Little River MMX Thinning Environmental Assessment

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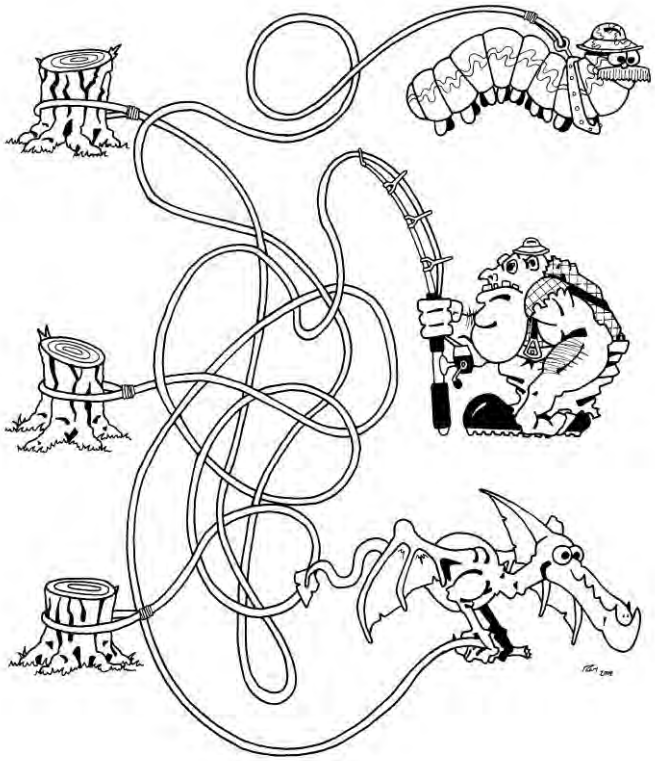

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Roseburg District
Swiftwater Field Office
Roseburg, Oregon

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Executive Summary

The Little River MMX Thinning project area occurs within the Adaptive Management Area (AMA), General Forest Management Area (GFMA), and Riparian Reserve land use allocations administered by the Swiftwater Field Office, Roseburg District Office BLM. This Environmental Assessment (EA) considers two alternative treatments (including No Action) on approximately 1,504 acres of forest stands, 35-62 years old, in the proposed Root Canal, Baker Street, Horseshoe, and Emile Islands timber sales and the effects of those treatments. See *Table i* (*Comparison of the Key Findings and Effects of the Little River MMX Thinning Alternatives*). This table highlights specific examples of the differences among the alternatives. For a complete discussion of the alternatives, see *Chapters 2* and *3*.

The Roseburg District initiated planning and design for this project on December 1, 2009 to conform and be consistent with the Roseburg District's 1995 RMP. Following the March 31, 2011 decision by the United States District Court for the District of Columbia in Douglas Timber Operators *et al*. v. Salazar, which vacated and remanded the administrative withdrawal of the Roseburg District's 2008 ROD/RMP, we evaluated this project for consistency with both the 1995 RMP and the 2008 ROD/RMP. Based upon this review, the proposed alternatives contain some design features not mentioned specifically in the 2008 ROD and RMP. The 2008 ROD and RMP did not preclude use of these design features, and the use of these design features is clearly consistent with the goals and objectives in the 2008 ROD and RMP. Accordingly, this project is consistent with the Roseburg District's 1995 RMP and the 2008 ROD/RMP.

Scoping comments gathered during the early stages in the planning process did not provide additional information specific to the proposed Little River MMX Thinning project. As a consequence, these scoping comments did not prompt the Swiftwater Field Office to alter or include additional analyses beyond that which the interdisciplinary team had already considered as pertinent.

Table i: Comparison of the Key Findings and Effects of the Little River MMX Thinning Alternatives.

