The biology of amphibians and reptiles in old-growth forests in the Pacific Northwest. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon, General Technical Report PNW-GTR-337, March 1995.

Bruner, Howard J. 1997. Habitat use and productivity of harlequin ducks in the central Cascade range of Oregon. Master's Thesis. Oregon State University, Corvallis, OR. 44 pp.

Cade, T.J., J.H. Enderson, C.G. Thelander, and C.M. White. 1988. Peregrine falcon populations: their management and recovery. The Peregrine Fund, Inc. Boise, Idaho, USA. 1988. 949pp.

Cary, A.B. 2004. Appendix 5: relationship of prey and forest management. *in* Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutierrez, J.M. Marzluff, L. Sztukowski. 2004. Scientific evaluation of the status of the northern spotted owl (SEI Report). Sustainable Ecosystems Institute, Portland OR. September 2004.

Chappell, C.B., R.C. Crawford, C. Barrett, J. Kagan, D.H. Johnson, M. O'Mealy, G.A. Green, H.L. Ferguson, W.D. Edge, E.L. Greda, and T.A. O'Neil. 2001. Wildlife habitats: descriptions, status, trends, and system dynamics. *in* D. H. Johnson and T.A. O'Neil (Manag. Dirs.) *Wildlife-Habitat Relationships in Oregon and Washington*. Oregon State University Press, Corvallis, OR, USA. 2001. 736 pp.

Claar, J.J., N. Anderson, D. Boyd, M. Cherry, B. Conard, R. Hompesch, S. Miller, G. Olson, H. Ihsle Pac, J. Waller, T. Wittenger, H. Youmans. 1999. Carnivores. Pages 7.1-7.63 *in* Joslin, G. and H. Youmans, coordinators. Effects of recreation on Rocky Mountain wildlife: A Review for Montana. Committee on Effects of Recreation on Wildlife. Montana Chapter of The Wildlife Society. 307 pp.

Copeland, J.P. 1996. Biology of the wolverine in central Idaho. M.S. thesis, Univ Idaho, Moscow. 138 pp.

Corkran, C.C. and C.R. Thoms. 1996. Amphibians of Oregon, Washington and British Columbia. Lone Pine Publishing, Redmond, Washington. 175 pp.

Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutierrez, J.M. Marzluff, L. Sztukowski. 2004. Scientific evaluation of the status of the northern spotted owl (SEI Report). Sustainable Ecosystems Institute, Portland OR. September 2004.

Csuti, B., A.J. Kimerling, T.A. O'Neil, M.M. Shaughnessy, E.P. Gaines, and M.M.P. Huso. 1997. Atlas of Oregon Wildlife (Distribution, Habitat, and Natural History), Oregon State University Press, Corvallis, Oregon.

Duncan, N., T. Burke, S. Dowlan, and P. Hohenlohe. 2003. Survey Protocol for Survey and Manage Terrestrial Mollusk Species From the Northwest Forest Plan. Version 3.0. 2003.

Duncan, N. 2004. Conservation Assessment for *Pristiloma arcticum crateris*, Crater Lake Tightcoil – originally issued as management recommendations, October 1999, Darryl Gowan and Thomas E. Burke, Authors. reconfigured September 2004 by Nancy Duncan.

Forsman, Eric D., R.G. Anthony, J.A. Reid, P.J. Loschl, S.G. Sovern, M. Taylor, B.L. Biswell, A. Ellingson, E.C. Meslow, G.S. Miller, K.A. Swindle, J.A. Thrailkill, F.F. Wagner, D.E. Seaman. 2002. Natal and breeding dispersal of northern spotted owls. The Wildlife Society, Wildlife Monographs No. 149, October 2002.

Gilbert, F.F. and R. Allwine. 1991. Terrestrial amphibian communities in the Oregon Cascade Range. pp. 319-325 *in:* Ruggiero, Leonard F.; Aubry, Keith B.; Carey, Andrew B.; Huff, Mark H., tech. coords. Wildlife and vegetation of unmanaged Douglas-fir forests. USDA Forest Service, Pacific

Northwest Research Station, Portland, Oregon, General Technical Report PNW-GTR-285, May 1991.

Hammond, P.C. 2003. Report on possible occurrences of the Fender's blue butterfly and the Mardon skipper on National Forest lands in western Oregon. Philomath, OR. May 26, 2003.

Hayes, J.P. 2003. Habitat ecology and conservation of bats in western coniferous forests. pp. 81-119 *in:* C.J. Zabel and R.G. Anthony, eds. Mammal community dynamics: management and conservation in the coniferous forests of Western North America. Cambridge University Press. 2003.

Hayes, M.P. 1994. The spotted frog (*Rana pretiosa*) in western Oregon. Department of Biology, Portland State University. Unpublished Report 30 pp.

Heinemeyer, K.S., B.C. Aber and D.F. Doak. 2001. Aerial surveys for wolverine presence and potential winter recreation impacts to predicted wolverine denning habitats in the southwestern Yellowstone Ecosystem. Unpubl. Report. University of California, Santa Cruz Department of Environmental Studies. 33 pp.

Hornocker, M.G., and H.S. Hash. 1981. Ecology of the Wolverine in Northwestern Montana. Can. J. Zool. 59:1286-1301.

Johnson, David H. and T.A. O'Neil (Manag. Dirs.). 2001. Wildlife-habitat relationships in Oregon and Washington. Oregon State University Press, Corvallis, Oregon.

Joslin, G. and H. Youmans, coordinators. 1999. Effects of recreation on Rocky Mountain wildlife: A Review for Montana. Committee on Effects of Recreation on Wildlife. Montana Chapter of The Wildlife Society. 307 pp

Krebs, J.A. and D. Lewis. 1999. Wolverine ecology and habitat use in the North Columbia Mountains: progress report. Columbia Basin Fish and Wildlife Compensation Program. Nelson, British Columbia.

Leonard, W.P., H.A. Brown, L.L.C. Brown, K.R. McAllister, and R.M. Storm. 1993. Amphibians of Washington and Oregon. Seattle Audubon Society. Seattle Washington, 168 pp.

Lint, J.B. (technical coordinator). 2005. Northwest forest plan – the first ten years (1994-2003): Status and trend of northern spotted owl populations and habitat. Gen. Tech. Rep. PNW-GTR-[In Press]. Portland, OR: USDA Forest Service, Pacific Northwest Research Station.

Lyon, J.L., K.B. Aubry, W.J. Zielinski, S.W. Buskirk, and L.F. Ruggiero. 1994. The scientific basis for conserving forest carnivores: considerations for management. Pages 128-137. *in* L.R. Ruggiero, K.B. Aubry, S.W. Buskirk, L.J. Lyon and W.J. Zielinski, eds. The scientific basis for conserving forest carnivores: American marten, fisher, lynx and wolverine in western United States. USDA Forest Service Gen. Tech. Rep. RM-254. 184 pp.

Maj, M. and E.O. Garton. 1994. Fisher, lynx, wolverine: summary of distrubution information. Appendix B (7pp.) *in* L.R. Ruggiero, K.B. Aubry, S.W. Buskirk, L.J. Lyon and W.J. Zielinski, eds.

The scientific basis for conserving forest carnivores: American marten, fisher, lynx and wolverine in western United States. USDA Forest Service Gen. Tech. Rep. RM-254. 184 pp.

Marshall, David B. 1988. Status of the wolverine in Oregon. Unpublished Report. Oregon Department of Fish and Wildlife, Portland, OR. Unpublished Report. 18 pp.

McKelvey, K.S., K.B. Aubry, and Y.K. Ortega. 2000. History and distribution of lynx in the contiguous United States. Pages 207-264. *in* Ruggiero, L. F., K. B. Aubry, S. W. Buskirk, G. M. Koehler, C. J. Krebs, K. S. McKelvey, and J. R. Squires. 2000*a*. Ecology and conservation of lynx in the United States. Univ. Press of Colorado. Boulder, CO. 480 pp.

McKelvey, K.S., K.B. Aubry, and P.T. Rivera. 2002. Historical biogeography of the wolverine in the United States. *in* Proceedings: Defenders of Wildlife's Carnivores 2002, From Mountains to the Sea: A Conference on Carnivore Biology and Conservation, Session 2: Wolverines in the Contiguous United States. November 17-20, 2002. Monterey, CA.

NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.5. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. Copyright © 2005 NatureServe, 1101 Wilson Boulevard, 15th Floor, Arlington Virginia 22209, U.S.A. All Rights Reserved.

O'Neil, Thomas A., David H. Johnson, Charley Barrett, Maria Trevithick, Kelly A. Bettinger, Chris Kiilsgaard, Madeleine Vander Heyden, Eva L. Greda, Derek Stinson, Bruce G. Marcot, Patrick J. Doran, Susan Tank, and Laurie Wunder. *Matrixes for Wildlife-Habitat Relationship in Oregon and Washington*. Northwest Habitat Institute. 2001. *in* D. H. Johnson and T.A. O'Neil (Manag. Dirs.) *Wildlife-Habitat Relationships in Oregon and Washington*. Oregon State University Press, Corvallis, OR, USA. 2001. 736 pp.

Ormsbee, P. 1999. Personal Communication. Forest wildlife ecologist, Regional bat specialist, Willamette National Forest, February 9, 1999.

Pagel, J.E. (Ed.). 1992. Protocol for observing known and potential peregrine falcon eyries in the Pacific Northwest *in* Proceedings- Symposium on peregrine falcons in the Pacific Northwest, 16-17 Jan. 1991. Rogue River National Forest, 125 pp.

Perlmeter, S. 1996. The bat project: Report of activities for 1996. Willamette National Forest, 23 pp.

Potter, A., J. Fleckenstein, S. Richardson, and D. Hays. 1999. Washington state status report for the mardon skipper. Washington Department of Fish and Wildlife, Olympia. 39pp.

Potter, A., J. Fleckenstein, J. Feen. 2002. Mardon skipper range and distrubution in Washington in relation to state and federal highways with a habitat description and survey method guidelines – Final Report to Washington Department of Transportation. A report to Washington Dept. of Transportation, Olympia, WA under Washington Dept. of Fish and Wildlife agreement number 39012270. June 30, 2002.

Powell, R.A. and W.J. Zielinski. 1994. Fisher. Pages 38-73. *in* L.R. Ruggiero, K.B. Aubry, S.W. Buskirk, L.J. Lyon and W.J. Zielinski, eds. The scientific basis for conserving forest carnivores:

American marten, fisher, lynx and wolverine in western United States. USDA Forest Service Gen. Tech. Rep. RM-254. 184 pp.

Pyle, R.M. 2002. The butterfies of Cascadia: a field guide to all the species of Washington, Oregon, and surrounding territories. Seattle Audubon Society. Seattle, WA. 2002.

Rowland, M.M., M.J. Wisdom, D.H. Johnson, B.C. Wales, J.P. Copeland, and F.B. Edelmann. 2003. Evaluation of landscape models for wolverines in the interior Northwest, United States of America. Journal of Mammalogy, 84(1):92-105, 2003.

Seitz, R. 2005. Personal Communication. Wildlife Biologist, McKenzie River Ranger District, Willamette National Forest. 6/27/2005 and 7/19/2005.

Thomas, J.W., E.D. Forsman, J.B. Lint, [and others]. 1990. A conservation strategy for the northern spotted owl: a report of the Interagency Scientific Committee to address the conservation of the northern spotted owl. Portland, OR: USDA Forest Service; USDI Bureau of Land Management, Fish and Wildlife Service, and National Park Service. 427pp.

USDA Forest Service. 1990. Willamette National Forest Land and Resource Management Plan, 1990.

USDA Forest Service. 1994a. South Fork McKenzie River Watershed Analysis. Willamette National Forest, Blue River (McKenzie River) Ranger District. December 1994.

USDA Forest Service. 1995. North Fork of the Middle Fork Willamette River Watershed Analysis. Willamette National Forest, Oakridge (Middle Fork) Ranger District. September 1995.

USDA Forest Service. 2000. INTERIM FINAL (draft) Peregrine Falcon (*Falco peregrinus anatum*) Nest Site and Habitat Management Plan with Site Specific Appendix. Willamette National Forest. April 17, 2000.

USDA Forest Service. 2002. Environmental assessment: peregrine falcon forest plan amendment-DRAFT. Willamette National Forest – Oregon. August 2002.

USDA Forest Service, Pacific Northwest Region. 2004a. Regional Forester's Sensitive Animal List. July 21, 2004.

USDA Forest Service Pacific Northwest Region. 2004b. Federally Listed or Proposed Species and Proposed or Designated Critical Habitat List. July 21, 2004.

USDA Forest Service. 1994. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl, and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl, USDA Forest Service and USDI Bureau of Land Management, 1994.

USDA Forest Service, USDI Bureau of Land Management. 2001. Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. January 2001.

USDA Forest Service, USDI Bureau of Land Management. 2004. Record of Decision to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl. March 2004.

USDA Forest Service, USDI Bureau of Land Management, Columbia River Gorge NSA, USDI Fish and Wildlife Service. 2005. Biological Assessment of Activities with the Potential to Disturb Northern Spotted Owls or Bald Eagles: Willamette Planning Province – FY2006-2007. July 28, 2005.

USDA Forest Service, Willamette National Forest. 2008. Biological Assessment for Four Vegetation Management Projects. February 2008

USDI Fish and Wildlife Service. 2008. Letter of Concurrence regarding informal consultation on four vegetation management projects within the Willamette Planning Province, which may affect northern spotted owls and spotted owl critical habitat (FWS *reference*: 13420-2007-I-0038).

USDI Fish and Wildlife Service. 2004a. Northern spotted owl, five-year review summary and evaluation. Fish and Wildlife Service, Portland, OR. 72pp.

USDI Fish and Wildlife Service. 2004b. 50 CFR Part 17. endangered and threatened wildlife and plants; review of species that are candidates or proposed for listing as endangered or threatened; annual notice of findings on resubmitted petitions; annual description of progress on listing actions; notice of review; proposed rule. Federal Register Vol.69, No.86 24876-24909, May 4, 2004.

USDI Fish and Wildlife Service, and National Marine Fisheries Service. 1998. Endangered Species Consultation Handbook: Procedures for conducting consultation and conference activities under Section 7 of the Endangered Species Act. March 1998.

USDI. 1982. Pacific Coast Recovery Plan For The American Peregrine Falcon. The Pacific Coast American Peregrine Falcon Recovery Team, USFWS Denver, Colorado. August 1982. 87pp.

USDI. 1986. Recovery Plan for the Pacific Bald Eagle. Portland, OR. 160 pp.

USDI. 1992. Recovery Plan for the Northern Spotted Owl – Draft. Portland, OR: U.S. Department of the Interior. 662pp.

USFWS. 2003. Monitoring plan for the American peregrine falcon, a species recovered under the Endangered Species Act. U.S. Fish and Wildlife Service, divisions of Endangered Species and Migratory Birds and State Programs, Pacific Region, Portland, OR. 53pp.

Verts, B.J. and Leslie N. Carraway. 1998. Land mammals of Oregon. University of California Press, Berkeley and Los Angeles, California.

Waldien, D.L. 1996. Bat communities of Western Oregon: Landscape relationships of roost structures and activity areas of *Myotis evotis* (Long-eared myotis). Annual Report. Unpublished. 38 pp.

Weller, T.J. and C.J. Zabel. 2001. Characteristics of fringed myotis day roosts in northern California. Journal of Wildlife Management 65(3):489-497.

Youmans, H. 1999a. Project Planning. Appendix C (12pp.) *in* Joslin, G. and H. Youmans, coordinators. Effects of recreation on Rocky Mountain wildlife: A Review for Montana. Committee on Effects of Recreation on Wildlife. Montana Chapter of The Wildlife Society. 307 pp

File Code:	2600 Wildlife	**Date:**	June 25, 2008
Route To:	Files		
Subject:	Terrestrial Wildlife Specialist's Report for Ball Park Thin Project		
To:	Files		

SUMMARY OF DETERMINATIONS

For reasons addressed later in this document it is considered that activities proposed by the Ball Park Thin Project should not result in any adverse impacts to other rare and uncommon species, MIS, or other terrestrial wildlife species, and long-term effects should be positive as a result of increased overall biodiversity. Taking No Action would have no effect on these species while allowing growth of timber stands to continue.

Cumulative effects of this project in conjunction with other reasonably foreseeable projects in and adjacent to this area are not expected to influence the ability of other rare and uncommon species under the Northwest Forest Plan or as Management Indicator Species on the Willamette National Forest to persist or become established in habitat associated with the project area. Maintenance and/or recovery of late successional habitat serving as current or potential dispersal corridors surrounding the project area will ensure ongoing opportunities for occupancy and movement of terrestrial wildlife species that may occur in vicinity of this project and are dependent on such habitat.

SUMMARY OF SEASONAL RESTRICTIONS/RECOMMENDATIONS

Implementing the following recommendations would ensure effects or impacts on listed species from proposed activities would be no greater than those addressed in this document, and also would mitigate those impacts.

- Avoid habitat disturbance within 10 meters of perennially wet areas. This measure would ensure protection of the Crater Lake Tightcoil which may be present in the area.
- Protect decadent trees and snags >12"dbh adjacent to the project area to the greatest extent feasible during logging and hazard tree removal activities.
- Implement haul route hazard tree felling outside the critical seasonal restriction period for cavity nesters from April 1-June 30.
- Replacement for loss of hazard trees along the haul route is recommended by snag creation within Ball Park units if prescribed fire does not create recommended snag levels of 3/acre. Only those hazard trees along the haul route in a snag or dead top tree condition and greater than 14" dbh would be replaced. Preliminary estimates are that approximately 200 snags or danger trees would need to be felled. Additional snag creation up to the recommended level of 3 snags over 14" dbh/acre may occur to provide habitat for cavity nesters as well as Pacific Fringe-tailed Bats. Snags created as a result of prescribed underburning or natural mortality would be counted towards this recommended total.

- Consider additional activities that improve elk and deer forage habitat throughout summer and winter range within Latiwi, County, Upper Westside, Deer, and Belknap-Paradise Camp Emphasis Areas.

INTRODUCTION

This report serves to document potential impacts to terrestrial wildlife considered as other rare and uncommon species and Management Indicator Species (USDA 1990) plus other wildlife and associated habitat that may occur in or near a project area from activities associated with this project. A separate biological analysis/evaluation (BA/BE) addresses effects to threatened, endangered and sensitive (TES) fauna species.

PROJECT LOCATION AND DESCRIPTION

The McKenzie River Ranger District proposes to conduct activities on approximately 1,160 acres of the Ball Park Project Area. The proposed activity acres include timber harvest (1064), natural fuels underburns (49), and rock quarry/borrow pits use (5). The timber harvest would yield a gross estimate of 13.1 million board feet (MMBF) of wood products. This proposal, represented in Alternative B in this EA, would include canopy thinning on 663 acres, wildlife forage thinning on 129 acres, and riparian thinning on 122 acres. The timber sales from this proposal would likely be sold over a three year time span, beginning in fiscal year 2009.

The Ball Park Thin Project area is within the Deer Creek Subwatershed (6^{th} field) of the Upper McKenzie Watershed (5^{th} field) on the McKenzie River Ranger District. The project area consists of 14,508 acres located northwest of the McKenzie River, east of the HJ Andrews Experimental Forest, and south of the District boundary that is adjacent to the Sweet Home District. Major drainages include Deer Creek, Budworm Creek, Fritz Creek, and Carpenter Creek.

Legal description of the project: T.14S, R.6E, Sec. 20,28-30,32,33; T.15S, R.6E, Sec. 3-6, 8-11, 14-16,22,23; Willamette Meridian; Lane and Linn Counties, Oregon.

The Willamette National Forest Land and Resource Management Plan shows land allocations in the project area as: 4-Research Natural Area, 5a- Special Interest Area, 6d McKenzie River Wild and Scenic, 9c- Wildlife Marten Area, 9d- Special Wildlife Habitat Area, and 14a-General Forest. Northwest Forest Plan land allocations are Late Successional Reserve, Administratively Withdrawn, Congressionally Withdrawn, Adaptive Management Area, and Matrix.

Forested habitat surrounding the project areas is most closely associated with the Westside Lowland Conifer Hardwood Habitat type described by Chappell et al. (2001).

Alternatives:

The Ball Park Thin Project will be analyzed in an Environmental Assessment that reviews three alternatives – a No Action alternative and two Action Alternatives. The Action Alternatives involve activities described above.

Action Alternative: The influence of proposed activities on terrestrial wildlife is considered in the context of whether or not suitable habitat may be modified, or if a species may be present at or near sites where physical disturbance may occur, or be sensitive to and thereby influenced by anthropogenic activities occurring during implementation of this project. Habitat disturbance that may affect some terrestrial wildlife species could occur as a result of this project. That potential is addressed later in this report.

No Action Alternative: There is no rationale to suggest the No Action alternative would affect or impact any terrestrial wildlife species based on their ecological requirements and current habitat conditions in the project area. Considering the No Action Alternative would have no effect/impact on terrestrial wildlife species is based on the following assumption - taking no action would not affect current habitat or wildlife species that may be present as either evolves without human management. The dynamic nature of habitat suitability that may be subject to an unknown frequency and variety of stochastic events is considered beyond the scope of this evaluation. Only potential effects or impacts of the Action Alternative will be discussed further in this document.

WATERSHED ANALYSIS / ADDITIONAL DOCUMENT SUPPORT

Proposed activities respond positively to recommendations made that address vegetation and wildlife in the Upper McKenzie Watershed Analysis.

MANAGEMENT DIRECTION COMPLIANCE

The alternative selected for management of the Willamette National Forest includes a strategy that provides Management Requirements (MRs) exceeding the minimum MRs established for Management Indicator Species (MIS) as presented in the Willamette Forest Plan FEIS Appendices - Volume 1 (USDA 1990, pp B-79 through 82). Maintenance of the MRs ensures the viability of MIS and the species they represent. The MRs have been further enhanced for most MIS species (i.e. those species dependent on old growth and mature conifer habitat, and dead and defective tree habitat) under the Forest Plan S&Gs as amended by the Northwest Forest Plan.

Proposed action associated with this project complies with current forest Standards and Guidelines (S&Gs) pertaining to MIS and other rare and uncommon species management. This proposal also complies with other S&Gs established in the Willamette National Forest Land and Resource Management Plan (1990) as amended by the Northwest Forest Plan Records of Decision (ROD) (1994, 2001, and 2004).

ADJACENT ACTIVITIES / CUMULATIVE EFFECTS

Many years of fire suppression have contained fires to a size of mostly less than one acre, resulting in light to moderate burn intensities. Fire suppression has also contributed to conifer encroachment in meadow habitat in this area.

GENERAL WILDLIFE OVERVIEW

As previously stated, forested habitat surrounding the project areas is most closely associated with the Westside Lowland Conifer Hardwood Habitat type described by Chappell et al. (2001). In this habitat type, plant associations relevant to the project area vary considerably.

Westside Lowland Conifer Hardwood Habitat

Where it occurs in Washington and Oregon, 233 wildlife species have been identified as associated with the Westside Lowland Conifer Hardwood Habitat type described by Chappell et al. (2001). These species includes birds, mammals, amphibians, and reptiles.

Historic sighting records and current inventory data have documented the presence of many species within or near the project area. Effects from project activities will enhance overall biodiversity in the area

Project Effects to General Wildlife: Habitat altering activities proposed by this project should not affect other terrestrial wildlife species such that their ability to persist in the vicinity of the project area or throughout their ranges would be compromised. Project effects to wildlife species are essentially unquantifiable on an individual basis relative to the amount of habitat modified or disturbed against the amount available throughout the surrounding Westside Lowland Conifer Hardwood Habitat type and the affected plant associations within it. Project effects would result in a positive yet marginal overall contribution, with respect to restoring historic habitat and biodiversity, to cumulative effects that have occurred from past actions affecting the project area.

Recommendation Pertaining to General Wildlife: Ensure that measures identified in the proposal to avoid habitat disturbance within 10 meters of perennially wet areas are implemented. This measure would provide refugia in a limited amount of the project area for a variety of wildlife species that may be present and associated with habitat exposed to activities while being implemented.

SNAGS AND DOWN WOOD

The significance of the ecological role of dead wood, i.e. snags and large down wood in influencing ecosystem diversity and productivity is well addressed in the Willamette National Forest Land and Resource Management Plan (1990) and elsewhere (Brown et al. 2003). The importance of dead wood in coniferous forests of the Pacific Northwest is further emphasized by management Standards and Guidelines (S&G) under the Northwest Forest Plan ROD (1994, 2001), as well as elsewhere throughout published literature (Hagar et al. 1996, Hallett et al. 2001, Laudenslayer et al. 2002, Lewis 1998, Muir et al. 2002, Rose et al. 2001).

Under the Willamette Forest Plan as amended by the ROD, snag habitat shall be managed at levels capable of providing for at least 40% or greater potential populations of cavity-nesting species. Current science has not tested the validity of the potential population approach to species management, yet it remains the basis for S&Gs (Standard and Guidelines) involving snag management. Strong support for identifying more appropriate amounts of snag and down wood habitat has resulted in the development of new approaches in addressing these habitat components. One such approach is DecAID - the decayed wood advisor for managing snags, partially dead trees, and down wood for biodiversity in forests of Washington and Oregon (Mellen et al. 2006). DecAID has been created to help managers decide how much dead wood to provide for this part of a species' habitat needs, and is designed to apply to salvage and green tree projects. A benefit of using DecAID during the planning process is that it determines if current dead wood levels are consistent with reference conditions. In addition, DecAID can be applied to identify dead wood management goals for projects that affect dead wood habitat throughout dominant habitat types. Snag and dead wood habitat levels were compared to DecAID recommendations and Forest Plan S&Gs based on population potential for this project.

Interpretation and/or application of advice obtained from DecAID for how the Ball Park Project may affect dead wood habitat is based on referencing information available in DecAID for the Westside Lowland Conifer-Hardwood habitat type in the Western Oregon Cascades with a Small/Medium Tree Vegetation Condition (WLCH_OCA_S). All Ball Park Project stands are within this vegetation condition with the exception of the two proposed natural fire stands, which are in the Large Tree condition. The Ball Park Project planning area (14,508 acres) is considered an appropriate sized area of similar habitat to consider when evaluating current and future levels of dead wood (Mellen et al. 2006).

Snags (Current Condition)

Estimates for current snag size and distribution are displayed in Table 30, and were made based on estimates from a combination of stand exam data, knowledge of previous snag creation activity, and field reconnaissance.

Two approaches were used to assess snag levels for the Ball Park project area:

- Seral stage habitat evaluation
- DecAID tool

Seral stage habitat evaluation:

Natural forest stands in all seral stages will usually contain large downed wood on the forest floor and snags in the overstory. Many stands that are currently in the early and especially mid seral stages, logged prior to about 1987, do not contain snags and large down wood or only very limited amounts. After that time, snag habitat was sometimes retained and generally created at variable levels of 1-4 snags/acre.

The younger early seral stands (<25 years old) generally contain very little large down wood left after the logging operation. Some of the older early seral stands (26-40 years old) contain much higher levels of very large diameter down wood. This remnant down wood is relatively old, and mostly all in the higher decay classes 3-5 (Bartels et al. 1985). Snag and down log information from CVS plots was summarized by vegetation series for natural stands in mature and old-growth stages for the Mid-Willamette LSR Assessment. The following table is extracted from additional information, and shows only big snags (>20", >16') and big logs (>21", >21'). Levels of snags and logs are highly variable among stands.

Table 1. Big Snag and Log Ranges by Vegetation Series Present in the Ball Park Thin Project Area (USDA Willamette National Forest et. al 1998).

Series	Big snags per acre	Big logs per acre
Pacific silver fir	21	19
Mature	(14-29)	(5-13)
Old growth	32	12
	(18-43)	(7-16)
Douglas-fir	0	9
Mature	(0-5)	na
Old growth	21	13
	(11-21)	(9-22)
Western hemlock	11	11
Mature	(5-21)	(8-25)
Old growth	24	14
	(13-42)	(9-21)

Numbers shown in parentheses show within stand variability.

Levels of large snags in the Ball Park Project Area were assessed using the following information:

- Annual USDA Forest Service Region 6 aerial flight information from 1988-2006 which shows recent large tree mortality in unmanaged stands, and categorizes this by mortality agent.
- District records of snag and down wood creation in managed stands after harvest.
- Field observations

Early and early-mid seral plantations (<40 years old): Within 3,953 acres of managed stands, 621 snags were created. An additional 100 snags are assumed to have been left after logging operations = 721 snags or 0.2 snags/acre.

Mid seral plantations (40-79 years old): Of the 1,704 acres in mid seral stages, one snag/acre is assumed. This may be a high estimate based on 2007 field observations in mid seral plantations being proposed for the Ball Park Project.

Old Growth stands: Within 6083 acres classified as old growth or older mature, an average estimate of large snags per acre was determined based on the proportion of each vegetation series and the mean level of large snag occurrence within each vegetation series. This resulted in a gross level assumption of 18 large snags per acre in old-growth stands within the Ball Park Project Area.

Mature stands: Within 1784 acres of mature stands, it is estimated that they contain 50% of the snags that old growth stands contain, which is 9 large snags per acre.

Aerial flight information for unmanaged stands was considered, but was not additive to the above discussed snag totals. Current levels of large tree mortality are not considered to be outside the levels of normally occurring insect and disease mortality. The forest insect and disease detection survey cannot measure older snags in the later decay classes and trees broken by wind, and may not accurately record snag recruitment in the understory due to suppression. Down wood recruitment also cannot be recorded. Future areas of tree mortality due to damage from Balsam woody adelgid were also documented, but are not judged to be significantly outside the normal range of occurrence.

Table 2. Natural Snags Recruited by Aerial Survey Year and Mortality Agent.

Survey Year	Dead Trees by Mortality Agent					
	Douglas-fir beetle	**Fir engraver**	**Mountain pine beetle (lodgepole pine)**	**Silver fir beetle**	**Bear**	**Annual Total**
1988	5.00					5.00
1989		129.42				129.42
1990	15.01			10.01		25.02
1992	280.19	15.01		26.44		321.65
1993	35.02	937.34		15.01		987.37
1995		185.09	20.01			205.10
1996		40.85			5.00	45.86
1998	5.00			50.03		55.03
1999	145.10				50.03	195.13
2000	25.63					25.63
2002	10.01				55.04	65.05
2003					40.03	40.03
2004				739.94		739.94
2005					10.01	10.01
2006			20.01		205.13	205.13
2007	1.83			43.65	43.02	88.50
Grand Total	522.79	1307.71	40.02	885.08	408.26	3143.85

Currently existing large snag levels >20”dbh on the landscape in the Ball Park Project Area are assumed to be 9.6 per acre across all seral stages. For only unmanaged stands, a very general estimate of snag presence is 16 snags per acre. For the 5,657 acres of managed stands ages 0-80 years, snag levels are estimated to be approximately 0.4 per acre. A very rough estimate considering the effects of insect and diseases is assumed to increase this to 0.6 large snags/acre.

Table 3. Snag levels in the Ball Park Project Area.

Unmanaged Stands	Managed Stands
• Old Growth stands assumed to have	• In stands with snag creation: 621 wildlife

18 large snags/acre.
- Mature stands assumed to contain 50% of old growth stands or 9 large snags/acre.
- Aerial flights: 0.2/acre in all seral stages

trees created in 1982, 1983, 1986, 1994, and 2001.
- Many managed stands had no snag creation.
- Average for all managed stands combined: 0.4 snags/acre

On a larger scale, dead tree patches have largely been missing in the western Oregon landscape due to fire suppression and post-fire salvaging, at least until the 1991 Warner Creek Fire on the Willamette National Forest, which was not salvaged. Additional large-scale snag habitat was created by the 2003 B&B Complex Fire, although most of this burned on the eastside Deschutes National Forest. Large landscape-scale snag patches, especially in high elevation wilderness, last only a few decades before forest succession reclaims them. About 30 percent of snags less than 40 inches dbh fall down within the first decade (Mellen et al. 2006) and 50 percent of Douglas-fir less than 16 inches dbh fall within the first 15 years (Everett et al. 1999). Larger diameter trees usually remain standing for much longer periods.

In 2002, there were roughly 29 concentrations of large snag patches greater than 10 acres per patch which are currently scattered across the landscape within the Oregon Western Cascade Province (Davis 2003). The average distance between snag patches is about 4.2 miles. This is the average, shortest distance from one cluster of patches to another. Considering this is the best, most concentrated snag habitat, with moderate and lower quality habitat in between, it is expected that this should allow for fairly good connectivity of high quality snag-dependent bird habitat.

DecAID: Snag levels within the project area were compared against those listed in DecAID for Westside Lowland Conifer-Hardwood habitat type, in the Western Oregon Cascades, with a Small/Medium Tree Vegetation Condition (WLCH_OCA_S). Current snag levels throughout the planning area are above average values of the 50% tolerance range representative for snags in unharvested areas in this habitat type and condition.

Table 4. Current Condition (Alt. A) and Estimated levels of Snag Habitat in Comparison with DecAID

		DecAID	
Snag Size	**Current Snags per Acre***	Un-harvested inventory plots (un-thinned managed stands)	All inventory plots (previously thinned and un-thinned managed stands)
≥10" dbh	≥13 snags/acre	66th percentile	85th percentile
≥20" dbh	≥9.6 snags/acre	67th percentile	83rd percentile

* are in approximate numbers

The majority of large standing snags are Douglas-fir. The majority of smaller snags throughout the area is also Douglas-fir, and is a result of mortality from growth

competition. Snag distribution across the project area can be considered patchy and variable, and would be affected equally under either Action Alternative.

Down Wood:

Down wood estimates for current size and distribution were made based on reasoned estimates using inventory and stand exams from unthinned managed stands throughout the planning area. Tree mortality largely associated with self-thinning competition, cull logs from previous harvest activity, and localized breakout from snow loading has resulted in down wood levels as shown in Table 5.

Smaller logs are generally in decay class I and II, while larger logs are in decay class II and III. Many of the largest pieces of down wood (cull logs from initial harvest activity) exist in decay class III. Existing down wood occurs in a patchy rather than even distribution across the planning area.

Table 5. Current Condition (Alt. A) and Estimated levels of Down Wood in Comparison with DecAID

Down wood Size	Stand Type	Tons/Acre
≥6" diameter	Thinned managed stands	22.7
≥20" diameter		18.4
Down wood Size	**Stand Type**	**Tons/Acre**
≥6" diameter	Unthinned managed stands	38.1
≥20" diameter		24.8

In addition to dead wood levels associated with down logs, it is estimated that decaying wood habitat associated with stumps ≥20" diameter would cover less than 1% of areas treated under either Action Alternative. The amount is considered to be equal under either of these alternatives. Use of stumps throughout a range of decay classes has been documented for a wide variety of organisms (O'Neil et al. 2001, NatureServe 2006, Rose et al. 2001, Zabel and Anthony 2003). This type of dead wood provides a valuable, long-lasting habitat component that supplements the potential to maintain native biodiversity throughout the project area.

Down wood levels for this project were compared against those listed in DecAID for Westside Lowland Conifer-Hardwood habitat type, in the Western Oregon Cascades, with a Small/Medium Tree Vegetation Condition (WLCH_OCA_S). A review of DecAID data discloses current down wood levels throughout the planning area are above average values (within the 50% tolerance range) representative for dead wood in both harvested and unharvested areas within this habitat type and condition. How down wood levels in the Ball Park Project planning area compare to DecAID data is displayed in Table 5.

Table 6. Current Condition (Alt. A) and Estimated levels of Down Wood in Comparison with DecAID

	DecAID	
Down Wood Size	Unharvested inventory plots (unthinned managed stands)	All inventory plots (thinned and unthinned managed stands)

≥6" dbh	71st percentile	67th percentile
≥20" dbh	82nd percentile	78th percentile

Normal processes that influence these changes are highly variable in their ability to affect change (Rose et al. 2001). The natural fire interval for the Ball Park project area has been estimated at less than 50 years to 200 years with a mixed fire regime, depending on the area (Lantz, personal communication 2008). Insects and pathogens continually contribute to successional development; however, traditionally this occurs at a small scale relative to the overall landscape. The area is not prone to flooding or landslides which may also affect changes on a small scale. Windthrow is yet another normal process that has occurred, and would continue to occur unpredictably, to influence stand dynamics in this area on a small scale. Because the overall condition of the project area is largely influenced by previous management activities that have simplified stand and landscape structure and diversity, additional stand management may be seen as a method to assist in restoring some landscape conditions, such as stand dynamics associated with creating more normal levels of snags and down wood. Snag creation between 1988 through 2006 has already contributed 621 additional large snags to current stands less than 40 years old. Most of these snags were topped and should develop into useable snag habitat within ~5 years.

With current fire suppression efforts, not many wildfires can burn to create the diversity of snag and large down wood habitat on the landscape

A number of events throughout the watershed, as well as within the project area, have occurred to increase dead wood levels across the landscape. District fire records reveal that from 1970 to 2007, 36 small wildfires averaging less than one acre each have contributed to additional levels of dead wood in a patchy distribution throughout the project area. Any tree mortality associated with fires > 40 years ago likely created down wood habitat. Mortality from fires within the past 40 years may have created snag habitat. Wildfire intensity probably ranged from light to moderate. Salvage is not known to have occurred associated with any of these fire events, and it was likely from windthrow.

In addition to dead wood levels increasing related to effects from wildfire, effects from insects, disease, and other natural events have further increased this habitat component across the landscape surrounding the Ball Park Thin Project area. Annual aerial insect and disease detection surveys from 1988 through 2007 have documented several sites across the watershed (including locations within the planning area) where snag habitat, which will provide future large down wood habitat, is increasing in a patchy distribution from effects of these mortality agents (USDA 2008).

Reference information extrapolated from DecAID suggests current size, abundance, and distribution of snags and down wood exceeds average historic levels (50% tolerance) across the project area considering habitat type and vegetation condition. It should be noted that with respect to snags or down wood, the objective of the Ball Park Project is

more directed at managing for an average historic dead wood habitat condition rather than focusing on specific dead wood requirements for individual wildlife species.

Alternative A—Direct, Indirect, and Cumulative Effects

Alternative A does not propose management activities at this time and therefore would not alter snag and down wood densities. Existing vegetation conditions would continue to follow natural successional pathways, with snags and down wood responding accordingly. Snags and large down wood would continue to be created by the various natural mortality agents: insects and diseases, wildfire, windthrow, snowthrow, bear damage, as well as suppression mortality. Alternative A would have no direct, indirect, or cumulative effects on snag and down wood in the project area.

Alternatives B and C—Direct and Indirect Effects

Commercial thinning: Some loss of existing snag habitat would occur under either Action Alternative, due to safety issues. The highest loss of the largest snags, and currently injured trees which may become future snags, would occur as snags are felled along the Ball Park haul route for safety reasons. Most of these are concentrated at higher elevations above 2500 feet. Some existing snags in proximity to harvest activities would present a serious safety risk to workers involved with implementing the silvicultural prescription. Current snag levels within Ball Park harvest units are low to almost none, so loss within thinning units is judged to be minor. Snag loss would be greatest among sizes <10”dbh, intermediate for snags ≥10-20” dbh, and very low among snags ≥20”dbh. All felled snags would be left as down wood. Depending on decay class and burning conditions, some felled snags may be fully or partially consumed during subsequent fuels reduction of underburning.

This project would thin units down to 40% canopy closure, resulting in retention of 77-444 trees per acre >7”dbh, depending on the specific unit. Alternative C would thin trees down to 30% canopy closure within six units with the same trees per acre retention ranges. Some of the retained green trees may have defects that would provide future dead wood habitat.

Post-harvest fuels treatments: Underburning many of the thinned stands may produce additional snag habitat, but is not judged to provide much due to the moister spring-like conditions this type of burning would occur in. Tree mortality of up to 10% would be acceptable, but in the past, many underburns have not reached 10%. Underburning may reduce existing large down wood habitat in specific areas when logs are in the older decay classes III or IV. Stands that are not underburned would have pile burning treatments to reduce fine fuels. Existing large down wood would not be impacted because burn piles are not placed over large existing down wood of any decay class. Pile

burning treatments are unlikely to result in tree mortality directly adjacent to burn piles. Any such mortality would add to an existing patchy distribution of snag habitat throughout the planning area.

Natural Fuels Underburn: Implementing a natural fuels underburn on two units may slightly increase snag habitat and is not expected to impact large down wood habitat except in a minor way. The fire prescription calls for 10% live tree mortality (with an acceptable range of 5-20%), which in a mature forest stand translates to approximately 8-10 snags/acre being created on the 49 acres where this treatment is prescribed.

Within stand variability throughout the planning area influences current snag distribution. This variability would also influence the location of replacement snags, which would be provided for in a patchy rather than even distribution across the area. This prescription is common to each Action Alternative and would assure compliance with Northwest Forest Plan guidance to maintain 40% of potential populations of cavity nesting species (USDA, USDI 1994 page C-42).

Post harvest and fire treatment snag sizes and quantities would be consistent within the range of average levels recently provided from plot data from unharvested stands in a Western hemlock vegetation series such as those influencing habitat throughout most of the project area (McCain 2002). These data are presented in terms of tolerance levels as described in DecAID. They reveal that 50% of individuals in all populations of species using snags in Pacific Silver Fir and Western hemlock vegetation series types can be expected to occur where greater than 8 snags per acre ≥ 20" dbh exist. Although this data applies to unharvested tree condition class stands, snag habitat throughout the Ball Park project area would fall within this range.

Based on current stand structure, composition, and habitat type there is generally sufficient site-specific potential to support application of the Northwest Forest Plan Standard and Guideline (USDA, USDI 1994 page C-40) to leave an average of 240 linear feet of logs per acre greater than or equal to 20 inches in diameter or material of the largest diameter class available across areas treated by the Ball Park Project under either Action Alternative.

Alternatives B and C—Cumulative Effects

The cumulative effects analysis area was the Ball Park project area. As mentioned above the project area (14,508 acres) is considered an appropriate sized area of similar habitat to consider when evaluating current and future levels of dead wood (Mellen et al. 2006). Approximately 8%, or 1,205 acres, of these Forest Service lands have been managed for timber production .

Past management actions related to timber harvest activity are generally responsible for the current condition of dead wood habitat throughout the planning area. These actions have affected the overall amount and distribution of dead wood habitat by reducing the amount of old-growth habitat and increasing the amount of mid seral habitat. There are no foreseeable actions that would affect dead wood habitat in this area. Current science

and the changing trend in timber management that has occurred within the past decade, and is projected for the future, should positively influence management of decaying wood as previously harvested stands redevelop, and more emphasis is placed on retention of key structural components in harvested stands.

Data analysis reveals the amount and distribution of snag and down wood habitat would essentially remain unchanged or experience a slight increase under either Action Alternative. Commercial thinning as proposed under either Action Alternative for the Ball Park Project is therefore likely to have little or no cumulative effect on dead wood habitat throughout the planning area. The action alternatives would allow trees to grow larger and faster, and to develop characteristics such as large limbs and crowns. The increased health and resistance of the thinned forest stands to future insect infestations and disease would make natural snag development less likely for the next 10-20 years. Whether or not the natural fuels underburn stands show increased or decreased snag development after the first round of tree mortality post-fire is unknown.

Dead wood habitat should exist in a sufficient amount and distribution to support the local wildlife community, including MIS such as pileated woodpecker, marten, and cavity nesters such that their ability to persist or become established would not be limited by this habitat component important to most members of the wildlife community in this area.

Alternatives B and C—Conclusions

Under either Action Alternative the Ball Park Project proposes commercial thinning in approximately 53% of mid-seral (stem exclusion) habitat throughout the planning area. This relates to approximately 6% of the entire planning area. There is essentially no difference between Action Alternatives and their effect on dead wood.

The silvicultural prescription calls for protection of existing snags and down logs. However, some amount of loss or disturbance of snags and down wood is inevitable as a result of safety and logging feasibility issues. Measures are identified to address this loss or disturbance. Effects analysis reveals that proposed activities in conjunction with mitigation measures would result in a stable or slight increase in dead wood levels associated with areas treated. Direct and indirect effects would be limited to an undetermined number of snags and logs that may be unavoidably affected or created within harvest units and the prescribed natural fire stands.

DecAID relies on data from unharvested plots to assist managers in setting objectives aimed at mimicking natural conditions. Considering current conditions of snag and down wood habitat along with the information presented above, it is expected that dead wood levels throughout the Ball Park planning area should remain above average in the natural range considered for similar habitat following thinning, subsequent fuels reduction, and prescribed natural fire.

On a smaller stand scale, dead wood levels would be on the low end of the natural range as shown in DecAID and the Willamette Province LSR Assessment. For this reason, snag creation at the level of three per acre at a minimum of 14" dbh is recommended as an enhancement to the project area throughout all units if monitoring following logging and fire activities shows the area to be deficient. Large down wood creation is recommended if monitoring following all logging and fire activities shows levels to be below 240 linear feet/acre with a minimum dbh of 14".

The Ball Park Project would maintain dead wood habitat throughout a managed forest that typifies the planning area at levels that would ensure its' ongoing central role in the ecological processes affecting this type of forested habitat (Rose et al. 2001). The project would comply with S&Gs for snag and down wood management.

Project Effects to Snags and Down Wood:
Data analysis reveals the amount and distribution of snag and down wood habitat would essentially remain unchanged or experience a slight increase under either Action Alternative. Commercial thinning as proposed under either Action Alternative for the Ball Park Thin Project may result in a very slight increase in dead wood habitat throughout the planning area. Hazard tree removal along the haul route is expected to result in a very slight decrease in snag habitat within the planning area. The action alternatives would provide ecological benefits to wildlife by allowing trees to grow larger and faster, and to develop other desirable tree habitat characteristics such as large limbs and crowns.

Recommendations pertaining to snags and down wood:

- Protect decadent trees and snags >12"dbh adjacent to the project area to the greatest extent feasible during logging and hazard tree removal activities.
- Implement haul route hazard tree felling outside the critical seasonal restriction period for cavity nesters from April 1-June 30.
- Replacement for loss of hazard trees along the haul route is recommended by snag creation within Ball Park units if prescribed fire and other mortality factors do not create recommended snag levels of 3 per acre. Only those hazard trees along the haul route in a snag or dead top tree condition and greater than 14" dbh would be replaced. Preliminary estimates are that approximately 200 snags or danger trees would need to be felled. Additional snag creation up to the recommended level of 3 snags over 14" dbh/acre may occur to provide habitat for cavity nesters as well as Pacific Fringe-tailed Bats. Snags created as a result of prescribed underburning or natural mortality would be counted towards this recommended total.
- Large down woody material: At least 240 lineal feet per acre of decay class I and II material greater than 18" diameter would be retained within all harvest units. Full tree length down wood material is preferable to maximize wildlife habitat value; lengths less than 20 feet would not count towards this total. Where the preferred size of material is not available, 240 lineal feet per acre of the largest diameter leave trees would be retained. Some of this material should be created

over or directly adjacent to streams if possible. If post-harvest monitoring does not show large down woody material to be present at the recommended levels, falling would take place to create up to one half the amount. Additional large down wood would be assumed to blow down within several years of the logging activity. The intent of this mitigation measure is to maintain currently existing levels, as well as the short-term future input that would be expected within these ~40 year old stands.

OTHER RARE OR UNCOMMON WILDLIFE SPECIES

Species listed below in Table 2 were compiled from the 2001 and 2003 Annual Species Reviews and incorporate those vertebrate species whose known or suspected range includes the Willamette National Forest according to the following documents: Survey Protocol for the Great Gray Owl within the range of the Northwest Forest Plan v3.0 (Quintana-Coyer 2004), January 12, 2004 and Survey Protocol for the Red Tree Vole v2.1, October2002.

Table 7: Other Rare or Uncommon Wildlife Species Known on the Willamette National Forest.

	Survey Triggers			Survey Results			Site Management
	Within Range of the Species?	Project Contains Suitable habitat?	Project may negatively affect species/habitat?	Surveys Required?	Survey Date (month/year)	Sites Known or Found?	
Vertebrates							
Great Gray Owl (*Strix nebulosa*)	Yes	No	No	No	NA[1]	NA	NA
Red Tree Vole (*Arborimus longicaudus*)	Yes[2]	Yes	Yes	Yes	7/2007 and 10/2007	No	NA

[1] N/A = Not Applicable

Red tree vole (*Arborimus longicaudus*):

This project is within the Northern Mesic Zone where the red tree vole is uncommon, and pre-disturbance surveys are considered practical. Surveys for red tree voles were conducted in suitable habitat. Although potential nests were found, no active red tree vole nests were detected.

Other ROD Species/Habitat:

Cavity-nesting birds - White-headed woodpecker, black-backed woodpecker, pygmy nuthatch, and flammulated owl: The white-headed woodpecker, black-backed woodpecker, pygmy nuthatch, and flammulated owl will not be sufficiently aided by applying mitigation measures for riparian habitat protection or other elements of the Northwest Forest Plan (USDA, USDI 2001 and 2004). These four species occur primarily

on the periphery of the range of the northern spotted owl on the east slope of the Cascade Range in Washington and Oregon however, they are not likely to occur in the project area.

To ensure the distribution and numbers of all four species do not decline on BLM Districts and National Forests within the range of the northern spotted owl, adequate numbers of large snags and green-tree replacements for future snags in appropriate forest types within the range of these four species will be maintained in sufficient numbers to maintain 100 percent of potential population levels of these four species (USDA, USDI 2001 and 2004).

A discussion of how proposed activities may impact this habitat component is conducted in the Snags and Down Wood section of this document.

The influence of this project on these species is considered either neutral or beneficial. Proposed activities would generally occur outside the breeding season, and the likelihood that they occur in the project area is considered low. Beneficial influences are associated with a potential to improve foraging habitat and overall biodiversity that may attract their presence in the area.

Bat roosts – caves, mines, and abandoned wooden bridges and buildings: There are no caves, mines, abandoned wooden bridges or buildings within the project area that would need to be protected from activities associated with this project.

Project Effects and Cumulative Effects to Other Rare or Uncommon Species, and Other ROD Species: Activities proposed by this project include measures that maintain and protect habitat components important to support potential use by other rare or uncommon species, and other ROD Species. Implementing project activities as proposed should have no direct or indirect effect on these species such that their ability to persist within the project area or throughout their ranges

Current S&Gs governing management of this area provide direction that should ensure the long-term maintenance of amount and distribution of suitable habitat for this group of species. With respect to restoring historic habitat and biodiversity that may benefit these species, project effects may result in a positive yet marginal overall contribution to cumulative effects that have occurred from past actions within the project area.

Ensure that perennially wet habitat associated with springs in portions of Ball Park Thin Project area are protected by a 10-meter buffer against disturbance from proposed activities including prescribed burning.

Apply previous recommendations made in this report pertaining to snags and other dead wood habitat.

MANAGEMENT INDICATOR SPECIES (USDA 1990)

Background and Effects Summary: The Willamette Forest Plan has identified a number of terrestrial wildlife species with habitat needs that are representative of other wildlife species with similar habitat requirements for survival and reproduction. These management indicator species (MIS) include spotted owl, bald eagle, peregrine falcon, cavity excavators, pileated woodpecker, deer, elk, and marten. Spotted owls, bald eagles, and peregrine falcons are addressed in a separate Biological Assessment and Biological Evaluation. The other MIS have potential to occur in or near the project area and are addressed below. Activity associated with the proposed action is consistent with, or exceeds Willamette Forest Plan Standards and Guidelines as they pertain to MIS management.

Habitat for terrestrial MIS modified by activities associated with the proposed Ball Park Thin Project would be limited to foraging use by these species. Activities could result in disturbance to MIS that may be present in or adjacent to proposed treatment sites. However, any modification or disturbance that may occur associated with this project is not of a scale that would threaten the viability of any MIS to persist within the project area or throughout the range of these species.

Pileated Woodpecker:

Current, as well as historic, composition and structure associated with habitat type and plant associations surrounding the project area favor nesting and foraging use by pileated woodpeckers (Csuti et al. 1997, Marshall et al. 2003, NatureServe 2008, O'Neil et al. 2001).

Effects from proposed activities previously addressed in this report pertaining to snags and down wood as habitat important to cavity nesting birds, are also relevant to how this restoration project may affect this MIS.

Currently the Oregon Natural Heritage Program (ONHP), The Nature Conservancy (TNC), and the Oregon Department of Fish and Wildlife (ODFW) show the status of the pileated woodpecker to be secure, which suggests the changing trend in timber management that has occurred within the past decade, and is projected for the future, may positively influence occupancy of suitable habitat by this species as previously harvested stands redevelop, and more emphasis is placed on retention of key structural components in unharvested stands (USDA 1985; USDA, USDI 1994).

Marten:

Marten occupy a narrow range of habitat types found in or near coniferous forests. More specifically, they associate closely with late-successional stands of mesic conifers – especially those with complex physical structures near the ground such as large low snags and down wood (Chapin et al. 1997, NatureServe 2008, Ruggiero et al. 1994, Verts and Carraway 1998, Zielinski et al. 2001). Current habitat surrounding the planning area does include these characteristics. Marten are known to occur within the project

watershed, and despite lack of documented presence in the immediate vicinity it should be assumed the species is likely a member of the local faunal community.

In the General Wildlife Overview section of this report the marten was identified as a species closely associated with habitat in and adjacent to this project area. Effects identified pertinent to general wildlife, as well as to snags and down wood, apply to this MIS. Because marten prefer a more interior setting, large snags or down logs that could function as denning habitat would not be affected by this project. Foraging habitat for marten would likely improve as a result of beneficial habitat changes for prey species known to be favored by marten such as voles, rabbits, squirrels, and mountain beaver (Csuti et al. 1997).

Currently the ONHP, TNC, and the ODFW show the status of this species to be secure or not immediately imperiled, which suggests species viability may be assured as long as adequate protection measures such as Standards and Guidelines governing activities proposed by this type of project continue to be implemented. The changing trend in timber management that has occurred within the past decade, and projected for the future, may positively influence occupancy of suitable habitat for marten as previously harvested stands redevelop, and more emphasis is placed on recruitment of key structural components missing from harvested stands and retention of key structural components present in unharvested stands.

Cavity Excavators:
The significance of snags as one component characterizing both old-growth and younger timber stands, and the dependence of primary cavity excavators on this component as MIS that provide nesting and denning habitat for numerous additional species of birds and mammals (secondary cavity nesters) is thoroughly addressed in the Willamette National Forest Land and Resource Management Plan (1990). The significance of this relationship is further emphasized by management S&Gs under the Northwest Forest Plan ROD (1994, 2001, 2004) and elsewhere throughout published literature (Hagar et al. 1996, Hallett et al. 2001, Lewis 1998, Muir et al. 2002, Olson et al. 2001, Rose et al. 2001).

All species of primary cavity excavators used as ecological indicators in the Willamette Forest Plan (USDA 1990) have current and/or future potential to occupy habitat surrounding the project area based on recognized associations with the Westside Lowland Conifer Hardwood Forest Habitat type (O'Neil et al. 2001).

Effects from proposed activities previously addressed in this report pertaining to snags as habitat important to cavity nesting birds, are also relevant to how this project may affect this group of MIS cavity excavators. This project does propose modification of current nesting habitat and could result in disturbance during the breeding season for this group of species. The number of small and larger diameter snags identified as a safety hazard to work areas that may be felled or that could be affected by thinning and prescribed burning is considered inconsequential relative to this type of habitat component in the

surrounding landscape where fire is recognized as the major natural disturbance (Chappell et al. 2001).

Activities proposed by this project include measures that maintain and protect habitat components important to support use by the group of cavity excavators listed as MIS. Implementing project activities as proposed should have no direct or indirect effect on these species such that their ability to persist within the project area or throughout their range. Current Standards and Guidelines governing management of this area provide direction that promotes long-term maintenance of amount and distribution of suitable habitat for this group of species. With respect to restoring historic habitat and biodiversity that may benefit these species or their prey, project effects should result in a positive yet marginal overall contribution to cumulative effects that have occurred from past actions affecting the project area.

Elk/Deer (Big Game):

Current Condition – Big Game Habitat

The geographic scale used to assess direct, indirect and cumulative effects for Elk Habitat includes the project activity units and five Emphasis Areas within which management activities would occur. These emphasis areas were used for the scope of analysis because of established ratings for elk habitat that are described in the Willamette National Forest Plan Standards and Guidelines. These Emphasis Areas do not include private lands.

Affected Environment—Elk Habitat

Management objectives for deer and elk habitat apply to specific mapped "Emphasis Areas" within the Willamette National Forest. Each emphasis area has been assigned a rating of high, moderate, or low. Standards and Guidelines for management of these areas were developed in cooperation with the Oregon Department of Fish and Wildlife.

The Ball Park planning area includes portions of five designated emphasis areas: Latiwi, County, Upper Westside, Deer, and Belknap-Paradise Camp. These areas are managed for elk habitat under guidance from the Willamette Forest Plan Standards and guidelines (FW-137) with the assumption that providing high quality elk habitat would adequately address needs for black-tailed deer.

Elk Model for Ball Park Project Area

A Model to Evaluate Elk Habitat in Western Oregon (Wisdom 1986) is used to estimate habitat effectiveness (HE), which is defined as the proportion of achievement relative to an optimum condition. The management intent is to maintain effectiveness within a

range of values with the optimum value being 1.0. HE incorporates and qualifies four key habitat attributes: size and spacing of forage (HEs), quality of forage (HEf), cover areas (HEc), and open road density through elk habitat (HEr). Each habitat variable is calculated individually and allows for a comparison by variable or as a whole (HEI). The elk model considers past and ongoing activities and results in an evaluation of the cumulative impacts on habitat from the past, present, and foreseeable future actions in the Emphasis areas.

Maintaining a balance between cover and forage areas is a key component of elk habitat management in the Wisdom model. Using tightly controlled experimental conditions, Cook et al.(1998) found that thermal cover did not enhance elk survival and production, and was not required by elk where food was not limiting, and could not compensate for inadequate forage conditions. Further research has shown that high summer and fall forage quality is critical to elk reproduction, survival, and population growth and stability (Cook et al. 2004). The increased importance of available forage abundance and quality compared to thermal cover has also been supported by nutritional and physiological studies of black-tailed deer (Parker et al. 1999).

The Wisdom model was developed to evaluate landscape areas where quality forage areas were provided primarily by clear cutting and associated post-harvest burning and fertilization. With the dramatic decline in regeneration timber harvest under the Northwest Forest Plan, there has been a corresponding decline in high-quality elk forage habitat. This trend, coupled with recent studies, has increased the importance of providing foraging habitat for elk. A drawback of the Wisdom model is that forage is evaluated based on the *average value* of defined forage areas and does not consider the amount of forage provided. Areas that provide meaningful forage are not considered in the forage effectiveness calculations. For example, providing substantial acres of temporarily improved elk and deer forage conditions by moderate commercial thinning may result in a lower forage score in the Wisdom model if these acres lower the average value for forage areas in the landscape. Published research supports the idea that increasing the amount of available forage by commercial thinning should improve overall habitat conditions for elk and deer within the analysis area regardless of the average forage value derived from the Wisdom model.

Another example for which the model does not effectively show results due to the averaging nature of the values is for cover values. If thermal habitat is thinned and temporarily loses its' thermal value, the model increases the cover value because a greater amount of remaining cover may be optimal thermal (compare Tables 9 and 10 below).

Table 8 displays the condition of habitat values for patch size and spacing (HEs), open road density (HEr), cover quality (HEc), forage quality (HEf), and overall habitat quality (HEI) that existed for big game habitat when the Upper McKenzie Watershed Analysis was conducted in 1995. Table 9 displays the current condition that existed in 2008.

Table 8. HEI Analysis for Elk Habitat in the Ball Park Project Area, 1995.

Emphasis Area Name	Emphasis Rating	Results for Each Model Variable				
		HEs	HEr	HEc	HEf	Overall HEI
Upper Westside/Upper Westside McKenzie*	High	0.82	**0.49**	**0.47**	**0.42**	**0.53**
Latiwi	Moderate	0.83	**0.38**	0.40	0.52	0.51
County/Deer*	Moderate	0.90	0.48	0.41	0.48	0.51
Belknap-Paradise Camp	Moderate	0.52	0.54	0.45	0.45	0.48

*Upper Westside was analyzed with Upper Westside McKenzie which is not within the Ball Park Project Area. The County Emphasis Area was analyzed with the Deer Emphasis Area.
Values shown in bold are below recommended minimum threshold levels in the Willamette NF Land Management Plan. Target Levels:
High Emphasis Area Individual Index: >0.5 Overall index: >0.6
Moderate Emphasis Area Individual Index: >0.4 Overall Index: >0.5
Low Emphasis Area Individual Index: >0.2 Overall index: increase any variable <0.2

Table 9. HEI Analysis for Elk Habitat in the Ball Park Project Area, 2008. Current condition and No Action Alternative A.

Emphasis Area Name	Emphasis Rating	Results for Each Model Variable				
		HEs	HEr	HEc	HEf	Overall HEI
Upper Westside/Upper Westside McKenzie*	High	0.71	**0.32**	0.64	**0.39**	**0.49**
Latiwi	Moderate	0.79	**0.33**	0.58	0.55	0.54
County/Deer*	Moderate	0.88	0.44	0.53	0.44	0.55
Belknap-Paradise Camp	Moderate	0.82	0.54	0.65	0.45	0.60

Summary of Existing Elk Model Variables for the Ball Park Project Analysis Area
• **Size and Spacing of Forage**: The size and spacing habitat effectiveness rating (HEs) for forage and cover in all four elk emphasis areas is excellent. Management goals for size and spacing are currently being met.
• **Road Density:** Road densities in two areas are currently adequate with HEr values of County/Deer (0.44) and Belknap-Paradise Camp (0.54). Road densities in the Upper Westside (0.32) and Latiwi (0.33) areas are currently below Forest standards.
• **Cover:** The habitat effectiveness value for cover (HEc) in all four elk emphasis areas are excellent and meeting Forest Plan standards.
• **Forage:** Forage quality habitat effectiveness ratings (HEf) for Latiwi (0.55), County/Deer (0.44), and Belknap-Paradise Camp (0.45) areas are currently meeting Forest Plan standards. The Upper Westside (0.39) emphasis area is currently below Forest Plan standards.
• **Habitat Effectiveness Index (HEI):** The overall ratings of (HEI) indicate that three emphasis areas are currently above Forest plan standards: Latiwi (0.54), County/Deer (0.55), and Belknap-Paradise Camp (0.60). The overall HEI rating for Upper Westside (0.49) is currently below Forest Plan standards.

Table 10. HEI Analysis for Elk Habitat in the Ball Park Project Area, Alternative B. Values for Alternative C are identical, and are only shown as a second value if different.

Emphasis Area Name	Emphasis Rating	Results for Each Model Variable				
		HEs	HEr	HEc	HEf	Overall HEI
Upper Westside/Upper Westside McKenzie*	High	0.74/0.73	**0.32**	0.65	**0.37/0.40**	**0.48/0.49**
Latiwi	Moderate	0.93	**0.33**	0.60	**0.27**	**0.47**
County/Deer*	Moderate	0.92	0.44	0.55	**0.33/0.37**	0.52/0.53
Belknap-Paradise Camp	Moderate	0.85	0.54	0.65	0.41	0.59

Forage, Hiding, Thermal, Optimal Thermal Habitat, and Road Densities

Past harvest activities have shaped the landscape in terms of the juxtaposition and types of elk habitat. Harvest treatments were primarily regeneration, including clearcuts and shelterwoods. These harvested units once provided a wealth of quality forage for elk but have since grown into hiding and thermal cover. No specific data are available for the local elk/deer population within the five Emphasis Areas that this project overlaps.

Current ODFW biological data are not sufficient to provide an accurate estimate of the black-tailed deer population in western Oregon (ODFW 2002). Recent ODFW elk population estimates show that the state management unit in vicinity of the project area (McKenzie) has elk herds with population numbers near their current management objectives (Bill Castillo pers com; ODFW 2005).

Environmental Consequences—Elk Habitat

Alternative A (No Action)—Direct, Indirect, and Cumulative Effects

Current trends of elk habitat development would continue to occur naturally over time with Alternative A. Existing elk foraging habitat within open plantations may continue growing denser into hiding cover and then to thermal cover. Some of the current foraging habitat areas are in higher elevation frost pockets that may be maintained in a long-term foraging habitat condition. Meadow habitats may undergo slight levels of tree encroachment that is not judged to be severe at this time. Thermal cover would continue to slowly grow towards optimal thermal cover during the next 50-100 years. While thermal habitat quality would not be temporarily reduced which is the case with Alternatives B and C, at approximately 10 years post-thinning the rate of thermal habitat improvement would be lower compared to stands which had thinning treatments. With Alternative A, the current elk effectiveness ratings would not change significantly within the next few decades.

In ten years, some forage availability would be expected to decrease in this area as current harvest openings grow into hiding cover. In the absence of additional harvest or wildfire, no new foraging areas would be created. The current optimal and thermal cover would not significantly change.

In 50 years, approximately 30% of the existing thermal cover would shift into optimal thermal cover. Hiding cover would succeed into thermal cover. Road density and big game security would not change. Overall habitat quality may decrease from the loss of forage. No foreseeable timber or fuels management activities are scheduled to occur in the analysis area that could contribute to incremental cumulative effects on elk habitat.

Alternative B —Direct and Indirect Effects

The proposed thinning (915 acres) for the Ball Park Project would change the function of elk habitat from thermal cover to mostly lower quality thermal cover that contains small inclusions of forage areas. Opening of the canopy is expected to temporarily improve understory shrub and forb development by increasing sunlight within stands. Small one-acre gaps within thinning units would provide small forage openings totalling 129 acres scattered across all proposed thinning units. Forage quality would be highest within the

gap centers where the most sunlight would encourage forb and shrub development. Forage quality along gap perimeters would be lower due to increased shade. Thermal habitat quality in these 40 year old plantations is currently moderately low due to the young age of the stands. After thinning to an average of 40% canopy closure thermal habitat quality would be low for several years, and is expected to fully recover when the canopy again closes in approximately 7-10 years. At this time, thermal habitat quality would be improved slightly compared to before thinning since trees would have been released and grown taller and larger canopies. Additional understory development would also benefit thermal habitat quality.

Elk Model results for Alternative B show an improvement in cover values for all but the Belknap-Paradise Camp elk emphasis area. In the short-term, this is not what would actually occur. However, after approximately 10 years the thermal cover value would improve over the current condition when canopies close back in, tree diameters increase, and understory structure improves.

Forage values with Alternative B show a reduction in all four emphasis areas due to the averaging nature of the model. In reality, forage values would temporarily increase due to increased sunlight from canopy thinning. Gap forage values may remain higher longer, depending on tree regeneration within created gaps.

Alternative C—Direct and Indirect Effects

With Alternative C, effects will be similar to Alternative B. The difference is in a higher acreage of forage gaps totaling 151 acres which will better benefit elk and other species that depend on early seral habitats. Gap sizes will range from one to three acres. Within the larger gaps early seral habitat will develop slightly better than within a one acre gap because more area will be open to sunlight which will improve herbaceous and forb forage development. Flowering shrubs, berries, and grasses will show improved growth benefiting species that use them such as hummingbirds and black bears. In addition, six units totaling 217 acres will have more intensive thinning treatments resulting in 30% average canopy cover. These units were selected based on the excellent potential they offer for improved understory forage development.

Elk Model results for Alternative C show a small improvement in forage values for both the Upper Westside and County/Deer emphasis areas compared to Alternative B (Table 28). This slightly increases overall HEI scores by 0.01 for both the Upper Westside and County/Deer emphasis areas. In addition, the Size and Spacing variable in the Upper Westside emphasis area shows a decrease from 0.74 to 0.73. Other values within the elk model for Alternative C are identical to those for Alternative B.

Alternatives B and C—Direct and Indirect Effects

The proposed road decommissioning of 0.53 miles may benefit elk and other wildlife species susceptible to human disturbance by more permanently blocking off access. Both roads (2654795 and 2654812) are currently bermed and not driveable. Decommissioning will reduce or eliminate soil compaction to better allow establishment of herbaceous forage until trees colonize the former road surface. Road densities and potential disturbance to elk and other wildlife species in the Ball Park Project area would temporarily increase during implementation of this project with 3 additional miles of temporary native surface roads and increased traffic to access thinning stands. However, all these roads would be closed once the project is completed which is expected to be 10 years after the decision notice. Elk Model road densities would not change.

The proposed prescribed burning of two stands totaling 91 acres would slightly reduce thermal cover quality for several years due to opening of the canopy and expected tree mortality. Within approximately 10 years post-burning the mature overstory trees and smaller understory trees and shrubs will be released, at which time these two stands would have slightly improved thermal habitat conditions. In addition, burning may create small understory forage patches of high value to elk and other early seral wildlife species. This would slightly improve forage habitat quality in the County/Deer Emphasis Area.

Alternatives B and C—Cumulative Effects

Past management activities initially resulted in an abundance of forage habitat with the many acres of regeneration harvesting that occurred. The more recent lack of regeneration harvest has allowed these forests to grow into hiding and thermal cover to create the current condition represented by the no action alternative in Table 27. The overall impact of the proposed action is that thermal cover in treated stands would be changed to lower quality thermal cover, or hiding cover or forage. There are no foreseeable actions that would modify habitat in these Elk Emphasis Areas.

Alternatives B and C—Conclusions

Proposed activities would increase habitat quality for elk and deer in all five Emphasis Areas. Open road densities would not change in the long-term. Forage quality would noticeably increase on the 129 gap acres in Alternative B and 151 gap acres and 217 acres of 30% thinning in Alternative C. Beneficial effects to elk and other early seral species' forage from thinning and prescribed burning proposed by this project are not expected to be reflected in individual or overall habitat effectiveness values in the elk model given that the majority of acres would remain in a thermal cover classification under both Alternatives B and C. A limited number of animals would benefit from the small-sized openings that would be created by the project, so there would be little potential for any noticeable population response as a result of the proposed actions.

Project effects to elk and deer are essentially unquantifiable on an individual basis relative to the amount of habitat modified or disturbed against the amount available to these species on a daily basis in the affected Emphasis Areas. Direct and indirect effects are largely limited to potential temporary displacement of individuals during implementation of proposed activities. Short and long-term increases in forage habitat would be evident within the project area. In the context of the Emphasis Areas and adjacent 5th field watersheds, project effects would result in a minor contribution to cumulative effects that have already occurred from past management actions surrounding the project area. Given what is currently known about local deer and elk populations, the future viability of these species is assured as long as habitat restoration opportunities continue to be implemented – especially when conducted at an appropriate scale.

MIS summary:

Although proposed activities would modify some suitable habitat, and likely disturb some individual terrestrial MIS that may be present, they should not threaten the capability of any local population of these species to persist or become established in the project area. Any project effect considered negative in this regard would be short-term and minimal compared to the amount of habitat available in the surrounding landscape. Cumulative effects to MIS from proposed activities would be small in scale yet generally beneficial, as they contribute to long-term improvements in the overall diversity of habitat in the Ball Park Thin Project area.

Current available data or reports on the status of the above MIS, and additional information on the status and management of these MIS may be found on the following websites:

http://oregonstate.edu/ornhic/ORNHP.html

http://www.heritage.tnc.org/nhp/us/or/

http://www.dfw.state.or.us/ODFWhtml/InfoCntrWild/InfoCntrWild.html

Recommendations Pertaining To MIS: For cavity excavators (including pileated woodpecker and secondary cavity nesters) and marten - recognize previous recommendations made in this report pertaining to snags and other dead wood habitat.

For Elk/Deer: Consider additional activities that improve forage habitat throughout summer and winter range within Latiwi, County, Upper Westside, Deer, and Belknap-Paradise Camp Emphasis Areas.

MIGRATORY LAND BIRDS

Land bird species exhibit a dramatic response to the height, seral stage, canopy structure, and spatial distribution associated with forest habitat where greater numbers of birds are associated with more complex heterogeneous forested landscapes (Altman 1999). The current amount of forested and open ecotonal habitat characteristic throughout the project area should be attractive for use by a variety of avian species (Gilbert and Allwine 1991). However effects from past management practices – specifically fire suppression – have resulted in simplification of habitat throughout this area as forest encroachment progresses on meadow habitat.

Altman and Hagar (2007) identify 93 bird species in the Pacific Northwest that regularly breed in conifer forests less than 60 years of age. Over half of these species are experiencing population declines. Thinning generally does not change habitat conditions so dramatically that bird species can no longer use the stand, but often temporarily increases or decreases bird abundance depending on species. Altman and Hagar (2007) summarize studies showing 21 species of migratory birds whose range overlaps the project area increasing in abundance following forest thinning treatments. Seventeen migratory bird species did not change in abundance or had mixed responses in thinned forests, while 7 species generally decreased in abundance, at least temporarily, after thinning. Silvicultural treatments that promote understory shrub development, trees species diversity, deciduous trees, and the growth of larger trees; maintain snags and downed logs; and create gaps in the stand generally improve avian biodiversity. Thinning has not been shown to have long term effects on any sensitive bird species or species of special concern.

Alternative A (No Action)—Direct, Indirect, and Cumulative Effects

Alternative A does not propose management activities at this time and therefore would not alter habitat conditions for migratory landbirds. Existing vegetation conditions would continue to follow natural successional pathways, and bird populations would respond accordingly. While no snag habitat used by certain species of migratory land birds would be lost due to roadside hazard tree removal, no snag habitat would be created within forest stands where it is currently at extremely low densities, or non-existent. Additional snag habitat would be created through natural mortality in forest stands which are currently at low densities. Alternative A would have no direct, indirect, or cumulative effects on habitat of migratory landbirds in the project area.

Alternatives B and C—Direct and Indirect Effects

Felling of trees within ~40 year old plantations or along roadsides associated with this project may unintentionally affect habitat for individual migratory birds, but is not expected to have a measurable effect on their overall habitat or populations because of the limited extent of habitat removal. Thinning in young stands and prescribed fire in mature stands may impact habitat for certain species such as Hutton's vireo, golden-

crowned kinglet, hermit thrush, and Swainson's thrush by reducing suitable habitat. There would be areas of no harvest, such as buffers of special plant habitats or specific riparian areas, within some of the proposed stands providing potentially less impact.

Species that use early seral stages, such as the winter wren, American robin, and grouse, may benefit from thinning harvest treatments, especially the small gaps. Species which would increase in number as a result of thinning include Dark-eyed junco, Warbling vireo, American robin, Hairy woodpecker, Townsend's solitaire, Evening grosbeak, Western tanager, and Hammond's flycatcher (Hayes et al. 2003).

Snag habitat which may be used by migratory land birds such as western bluebirds or swallows, would be lost due to roadside hazard tree removal under Alternatives B and C. However, snags would be created in some thinning units from the post-harvest burn, as well as throughout the 92 acres of prescribed fire within two mature forest stands. It may take approximately ten or more years before these created snags become functional, although increased insects on these dead trees may increase bird foraging habitat within only a few years.

The low intensity forest underburns after thinning within some units may occur in spring. The natural fuels underburn in the two selected mature stands may occur in the fall. Spring burning may impact nesting land bird species by leading to nest failure or individual mortality. Species most affected would be those birds which nest relatively low to the ground such as hummingbirds, flycatchers, warblers, sparrows, and thrushes. Most migratory land birds generally fledge in June or July, although this can be later when second nest attempts are made. Juveniles of some species may not be able to fly long distances until late summer, however, many species are independent much earlier and would be able to escape a fire and smoke situation that could harm them.

Alternative B—Direct and Indirect Effects

Alternative B would impact migratory land bird habitat by thinning 915 acres of young forest plantations. No thinning would reduce final canopy closure to less than an average of 40%. Those species that would be less affected as a result of moderate thinning, compared to a more intensive canopy thinning, include Pacific-slope flycatcher, Hutton's vireo, and brown creeper (Hayes et al. 2003).

Alternative C—Direct and Indirect Effects

Alternative C would impact migratory landbirds by thinning 915 acres of young forest plantations of approximately 40 years of age. This Alternative would create slightly more gap habitat within stands (151 acres compared to 129 acres with Alternative B) which would benefit early seral land bird species. In addition, Alternative C would thin to 30% remaining canopy closure on 217 acres, also benefiting those species that more prefer open stand conditions (Rufous hummingbird, Anna's hummingbird, California quail, long- and short-eared owls, Vaux's swift). While those land bird species benefit,

others would be impacted more as a result of a canopy thinning leaving 30% cover. Species that would respond negatively include Pacific-slope flycatcher, Hutton's vireo, and brown creeper (Hayes et al. 2003). Habitat for these latter bird species would improve once canopies close back in 8-10 years.

Alternatives B and C—Cumulative Effects

Past management activities within the Ball Park Project area have resulted in changes to the seral stage composition across the landscape altering habitat conditions for land birds. Different species occupy different seral stage habitats and therefore the effects to habitat for each species depend on the specific type of change that occurred. Effects from the proposed thinning and underburning activities of the Ball Park Project would be an increase in the acres of small openings created across the landscape, which may impact some landbird habitat by reducing suitable, dense nesting habitat in very young trees. The more open nature of the remaining young trees may make nests more available to landbird nest predators, i.e. Stellar's jays or common ravens. There are no other reasonably foreseeable future timber harvest or prescribed fire activities planned for the project area.

Conclusion: The number of individuals and/or species potentially affected by proposed activities is unknown and considered unquantifiable without reliable survey data. Habitat changes proposed by this project should not affect this group of species such that their ability to persist in the vicinity of the project area or throughout their ranges would be compromised.

Both short and long-term suitability of open forest, meadow, and edge habitat in and near proposed treatment areas should improve for the majority of bird species that are likely to forage and nest in this area – albeit on a small scale compared to the surrounding landscape.

Project effects to Migratory Land Birds are of no measurable consequence on an individual basis relative to the amount of habitat modified or disturbed against the amount available throughout the surrounding Westside Lowland Conifer Hardwood Habitat type and the affected plant associations within it. Project effects would result in a positive yet marginal overall contribution, with respect to restoring historic habitat and biodiversity, to cumulative effects that have occurred from past actions affecting the project area.

Recommendations pertaining to Migratory Land Birds: Apply recommendations

pertaining to snag habitat discussed above.

This document was prepared by: /s/ Ruby Seitz Date: June 25, 2008

Wildlife Biologist
McKenzie River Ranger District
Willamette National Forest

Appendix 1: Literature referenced during preparation of this report to arrive at determinations regarding potential influence of the proposal on terrestrial wildlife species and habitat.

Altman, B. 1999. Conservation strategy for landbirds in coniferous forests of western Oregon and Washington. Version 1.0. Prepared for: Oregon-Washington Partners in Flight. March 1999.

Altman, Bob, and Hagar, Joan. 2007. Rainforest Birds: A Land Manager's Guide to Breeding Bird Habitat in Young Conifer Forests in the Pacific Northwest, U.S. Geological Survey, Scientific Investigations Report 2006-5304, 60 p.

Bartels, R., J.D. Dell, R.L. Knight, and G. Schaefer. 1985. Dead and down woody material. Pages 172-186 in E.R. Brown, editor. Management of wildlife and fish habitats in forests of western Oregon and Washington. U.S. Forest Service, Pacific Northwest Region.

Castillo, W.J. 2005. Personal Communication. District Wildlife Biologist, South Willamette Watershed District, Oregon Department of Fish and Wildlife. March 9, 2005.

Chapin, T.G., D.J. Harrison, and D.M. Phillips. 1997. Seasonal habitat selection by marten in an untrapped forest preserve. Journal of Wildlife Management 61(3): 707-717.

Chappell, C.B., R.C. Crawford, C. Barrett, J. Kagan, D.H. Johnson, M. O'Mealy, G.A. Green, H.L. Ferguson, W.D. Edge, E.L. Greda, and T.A. O'Neil. 2001. Wildlife habitats: descriptions, status, trends, and system dynamics. *in* D. H. Johnson and T.A. O'Neil (Manag. Dirs.) *Wildlife-Habitat Relationships in Oregon and Washington*. Oregon State University Press, Corvallis, OR, USA. 2001. 736 pp

Cook, J.G., L.L. Irwin, L.D. Bryant, R.A. Riggs, and J.W. Thomas. 1998. Relations of forest cover and condition of elk: a test of the thermal cover hypothesis in summer and winter. Wildlife Monographs, No. 141, October 1998.

Cook, J. G., B. K. Johnson, R.C. Cook, R. A. Riggs, T. Delcurto, L. D. Bryant, and L. L. Irwin. 2004. Effects of summer-autumn nutrition and parturition date on reproduction and survival of elk. Wildlife Monographs 155.

Csuti, B., A.J. Kimerling, T.A. O'Neil, M.M. Shaughnessy, E.P. Gaines, and M.M.P. Huso. 1997. Atlas of Oregon Wildlife (Distribution, Habitat, and Natural History), Oregon State University Press, Corvallis, Oregon.

Davis, R. 2003. Baked Apple wildfire effects evaluation project. Umpqua National Forest.

Duncan, N., T. Burke, S. Dowlan, and P. Hohenlohe. 2003. Survey Protocol for Survey and Manage Terrestrial Mollusk Species From the Northwest Forest Plan. Version 3.0. 2003.

Everett, Richard L.; Lehmkuhl, John; Schellhaas, Richard; [and others]. 1999. Snag dynamics in chronosequence of 26 wildfires on the east slope of the Cascade Range in Washington state, USA. International Journal of Wildland Fire. 9(4): 223-234.

Gilbert, F.F. and R. Allwine. 1991. Spring bird communities in the Oregon Cascade Range. pp. 319-325 *in*: Ruggiero, Leonard F.; Aubry, Keith B.; Carey, Andrew B.; Huff, Mark H., tech. coords. Wildlife and vegetation of unmanaged Douglas-fir forests. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon, General Technical Report PNW-GTR-285, May 1991.

Hallett, J.G., T. Lopez, M.A. O'Connell, M.A. Borysewicz. 2001. Decay dynamics and avian use of artificially created snags. Northwest Science 75:378-386.

Hagar, J.C., W.C. McComb, and W.H. Emmingham. 1996. Bird communities in commercially thinned and unthinned Douglas-fir stands of western Oregon. Wildlife Society Bulletin 24 (2): 353-366.

Hayes, J., J. Weikel, M. Huso, and J. Erickson. 2003. Response of Birds to Thinning Young Douglas-fir Forests. Cooperative Forest Ecosystem Research, USGS FS-033-03.

Johnsgard, P.A. 1988. North American Owls – biology and natural history. Smithsonian Institution Press. 295 pp.

Johnson, David H. and T.A. O'Neil (Manag. Dirs.). 2001. Wildlife-habitat relationships in Oregon and Washington. Oregon State University Press, Corvallis, Oregon.

Lantz, M. 2008. Personal Communication. Assistant Fire Management Officer, McKenzie River Ranger District, Willamette National Forest. 5/15/2008..

Laudenslayer, W.F.Jr., P.J. Shea, B.E. Valentine, C.P. Weatherspoon, T.E. Lisle, technical coordinators. 2002. Proceedings of the symposium on the ecology and management of dead wood in western forests. 1999 November 2-4; Reno, NV. Gen. Tech. Rep. PSW-GTR-181. Albany, CA: Pacific Southwest Research Station, USDA Forest Service; 949pp.

Lewis, J.C. 1998. Creating snags and wildlife trees in commercial forest landscapes. Western Journal of Applied Forestry, Vol. 13, no. 3 pp. 97-101.

Marshall, D.B., M.G. Hunter, and A.L. Contreras, Eds. 2003. Birds of Oregon: A General Reference. Oregon State University Press, Corvallis, OR. 768pp.

Mellen, Kim, Bruce G. Marcot, Janet L. Ohmann, Karen Waddell, Susan A. Livingston, Elizabeth A. Willhite, Bruce B. Hostetler, Catherine Ogden, and Tina Dreisbach. 2006. DecAID, the decayed wood advisor for managing snags, partially dead trees, and down wood for biodiversity in forests of Washington and Oregon. Version 2.0. USDA Forest Service, Pacific Northwest Region and Pacific Northwest Research Station; USDI Fish and Wildlife Service, Oregon State Office; Portland, Oregon. http://wwwnotes.fs.fed.us:81/pnw/DecAID/DecAID.nsf

Muir, Patricia S., Mattingly, Rosanna L.; Tappeiner II, John C.; Bailey, John D.; Wlliott, Wayne E.; Hagar, Joan C.; Miller, Jeffrey C.; Peterson, Eric. B.; and E. E. Starkey. 2002. Managing for Biodiversity in Douglas-fir Forests of Western Oregon. Biological Science Report USGS/BRD/BSR-2002-0006.

NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.0. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. Copyright © 2008 NatureServe, 1101 Wilson Boulevard, 15th Floor, Arlington Virginia 22209, U.S.A. All Rights Reserved.

Olson, D.H., J.C. Hagar, A.B. Carey, J.H. Cissel, and F.J. Swanson. 2001. Wildlife of westside and high montane forests. pp. 187-212. *in* D. H. Johnson and T.A. O'Neil (Manag. Dirs.) *Wildlife-Habitat Relationships in Oregon and Washington*. Oregon State University Press, Corvallis, OR, USA. 2001. 736 pp.

O'Neil, Thomas A., David H. Johnson, Charley Barrett, Maria Trevithick, Kelly A. Bettinger, Chris Kiilsgaard, Madeleine Vander Heyden, Eva L. Greda, Derek Stinson, Bruce G. Marcot, Patrick J. Doran, Susan Tank, and Laurie Wunder. *Matrixes for Wildlife-Habitat Relationship in Oregon and Washington*. Northwest Habitat Institute. 2001. *in* D. H. Johnson and T.A. O'Neil (Manag. Dirs.) *Wildlife-Habitat Relationships in Oregon and Washington*. Oregon State University Press, Corvallis, OR, USA. 2001. 736 pp.

Oregon Department of Fish and Wildlife. 2002. Draft black-tailed deer work group report 2002 (7/12/02). Oregon Department of Fish and Wildlife, P.O. Box 59, 2501 S.W. First Avenue, Portland, Oregon 97201.

Oregon Department of Fish and Wildlife. 2005. DRAFT Review of Oregon's mule deer and elk management objectives February 2005. Proposals developed by district working groups for public review. Oregon Department of Fish and Wildlife, 3406 Cherry Avenue NE, Salem, Oregon 97303.

Parker, K. L., M. P. Gillingham, T. A. Hanley, and C. T. Robbins. 1999. Energy and protein balance of free-ranging black-tailed deer in a natural forest environment. Wildlife Monographs 143.

Quintana-Coyer, D.L., R.P. Gerhardt, M.D. Broyles, J.A. Dillon, C.A. Friesen, S.A.Godwin, and S.D. Kamrath. 2004. Survey protocol for the Great Gray Owl within the range of the Northwest Forest Plan. Version 3.0, January 12, 2004. Prepared for the USDA Forest Service and USDI Bureau of Land Management.

Rose, C.L., B.G. Marcot, T.K. Mellen, J.L. Ohmann, K.L. Waddell, D.L. Lindley, B. Schreiber. 2001. Decaying wood in Pacific Northwest forests: concepts and tools for habitat management. pp. 580-623. *in* D. H. Johnson and T.A. O'Neil (Manag. Dirs.) *Wildlife-Habitat Relationships in Oregon and Washington*. Oregon State University Press, Corvallis, OR, USA. 2001. 736 pp.

Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, L.J. Lyon, and W.J. Zielinski (technical editors). 1994. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the western United States. USDA Forest Service General Technical Report RM-254. September 1994.

USDA Forest Service. 1985. Publication No. R6-F&WL-192-1985. Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington.

USDA Forest Service. 1990. Willamette National Forest Land and Resource Management Plan, 1990.

USDA Forest Service, Willamette National Forest; USDI Salem District BLM; USDI Fish and Wildlife Service OSO. 1998. Mid-Willamette Late-successional Reserve Assessment. August 24, 1998.

USDA Forest Service. 2005. Forest health protection aerial survey data. Forest Health Protection, USDA Forest Service, Pacific Northwest Region. http://www.fs.fed.us/r6/nr/fid/as/

USDA Forest Service, USDI Bureau of Land Management. 1994. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl, and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl, USDA Forest Service and USDI Bureau of Land Management, 1994.

USDA Forest Service, USDI Bureau of Land Management. 2001. Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. January 2001.

USDA Forest Service, USDI Bureau of Land Management. 2004. Record of Decision to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl. March 2004.

Verts, B.J. and Leslie N. Carraway. 1998. Land mammals of Oregon. University of California Press, Berkeley and Los Angeles, California.

Wisdom, M., L.R. Bright, C.G. Carey, W.W. Hines, R.J. Pedersen, D.A. Smithey, J.W. Thomas, and G.W. Witmer. 1986. A model to evaluate elk habitat in western Oregon. USDA Forest Service, Pacific Northwest Region Report R6-F&WL-216-1986. March 1986.

Zabel, C.J. and R.G. Anthony. 2003. Mammal community dynamics – management and conservation in the coniferous forests of Western North America. Cambridge University Press. 709pp.

Zielinski, William J., K.M. Slauson, C.R. Carroll, C.J. Kent, D.G. Kundrna. 2001. Status of American martens in coastal forests of the Pacific states. Journal of Mammalogy, 82(2):478-490.

Landscape-level Snag Habitat Patches on the McKenzie River Ranger District.

COVER INFORMATION

Reply To: 2550 Soil Management
2520 Watershed Protection and Management

Subject: SOIL AND GEOLOGY REPORT
Ballpark Environmental Assessment

To: District Ranger, McKenzie River Ranger District

By: Douglas C. Shank, Forest Geologist

Date: December 3, 2007

I. INTRODUCTION

A. PURPOSE AND NEED FOR PROJECT

The District Ranger of the McKenzie River Ranger District of the Willamette National Forest has determined that a need exists to commercially thin about 1500 acres of managed stands in the Upper McKenzie River Watershed. The purpose of the project is to:

1) Improve the growth of various plantation timber stands and promote forest health by reducing current stocking levels to enhance growth and vigor of the remaining trees and to reduce future losses from fire, insects, disease, and from snow breakage; 2) Manage activity-created and natural fuels as needed to meet Forest Plan Standards and the historical fire regime processes by underburning, machine piling, hand piling and burning; 3) Maintain or reduce the existing road system as much as is practical; and 4) Provide a sustainable supply of commercial wood products.
In summary, the purpose of this project is to improve timber stand health and vigor, enhance tree growth, maintain roads, and provide wood products from previously managed stands. An additional aim of the project is to enhance conditions in riparian areas to meet Aquatic Conservation Strategy Objectives. By enhancing tree growth, larger trees will better provide more shade for streams, moderate microclimate, improve overall structural diversity, and contribute future sources of coarse woody debris for streams.

B. PROPOSED ACTION AND CONNECTED ACTIONS

The District Ranger for the McKenzie River Ranger District of the Willamette National Forest

proposes to implement the following actions during the next five years within previously managed stands in various management allocations in the Upper McKenzie watershed. The Ball Park Thin Project is within the Deer Creek Subwatershed (6^{th} field) of the Upper McKenzie Watershed (5^{th} field). The Upper McKenzie River Watershed Analysis, completed in 1995, includes descriptions of present conditions, relevant processes, likely future conditions, concerns, and restoration needs to help with project development. The Ballpark project includes the following proposed actions:

1. Commercially thin approximately 1500 to 1600 acres of 30 to 60 year old stands with ground based, sky line, or helicopter yarding systems, as appropriate.

2. Construction of temporary roads or reconstruction and maintenance of older system roads to provide access for various management activities.

3. Precommercially thin up to several hundred acres of adjacent managed plantations, and fertilize these stands if funds are available.

4. Reduce management created fuels or natural fuel accumulations through various methods such as hand and machine piling and pile burning or broadcast under-burning to lessen the fire hazard; or broadcast burn or underburn various natural stands and meadows to return the role of fire as a natural disturbance process in the ecosystem.

5. Manage or expand development in the Boulder or Upper Boulder, Dogwood, Westside or Latiwi Rock Sources, as needed, to provide a variety of rock products for various management activities.

II. SUMMARY

A. RESOURCES CONSIDERED

This report documents the existing conditions and potential impacts to the soil and geology resource. The major short-term impacts to soil productivity from harvest activity, as discussed in the Willamette National Forest Final Environmental Impact Statement (FEIS 1990), include displacement, compaction, nutrient loss, and instability. In most situations, preventing soil impacts is the most effective and feasible way of ensuring long-term soil productivity.

B. METHODS

The information for this report was obtained by intensive field reconnaissance of proposed units as well as the terrain surrounding the units. In most units, where ground based harvest methods were proposed, transects were walked and information taken to determine the numerical extent of existing compaction, as a percentage of the transect distance.

C. RESULTS

Unsuited landtypes, both unregenerable and unstable, were mapped and will be deleted from proposed harvest units (as appropriate). Unit 390 has a large band of rocks and cliffs, Landtype 310-610, running through the southern portion of the unit. This unsuited area will be deleted during layout. Skyline corridors running through this unsuited rocky area (or as applicable in other units) are acceptable to access suited portions of the unit. Trees in the unsuited area that need to be cut to maintain the integrity of the sky line corridor will generally be left for down woody debris (unless other wise agreed to by Forest Service personnel). Some of the non-harvest fire related units contain large unsuited areas. This is acceptable as no harvest is proposed and the objective is to return fire to areas that naturally burned relatively frequently.

Anticipated direct effects to the soils resource will be within Willamette National Forest Standards and Guidelines. Recommended suspension requirements will control the potential for unacceptable displacement. Ground based yarding systems are recommended for those units or portions of units with side slopes gentle enough to support mechanized equipment. Skyline yarding with one end suspension will be recommended for units or portions of units with side slopes greater that 30% to avoid excessive disturbance from heavy equipment. Potential nutrient loss will be controlled by duff retention standards. Long term slope stability is being mainteined by recommending the deletion of portions of units with actively unstable or potentially highly unstable side slopes. Consequetly, slope instability is not considered a concern for any unit in this project area. Compaction will be controlled by designated skid or forwarder roads, the use of existing roads as much as possible, and subsoiling.
The field investigation indicated that none of the units as a whole exceeded the Willamette National Forest FW-081 Standard of 20% of an activity area impacted by compaction. Some units, like Unit 140 or Unit 150, had high individual transect values that approach the standard. Usually, these were transects that crossed old landing sites. However, these units as well as the others were, on average, sufficiently below or well below the threshold not to be considered a concern. One of the goals with entry into all these units is to provide the opportunity to subsoil the existing skid roads as much as is practical in order to reduce compaction to lower levels. With entry into any ground-based unit, evident skid or haul roads will be utilized before any new skid road is approved. It is possible with this proposed action that cumulative compaction in some portions of some units may exceed the threshold at the completion of harvest activities. Consequently, subsoiling is recommended enhancement to insure that cumulative levels remain below the 20% standard. In total all these units together would generate around 30 acres of enhancement subsoiling at an approximately cost of $10,500. If some of these units are not included for harvest or if sufficient enhancement funds are not present for all units, then the dollars that are available will be distributed on a priority basis to the units with the greatest level of initial compaction, receiving the most attention.

D. CONCLUSIONS

The soil protection measures are designed to maintain long term soil productivity and provide a level of erosion control that is consistent with the standards and guidelines of the Willamette National Forest's

Land and Resource Management Plan (1990) and Oregon State Department of Environmental Quality guidelines. All prescriptions or mitigation measures discussed in this report are designed to meet or exceed the requirements outlined in the General Water Quality Best Management Practices Handbook (Pacific Northwest Region, November 1988). Prescriptions for soil protection and watershed considerations take into account past and predicted future land management activities. Standard contract language should provide sufficient erosion control measures during timber sale operations (BMP T-13). Revegetation of areas disturbed by harvest activities (such as landings, temporary roads, and equipment storage areas) is required with an appropriate seed mix (BMP T-14, T-15, and T-16).

III. REGULATORY FRAMEWORK

A. LAWS AND REGULATIONS -- 36 C.F.R. 219.14(a) directs the Forest Service to classify lands under their jurisdiction as not suited for timber production if they fall into any of four categories:

a. Non-forest;
b. Irreversible soil or watershed damage (from NFMA 6(g)(3)(E)(i));
c. No assurance of reforestation within five years;
d. Legislatively or administratively withdrawn.

This report considers the first three categories of land. On the Willamette National Forest these areas are defined by landtype, which will be explained in much greater detail in the Procedures and Methodology Section.

B. REGIONAL GUIDELINES -- Forest Service Manual R-6 Supplement No. 2500.98-1 (Title 2520 Watershed Protection and Management) clarifies direction for planning and implementing activities in areas where soil quality standards are exceeded from prior activities; redefines soil displacement; provides guidance for managing soil organic matter and moisture regimes. In addition, the USDA FS Pacific Northwest Region handbook on General Water Quality Best Management Practices (November, 1988) provides a guide on practices which are applicable in conducting land management activities to achieve water quality standards to ensure compliance with the Clean Water Act, as amended, and Oregon Administrative Rules.

C. FOREST PLAN -- Chapter IV of the Willamette Forest Plan states the Forest-wide Standards and Guidelines for a variety of resources and activities. Soil and Water Quality protection are addressed in the section from FW-079 to FW-114. Based on direction in the Forest Wide Standards and Guides, FW-079 and FW-080 and BMP T-1, T-2 and T-3, the following activities were performed as part of the planning process: verifying the present SRI land type boundaries; determining the location of unsuited and unmanageable landtypes; prescribing slash treatment and suspension objectives for the possible units; and evaluating potential watershed impacts from management.

IV. DESIRED FUTURE CONDITION

The major short-term impacts to soil productivity from harvest activity, as discussed in the Willamette National Forest Final Environmental Impact Statement (FEIS 1990), include displacement, compaction, nutrient loss, and instability. In most situations, preventing soil impacts is the most effective and feasible way of ensuring long-term soil productivity. The total area of cumulative detrimental soil conditions should not exceed 20% of the total acreage within the activity area, including roads and landings.

A. DISPLACEMENT --Displacement is defined as the removal of more than 50% of the topsoil or humus enriched soil horizons from an area of 100 square feet which is at least 5 feet in width. Displacement can occur with timber management during road or landing construction, yarding, or the mechanical treatment of slash, such as machine piling. Contract requirements which reduce or eliminate displacement are the primary way to minimize this concern.

B. COMPACTION -- Compaction is defined as an increase in soil bulk density of 15% or more and/or by a reduction of macropore space of 50% over the undisturbed soil. Excessive soil compaction from heavy, mechanized equipment used during logging can decrease soil productivity by restricting root growth, reducing rainfall infiltration rates, and increasing over land flow and run off. Prior management on some units, conducted before any requirements were established, created compaction conditions which may now approach or exceed the currently accepted standards and guidelines. Activities which minimize further compaction such as skyline logging, utilize existing compacted areas as much as possible, or reduce existing compaction through mechanical means (subsoiling) are recommended.

C. NUTRIENT LOSS --The primary mechanism for excessive nutrient loss is uncontrolled wild fire at high fuel loadings, low fuel moistures, and adverse weather conditions. Fire recurrence intervals of 100 to 200 years are apparent in the natural system, with shorter intervals in some critical high lightning areas or with suspected aboriginal burning. The actual thinning or harvest of these units is not as much concern for long term soil productivity as the concomitant slash accumulation and the potential for wild fire. On the other hand, NO ACTION IS NOT considered beneficial for long-term soil productivity either. Overstocked stands will rapidly see density increase, growth slow, and mortality rise. Fuel accumulations from blow down, snow down, and bug kill provide an ever increasing amount of fuel loading. Activities, which reduce stocking levels, improve stand vigor, and eliminate excessive fuel loading are favored.

D. INSTABILITY -- Slope instability is also a natural ecological component of the Cascade Range ecosystem. Debris chute failure recurrence is generally associated with more episodic large fire and / or flood events. Slump / earth flow instability is more steady state and may extend for centuries. Slope failures of either type carry large wood and rock to stream systems. This material is needed to both create suitable structure for sediment storage and provide the gravels required for fish and other aquatic habitat. On the other hand, numerous failures, without the associated boulder or log structure, can overload a system with sediment and destroy functioning habitat. Activities which do not exacerbate existing unstable areas or promote long-term stability are favored.

V. ANALYSIS METHODS

Field work was specifically conducted for Ball Park timber sale environmental assessment through the spring and summer of 2007. During that period, I conducted a field reconnaissance of potential harvest units and surrounding areas for a planned timber sale in order to help implement Willamette National Forest program direction. Specific field days included March 29, April 26, May 1 and 11, June 28, July 24, and August 13, 2007. Considerable additional field work was conducted in 2004 in this same area and was also utilized in this report (approximately 13 days - May 21, 26, and 27, June 28, July 9 and 26, and September 7, 9, 22, 23, 27, 28, and 29, 2004, were involved in field exploration and investigation for that previous project.)

A. FIELD INVESTIGATION STANDARDS

A major portion of the field investigation was directed at distinguishing the various identifiable landtype components within the study area and mapping them on the photo overlays. Much of the landtype

analysis referenced in this report was originally conducted for previous timber sale planning activities. In general, the field investigation confirmed some of the original 1973 SRI designations and the previously mapped work. The major portion of the field work involved site specific evaluation of existing conditions within each of the units. My field investigation of landtypes and the determination of the impacts from prior management activities formed the basis for the site-specific recommendations and mitigations that follow in this report.

B. LANDTYPES -- Description and discussion

1. Unsuited and unmanageable landtypes have been delineated within the project area as part of the landtype mapping process (FW-180). Unsuited and unmanageable landtypes occur in two basic categories - those acres that are un-regenerable and those where harvest will cause irreversible impacts. Those landtypes that are considered to have regeneration difficulties (BMP T-20) could include 1, 2, 3, 4, 5, 6, 7, 62, 210, 310, 610, and 710 or combinations of these landtypes. Almost all have numerous rock outcrops and cliffs, shallow gravelly soils with rock fragment content generally greater than 70%, and talus. Landtypes 6 and 7 are wet and dry meadows, respectively, and most areas of Landtype 6 are considered "wetlands" (BMP T-17 and W-3). All are currently considered noncommercial forestland or non-reforestable in the five-year time frame. Officially, 210, 310, and 610 are defined as marginally reforestable at least to extensive levels on easterly and northerly aspects, and non-reforestable in the five-year time frame on southerly and westerly aspects. However, almost no successful timber management has ever occurred on any aspect related to these specific landtypes on the McKenzie River Ranger District. Consequently, the north and east aspects of 210, 310, and 610 are considered unmanageable (no sufficient assurance of regeneration within the five year time frame) land in this report.

2. Landtypes considered unsuited because harvest will result in irreversible resource damage are primarily those that are actively unstable or potentially highly unstable (FW-105, BMP T-6). They could include the primary Landtypes 25 and 35, and the complexes of 255 (25 plus 35), 256, and 356. Landtypes 256 and 356 have actively unstable areas very closely associated and generally in direct contact with stream riparian areas or stream courses. These areas all commonly display slump type topography and include such features as tension cracks, bare soil scarps, leaning and fallen trees, sags and depressions, seeps, and disrupted drainages. Failure depths are such that root strength probably has little effect. However, the instability problem can be aggravated by timber harvest, as removing the trees tends to raise ground water levels due to the loss of evapotranspiration. This in turn reduces the soil strength and can cause increased or renewed instability. On the other hand, thinning these areas can create thriftier stands that have greater root strength and increased evaporation over time. Other landtype complexes that contain elements of 25 or 35, such as 225, 235, 251, 252, 253, 254 and 353 need to be evaluated on a case-by-case basis as management activities are proposed.

3. Landtype complexes, such as 55-162-164, 443-554, or 16-55 have elements of both or all landtypes that were either not differentiable at the photo scale, or sufficient field time was not available to distinguish the various components.

4. The remaining landtypes are adequately discussed in the Willamette National Forest Soils Resource Inventory. This document, first developed in 1973 and updated in 1990, was made to provide some basic soil, bedrock and landform information for management interpretations in order to assist forestland managers in applying multiple use principles. The 1973 text and descriptions are used here. A copy is on file with the Natural Resources Staff group at the McKenzie River Ranger District.

C. BASIS FOR EVALUATING EFFECTS

For the soil resource the scale of analysis for both direct / indirect effects and cumulative effects is almost always the “unit”, i.e. the stand polygon proposed for silvicultural treatment. The unit of measure for evaluating those effects is generally considered the percent of the “unit” affected. The summing of acres for various units, such as the total acres of skyline logging in a given alternative, is not an evaluation criterion for soils impacts. Impacts are evaluated on a unit-by-unit basis, and are generally the same in any given unit for all action alternatives, unless otherwise noted.

VI. EXISTING CONDTION AND ENVIRONMENTAL CONSEQUENCES

A. INTRODUCTION

Deer Creek is part of the Mckenzie River Basin, which is located on the western slope of the Cascade Range. The Cascade Range extends for over 625 miles from northern California well into British Columbia in Canada. The general physiography of the Cascades is dominated by a string of potentially active volcanic peaks. These relatively recent craggy summits overlie a complex geological sequence of older volcanic and sedimentary rocks. The over all form of the north - south trending Cascades reflects the line of subduction of the Pacific oceanic plates as they move under the North American continental plate. This plate commotion has modified the Cascades by basin and range faulting to the east, and episodic mountain building and volcanism throughout their history and extent. The surface expression of these rock sequences has been altered through time by the numerous rivers that drain the wet western flanks and by intensive periods of mountain glaciation.

Deer Creek straddles the time between the older Western Cascades sequences of Oligocene and lower Miocene volcanic and volcaniclastic rocks more common to the north and west, and the younger High Cascade volcanic units of Upper Pleistocene and Quaternary age to the east. Considered part of the Western Cascade physiographic region, the Deer Creek study area is composed primarily of upper Miocene basaltic andesite and andesite flows and flow breccias, lahars, and volcanic conglomerates. These rocks range in age from about 17 million years ago to about 10 million years old (Tfc of Walker and Duncan, 1989). Over lying this strata on most ridges are 4 to about 10 million year old olivine basalt, basaltic andesite and dacite lava flows (Tb of Walker and Duncan, 1989). Some ridge capping flows of this time period are lithologically similar to flow rocks of the oldest flows of the High Cascade volcanic sequence, and some are more like flows that in the past have been mapped as part of the Sardine Formation in the Western Cascade Province (Walker and Duncan, 1989).

The surface expression of these rock formations has been extensively modified by erosion since late Miocene time, especially from Pleistocene through Holocene with glacial activity. Glacial forms are common in the study area, and ice cap glaciers probably covered the High Cascade platform to the east several times during the Pleistocene. Valley glaciers likely traveled both down and up Deer Creek as it acted both as a valley glacier and as an outlet for excess ice accumulation to the east from the High Cascade platform. Small cirque basins, hanging valleys, and assorted morainal deposits all reside on the landscape, but some have been extensively altered by stream erosion and slope instability. Locally, some of the bedrock materials tend to weather to form deep colluvial and residual soils that can give rise to unstable terrain with both rotational and translational failures. This complex geologic history has produced a myriad of diverse landforms and soils. A geomorphically complex terrain with a distinctive and diverse topographic expression, landforms range from highly glaciated upland benches and flats with extensive ground moraine (such as Conroy Creek), to steep rocky canyons and crags of Frissell, to the large scale stabilized slump / earthflow complexes and associated glacial deposits of Carpenter Creek, to the flat stable river terraces and outwash plains along the main stem of the McKenzie River at the confluence of with Frissell and Deer Creeks.

Soils developed from both the volcanic and glacial deposits, even on the steeper side slopes, are usually stable and productive. The various soils associated with the numerous land types are generally well drained where permeability is rapid in the surface soil and moderately rapid in the subsoil. Because of high infiltration rates, overland flow is generally uncommon except during periods of high rainfall and snow melt. In the proposed units, side slopes range from near zero to about 30% on the gentler slopes to 40 to 80% on the steeper terrain. Offsite erosion is generally not a concern because of the vegetative ground cover, the high infiltration rates, and the gentle to moderate side slopes for many units.

Most of this project area was burnt by either natural or aboriginal fires that were likely prevalent and carried through much of the project area in the last several hundred years. Many areas may have been under burnt instead of stand replacement. Consequently, natural accumulations of down woody debris may not have been prevalent in many parts of this project area. These conditions would vary across the landscape, depending on aspect, elevation, and slope position.

B. ALTERNATIVES

All action alternatives and the no-action alternative will be evaluated for impacts to the soil resource. In this analysis, all the action alternatives have the same basic effects and the same soil protection measures, as described on a unit-by-unit basis, and will be considered similarily. Evaluating impacts and their potential significance between or among alternatives requires discussing the duration and intensity of those impacts. Often various words are utilized to describe those conditions. The following definitions apply to impacts described in this report.

1. Duration

- Short-term: The effects last for a few weeks to one or two years;
- Intermediate: The effects last from one or two years to about a decade:
- Long-term: The effects last from about 10 years to several score years or longer.

2. Intensity

- Low, negligible, little or no, minimal, minor: The impacts are essentially zero, at the lowest levels of detection, or very slight but still noticeable.
- Moderate, reasonable: The impacts are readily apparent, but meet standards and guides.
- Excessive, substantive, major, critical: The impact is moderately severe and likely approaches the upper limits of standards and guides.
- Significant, unacceptable: The impacts are severe, and likely exceed standards and guides or do not meet Best Management Practices.

3. Basis for Evaluation.

For the soils resource the scale of analysis for both direct / indirect effects and cumulative effects is almost always the "unit", i.e. the stand polygon proposed for silvicultural treatment. The unit of measure for evaluating those effects is generally considered the percent of the "unit" affected. Impacts are evaluated on a unit-by-unit basis, and are generally the same in any given unit for all action alternatives.

C. DIRECT AND INDIRECT EFFECTS

The major short-term, intermediate, or long-term impacts to soil productivity from harvest activity, as discussed in the Willamette National Forest Final Environmental Impact Statement (FEIS 1990), include displacement, compaction, nutrient loss, and instability. In most situations, preventing soil impacts is the most effective and feasible way of ensuring long-term soil productivity. The following sections discuss in more detail (1) how the proposed action may affect the soil resource or (2) mitigations that can be utilized to avoid potentially undesirable effects.

1. No Action Alternative

Stands will continue to develop. Many of the stands proposed for thinning currently have little understory vegetation because of the lack of sunlight to the forest floor. Intermediate and suppressed trees would slowly be removed from the stand through mortality and decay. In areas of heavy stocking, stands would stagnate. Blow down and snow down would continue to add fuel to the fuel loading. In general, plant diversity would diminish as well as soil biota because of the lack of sunlight. Evidence of compaction from previous entries is still present in most ground-based units. In areas already compacted or disturbed by the initial entries, the soil building process will continue to return the soil to near preharvest conditions in the longer term. Short-term to intermediate term impacts from harvest, such as soil disturbance, dust or mud, slash accumulation and disposal, and longer term impacts such as compaction and nutrient loss would not occur. Slope

instability is not generally a geologic process that is active in any of the proposed units. Actively unstable or potentially highly unstable soils were deleted in the action alternatives. Consequently, in the short or intermediate term, no effects to slope instability are anticipated whether the units are managed or not. However, in the longer term, avoidance of any timber management in the actively unstable or potentially highly unstable areas could lead to increased instability as these stands tend to suppress. The potential loss of large wood or increased tree mortality will create conditions where slope failures could become more prevalent or excessive.

2. All Action Alternatives

All action alternatives have the same basic effects and the same soil protection measures, as described on a unit-by-unit basis. Some units may be evaluated that do not end up being considered in any action alternative.

A. Displacement

a) Existing Condition

Displacement occurs with three separate timber harvest activities: yarding, slash treatment, and road building and maintenance. Yarding activities on the existing plantations have for the most part occurred with the appropriate suspension requirements. Slash treatments usually maintained some amount of duff, though the current duff retention standards may not have been achieved. Some of the oldest managed stands may have been tractor piled. Tractor piling can result in both excessive disturbance and excessive compaction. Whether these two activities resulted in moderate to major detrimental impacts to productivity in some units is difficult to determine. Tractor piling has NOT been considered acceptable as a management tool for over 20 years on the Willamette National Forest. Stand, shrub and brush growth, as well as duff accumulation over the decades has provided an effective ground cover. At the point in time, little physical evidence can be found in any unit to indicate whether these two timber management activities resulted in significant, long-term detrimental soil displacement, off-site soil movement, or substantive loss of productivity.

Road development in this project area is extensive, and most large blocks of forest have been accessed. Most major road systems were constructed in the 1960s and 1970s with older road construction standards, though many roads are located on stable benches, flats or ridges. The amount of new road construction slowed considerably in the late 1980s, and with subsequent entries reconstruction began to dominant. Newer roads, when required, were constructed to different and better standards. Road grades were steepened and pitched to better fit roads to the terrain. Cuts and fills were minimized, and drainage controls were added to promote long term slope stability. Most road cuts and fills have naturally vegetated over the years. Because the side slopes are relatively gentle and overland flow is limited throughout this project, erosion from roads is not generally considered a concern, except in a few localized areas.

I specifically walked proposed spur routes in Unit 20 and Unit 150. Both routes are located on gentle, stable side slopes in common material.

b) Environmental consequences

The logging suspension requirement for a proposed unit is mandated in the Land and Resource Management Plan to protect the soil from excessive disturbance or displacement

(FW-107 and BMP T-12). The area near tail trees and landings is generally excluded from this suspension constraint. Unless otherwise stated or mitigated, all designated streams require full suspension or yarding away from the stream course during the yarding process (MA-15-27). To adequately protect the soil resource, the primary yarding objective for all units will be either ground based systems with predesignated skid roads and directional falling as appropriate, or skyline yarding with one end suspension, except at tail trees and landings. The primary factor differentiating these two yarding systems will be side slope.

Ground-based yarding systems may be employed on those acres in each unit where slopes are gentle enough (generally 30% or less) for ground-based systems. Ground based yarding systems, such as processor / forwarder, conventional line pulling with skidder, or shovel could be utilized in many proposed units. All areas where ground based yarding might occur, are well away from active drainages, or skid roads will cross ephemeral swales only during dry periods and at right angles. All ground based yarding will require the B6.422 contract clause be strictly adhered to, and/or line pulling and directional falling will be implemented, as appropriate. In all cases, existing skid or haul roads will be utilized before any additional new skid or forwarder roads are developed.

Skyline yarding with one end suspension will be recommended for units or portions of units with side slopes greater that 30% to avoid excessive disturbance from heavy equipment.

In conclusion, disturbance from yarding will be well within the Regional and Forest standard and significant adverse impacts are not anticipated. With appropriate suspension during logging, soil disturbance is minimal and off site erosion is essentially non-existent. During harvest, the retention of stream adjacent trees and the requirement of full suspension yarding over or away from stream courses will minimize or eliminate off-site erosion.

NOTE: A more complete discussion of yarding suspension requirements and effects follows in the compaction section, just ahead, and can also be found in the unit summary tables.

B. Compaction

a) Existing Condition

The major source of compaction (and also much disturbance) is ground based skidding equipment. Unrestricted tractor yarding and tractor piling are not considered an option on those landtypes where sideslopes are gentle enough (generally less that 30%) to support tractor usage (BMP T-9 and VM-1, and FW-107). The silty nature of the fine-grained soils, and evidence that significant soil moisture is available most of the year indicate that any type of unrestricted tractor yarding and piling (even low ground pressure) would lead to excessive soil compaction and/or disturbance. Restricted tractor yarding from predesignated skid roads (B6.422 contract clause) is considered an option if the adversely affected area remains less than 20% of the activity area (BMP T-11). With tractor yarding, skid roads are predesignated, approved in advance of use by the Timber Sale Officer and generally 150 to 200 feet apart. With a processor/forwarder system the skid roads are still

preapproved and usually only about 50 to 60 feet apart, but the number of trips for each individual road are substantially less than with skidding.

Extensive monitoring over many years has also shown that when designated skid roads are properly utilized in conjunction with line pulling and directional falling, compaction from ground-based tractor operations generally remains at about 9 to 13%. Residual compaction from the original harvest of these plantations needs to be considered.

Reducing the effective weight of the tractors and reducing the number of trips over a piece of ground are other means to reduce the risk of soil compaction and displacement. Yarding over frozen ground or over a deep, solid snow pack (24 inches of dense snow **or equivalent**) also substantively reduces soil disturbance and compaction (BMP VM-4). Over-the-snow yarding is encouraged for any of these units, as long as other resource objectives can be achieved, and sufficient snow accumulation is available. Monitoring of previous over-the-snow operations on various Districts has shown that essentially no displacement or compaction occurs, when it is properly implemented.

b) Environmental consequences

Evidence of compaction from previous entries is still present. Field reconnaissance through almost all the proposed units show some level of existing compaction. Oriented transects were walked through most all the larger portions of possible tractor units. Transects were usually about 500 to 1000 feet in length, though both shorter and longer transects were walked. The results of the field investigation follow this paragraph. In no case was compaction measured directly. Heavily disturbed skid roads, landings or other areas where equipment tracks were evident are considered adversely compacted. Transects measure the amount of compacted ground along a line within a proposed unit. They were generally oriented to obtain information on management activities. They are not random, nor statistically representative of a particular unit. However, they do provide a strong indication of the degree of concern for the unit under investigation. In some cases multiple transects were walked in some units in different directions in order to provide more information, or to monitor and evaluate the initial results for accuracy. Ranges indicate some degree of uncertainty in the presence of compacted skid roads because of brush or other factors.

Unit No.	Percent compacted along an individual transect.
90	12 to13
120	10, and 10 to 15, very brushy
130	7 to 8, and 4
140	10 to 12, and 16 to 18
150	20 (includes large landing), and 13
160	11, 7 to 8, 4 to 5, and 14
170	15, and 12 to 15
200	4
210	2
220	9, and 10 to 15 (very brushy)
230	8 to 10
240	0 to 2, 3 to 4, and 10
260	4 to 5, and 10
270	6 to 7

290 1 to 2, and 1 to 2
300 0 to 2, 0 to 2, and 7 to 9

The field investigation indicated that none of the units as a whole exceeded the Willamette National Forest FW-081 Standard of 20% of an activity area impacted by compaction. Some units, like Unit 140 or Unit 150, had a high individual transect value, which approached the standard. Usually, these were transects that crossed old landing sites. However, these units, as well as the others were, on average, sufficiently below to well below the threshold not to be considered a concern. One of the goals with entry into all these units is to provide the opportunity to subsoil the existing skid roads as much as is practical in order to reduce compaction to lower levels. With entry into any ground-based unit, evident skid or haul roads will be utilized before any new skid road is approved. It is possible with this proposed action that cumulative compaction in some portions of some units may exceed the threshold at the completion of harvest activities. Consequently, subsoiling is recommended enhancement to insure that cumulative levels remain below the 20% standard. Based on previous experience, this effort should be successful. For example in previous activities with other units with past subsoiling, the overall compaction was reduced by about 5 to10% from initial levels.

Consequently, at the completion of harvest activities, some subsoiling is recommended for most ground based units in order to reduce compaction levels and improve overall productivity. Almost all the units investigated were either ground based in total or could contain some ground based logging. The total ground based area could approach 600 acres. Assuming approximately 5% reduction in compaction at the completion of harvest activities, the equivalent of 30 acres could be subsoiled. At about $350 per subsoiled acre, this totals to about $10,500 of recommended enhancement subsoiling. If some of these units are not included for harvest or if sufficient enhancement funds are not present for all units, then the dollars that are available will be distributed on a priority basis to the units with the greatest level of initial compaction, receiving the most attention. In summary, with the use of designated skid roads, the reuse of the existing skid road system, and the subsoiling of primary landings and skid roads, compaction is not anticipated to exceed the 20% value in any unit and should be below the 15% level (or lower) in most units. Therefore it is not cumulatively significant. Subsoiling may be curtailed in some areas in order to reduce the amount of root pruning of leave trees and to avoid excessive amounts of exposed soil.

Skyline operations in thinning units with small wood and intermediate supports usually impacts less than 1% of the unit area. Similar to what was discussed above, most units also had side slopes that were too steep for ground based equipment. Consequently, these areas were recommended for skyline yarding with partial suspension because of side slope constraints. Skyline landings are primarily planned at old existing landings, road turnouts, and road junctions. Little new spur road will be required, and where needed, new spur roads are located on gentle, stable side slopes. New or reused spur roads are proposed for decommissioning after completion of harvest activities. Consequently, cumulative effects from existing compaction and skyline yarding are not anticipated.

C. Nutrient Loss

a) Existing Condition

Many of the stands in this project area may have had an active fire history in the last 100 to 500 years or so, primarily with natural or aboriginal under burning. As a result, large expanses never had much down woody debris, or all of the accumulating down woody debris was removed by the fires. Many of the managed stands also had the initial harvests when PUM standards were in effect. This required that larger waste material (usually 8 inches wide and 10 feet long or greater) be removed from the units to reduce fire intensity. On the other hand, some of the oldest stands were harvested when utilization standards were low or absent, and this resulted in concentrations of large woody debris in some locations. In addition, most managed stands were broadcast burned which removed additional amounts of above ground organic matter. Consequently across numerous older managed stands, management generated, down woody debris or slash is at low levels, likely replicating the natural condition in many areas. Conversely, some localized areas have substantive accumulations. Younger plantations retained much more slash and large woody debris as was the current Forest plan direction. As a result, a wide range in the above ground tonnage of decomposing organic matter exists with amounts generally varying management history and fire intensity. The variety exists both between and within units.

b) Environmental consequences

Duff Retention objectives were specifically developed decades ago by the Willamette National Forest to apply to clear cut harvest prescriptions with broadcast burns on various landtypes with differing surface soil erosion potentials. Duff retention is the amount of duff thickness remaining after management activities are completed. For example, if average premanagement duff thickness was one inch, and approximately one half inch remained after broad cast burning, then duff retention would be 50%. When these standards were developed, duff retention on partial cut harvest prescriptions was not a significant issue, and none were formulated. Monitoring and field reconnaissance in recent years has shown that the duff retention percentages for under burns in partial cuts, thinnings, or fuels reduction within unmanaged stands, which maintain an intact live root mat and live canopy cover over most of the unit, could be less (to much less) and still achieve adequate soil protection. Having said that, actual duff retention measurements on under burns (both natural and management directed) on various Districts in the last few years indicate that the “broadcast burn” standards for duff retention are generally approached or achieved, even if they are not specifically required. Consequently, they serve as a good goal and are recommended as a desired objective for the units in this report.

In the unit summary section, objectives for duff retention will be specified for each unit.

For all action alternatives, within the managed plantations, slash will either be scattered in the units, piled and burned, or perhaps broadcast or under burned. Piling may occur by hand or with a grapple machine. Grapple piling occurs with a grapple not with a dozer brush rake. Grapple piling requires only one pass of the machine across the landscape, and

the machine works while sitting on slash. Extensive monitoring of grapple machine piling operations indicates that little or no additional compaction or displacement occurs. On typical thinning, hand piles number about 40 per acre and occupy about 20 square feet per pile for a total of about 800 square feet per acre or about 1.8% per acre. Machine piles are substantively less in number, but correspondingly larger in size so that the 1.8 to 2% figure is maintained. In many cases only a few acres of any particular unit are hand piled or machine piled. Burning the piled slash may develop sufficient heat to affect the underlying soil. However, pile burning is usually done in the fall or winter months when duff and soil moistures are higher, and this helps reduce the downward heat effects to the soil. Consequently, pile burning is considered a minor effect and not cumulative because of the limited overall acreage involved.

Another aspect of long term nutrient availability and ectomycorrhizal formation is the amount of larger woody material retained on site. Management activities will be planned to maintain enough large woody debris (dead and down) to provide for a healthy forest ecosystem and ensure adequate nutrient cycling (FW-085). At this time, site specific needs will be considered commensurate with wildlife objectives as outlined in FW-212a and FW-213a (as amended). In addition, it is recommended that, with the ground based harvest systems, the logger should avoid disturbance to the existing large down woody debris concentrations created by the initial entry as much as practical.

In summary, duff retention objectives will be provided on a unit-by-unit basis in the unit summary table. Concentrations of larger down logs that were produced naturally with the initial harvest should be left undisturbed as much as possible. Consequently, with the retention of adequate duff and woody debris, potential adverse impacts to long-term soil productivity are not anticipated.

D. Instability

a) Existing Condition

As was stated previously, Deer Creek is not considered highly unstable as compared to other drainages on other Districts on the Willamette National Forest. However, several actively unstable and potentially highly unstable landtypes do occur in this project area. The timber on some of these areas may have been cut in the past, prior to the establishment of any standards. The recent intense

rainstorms from 1996 to 2000 did generate debris chute type soil failures in some areas, as well as in the western portion of Unit 70 and the northern portion of Unit 90, both of which also had several older failure sequences. Actively or potentially highly unstable terrain is associated with Units 70, 90, 150, 180 and 220.

b) Environmental Consequences

For Units 70 and 90, the unstable areas will be deleted from the units at layout. Unit 180 contains an active earthflow along the north boundary and within the unit. However, this entire unit was dropped from consideration in any action alternative because of the limited volume available in most of this plantation. Units 150 and 220 have unstable areas adjacent to, but outside of the managed stands. Because of drainage geometry and slope position, harvest in remaining portion of Unit 90 will have no affect on the actively unstable area. Harvest in Units 70, 150, and 220 could have some affect to the unstable areas, as they are down slope of potential harvest areas. The removal of trees from these units will in the short to intermediate term reduce evapotranspiration as compared to the current condition. This could result in slight increases in the ground water level, which might affect slope instability. However, this is not considered a concern for two reasons: 1) these changes are anticipated to be within levels that similar to natural rainfall amounts at one to five year storm events; and 2) if no action occurs, suppression will result in the stands loosing trees or growth with a similar loss in evapotraspiration in approximate the same time frames. With thinning the stand will return to current levels of water usage within a few years, and this rate will be maintained or increase for decades into the future as the stand matures. Consequently, potential slope instability with proposed management in any unit is not considered a concern. No specific mitigation is proposed for these units, as none is needed.

E. Transportation Development

Some units may require temporary roads to access suitable landing sites for either ground based or skyline yarding systems. In all cases, these temporary roads are located on gentle stable side slopes in common material.. For the most part, no active drainages are crossed. Some units are accessed by opening old logging roads constructed many decades ago. In most cases, use of these old roads will allow for drainage structure improvements and fill stabilization. Some units are accessed by using newer Forest Service roads that now require some additional work to maintain adequate road drainage and surface integrity. In summary, development of the transportation system for this sale will maintain slope stability, will produce little or no off site erosion, and will provide opportunity to rehabilitate old road courses.

I specifically walked proposed spur routes in Unit 20 and Unit 150. Both routes are located on gentle, stable side slopes in common material.

F. Unsuited lands

Unsuited landtypes, both unregenerable and unstable will be deleted from proposed harvest units. The unstable areas were previously discussed. Several units have wetlands or rocky areas along the boundaries or within the proposed units. Generally, these areas will be deleted from harvest as is appropriate. Unit 390 has a large band of rocks and cliffs, Landtype 310-610, running through the southern portion of the unit. This unsuited area will be deleted during layout. Skyline corridors running through this unsuited rocky area (or as applicable in other units) are acceptable to access suited portions of the unit. Trees in the unsuited area that need to be cut to maintain the integrity of the sky line corridor will generally be left for down woody debris (unless other wise agreed to by Forest Service personnel). Partial suspension is the logging requirement over rocky areas. Wetlands, as with all riparian zones, require full suspension with the skyline corridors. Some of the non-harvest fire related units, specifically 2000 and the Meadow contain areas, unsuited for timber management. As was stated, no harvest is planned in these areas. Burning this terrain is not a considered a concern as the proposal is to return fire to areas that naturally burned relatively frequently.

D. CUMULATIVE EFFECTS ASSESSMENT

For the soils resource the scale of analysis for both direct / indirect effects and cumulative effects is almost always the “unit”, i.e. the stand polygon proposed for silvicultural treatment. The unit of measure for evaluating those effects is generally considered the percent of the “unit” affected. The major short-term impacts to soil productivity from harvest activity include displacement, compaction, nutrient loss, and instability. Forest-wide Standards and Guidelines FW – 081, Detrimental Soil Conditions, state that the total area of cumulative detrimental soil conditions should not exceed 20% of the total acreage within the activity area, including roads and landings. In most situations, preventing soil impacts is the most effective and feasible way of reducing cumulative effects and ensuring long-term soil productivity.

The primary previous impact to the soil resource from management is compaction, the effects of which can remain apparent for decades. Potential cumulative effects from displacement, nutrient loss, and instability with previous management were not observed in the field reconnaissance, or were deleted from the proposed units. Existing compaction levels have been documented and discussed for the various units. The impacts are evaluated on a unit-by-unit basis, and are generally the same in any given unit for all action alternatives, unless otherwise noted. The soils mitigation measures are designed to limit the amount of additional compaction, and the subsoiling is intended to reduce compaction where levels would exceed standards and guides. It is possible that some portions of some ground based units may approach the 20% standard at the completion of yarding, grapple piling, and pile burning. No unit is anticipated to exceed the 20% standard in total, and units will be prioritized so that limited enhancement dollars will be expended on those units with the greatest anticipated cumulative effects from management. The objective is to remain below the 20% cumulative level, maintain long term soil productivity, and provide a level of erosion control that is consistent with State guidelines.

All prescriptions or mitigation measures discussed in this report are designed to meet or exceed the requirements outlined in the General Water Quality Best Management Practices Handbook (Pacific Northwest Region, November 1988). Prescriptions for soil protection and watershed considerations take into account past and predicted future land management activities.

At this time, no single unit measure of long-term soil productivity is widely used. Information on the survival and growth of planted seedlings may indicate short-term changes in site productivity. However, the relationship of short-term changes to long-term productivity is not fully understood at present. Experience indicates that the potential impacts on soils are best evaluated on a site specific, project-by-project basis. The major soils concerns – displacement, compaction, nutrient loss, and instability - are most effectively reviewed, for both short and long-term effects, at the project level. With proper project implementation, as specified by my recommendations that immediately follow in the next section on mitigation measures and design standards, unacceptable cumulative effects on the soils resource are not anticipated from any of the action alternatives (BMP W-5). Consequently, the utilization of soil protection measures and best management practices as defined in this report will generally preclude the need for additional cumulative effects analysis. Deviations from the standards and guidelines would be the primary trigger for a cumulative effects review, and no deviations are planned.

E. MITIGATION MEASURES, by unit and common to all action alternatives

The various proposed units are located on productive soils as localized unsuited areas of rocks and cliffs or potentially unstable areas were generally avoided, unless otherwise listed. Recent thinning on similar landtypes on this and other Ranger Districts has shown that 1) By avoiding sensitive landtypes, slope stability has been maintained after harvest; 2) With appropriate suspension during logging, soil disturbance was minimal and off-site erosion was essentially non existent; and 3) With appropriate contract language and enforcement, excessive compaction which results from unrestricted tractor yarding did not occur.

1. Soil Protection Measures

The following table discusses mitigations that would be necessary on a unit-by-unit basis. The information and recommendations were developed based on A) direction in the Forest Wide Standards and Guides (primarily FW-079, FW-090 and FW-179) to maintain or enhance soil productivity and stability, B) the field reconnaissance, and C) experience gained from extensive monitoring of similar projects. This data table addresses both suspension requirements and duff retention objectives, as well as pertinent specific comments for particular units (where necessary). The second list, that follows this table, has implementation mitigation measures that would also be applied to all units in any action alternative.

Unit	SRI	Suspension	Duff Retent. %	Comments
10	19, 194	Partial, Ground	40-60	Yarding method depends on side slope. Implement B6.442 on ground based portions.
20	134-135, 214, 554	Partial, Ground	30-50	Yarding method depends on sideslope. Implement B6.442 on ground based portions.
30	44, 441, 13, 19	Partial, Ground	40-60	Yarding method depends on sideslope. Implement B6.442 on ground based portions.
40	55-162164, 201-212-214, 443, 55	Partial, Ground	40-60	Yarding method depends on side slope. Implement B6.442 on ground based portions. Small wetlands at NE, SW and south boundaries.
50	443-554, 55	Partial, Ground	40-60	Yarding method depends on side slope. Implement B6.442 on ground based portions.
60	443-554	Partial, Ground	40-60	Yarding method depends on side slope. Implement B6.442 on ground based portions.
70	441, 443-554, 55	Partial, Ground	40-60	Wet area (Landtype 6-55) along north boundary. Potentially unstable, rocky area with small cliffs (Landtype 204-251) along west boundary; delete below sharp slope break.
80	55, 554	Partial, Ground	20-40	Yarding method depends on side slope. Implement B6.442 on ground based portions.
90	212-231, 55, 441	Partial, Ground	40-60	Yarding method depends on side slope. Implement B6.442 on ground based portions. Potentially highly unstable and actively unstable along north boundary.
100	443, 19-194, 75	Partial,Ground	50-70	Yarding method depends on side slope. Implement B6.442 on ground based portions. Dry meadow along NW boundary. Some Mt. Hemlock plant community.
110	44, 16, 554	Partial, Ground	40-60	Yarding method depends on side slope.

				Implement B6.442 on ground based portions.
120	55	Ground	20-40	Implement B6.442 on ground based portions. Wetland along N bndry.
130	16-55	Ground	20-40	Wetland & dry meadows along S bndry.
140	16-55,44	Partial, Ground	30-50	Wetland along NW boundary. Dry brushy meadow interior.
150	554, 44, 164	Partial, Ground	30-50	Actively unstable along SW boundary, outside of unit.
16 0	55	Ground	60-80	
170	19	Partial , Ground	30-50	Wetland interior at north side of unit.
180	13	Partial, Ground	50-70	Actively unstable along north boundary and within unit. Unit dropped – low vol.
190	19, 13	Partial, Ground	30-50	Yarding method depends on side slope. Implement B6.422 on ground based areas. Wetland at south boundary.
200	554	Ground	20-40	Implement B6.422.
210	554	Ground	20-40	Implement B6.422.
220	13, 13-16	Partial, Ground	20-40	Yarding method depends on side slope. Implement B6.422 on ground based areas.Unstable along W boundary.
230	554	Ground	20-40	Implement B6.422. Dogwood Rock Source at south boundary.
240	55	Ground	20-40	Implement B6.422
250	19, 194	Partial, Ground	30-50	
260	55	Ground	20-40	Implement B6.44. Small dry meadow at south boundary.
270	55	Ground	20-40	
280	201-204, 301, 304	Partial	60-80	
290	55, 44	Partial, Ground	40-60	
300	55	Ground	20-40	Implement B6.422
310	55, 301-304	Partial, Ground	60-80	Rocks at SE boundary – low volume. Yarding method depends on side slope. Implement B6.422 on ground based areas.
320	55	Ground	20-40	Old growth unit – dropped
330	214-234	Partial	50-70	
340	44, 194-554	Partial, Ground	50-70	Yarding method depends on side slope. Implement B6.422 on ground based areas.
350	441	Partial	50-70	
360	15-16	Ground	20-40	
370	55, 441-443	Partial, Ground	30-50	
380	15-16, 301, 204-303	Partial, Ground	60-80	Yarding method depends on side slope. Implement B6.422 on ground based areas. Occasional small rocky areas.
390	441-443, 310-610, 204-303, 164	Partial	60-80	Rocky unsuited band within interior of unit – delete during layout.
400	44, 194	Partial, Ground	30-50	Small rocky area along road at SE boundary. Yarding method depends on

				side slope. Implement B6.422 on ground based areas.
1001	202	Partial	60-80	Non harvest, fire unit.
1002	55	Ground	20-40	Non harvest fire unit.
1003	554	Partial, Ground	40-60	Non harvest fire unit.
1004	194	Partial, Ground	40-60	Non harvest fire unit.
2000	201, 203, 204, 13-16-135, 310, 3-610	Partial	60-80	Non harvest fire unit. Areas of unsuited rocks and cliffs.
Mea-dow	3-7-710		40-60	Unsuited dry meadow, rocks and cliffs. Proposed burn area.

NOTES:

A) **Some units (or portions there of) that were reviewed in the field reconnaissance and discussed in this report and the unit summary section may not be included in any action alternative, or have been combined with other units. They are included to document the work that was accomplished.**

B) Partial means skyline logging with one end suspension and full suspension over wet draws, drainage courses, or wetlands, unless specific mitigation measures such as bump logs are implemented. The area at tail trees and landings is excluded. Ground means a ground based system such as tractor, skidder, shovel or processor / forwarder.

C) These Duff Retention objectives were specifically developed to apply to clear cut harvest prescriptions on these particular landtypes. The percentages for partial cuts, thinnings, or underburns of unmanaged stands, which maintain an intact live root mat and live canopy cover over most of the unit, could be less (to much less) and still achieve adequate soil protection. Duff retention monitoring in the last few years on underburns on various Districts indicates that these levels of duff retention are generally approached, even if they are not specifically required.

D) Some units could be planned for harvest with helicopter yarding. This is done to reduce the development of a transportation system that would be needed for conventional logging and is not required for adequate soil protection.

2. Site Specific Mitigation Measures -- common to all action alternatives

a) Ground-based equipment should generally operate in the dry season, usually considered from May through October, unless otherwise restricted by other resource concerns or waived by Forest Service personnel.

b) Where operable, harvested trees should be topped and limbed in the units in order to provide small limbs and needles for nutrient recycling. This objective has to be tempered with the need to reduce fuel loading to control potential wild fires, and to meet site specific standards for slash loadings.

c) Horses and ground -based equipment are usually limited to side slopes less than 30%, unless otherwise directed by Forest Service personnel, in order to reduce soil disturbance.

d) Ground-based skidding equipment shall stay on designated skid trails. Ground-based skid trails will be predesignated and preapproved before use (B6.422). Existing skid roads should always be used before new skid road locations are approved. They should not usually exceed 15 feet in width, and the objective is to maintain a 10 to 12 foot width throughout the length. Where practical the skidder, cat, shovel or forwarder should travel on slash. Traveling on slash has been shown to reduce off site soil erosion or lessen soil compaction. Skid roads will generally be 100 to 200 feet apart with conventional line pulling operations, and 40 to 60 feet apart with processor / forwarder operations.

e) Partial or one end suspension is required on skyline units, except at tail trees and landings. Given the gentle to moderate slope of the terrain, small sections of ground lead may occur in some areas, and this is acceptable.

f) The reopening of temporary, unclassified roads should usually occur in the dry season, generally considered May through October to avoid surface erosion from exposed soil (unless directed otherwise by Forest Service personnel). Open roads should be storm proofed if they have to set through extended periods of wet weather.

g) Where practical, at the completion of harvest activities, limbs and woody debris should be placed on areas of exposed soil to reduce the potential for off site soil erosion.

h) Unclassified or temporary roads used outside the standard operating season, should generally be rocked, snow covered, or frozen to reduce the potential for erosion, unless other mitigating or extenuating circumstances are present.

i) Cable corridors spacing should be set to both minimize damage to standing timber, as well as the under lying vegetation and soil.

j) Trees, not designated for harvest in riparian buffers that need to be cut to facilitate harvest operations, should be dropped into the stream if possible, to aid in woody debris recruitment.

k) Avoid disturbance to the existing large down woody debris concentrations created by the initial entry as much as practical.

l) At the completion of harvest activities, spur roads, tractor skid roads or forwarder roads should be water barred and scarified, as is necessary. Where possible, skid roads and landings should be subsoiled in order to reduce compaction and return the site to near original productivity. Subsoiling needs to be considered in light of the potential for root pruning, damage to existing regeneration, and the increased amount of soil disturbance.

F. MONITORING REQUIREMENTS

As the proposed project is carried out, it will be monitored to evaluate implementation efficiency, prescription adequacy, and to update sale area rehabilitation needs or protection. Primary implementation monitoring will be conducted at the contract administration phase of the project by the Timber Sale Officer. The logger will be required to maintain adequate suspension during the harvest process, to remain on designated skid roads and landings with equipment, and to limit the number and extent of skid road utilized. In addition, a host of other contract requirements dealing with such items as erosion control, hazardous material use, fire restrictions, etc. will be enforced. Duff retention will be monitored as part of any post sale activity that may affect the soil resource, such as spot or pile burning, grapple piling, or broadcast burning.

VII. CONSISTENCY WITH DIRECTION AND REGULATIONS

A. STANDARDS AND GUIDELINES

Prescriptions for soil protection, watershed considerations and riparian needs of the sub-basin take into account past and predicted future land management activities. The soils mitigation measures are designed to provide a level of protection and erosion control that is consistent with the standards and guidelines of the Willamette National Forest's Land and Resource Management Plan (1990). On site sedimentation is anticipated to be within National Forest and Oregon State Guidelines. All prescriptions or mitigation measures discussed in this report are designed to meet or exceed the requirements outlined in the General Water Quality Best Management Practices Handbook (Pacific Northwest Region, November 1988). Standard contract language should provide for sufficient erosion control measures during timber sale operations (BMP T-13). Revegetation of areas disturbed by harvest activities (such as landings, temporary roads, and equipment storage areas) is required with an appropriate seed mix (BMP T-14, T-15, and T-16).

Other applicable Standards and Guides and/or Best Management Practices may exist which were not directly referenced in this document. Their exclusion does not indicate that they were overlooked or are inapplicable. As project development proceeds, appropriate constraints or mitigations may be added or changed in order to better meet the intent of adequate resource protection or enhancement as directed in the 1990 Willamette National Forest Land and Resource Management Plan and Final Environmental Impact Statement.

B. IDENTIFICATION OF IRREVERSIBLE OR IRRETRIEVABLEE RESOURCES

No irreversible and /or irretrievable use of the soils or geology resource is anticipated, beyond that which has been previously identified in the Willamette National Forest Land and Resource Management Plan, as amended. Road or landing aggregate, either crushed or pit run, that might be required for this sale could come from various rock sources. Development could occur within the Boulder or Upper Boulder, Dogwood, Westside or Latiwi Rock Sources, as needed, to provide a variety of rock products for road maintenance and road reconstruction associated with the harvest and haul needs. Minor clearing, generally of less than one acre for any individual pit could be associated with the development of any of these rock sources. Clearing could include managed

stand trees in plantations or brush, or adjacent snags and danger trees. Dogwood Rock Source is located at the south end of Unit 230.

C. CONSULTATION WITH OTHERS - Logging systems work was done on several units in conjunction with Dan Fleming, Logging Systems Specialist on the McKenzie River Ranger District.

VIII. REFERENCES CITED

Legard, Harold A. and Meyer, LeRoy C., 1973: Willamette National Forest Soil Resource Inventory, Pacific Northwest Region, 167 p.

Walker, George W. and Duncan, Robert A., 1989, Geologic Map of the Salem 1 (degree) by 2 (degree) Quadrangle, Western Oregon: Miscellaneous Investigations Series, U. S. Geological Survey, 1989G.

Respectfully submitted,

DOUGLAS C. SHANK
Forest Geologist

Fire and Fuels Analysis
for
Ball Park Thin EA
April 2008

Mei Lin Lantz

I. Introduction

This document describes the Fire and Fuels direct, indirect and cumulative effects for the Ball Park Thin EA Proposed Actions on the McKenzie River Ranger District, Willamette National Forest. The Ball Park Thin EA Purpose and Need describes improving stand conditions in terms of species composition, density, and structure over the long term in previously managed stands up to 60 years of age and in fire regenerated stands generally up to 120 years of age. The amended Willamette Forest Plan includes goals and objectives for managing stands with silviculture techniques and fire, to maintain stand health and vigor and provide multiple use benefits, moving the project area toward the desired future conditions. Therefore, actions are needed within the project area to:

- Restore structural diversity in stem exclusion stands to enhance wildlife habitat;
- Accelerate restoration of late-successional conditions for stands within riparian reserves;
- Protect and enhance aquatic resources;
- Restore degraded roads infrastructure;
- Reduce hazardous fuels and return the role of fire to the ecosystem as a natural disturbance process;
- Provide a sustainable supply of wood in support of the local and regional economy;

The Purpose and Need list specific actions to be evaluated for fire and fuels. This document will express the direct, indirect and cumulative effects from the following actions:

- Manage activity-created fuels by underburning, piling and burning machine and hand piles to meet the Forest Plan Standards and to restore natural fire regime processes;
- Underburn natural fuels stands to make steps toward improving the historic fire regime and seral stage diversity in the watershed.

Global climate change is a non-significant issue that involves fire and fuels. Forests are considered sinks for carbon and many references refer to the potential of large wildfires to be detrimental to our global climate (JFSP, 2007). The scale of analysis is large for climate change and many of the factors are still being researched and evaluated. The reduction of hazardous fuels and the reintroduction of fire help reduce the severity or size of future wildfires which could aid in reducing the combustion of sequestered carbon in trees. Following is the section from Chapter IV of the Willamette FEIS for the Forest Plan. The effects of the alternatives are not significant when compared against regional or global levels of carbon storage or acres of deforestation. However, long-term monitoring and research is needed to evaluate the effects of management activities on climate, particularly in light of the increasing concerns about global warming.

II. Summary

This analysis shows the direct, indirect, and cumulative effects of using prescribed fire and reducing hazardous fuels. The use of prescribed fire underburns will aid in returning

the disturbance process historically present in this ecosystem and increase forest health. Additionally, this analysis explains how the fuels treatments (reducing fuels) through underburning, piling and burning, or chipping following commercial harvests will reduce the potential for wildfire effects in and near the area treated. Fuels treatments will reduce the hazardous fuels on the vertical and horizontal profile at the stand level and across the project area, thus reducing the potential wildfire severity. Treating fuels following harvest and underburning in natural fuels stands aim to provide safety for firefighters in suppression efforts. Fuels treatments will meet Forest Plan Standard and Guidelines to reduce hazardous fuel loading while meeting air quality regulations.

III. Regulatory Framework / Management Direction

1. Willamette National Forest Land and Resource Management Plan (Forest Plan) FEIS and Record of Decision (ROD) establishes Management Standards and Guidelines (S&G) for treatment, maintenance, or reduction of hazardous fuels to achieve the desired future condition.
2. The Oregon Smoke Management Plan and the State Implementation Plan regulate the standards set by the 1990 Clean Air Act and 1977 Clean Air Act and its amendments. The Willamette National Forest closely follows this plan to maintain air quality standards during prescribed fire treatments and wildfire.
3. Wilderness Act established policies in the Forest Plan for reducing particulate matter intrusions from July 1 – September 30 each year. These S&G are managed in prescribed fire planning to reduce intrusions into the Wilderness especially during this time frame and work with Smoke Management Forecasters prior to burning.
4. The National Fire Plan (NFP), developed in August 2000, identifies five key points and two apply to this project: *Key point 3 – Hazardous Fuel Reduction* and *Key point 4 – Providing Community Assistance.*
5. McKenzie River Ranger District follows The Northwest Oregon Fire Management Plan – an interagency plan established to provide additional guidelines for prescribed and wildfire activities.
6. A detailed, nationally approved Interagency Prescribed Fire Burn Plan is a requirement for any activity involving prescribed fire. This plan identifies management objectives specific to the Forest Plan, details about the stand to be burned, prescription parameters, contingency, safety hazards and mitigations, and public notification. The District or Forest Line Office is required to sign and approve the burn plans before implementation.

IV. Sequential flow of information and analysis

The McKenzie River Ranger District Interdisciplinary Team (IDT) identified and analyzed the Purpose and Need and Proposed Actions. Information from the IDT was used to support modeling and analysis for predicted fuel loading. Fire behavior, Fire Regime Condition Class, and air quality particulate emissions were then calculated using models at landscape (6^{th} and 5^{th} field watersheds) and project level scales.

V. Desired Future Conditions (DFC)

Forest Plan Standards and Guides (S&G) establish levels of allowable woody material following timber harvest. Two specific guidelines related to fire and fuels are Forest Wide (FW) 212 and 252 which state 7-11 tons/acre of 0-3" diameter fuels in stands post-harvest. These guidelines are to enable better control of wildfire, performed safely by firefighters, because conditions limit flame length and thus fire behavior. The DFC in Ball Park Thin Project Area also aims to return the natural role of fire as a disturbance process on the landscape. Over time implementing proposed fuels treatments, especially underburns will make steps toward changing Fire Regime Condition Class (FRCC) from FRCC 3 and 2 to a desired FRCC 1.

VI. Analysis Methods

For terminology and descriptions please refer to Attachment F1.

A. Models and Data

The following is a list of models and analysis techniques used for this report:

- ArcMap/GIS – program to utilize spatial data for fuel models, vegetation, FRCC, alternatives, etc. Data was gathered on the ground or from Willamette NF, FSVeg, LANDFIRE, and NW Oregon FRCC corporate GIS layers.
- BehavePlus 3.0 – program to determine a range of fire behavior characteristics including surface fire and passive or active crown fire to show how desired treatments change or reduce the intensity and severity of wildfire; change or reduce the effects from wildfire.
- Fire Behavior Prediction System Fuel Models (FBPS) – photo and data reference for identifying fuel models. Forty new fuel models are also available (Scott and Burgan 2005) but this analysis used the Standard 13.
- Fire Regime Condition Class (FRCC) – Northwest Oregon GIS coverage (from LANDFIRE) that determines stand characteristics and historical/current fire regimes. The current vegetation is from a combination of GIS vegetation queries, aerial photos, and local knowledge.
- FOFEM – program used to determine the range of fire effects, including effects on soil, trees mortality, smoke emissions, etc.
- LANDFIRE – Nationally consistent data of fuel models, FRCC, etc. that can be altered to fit a particular area.
- Photo Series for Natural Forest Residue for PNW– used to identify current fuel loading in Ball Park Thin Project Area. (Maxwell, et.al. 1980).
- PredictDAS – local spreadsheet formulated by Darryl Ashcraft, a retired FS employee, using calculations from Handbook to Predicting Residue Weights of Pacific Northwest Conifers (Snell & Brown 1980) to predict post-harvest fuel loading.

B. Basis for characterizing conditions

Fuel loading on the vertical and horizontal profile is the basis for characterizing the fire behavior across the landscape. Fire behavior is analyzed at the stand level and expanded across the landscape based on topography, weather, and fuels. Changes in FRCC show the reintroduction of fire as a disturbance process across the landscape. FRCC allows for fire to be evaluated across an area it may naturally occur (without suppression efforts).

Stratum FRCC is evaluated first and then stand FRCC is evaluated more at a field level using relationships between current seral stages. Stand FRCC allows assessment of treatments at a specific level so that proposed treatment can be evaluated at the smaller scale (Kertis et al. 2007 and Hann et al. 2001). Air quality measures are based on particulate matter emissions during the fuels treatments and potential intrusions into populated areas or Wilderness.

C. Basis for evaluating effects

The key measures used to analyze fire and fuels effects are: fuel loading in 1, 10, and 100 hour fuels size classes, crown base height (CBH), and fuel continuity horizontally and vertically across the landscape. Measurements are consistent with the Forest Plan S&G. For pre-harvest fuel loading field exams were used to identify tonnage of fuel currently in each stand. For post-harvest fuel loading silviculture stand exams and fuel loading exams were used with the *PredictDAS* spreadsheet model. Prior to fuels treatments fuels will be identified on the ground using transects and/or photo series to gather specific fuel loading. Air quality analysis is based on the guidelines the Willamette NF follows. Particulate matter (PM) is evaluated with the potential fuel loadings post harvest. Prior to work on the ground PM will again be modeled and reported to assure compliance with Air Quality regulations.

D. Scale of Analysis

This report identifies direct, indirect effects within the proposed treatment areas of 1,154 acres. Cumulative effects are analyzed the Ball Park Thin Project Area of 14,508 acres. The project lies within the Deer Creek Subwatershed (6^{th} field) within the Upper McKenzie River Watershed (5^{th} field). Specific field data within the Project Area was gathered as stated above. Models were used that included project data and data from large landscape level due to the character of fire as a disturbance and how it moves across the landscape. To identify specific effects of fuels treatments, models zoomed into the area using field information and landscape level data.

VII. Existing Condition

A.1. Existing Condition - Fire on the Landscape

Fire has and will continue to play an active and vital role in our forest ecology. Treatments in this project would help to return the ecological role of fire disturbance. Historically, across the Willamette National Forest, fire created mosaic patterns within the vegetation as it occurred at different times in the year or locations which affected the intensity and severity of the fire. Fires were often caused by lightning, and there are references and stories of Indigenous people using fire for managing resources, the land, and travel routes (Teensma 1987, Kay 2007). Fire affects forest ecology in multiple ways through such items as: distribution of fungus, changes in understory vegetation and distribution of canopy cover, and diversifying areas for wildlife. The influences of human actions (development and resources) over the past couple centuries warrant management activities to aid in maintaining, providing, and reducing hazards. Improving the role of fire is needed to decrease the potential of large, high severity wildfires, and to move the ecosystem closer to the natural disturbance process. Teensma studied fire history in an

area near Ball Park Thin Project Area. The MRFI (mean fire return interval) he analyzed ranged from <100 years to 166 years.

Kay (2007) describes low intensity fire occurred regularly and intentionally by Indigenous people across the Americas, as well as in the Willamette Valley. Trees species that are shade intolerant (*Pinus lambertina)* are found in many of the lower elevations on the McKenzie River RD and also known Indigenous travel routes and communities reveal Indigenous people inhabited the area. This suggests fire played an important role in developing the forest vegetation. Teensma's Dissertation (1987) shows how the natural fire rotation changed from times during Indigenous use, Anglo-settlement, and current fire suppression.

- 1772-1830 at 78 years
- 1851-1909 at 87 years
- 1910-1987 at 77 years

VII.A.2 Existing Condition - Past Management

Past management activities that have changed the fuel profile or fire behavior are grazing, timber harvesting, fuels treatments following timber harvests, and fire suppression. In 1920 management in National Forests began suppressing fires and managing for resource products which altered the natural regimes of fire. Over the past 36 years from 1970-2007 31 fires occurred in the Ball Park Thin Project Area. All fires were suppressed and most were contained to less than one acre. Lightning accounted for about 70% of the fires in the Project Area and the others were human-caused. Based on the recorded data from Willamette National Forest, the fire frequency is 1.7 fires every two years which implies that fire is a disturbance process in this ecosystem.

Many of the proposed Ball Park Thin units have been previously managed. Earlier commercial harvest, mostly regeneration harvests, left non-merchantable large woody material and fuels were not treated. Later harvest methods included yarding merchantable material and broadcast burning. Prior to the 1970's, the scale of acres treated was much larger than the more recent practices. No natural fuels prescribed fire (prescribed fire without timber harvest) has occurred in the Ball Park Thin Project Area in the past 50 years.

VII.A.3. Existing Condition - Fire Regime Condition Class

Fire Regimes describe the natural frequency fire occurs across the landscape pre-settlement and includes the historic aboriginal use (Agee 1993). Five Fire Regimes are used at the national level Fire Regime I, II, III, IV, and V (Hann et al. 2003). Within the Ball Park Thin Project Area the following Pacific Northwest Region 6 Fire Regimes have been classified:

- Fire Regime I – < 0-35 year fire return interval; low severity
- Fire Regime IIIa – < 50 year fire return interval; mixed severity
- Fire Regime IIIb – 50-100 year fire return interval; mixed severity
- Fire Regime IIIc – 100-200 year fire return interval; mixed severity
- Fire Regime V – 150+ year fire return interval; high severity

Fire Regimes use the description of mixed severity. This term on the Willamette NF explains the varying degrees of fire intensity that can occur given the topography, vegetation, and the ability of larger trees to withstand the intensity creating different levels of mortality. Mixed severity fires range from low intensity (low mortality) ground fires to higher severity fires where canopy fires kill most of the trees, thus mixed severity creates a mosaic of different mortality and seral stage classes across the landscape (Hann et al. 2004). For example a light intensity burn would not leave fire scars or cat-face on larger trees. Due to this light intensity fire understory vegetation would change, but evidence that a fire occurred would be difficult to find through tree scarring. No tree scarring does not discount that fire occurred across the landscape and played an important role ecologically (Kertis discussion 2008).

In addition to the frequency and severity, fire disturbance is categorized into Fire Regime Condition Class (FRCC). FRCC describes the degree of departure of current vegetation from the historic fire regime and helps to establish reference and evaluate risks to the ecosystem (Hann, et.al. 2001). FRCC 1, 2, and 3 rank the degree of departure:

- FRCC 1
  - Fire regimes near historic range (departure is no more than one return interval)
  - A low risk of losing key ecosystem components
  - Vegetation attributes are functioning within historical range
- FRCC 2
  - Fire regimes have been moderately altered from historical range; moderate changes in fire size and intensity has resulted
  - Moderate risk of losing key ecosystem components
  - Vegetation attributes have been moderately altered
- FRCC 3
  - Fire regimes have been significantly altered from their historical range; dramatic changes in fire size and severity has resulted
  - Severe loss of ecosystem components
  - Vegetation attributes have been significantly altered

As stated in documention from the NW Oregon FRCC workgroup in 2004, FRCC evaluation is conducted by identifying the plant communities (biophysical settings, BpS) that would exist given the soils, climate, topography, and the natural disturbance regime. This is followed by identifying current vegetation in five seral stage categories (early, mid-closed, mid-open, late-open, late-closed). The percentage change in each seral stage across the stratum (4-6th field watershed) shows the change or departure from historical seral stages that existed in the natural fire regime. The stratum FRCC categorizes fire as a landscape level disturbance and is evaluated across an area it may naturally occur. Stratum FRCC was first evaluated and secondly changes in the seral stages with the percent difference of change from past BpS account for the stand level FRCC. Stand FRCC was evaluated more at a field level using relationships between current seral stages and past (Kertis et al. 2007 and Hann et al. 2004). Much of the Ball Park area currently exists as seral stages of early, mid-closed, or late-closed with very few in the mid-open or late-open. This lack of seral stage variety is a main reason for departure from the historic.

Fig. 25: Fire Regimes

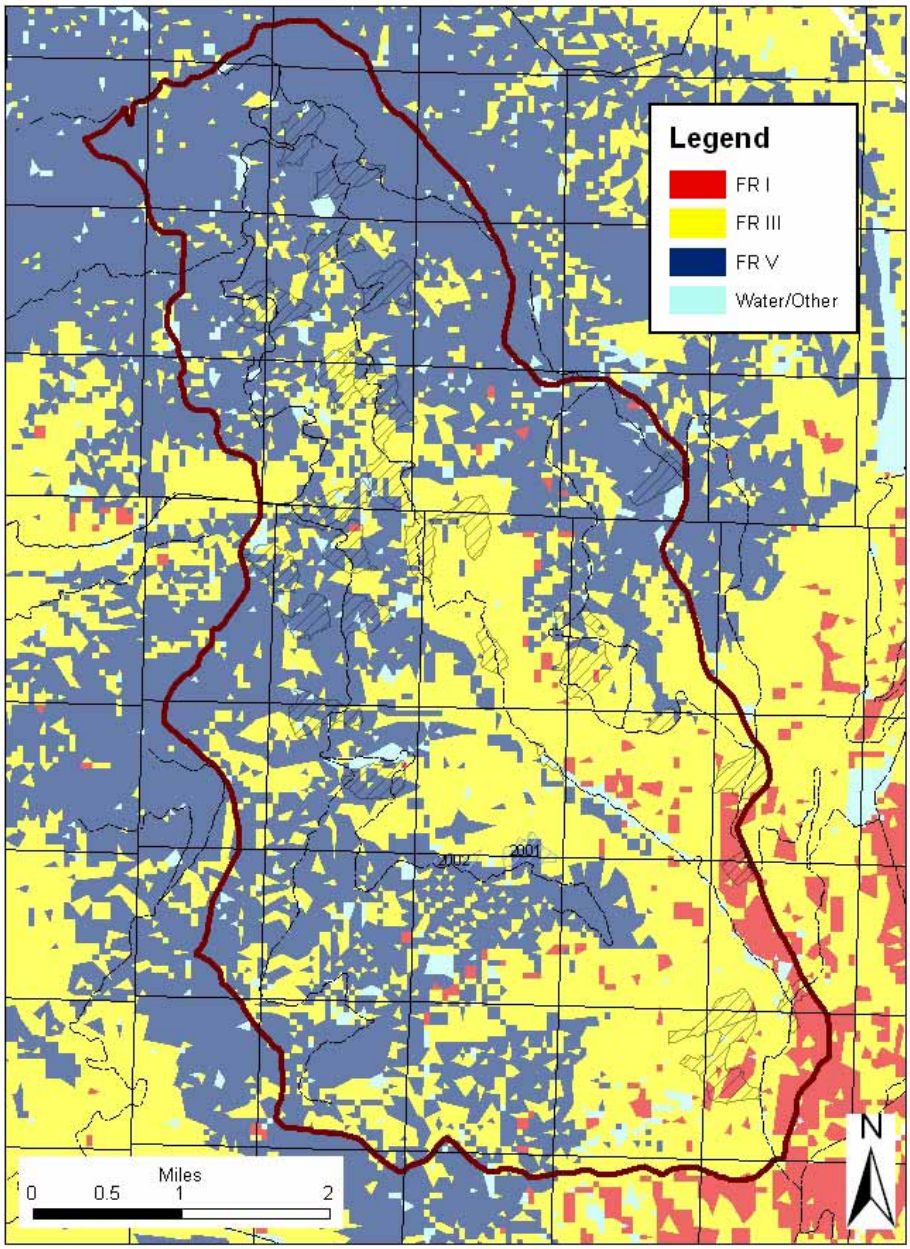


Fig. 26a: Stratum FRCC

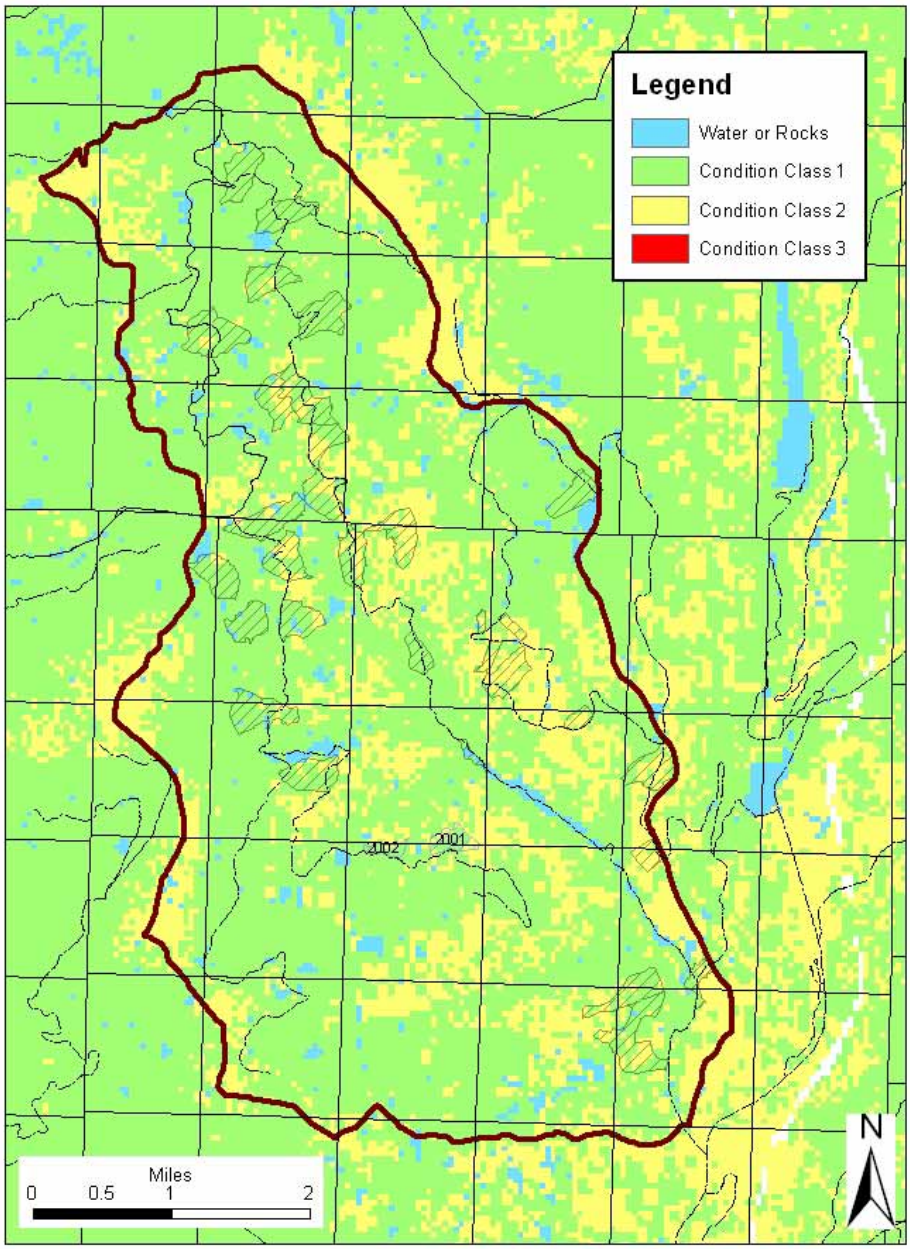
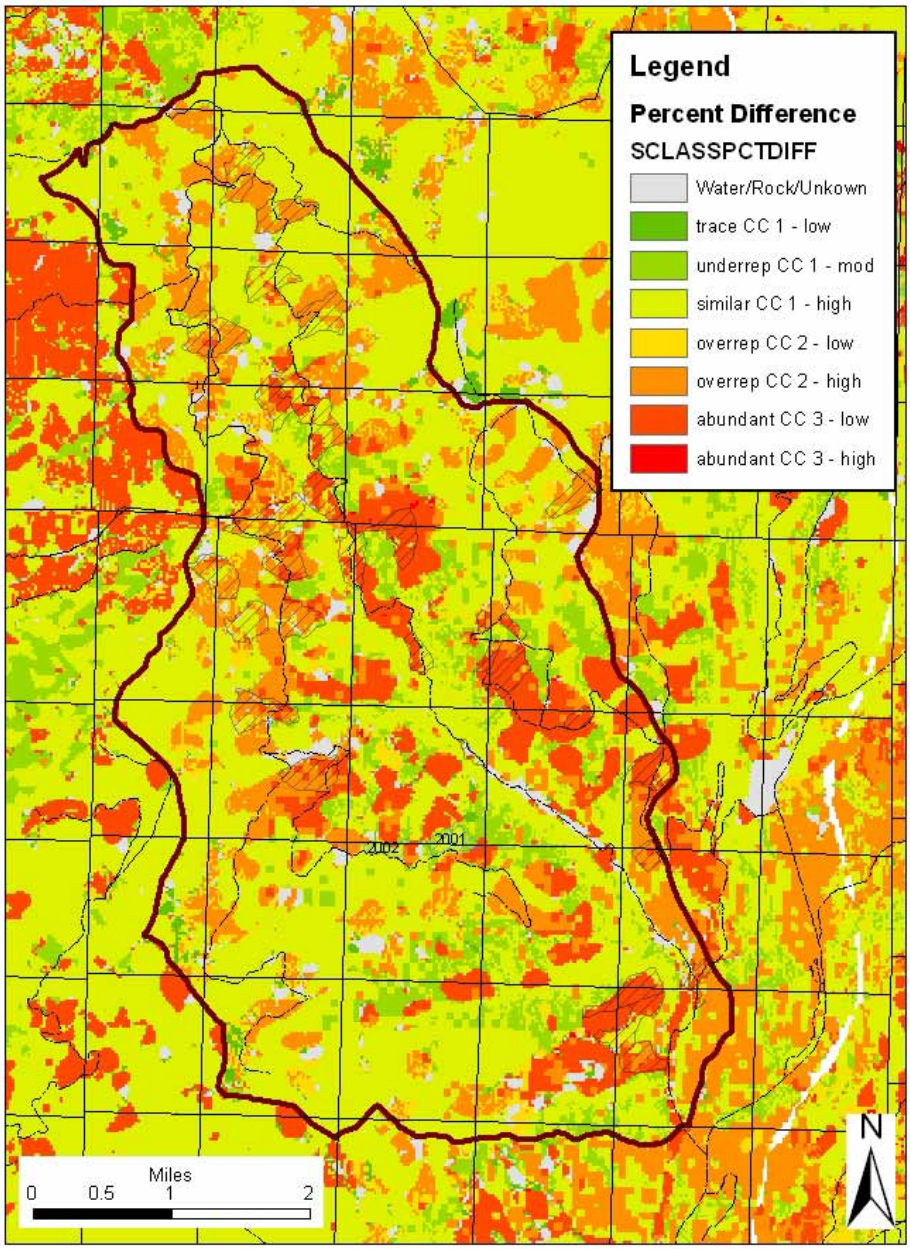


Fig. 26b: Stand FRCC - Percent Difference



Given the difference in seral stages – from historic to current – the Ball Park Thin Project Area ranges through all three FRCC levels and on average concludes the area is moderately altered from the historical range of variability for fire interval. A moderate change in potential fire intensity and severity has resulted (Kertis et al. 2007 and Hann et al. 2001). Additionally, susceptibility to fire and an elevated risk of high severity of fire within the Ball Park Thin Project Area should be tempered with the current continuous horizontal and vertical fuel profile and the main highway travel route. These factors and fire suppression create more of a potential for unnatural, severe fire and hazards to public and fire fighters.

VII.A.4. Existing Condition - Fuel Profile

Fuel models describe the fuel profile in the Ball Park Thin Project Area. Fuel models are a quantitative way to describe surface fuel loading (amount of fuel in tons/acre), arrangement, structure, and calculate predicted fire behavior. The primary fuel that carries the fire is the general classification in fuel models, i.e. grass, brush, timber litter, or timber slash. Fuel loading and depth correlate to the fire intensity and rate of spread. Horizontal fuels refer to ground or surface fuels, while vertical fuels refer to standing trees and ladder fuels such as limbs on the bole of trees, crown base height (CBH), regeneration, and brush.

Fuel loading and fuel models are described below. Both are used to calculate and predict expected fire behavior. Fuel loading is measured using size of fuel that relates to time frames based on how the fuel responds to moisture (how long it takes to dry and become consumable) and are then quantified using tons/acre. Measurements for fuel loading are:

- 0” – .24” diameter or 1 hour fuels
- .25” – .99” diameter or 10 hour fuels
- 1.0” – 2.99” diameter or 100 hour fuels
- ≥3.0” diameter or 1000 hour fuels

The Ball Park Thin Project Area is composed of the following natural fuel models (FM):

- **FM 1**– Representative of grass meadows or openings. Fuel loading in the 0-3 inch diameter fuels is less than 1.5 tons/acre. Less than one-third of the area contains trees or shrubs. Fire spreads quickly in this fine fuel when it is cured or nearly cured. *Example – Bunchgrass Meadow*.
- **FM 5** – Representative of timber plantations and natural regeneration between two and 10 feet tall. *Ceanothus velutinus* is the common understory brush. Shrubs or grass in the understory can carry the fire. Fuel loading in the 0-3 inch diameter for live and dead fuel is less than 3.5 tons/acre. *Example – second growth units under 30 years old that have trees ≤35’ tall and a shrub component along the 2654 Road*.
- **FM 8** – Mature short-needle conifer stands with light fuel loading in the 0-3 inch diameter fuels. This profile can be found in stands that were or were not previously harvested. Fire spread is generally slow with low flame lengths. Heavy fuel concentrations (jackpots) can flare up. Fuel loading in the 0-3” diameter for

live and dead fuel is less than 5 tons/acre. *Example – area along 2654 Road with few understory shrubs or regeneration.*

- **FM 10** – Representative of mixed conifer stands with heavy concentrations of large down wood, > 9" diameter. Fuel loading in the 0-3 inch diameter for live and dead fuel is less than 12 tons/acre. Ground fire behavior is higher in intensity than fuel models 8 because of the heavier fuel loading and the ladder fuels. Torching of trees (fire in the crowns of trees) occurs more frequently. *Example – areas along the 2654 about 4 miles up the road on the east side of the road.*

Post harvest units are categorized as FM11 and 12:

- **FM 11** – Light slash load resulting from light to moderate partial cuts or harvests which yard tops of trees attached to the last log. Fuel loading in the 0-3" diameter for live and dead fuel is <12 tons/acre. The continuity of the slash can increase fire behavior.
- **FM 12** – Moderate slash loads resulting from moderate or heavy partial cuts. Fuel loading in the 0-3" diameter for live and dead fuel is < 35.6 tons/acre. Fire behavior can be rapidly spreading, especially with red needles still on the branch wood.

Table F1 below summarizes the acres of each Fuel Model on National Forest Land using the FSVeg data.

Table F1: Existing Condition - Fuel Model within Ball Park Thin Project Area

	FM 5	FM 8	FM 10
Acres within Ball Park Thin Project Area	3561 Ac	4530 Ac.	5941 Ac.

The term hazardous fuel is used in current publications, such as the National Fire Plan, and describes the current and potential hazardous fuels in the Ball Park Thin Project Area:

- fine fuels (1, 10, and portions of 100 hour) generated following timber harvest and in forested areas that have been excluded from disturbance processes;
- vegetation structure with fine fuels on the ground, shrubs and small trees in the understory, lichen on larger trees, and tight canopy closure all contributing to rapid horizontal and vertical movement of fire;

VII.A.5. Existing Condition - Fire Behavior

The Ball Park Thin Project Area has a fire frequency of 1.7 fires every two years. This shows that fire continues to occur naturally in this area. Fire behavior is a result of the fuels, topography, and weather conditions. Fire behavior was modeled using BehavePlus3 with fuels and topography inputs that correspond to the Ball Park Thin Project Area and summer fire weather data representing the hot, dry fire weather (97^{th} percentile) similar to 2003 and 2006 is used to represent conditions where fires can escape initial attack, threaten resources, and have high severity/mortality. Areas with light fuel loading, such as FM 8, exhibit lower intensity fires with lower severity (low mortality of dominant vegetation). Fuel Model 10 exhibits high fire intensity and high severity including crown fire with mortality. Fuel Model 5 is also high fire severity and exhibits fast rates of spread. FM10 and 5 are difficult to contain because:

- flame lengths exceed the range of conditions for hand tooled firefighters (flame lengths over 4 feet in height require mechanized equipment, air resources, or indirect attack);
- rates of spread over 6 chains/hour (1 chain = 66 feet) exceeds direct attack cability of a 20 person crew.

Larger fuels, > 9" diameter, are not often considered the carrier of fire. Large 1000 hour fuel will create longer lasting intensity, higher flame lengths and enable crown and high severity fires to progress. Standard fire suppression operations would require mechanized suppression resources when flame lengths reach heights over four feet. Firefighters are not able to safely suppress fires directly if the flame lengths exceed four feet.

VII.B. Proposed Actions - Fire and Fuels

The proposed fire/fuels treatments for Alternative B and C are shown on Table F2 below. The treatments are based on the type of stand, age and size of trees (dbh), topography, and location. These factors create the parameters to implement the treatment.

- Natural Fuels UB – Underburn in Units 2001 and 2002
    - No commercial harvest but fuels and vegetation will be treated through an underburn with mortality up to 20%. Hazardous fuels will be reduced to S&G. Mop up will follow directly after ignition.
- UB – Underburn in activity slash units
    - Post harvest fuels on the ground will be underburned. Treatment will be done in spring-like conditions when 1000 hour fuels and duff are still moist, mortality of residual trees will be ≤10% because majority of the trees will be >15" DBH. Hazardous fuels will be reduced to S&G levels. Mop-up follows directly after the unit is ignited.
- UB-buffers – Buffers next to Units 1000, 1001, 1002, and 1003
    - These units are attached to units 270, 330, 240, and 210, respectively. The UB-buffer units are to provide a different method of holding fire within the UB unit. Due to safety concerns and ecological constraints, the UB-buffer units will reduce the need for handline and also create safer implementation for firefighters during the UB.
- UB* - Underburn *
    - Following the harvest the stand will be evaluated again to measure the residual tree DBH. If the majority of trees are 14" DBH they will be more resistant to a light/moderate underburn and the mortality of ≤10% can be maintained. If a unit has the majority of trees 12" DBH, mortality in an underburn may be difficult to hold at 10% or less due to the thin bark of the smaller trees. The treatments below will be the alternative.
- GP – Grapple pile
    - Within units or in parts of units that are logged with ground equipment, create and cover piles post harvest and then burn the piles in the winter to reduce hazardous fuels to S&G.
- HP – Hand pile

  - Within the unit where concentrations of slash exist or along the road to reinforce the road as a safer fire break and cover post harvest and then burn piles in winter to reduce hazardous fuels to S&G.
- GS – Group selection with broadcast burning
  - One acre (Alt. B) to three acre (Alt. C) acre gaps will be created during the timber harvest. Units 10, 20, 40, 60, and 400 will be underburned and gaps will be burned at the same time. Units 110, 120, 170, 220, 280, 290, 310, 330, and 390 may be underburn, if the DBH does not allow then only the gaps will be broadcast burned. If the GS is <5 acres per unit, the GS will not be broadcast burned. Other units with GP or HP treatments and GS >5 acres, will be broadcast burned within the groups selection given sufficient funding.

Table F2 shows the fuels treatment, fuel loading following timber harvest proposed for each unit and alternative.

Table F2: Fuels treatments and fuel loading for Alternatives B and C

Unit	Acres	Fuels Alt. B and C	Fuel Loading 0-3"
10	42	UB	13.6
20	42	BB	12.6
30	52	HP	11.9
40	40	UB	10.1
50	6	GP	20.8
60	52	UB	17.1
70	39	GP/HP	27
80	34	GP	18.2
110	44	UB*/HP	12.9
120	57	UB*/GP/HP	14.9
130	18	GP/HP	13.5
140	29	GP/HP	13.6
150	44	GP/HP	15.6
160	46	GP/HP	13.8
170	47	UB*/GP/HP	9.7
190	39	GP/HP	9.9
200	5	GP	11
Unit	**Acres**	**Fuels Alt. B and C**	**Fuel Loading**
210	10	GP	11.5
220	24	UB*/GP	15.1
230	11	GP	15.4
240	43	GP	11.6
270	14	GP	11.8
280	9	UB*/HP	26.1
290	51	UB*/GP/HP	13
310	52	UB*/GP/HP	8.6
330	18	UB*/HP	15.3
360	19	GP/HP	21.3
370	48	HP	19.1
390	82	UB*/HP	9.5
400	48	UB	14.8
1000	2	buffer	4
1001	16	buffer	4
1002	7	buffer	4
1003	17	buffer	4
2001	34	NFUB	4
2002	15	NFUB	4

VII.C. Environmental Consequences

VII.C.1. Effects of Alternative A – No Action

1.a. Direct, Indirect and Cumulative

In the Ball Park Thin Project Area the No Action Alternative would not support returning fire as a natural disturbance process to the ecosystem due to fire suppression responsibilities and life, property, and resource priorities. Through time, fuel loading would continue to increase and vegetation would continue through successional pathways. Stands would continue to grow increasing fuel loading on the ground and canopy closure thus escalating the potential wildfire behavior. In the absence of prescribed fire and treatments, ladder fuels and canopy closure would be high, thus providing propellants for severe, high intensity wildfires. FRCC would not be reduced or maintained at a FRCC1, again reducing the natural forest resiliency and changes to fire. No Action would not create the DFC, return fire as an ecosystem process, reduce firefighting risks, or be cost effective due to suppression of all wildland fires.

VII.C.2. Effects Common to Alternatives B and C

2.a Direct and Indirect Effects

Harvests increase fuel loading in a unit which increases the wildfire behavior potential. Following the harvests hazardous fuels increase and can exist for up to 5 years because of the red needle slash and loftiness of the fuels. This slash has high ignition and spread potential. The hazard would be reduced with fuels treatments 1-2 years post harvest. Across the landscape the lack of variability in the horizontal and vertical fuel profile also increases the spread potential and intensity of wildfire. The proposed fire and fuels Actions in Alternative B and C would change the fire and fuels environment by:

- returning the natural disturbance process of fire with prescribed fire UB treatments;
- reducing hazardous fuels to S&G and create variations in the horizontal and vertical fuel profile;
- creating a mosaic and distribution of seral stages present in a mixed severity fire regime taking steps towards changing FRCC3 →FRCC2 → FRCC1;
- increasing fire tolerant, shade intolerant conifers and reducing shade tolerant conifers;
- creating safe and cost effective protection of life, structures, and resources through reducing the risk of potential high severity fires.

All prescribed fire underburns would create variability across the landscape and return a vital disturbance process to the ecosystem. The distribution of seral stages that determine the FRCC would not completely change the Ball Park Thin Project Area from a FRCC3 or 2 to a FRCC1. However, the treatments would begin the steps towards reaching the FRCC1, displaying more variation of seral stages which occurred under historic fire events. Changes to seral class have occurred for over 100 years. Future treatments would need to take place in order to reach that goal and create mid open and late open seral stage distribution that is needed under a FRCC1.

The proposed timber harvests will create varying amounts of timber activity fuels (slash) in each unit (see Table F2). The increased fine fuel loading may reduce the success of initial attack suppression operations due to the faster rate of spread and the flame lengths >4 feet. Activity fuels treatments would reduce the amount of fuel created from the harvests to the S&G fuel loading of 7-11 tons/acre for 0-3” diameter fuel. Fuels treatments are proposed to be within 1-2 years after the harvest. The reduction in fuel loading would reduce the potential wildfire behavior.

Table F3 displays the changes in fire behavior within the unit of treatment for existing, post harvest, and post fuels treatment conditions. Fire behavior that exceeds 4 foot flame lengths require machinery or aerial support to reduce the risks to tooled firefighters.

Table F3: Existing fire behavior

	Rate of spread (chains/hour)	Flame length (feet)	Crown fire with % mortality	Spotting potential (miles)
FM5	117 ch/hr	13 feet	Active w/ 99% mort	Yes at 0.6 miles
FM10	38 ch/hr	11 feet	Active w/ 37% mort	Yes at 1.5 miles
FM12	37 ch/hr	13 feet	Active w/ 97% mort	Yes at 0.6 miles
Post Fuels Treatment	5 ch/hr	2 feet	Active w/ 12% mort	Yes at 0.6 miles

- Crown fire activity is displayed as *Active*, which means that fire is present in both the surface fuels and canopy fuels.
- FM12 examines the fire behavior of a post harvest unit. FM10 represents the natural fuels UB units.
- Post fuels treatment examines the fire behavior as FM8 because units will have lower fuel loading, higher CBH, and varying canopy density.

In all the units where fuels treatments take place the following S&G would be met.

- reducing fuel loading of 7-11 tons/acre for 0-3" diameter fuel;
- maintaining effective ground cover of 85% or more;
- weight of equipment and machinery would be within range;
- large woody debris at a minimum of 240 linear feet of representative DBH;
- IDT decision to keep overstory mortality at 10% or less.

The proposed treatment of Unit 2001 and 2002 would be a natural fuels underburn. This unit is along 1500705 Road. A natural fuels underburn is completed without harvests in the unit prior to burning. The UB would provide a reduction in fuel loading on the ground, reduce ladder fuels and vertical continuity, and create variations in the canopy closure through tree mortality. Mortality in these stands would be around 20% or less. The units would change from FM10 to a FM8 post UB. The fire behavior post burn aims to reduce the severity of wildfire behavior by reducing the spread potential of ground fire to crown fire, as well as reducing the severity of wildfire. Underburning is a preferred method of treatment not only to reduce hazardous fuels but to return fire to the ecosystem.

Underburns would take place during the spring or spring-like conditions where the soil and duff moisture are damp and fuel moisture in the large woody debri is high. These conditions slow or stop consumption which helps to retain sustainable levels of duff, soil coverage, and large woody debris often used by wildlife. Additionally, mortality of residual overstory trees can be controlled because of high live fuel moistures.

Underburns or broadcast burns may require handlines constructed around the perimeter. These are created prior to the burn and aid in containing the prescribed fire within the unit boundaries. Handlines are created by scraping fuel back to an 18" mineral soil line and scattering fuels that lie within 10 feet of the proposed line. If units are located on a steep slope waterbars are created within the fireline to reduce erosion.

On Units 270, 330, 240, 210 UB-buffers will be used if the unit is treated with an UB. This is to mitigate the need for handline along the unit boundary. Using the shaded and unharvested stand outside of the unit, fire would not be able to move quickly or with much intensity. The fire should not continue to move through the shaded area, thus a natural fire break or natural fire line is used instead of constructing handline. The UB-

buffers are small and they fill in the distance from the harvest unit to the road. If fire does move up into the canopy in the shaded area, firefighters will aim to reduce the intensity in the unharvested stand.

Hand, grapple, and landing piles are covered with regulatory plastic following construction. This creates a drier pocket of fuel in the middle of the pile and enables them to be burned in the late fall or early winter when there is very low risk of the piles spreading into other fuels. Removing the plastic before burning is suggested in order to aid in reducing emissions from the plastic.

VII.C.2.*b Cumulative Effects Common to Alternatives B and C*
Cumulative effects are based on management activities that have or would occur in the Ball Park Thin Project Area. The area analyzed displays the direct and indirect effects of fire on the treated units which translate to the variation of fuel profiles over the subwatershed landscape. Proposed fuel treatments, in concert with harvest activities, would help to diversify the fuel profile across the landscape. Future wildfire suppression actions will continue, however the proposed treatments aid in returning the natural disturbance to the landscape. Other future fire/fuels activities may be meadow burns. Bunchgrass Meadow was reviewed for prescribed fire due to the encroaching conifers and the potential loss of the open meadow in the future. Fire could be a proposal for meadow restoration in the next five years. This action would not create any negative effects as S&G would be maintained. No other foreseeable actions are planned within Ball Park Thin Project Area that would contribute incrementally to the cumulative effects from past or currently proposed activities. No adverse effects on the fuel profile or on fire behavior would result from the proposed fuel treatments.

VII.C.2.*c Conclusion to Effects of Alternative B and C*
Alternatives B and C fuels treatments would be conducted following S&G. FRCC 3 and 2 would move closer to FRCC 1. And all prescribed fire UB treatments would reintroduce the disturbance process of fire to the ecosystem.

VII.*D.1. Existing Condition – Air Quality*
The State of Oregon has been delegated authority for attainment standards set by the 1990 Clean Air Act and the 1977 Clean Air Act and its amendments. To regulate these standards, the state developed the Oregon Smoke Management Plan and the State Implementation Plan. These are guidelines and regulations for prescribed fire smoke emissions in Oregon. The Willamette National Forest has adopted this plan for emission control in Oregon (LRMP, 1990).

Designated Areas and Class I Airsheds are priority areas regulated in order to protect air quality. The Willamette Valley (at the eastern side, Leaburg), Oakridge, and Sisters are the closest Designated Areas to Ball Park Thin Project Area (xx, xx, and 33 miles respectively). Mt. Washington, Menagerie, and Three Sisters Wilderness are the closest Class I Airsheds to the Ball Park Thin Project Area (5, 9, and 10 miles respectively). Class I Airsheds are recommended to be protected from visibility impairment July 1 through September 15.

VII.D.2 ***Environmental Consequences – Air Quality***
2.a Direct, Indirect and Cumulative Effects of Alternative A – No Action
If no management actions take place in the Ball Park Thin Project Area no air quality impacts would occur in a scheduled timeframe. However, the risk of wildfire would still exist. In the event of a wildfire, air quality impacts are considerably higher than prescribed fire. Smoke emissions are not short term and can often last for many weeks or months, as witnessed during the Puzzle Fire in 2006 and GW Fires in 2007. Smoke emissions from wildfire are more likely to heavily impact communities and contribute to harmful, concentrated levels of PM 2.5 and PM 10 micrometers. Particulate Matter (PM) is hazardous to our health because the particles are small enough to penetrate through our throat and nose and enter our lungs (http://www.epa.gov/particles/). These are usually from industries, automobiles and fire smoke. Table F3 displays emissions are considerably higher than prescribed fire emissions, posing risk to community residents, forest users, and firefighters. Acreage used for the above wildfire calculation was 1,112 acres, the number of harvest and treated acres in Alternative B.

VII.D.2.*b Effects Common to Alternative B and C*
Prescribed fire of activity fuels in the Ball Park Thin Project Area would comply with Oregon Smoke Management Plan regulations. Smoke emissions would be mitigated based on the timing of the burns, seasonality, forecasted transport wind direction, and weather. Regulations from the Oregon Smoke Management enforce specific days which are suitable to burn in relation to other land owners burning or weather forecasts. Prescribed fire would most likely be avoided between July 1 and September 15 in order to protect visibility standards for Class I Airsheds.

Recreationists and some local residents near Ball Park Thin Project Area may be temporarily impacted by smoke from the prescribed fire underburns or pile burning. In the Oregon Smoke Management Plan, non-harmful concentrations of drift smoke are considered nuisance smoke (Oregon SMP 1995). Mitigation measures, such as signing along the road or near the treatment area, would be taken in order to reduce the amount of nuisance smoke and notifications to the public would be made prior to burning.

Smoke emissions were predicted using the estimates from the debris prediction tables and FOFEM (First Order Fire Effects Model version 5.0). This model calculates particulate matter emitted based on the amount of fuel consumed. Fuel inputs were from the predicted post harvest data and based on a percentage of fuels that would most likely be consumed given the prescribed fire window. That is, weather and fuels dryness would be measured to achieve the objective of reducing the fuel profile across the unit. From past experience, fuels treatments often consume an average of 80% of the fine fuels (0-1 inch diameter), 60% of the 1-3 inch fuels and only about 20% of the 3-9 inch. LWD >9 inches is most often too wet to be consumed. FOFEM however consumes 100% of 1, 10, and 100 hour fuels in spring-like conditions. Table F3 summarizes particulate matter predicted for fuels treatment activities.

Table F3: Summary of particulate matter emissions for Ball Park Thin Project Area for all treatments

Alternative A – Wildfire	Alternatives B and C

PM 2.5 total	3122 tons/acre	704 tons
PM 10 total	3683 tons/acre	934 tons

It is important to note these emissions levels do not occur at one time. Additionally the model is assuming the ground fuels on the entire unit will be burned, but his is not likely due to GP and HP will not collect all the fuels and may not be through the entire unit. Usually prescribed fires take place one unit at a time, and most likely one per day. For example, Unit 60 of 52 acres is predicted to have 17.1 tons/acre of 0-3" diameter fuel post-harvest. During the underburn, emissions are estimated at 11.4 tons/unit of PM2.5 and 13.1 tons/unit of PM10.

VII.D.2.*c Cumulative Effects of Alternative B and C*
No adverse effects on the air quality would result from the proposed fuel treatments. The area defined for cumulative effects is the Ball Park Thin Project Area, as well as the larger landscape where smoke emissions can travel. These are the locations of the Designated Areas and Class I Airsheds. Neither would be affected from the treatments. Smoke emissions would be short duration and mitigation measures would reduce the quantity of emissions during prescribed burns. Past management activities do not cumulatively add to air quality impacts from the proposed treatments. No other foreseeable management activities that would affect air quality are scheduled to occur in the Ball Park Thin Project Area.

VII.D.2.*d Conclusion of Effects of Alternative B and C*
Mitigation measures to reduce quantity of smoke emissions from burns would be to conduct UB in spring-like conditions (as stated in the fuels treatment section). Pile burning will be done in the winter where fires will burn dry material due to the covering and be highly unlikely to spread past the pile perimeter. All treatments should meet the S&G and Air Quality Regulations.

VIII. Cost of Project Treatments
The expected cost used in this analysis was developed for the McKenzie River RD in 2007 for all areas non-wilderness. Treatment costs were established as follows:

- Underburning - $850/acre (this includes prep, burning, and mop-up)
- Hand piling - $900/acre (this includes construction, covering and burning)
- Grapple piling - $600/acre (this includes construction, covering and burning)

Many complex objectives on each unit increase planning, preparation, and implementation time, thereby increasing the cost per acre. All treatment costs are less than the expected loss of resources and/or structures to wildland fire. Returning fire back into the ecosystem through the proposed actions would meet objectives defined in the Purpose and Need. Fuels treatments are selected on effectiveness at meeting resource objectiveness.

Table F4 below estimates the costs on the high end for Alternative B and C. The UB acres are for the maximum number of acres that could be underburned. The resultant

DBH in each unit post harvest would determine if the unit is UB or piled. Some units would receive both grapple piling and hand piling treatments depending on topography. These units are calculated using the GP costs.

Table F4: Estimated Treatment Costs By Alternatives

Treatment	Cost/ac	Acres B/C	Cost B/C
UB	$850	614	$521,900
HP/burn	$900	100	$90,000
GP/burn	$600	357	$214,200
Total Est. Cost			$826,100

IX. Monitoring

Fuels treatments would be monitored prior to treatments and also post treatments. Fuel loading would be evaluated, documented, and used in models to compose burn plans and also learn from treatments. Digital photos should be taken pre and post treatment in order to have a visible image of the changes that occur on the unit.

Attachment F1

Terminology

- Broadcast burn – prescribed fire with little or no standing tree vegetation

- Crown Base Height – the lowest canopy branches to the ground. Also it can be the fuel ladder from the height of ground fuel, through the next layer of shrubs or trees, up to the branches of the tallest trees.

- Fuel Loading – refers to the amount of fuel present in terms of weight per unit area. Fuels are expressed by size and hours required to dry.
    - 0" – .24" or 1 hour fuels
    - .25" – .99" or 10 hour fuels
    - 1.0" – 2.99" or 100 hour fuels
    - ⩾3.0" or 1000 hour fuels

- Fuel Models – quantify surface fuel loading, arrangement, structure. The primary fuel that carries the fire is the general classification key for fuel models, i.e. grass, timber litter, brush or timber slash.

- Fire Regime – describes the historic role of fire on the landscape. Fire regimes for Oregon and Washington are from the 1999 National Fire Strategy and are redefined for Region 6 based on common severity type, and the frequency of that expression on the landscape.

Fire regime group for R6	Frequency (Fire return interval)	Severity
I	0-35 years	Low severity (underburn)
II	0-35 years	High severity (stand-replacing)
III A	< 50 years	Mixed severity
III B	50-100 years	Mixed severity
III C	100-200 years	Mixed severity
IV A	35-100 years	High severity (stand-replacement), juxtaposed
IV B	100+ years	High severity (stand-replacing), patchy arrangement
IV C	100-200 years	High severity (stand-replacement)
V. A	200-400 years	High severity (stand-replacing)
V B	400+ years	High severity (stand-replacing)
V C	No Fire	
V D	Non-forest	

- Fire Regime Condition Class (FRCC) describes the degree of departure of current vegetation from the historic fire regime (Hann, et.al. 2004). FRCC 1, 2, and 3 ranks the degree of departure with the following:
    - FRCC 1
        - Fire regimes near historic range (departure is no more than one return interval)
        - A low risk of losing key ecosystem components
        - Vegetation attributes are functioning within historical range
    - FRCC 2

        - Fire regimes have been moderately altered from historical range; moderate changes in fire size and intensity has resulted
        - Moderate risk of losing key ecosystem components
        - Vegetation attributes have been moderately altered
    - FRCC 3
        - Fire regimes have been significantly altered from their historical range; dramatic changes in fire size and severity has resulted
        - Severe loss of ecosystem components
        - Vegetation attributes have been significantly altered
- FRCC is mapped and calculated using three steps:
    - determination of vegetation-fuel condition class
    - determination of fire frequency/severity condition class
    - determination of stratum fire regime condition class

Attachment F2

References

Agee, James K. 1993. **Fire ecology of Pacific Northwest Forests**. Island Press, Washington DC.

Brown, James K., Snell, J.A. Kendal. 1980. **Handbook for Predicting Residue Weight of Pacific Northwest Conifers**. USDA Forest Service. Pacific Northwest Forest and Range Experiment Station. GTR. PNW-103.

Hann, W.J.; Bunnell, D.L. 2001. **Fire and land management planning and implementation across multiple scales.** International Journal of Wildland Fire. 10:389-403.

Hann, W.; Shlisky, A.; Havlina, D.; Schon, K.; Barrett, S.; DeMeo, T.; Pohl, K.; Menakis, J.; Hamilton, D.; Jones, J.; Levesque, M.; Frame, C. 2003. **Interagency Fire Regime Condition Class Guidebook.** Last update January 2008. Version 1.3.0 [homepage of the Interagency and The Nature Conservancy Fire Regime Condition Class website USDA Forest Service, U.S. Department of the Interior, The Nature Conservancy, and Systems for Environmental Management**].** Online at **[www.frcc.gov]**

Harvey, Alan E., Martin F. Jurgensen, Michael J. Larson, Joyce A. Schlieter. 1986. **Distribution of active ectomycorrhizal short roots in forest soils of the inland Northwest: Effects of site and disturbance**. USDA INT-374. Intermountain Research Station, Ogden, UT.

Kay, C.E. 2007. **Are lightning fires unnatural? A comparison of aboriginal and lightning ignition rates in the United States**. Pages 16–28 in R.E. Masters and K.E.M. Galley (eds.). Proceedings of the 23rd Tall Timbers Fire Ecology Conference: Fire in Grassland and Shrubland Ecosystems. Tall Timbers Research Station, Tallahassee, FL.

Kertis, Jane et.al. 2007. **Fire Regime Condition Class (FRCC)**. Documentation to accompany the Documentation of the NW Oregon FRCC grid. USDA Forest Service. Region 6. NW Oregon FRCC Workgroup.

Kertis, Jane. March 2008. Discussion with Kertis and Willamette NF Fuels Working Group.

Means, J. E., Swanson, F. J., 1996. **Fire History and Landscape Restoration in Douglas-fir Ecosystems of Western Oregon** in Hardy, Colin C., Arno, Stephen F., eds. *The use of fire in forest restoration*. USDA Forest Service GTR INT-GTR-341. Intermountain Research Station, Ogden, UT.

Oregon Department of Environmental Quality. 1979. Oregon Visibility Protection Plan. OAR 340-200-0040.

Oregon Department of Forestry. 1995. Oregon Smoke management Plan. Amended. ORS 477.515.

Scott, Joe H.; Burgan, Robert E. 2005. **Standard fire behavior fuel models: a comprehensive set for use with Rothermel's surface fire spread model**. USDA Forest Service GTR. RMRS-GTR-153. Fort Collins, CO. 72 p.

Snell, J.A. Kendall; Browns, J. K. 1980. **Handbook to Predict Residue Weight of Pacific Northwest Conifers**. USDA GTR. PNW-103

Teensma, Peter D. 1996. **Integrating Fire Management Into Land Management Planning for Westside Forests** in Hardy, Colin C.; Arno, Stephen F., eds.. *The use of fire in forest restoration*. USDA Forest Service GTR. INT-GTR-341. Intermountain Research Station, Ogden, UT.

Maxwell, Wayne G., Ward, Franklin R., 1980. **Photo Series for Quantifying Natural Forest Residues in Common Vegetation Types of the Pacific Northwest**. USDA. USDA Forest Service General Technical Report. PNW 105.

Upper McKenzie Watershed Assessment. 1995. Deer Creek Watershed. Chapter 5

USDA and USDI. 2001. **Federal Register**. 66:751. January 4, 2001.

USDA Forest Service. 1990. Land and Resource Management Plan, Willamette National Forest.

USDA. **National Fire Plan**. http://www.forestsandrangelands.gov/index.shtml

Heritage Resources Specialist Report

Ball Park Timber Sale Thinning Project

Willamette National Forest
McKenzie River Ranger District

Linn and Lane County, Oregon

/s/ Cara M. Kelly
May 5, 2008
Cara M. Kelly
Archaeologist

HERITAGE RESOURCES

Ball Park Timber Sale Thinning Project EA
Willamette National Forest
McKenzie River Ranger District
December 14, 2007

Introduction

The purpose of this report is to analyze the effects of Timber Sale Harvest activities proposed under the Ball Park Timber Sale Thinning Environmental Analysis (EA) on cultural resources. Heritage resources are fragile and irreplaceable resource that chronicles the history of people utilizing the forested environment.

Regulatory Framework

The legal framework that mandates the Forest Service to consider the effects of its actions of heritage resources is wide-ranging. In this case, Section 106 of the National Historic Preservation Act (NHPA) of 1966 (amended in 1976, 1980, and 1992) is the foremost legislation governing the treatment of cultural resources during project planning and implementation.

Implementing regulations that clarify and expand upon the NHPA include 36 CFR800 (Protection of Historic Properties), 36 CFR 63 (Determination of Eligibility to the National Register of Historic Places), and 36 CFR 296 (Protection of Archaeological Resources), the 1994 Programmatic Agreement (PA) (amended in 2004) among the USDA Forest Service PNW, the Advisory Council on Historic Preservation, and the Oregon State Historic Preservation Officer Regarding Cultural Resource Management in the State of Oregon by the USDA Forest Service.

The National Environmental Policy Act is also a cultural resource management directive, as it calls for agencies to analyze the effects of their action of social-cultural elements of the environment. Laws such as the National Forest Management Act (NFMA) of 1976, the Archaeological Resources Protection Act (ARPA) of 1979, the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990, and Executive Order 13007 (Indian Sacred Sites) also guide the Forest Service decision making as it related to heritage resources.

The Willamette National Forest Land and Resource Management Plan tiers to the previously mentioned laws and corresponding Forest Service manual direction as it sets forth standards and guidelines that specify procedures for complying with all mandates for Federal Laws, acts, executive order and Federal regulations. Forest-wide management standards that are pertinent for this heritage resource effects analysis include:

- A cultural resource inventory shall be conducted for each proposed ground-disturbing activity and administered by a qualified archaeologist. The results of the inventory will be documented in a report which will serve as a planning document.

- The Forest's survey design strategy for cultural resource inventories shall be used to guide the inventory.

- Properties that may be affected by project activities will be evaluated using the criteria for eligibility to the National Register of Historic places.

- Measures shall be developed to protect significant sites from adverse effects due to ground disturbing and other activities.

Analysis Methods

The field methods were developed in accordance with the guidelines set forth by the Oregon State Historic Preservation Office and the Willamette National Forest Inventory Plan.

The objective of the Ball Park planning area survey is to identify all heritage sites within the area of potential effect of the project. Monitoring of previously identified sites within the project planning area is also performed, where feasible. The survey design included all areas of potential effect. This included identified harvest units and accompanying impact zones (e.g., landings, and road work). In accordance with the Willamette National Forest's Inventory Plan, 100 percent survey coverage of high probability areas and at least 20 percent coverage of low probability areas shall be performed. Utilization of information from prior surveys and the identification of known site locations were incorporated into the research design.

Description of Field Surveys

The archaeological survey of the Ball Park Thinning Timber Sale was conducted in order to comply with the above stated laws and regulations (see regulatory framework). A systematic surface pedestrian search is the principal manner for implementing the mandated goals.

Ground surveys for the proposed Ball Park timber sale occurred between August 20 and September 11, 2007. Surveys were conducted under contract by Warm Springs Geo Visions Cultural Resources Department for the Willamette National Forest. Pedestrian transects with 15 to 20 meter spaced intervals followed a specific orientation based on factors that included the shapes of units and landforms and the possible presence of historic Indian or Euro-American travel routes. One-by-one meter shovel scrapes made with entrenching tools exposed mineral soil every 20 to 30 meters in areas where dense vegetation limited ground visibility. Bearing orientations were followed to the best of abilities, but adjustments in orientation, spacing intervals, and shovel scrape spacing were made in order to avoid dangerous or unreasonable conditions (e.g., exceptionally steep

slopes or impenetrable vegetation). The surveyor's utilized Garmin Etrex Summit™ Global Positioning System units to record transect routes for accuracy of coverage and compass and tape techniques were also utilized (Gauthier et al. 2007). A total of 872 acres were survey consisting of 737 high probability and 135 low probability acres.

Existing Condition

The prehistory and history of the McKenzie River drainage have previously been summarized in Cultural Resource Overview for the Willamette National Forest, Western Oregon (Minor and Pecor 1977) the ten-year update of the above overview (Minor 1987) Prehistory and History of B. L. M. Lands in West-Central Oregon: A Cultural Resource Overview (Beckham, Minor, and Toepel 1981) Archaeology of Oregon (2nd Edition) (Aikens 1986), Cultural Resources Survey Report for the Ball Park Project Planning Area (Gauthier et al. 2007) and numerous other publications. These documents provide adequate detail of ethnographic and historic background for this report.

Ethnographic research has indicated that pre-contact and early historic aboriginal groups, probably the Molala, Kalapuya, and their ancestors used the general area for the main purpose of seasonal hunting, fishing, and plant gathering. In 1855 the surviving Molala and Kalapuya people signed the Dayton Treaty, which gave up all rights to land in the western Cascades and led to their removal to the Grand Ronde Reservation. By the end of the nineteenth century, the Kalapuya were reduced to less than 20% of their original numbers and only 31 Molalas remained.

Pre-contact resources include chipped obsidian lithic scatters and obsidian lithic isolates, representing tool use, modification, or manufacture related to hunting and gathering. Ongoing stone tool analysis, both by agency archaeologist and contractors, suggests that this portion of the Cascades was occupied primarily by people indigenous to the Cascades. Those people were probably ancestral to the Molala people that were involved in early but unratified treaties of the 1850s.

Ethnographic evidence suggests that several highly mobile groups indigenous to the western Cascade Mountains lived during the winter along low elevation streams, accessing the uplands during the summer and fall to hunt game and gather berries and other important plant resources. The Molala are linguistically related to Willamette Valley groups, but are thought to be a montane-based band that were living in the western Oregon Cascades during the historic period. The Molala generally are known to be split into two subgroups: the Northern Molala located in the vicinity of Mount Hood's drainage systems and the Southern Molala located west of the Klamath Lake area. Little is known of a third group, referred to as the Upper Santiam/Santiam band of Molala know to have occupied Linn and Lane counties in areas between the Northern and Southern groups. The Molala are also often culturally grouped with the Kalapuya who were based in the Willamette Valley but probably made seasonal forays to the Cascades for large game and berries. Many of the Molala and Kalapuya were removed to the Grand Ronde Reservation in western Oregon after the signing of the Dayton and Molalla Treaties of 1855) Other Molala shifted to the Siletz Reservation along the Oregon coast,

the Klamath reservation the to the south and east into Central Oregon where they were absorbed into the Confederated Tribes of Warm Springs Reservation of Oregon.

Extensive trail networks were important for traversing the Cascade Mountains, linking the Molala Indians with each other, surrounding tribes and important resource procurement and trade centers.

Plant food resources commonly used by Native Americans in the Ball Park project area include of sword and bracken fern, western red cedar, oceanspray, Oregon grape, huckleberry, strawberry, thimbleberry, hazelnut and sedges.

Historic accounts document the presence of horse-mounted Warm Springs Indian traveling into and through the area in the late 1800s and early 1900s (Williams 1988); these seasonal travels were motivated by the need for forage for horses, huckleberry gathering, inter-tribal contacts and visiting, hunting, fishing, trading with white settlers, and travel to seasonal cash employment, such as picking hops in the Willamette Valley (Bergland 1992).

The earliest recorded permanent Euoamerican settler in the vicinity was John Templeton Craig, who homesteaded at Craig's Pasture (now McKenzie Bridge) in the 1860s. The prospect of a toll road over the McKenzie Pass began to draw settlers into the area after 900 cattle and nine wagons made it over the pass on a rough track (the Scott Wagon Road) in the fall of 1862.

The Town of Blue River was founded in 1886. Subsistence hunting, farming, and stock raising were the primary lifestyles of the early settlers. A greater influx of people into the area was encouraged by the passage of the Forest Homestead Act in 1906, which allowed homesteaders to claim land set aside as national forest.

The first sawmill in the region was opened on the lower McKenzie in 1851 however systematic logging of huge forest did not occur until the 1890s. Hwy 126 was constructed by the CCC in the 1930s the Belknap CCC camp formerly occupied the site of the McKenzie River RD.

Historic use Administrative use appears in the form of trails and early logging activity. The Santiam NF Maps (1913, 1931) and the Cascade National Forest 1925 map depict several historic or prehistoric trails crossing through the project area. These include the Castle Rock Trails and trails to Deathball Rock and Thors Hammer. Several historic structure clustering around the Blue River, McKenzie Bridge, and Rainbow areas are visible on Forest Service maps dating back to the 1920s. A historic ranger Station at McKenzie Bridge, along with the paradise and blue River Guard stations, is also noted on Forest Service maps between 1913 and 1931. The Belknap CCC camp was located at the present site of the McKenzie River ranger Station (Gauthier et al. 2007).

Environmental Consequences

The site types recorded within the Ball Park project area include lithic scatters and lithic isolated finds. The sites are considered potentially eligible to the National Register of Historic Places (NRHP) and must be protected from project activities or evaluated to determine their eligibility to the NRHP. The proposed Ball Park Thin Timber Sale has the potential to affect one of the known cultural sites 06180100586.

Direct and Indirect Effect Alternative 1(No Action)

Implementation of the no action alternative would not directly nor indirectly affect cultural resources since there would be no change to the integrity of heritage resource sites.

Direct and Indirect Effect-Alternative B and C

Implementation both of these alternatives would result in ground disturbance on 915 acres of timber harvest, less than 3.0 miles of temporary spur road construction, .53 miles of road decommissioning, 43.9 miles of road maintenance and 91 acres of natural fuels underburn. Since appropriate and approved surveys and cultural site protection measures are already in place for this project (see Mitigation Measures Chapter 2), then potential direct effects would be in the form on inadvertent damage to the integrity of cultural resources which were not discovered during initial survey. Any sites uncovered during implementation of the project would require the application of Design Measures described in Chapter 2.

Cumulative Effects

Cumulative Effects Common to All Alternatives

It is not anticipated that there would be cumulative effects to the potentially eligible cultural resources in the Ball Park Timber Sale Project Area from any of the proposed actions as long as the Heritage mitigation and Design Criteria are implemented prior to timber harvest and associated activities

State Historic Preservation Office consultation has been completed under the terms of the 1995 Programmatic Agreement (amended 2004).

Mitigation Measures and Design Criteria

The proposed mitigation measures for the Ball Park Thin Timber Sale are listed below and cover all alternatives. They are based on the results of the field inventory and information gleaned form the District's cultural resource files. **Information specific to heritage resource location and content is exempt from disclosure under the Freedom**

Information act (FSM 6271.2). In order to facilitate the decision-maker, the information will be made available to him.

Mitigation Measures

- A 150 foot buffer and directional falling of trees away from the buffer will adequately protect site 06180400586 (TSO and Layout crew need to work with the Archaeologist to insure proper buffer width).

- The zone archaeologist will conduct post-harvest monitoring to document the condition of the above listed cultural site.

Design Criteria

- All NRHP eligible sites and potentially eligible sites must be avoided during all project activities.

- Changes to the current unit configurations and/or the addition of any new units, will require consultation with the District Archaeologist in order to protect known and unknown heritage resources.

- Project activities planned outside of the area defined in the heritage resource inventory schema must be coordinated with the district archaeologist prior to initiation. This includes the establishment of harvest landings, helicopter landings, guy-line equipment anchors, slash burning, removal of roadside danger trees, and ripping of temporary spur roads.

- Although no other surface or subsurface evidence of cultural resources was found in the proposed project, there remains the possibility that buried prehistoric or historic cultural resources area present and could be uncovered during project activities. If cultural resources are encountered during the course of this project, earth-disturbing activities in the vicinity of the find must be suspended, in accordance with federal regulations, and the zone archaeologist notified to evaluate the discovery and recommend subsequent course of action. Therefore, contract clause BT6.24 must be included in all project prospecti and contracts. The contract clause outlines the procedures to follow in the event heritage resources are discovered during timber sale operations.

Consistency with Direction and Regulations

Cultural site 06180100586, 06180700034 are potentially eligible for inclusion to the NHRP. All sites that have been evaluated as eligible or potentially eligible will be strictly avoided during ground-disturbing activities. Log landings or other ground disturbing activities will not be permitted near the eligible or potentially eligible historic properties.

Irreversible/Irretrievable Commitments

There are no irreversible and irretrievable commitments that would affect heritage resource by implementing any of the proposed alternatives.

References Cited:

Aikens, C. Melvin
1977 Problems of Archaeological Survey in Heavily Forested Regions: Seeing the Ground and Looking In Likely Places in the Woods of Western Oregon. Contributed paper at the 42nd Annual Meeting of the Society for American Archaeology, New Orleans, Louisiana.

1986 Archaeology of Oregon. U.S. Department of the Interior, Bureau of Land Management, Oregon State Office.

Baxter, Paul W.
1986 Archaic Upland Adaptation in the Central Cascades. Ph.D. Dissertation, University of Oregon, Eugene.

Bergland, Eric
1992 Historic Period Plateau Culture Tree Peeling in the Western Cascades of Oregon.Northwest Anthropological Research Notes 25(2):31-53.

Davis, Carl M.
1988 Willamette National Forest Cultural Resource Inventory Plan. U.S. Forest Service, Pacific Northwest Region.

Gauthier, Tara, Kellie Barnes, Maralee Wernz, Sally Bird
2007 Cultural Resources Survey Report for the Ball Park Project Planning Area, Willamette National Forest , Lane County, Oregon. Report No. 07-19.

McKenzie Ranger District Cultural Resource files and maps.

Flenniken, J. Jeffrey
1987 The Lithic Technology of the East Lake Site, Newberry Crater, Oregon. Department of Agriculture, Deschutes National Forest.

Hemstrom, Miles A., Sheila A. Logan, and Warren Pavlat
1987 Plant Association and Management Guide, USDA Forest Service, Pacific Northwest Region, R6-Ecol 257-B-86.

Kelly, Cara McCulley
2001 The Prehistory of the North Santiam Subbasin, on the Western Slopes of the Oregon Cascades. Masters Thesis, Oregon State University, Corvallis.

Legard, Harold A. and LeRoy C. Meyer
1973a Soil Resource Inventory: Atlas of Maps and Interpretive Tables. U.S. Forest Service, Pacific Northwest Region.

1973b Willamette National Forest: Soil Resource Inventory. U.S. Forest Service, Pacific Northwest Region.

Minor, Rick et al.
1987 Cultural Resource Overview of the Willamette National Forest: A 10-Year Update. Heritage Research Associates Report 60, Eugene, Oregon.

Snyder, Sandra L.
1987 Prehistoric Land Use Patterns in the Central Oregon Cascade Range. Dissertation. University of Oregon, Eugene.

Williams, Gerald W.
1988 McKenzie River Names. Unpublished manuscript on file, USDA Forest Service, Willamette National Forest, McKenzie River Ranger District, McKenzie Bridge, Oregon.

U.S. Forest Service
1931 Santiam National Forest Map
1937 and 1947 Willamette National Forest Maps