Key Finding/Effect		No Action Alternative	Proposed Action Alternative
Proposed Thinning	**Project Size**	0 acres	1,504 acres
	Thinning Prescription	None	*Upland Treatment* = 90-120 sq. ft. basal area *Riparian Treatment* = 70-80 sq. ft. basal area
	Volume Harvested	0 MMBF	27.2 MMBF
	Proposed Road Maintenance or Renovation	0 miles	29.96 miles
	Proposed Road Improvement	0 miles	0.85 miles
	Proposed Road Construction	0 miles	6.19 miles
	Proposed Road Decommissioning	0 miles	10.56 miles
Forest Vegetation	**Post-Harvest Canopy Cover**	No harvest 65-100%	40-86%
Northern Spotted Owls	**Thinning within Nest Patch** (300 meter radius)	0 acres	47 acres
	Thinning within Core Area (0.5 mile radius)	0 acres	282 acres
	Thinning within Home Range (1.2 mile radius)	0 acres	1,187 acres
	Suitable Habitat	None would be modified	6 acres
	Dispersal Habitat	None would be modified	1,498 acres
	Critical Habitat Modified	0 acres	0 acres
	Seasonal Restrictions	Known sites are located outside of threshold distances for disruption or disturbance; no seasonal restrictions necessary at this time.	
Peregrine Falcon	**Seasonal Restrictions**	February 1st through August 15th: • noise disturbance within 1 mile Protection Buffer • noise & visual disturbance within ½ mile Protection Buffer	
Soils	**Detrimental Compaction** (3-9% of the ground-based yarding area; 2-3% of the cable yarding area)	0 acres	12-44 acres
	Roads or spurs that would use existing, compacted trails	0 miles	1.31 miles
	Roads or spurs mulched with logging slash to aid soil recovery	0 miles	2.01 miles
Hydrology, Aquatic Habitat & Fisheries	**No-harvest Stream Buffer Widths**	None	35 feet intermittent streams 60 feet perennial & fish-bearing streams
	Net Roaded Area (peak flow response when > 12%)	3.2%	3.2%
	Stream Temperature	Stream temperature regimes would remain unchanged under either alternative	
	Sediment Regime	Sources of sediment from roads would not be fully repaired with road maintenance alone	Sources of sediment from roads would be reduced due to improved drainage
	Fish Populations	No impacts to fish populations would be anticipated under either alternative	
Botany	**Bureau Sensitive & Strategic Botanical Species** (14 populations, 5 species discovered in Little River MMX)	13 populations would persist at current levels and conditions; 1 population would be at-risk from noxious weeds	8 populations would persist at current levels due to protection from no-harvest stream buffers; 6 populations would be at risk from harvest operations
Carbon Storage	**Change at Harvest Time**	No harvest	-6,079 tonnes
	Carbon Storage in +100 years	728,566 tonnes	580,829 tonnes

Chapter 1. Purpose and Need for Action

A. Need & Purpose

The Bureau of Land Management (BLM), Swiftwater Field Office proposes thinning of approximately 1,504 acres of forest stands, 35-62 years old, in four proposed timbersales: Root Canal (546 acres), Baker Street (212 acres), Horseshoe (542 acres), and Emile Islands (204 acres). Collectively, these proposed sales are referred to as the Little River MMX Commercial Thinning project (Figures 1-5, Appendix G).

The stands in the Little River MMX project area are densely stocked stands that are currently at or beyond the appropriate relative density for thinning. The *need* for action is to provide substantial timber volume in support of the local economy and, within the reserved land-use allocations, accelerate development of habitat components for the northern spotted owl.

The *purpose* of the action is to reduce stand stocking in a manner that produces commercial timber in a cost-efficient manner while enhancing habitat for the northern spotted owl and improves vigor in the residual stand.

B. Conformance

The Roseburg District initiated planning and design for this project on December 01, 2009 to conform and be consistent with the Roseburg District's 1995 RMP. Following the March 31, 2011 decision by the United States District Court for the District of Columbia in Douglas Timber Operators *et al*. v. Salazar, which vacated and remanded the administrative withdrawal of the Roseburg District's 2008 ROD/RMP, we evaluated this project for consistency with both the 1995 RMP and the 2008 ROD/RMP. Based upon this review, the proposed alternatives contain some design features not mentioned specifically in the 2008 ROD and RMP. The 2008 ROD and RMP did not preclude use of these design features, and the use of these design features is clearly consistent with the goals and objectives in the 2008 ROD and RMP. Accordingly, this project is consistent with the Roseburg District's 1995 RMP and the 2008 ROD/RMP.

This environmental assessment (EA) analyzes the environmental consequences of the No Action Alternative and one Proposed Action Alternative to compare the environmental effects of each in the decision-making process. The need and purpose for action are consistent with the objectives of the 1995 *Roseburg District Record of Decision and Resource Management Plan* (ROD/RMP), which directs BLM to produce a sustainable supply of timber and other forest commodities from the Matrix, while providing habitat for a variety of organisms and providing for ecological functions such as dispersal of organisms (ROD/RMP p.33).

As described briefly above, the action alternatives all conform to the 1995 ROD/RMP (as amended), incorporating the standards and guidelines therein. Specifically, the alternatives conform to these 1995 ROD/RMP management actions/directions:

Riparian Reserve

- Apply silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives (1995 ROD/RMP, pg. 25).

General Forest Management Area

- Provide a sustainable supply of timber and other forest commodities (from the Matrix) (1995 ROD/RMP, pg. 33).

- Provide habitat for a variety of organisms associated with both late-successional and younger forests (1995 ROD/RMP, pg. 33).
- Provide for important ecological functions such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees (1995 ROD/RMP, pg. 33).
- Select logging systems based on the suitability and economic efficiency of each system for the successful implementation of the silvicultural prescription, for the protection of soil and water quality, and for meeting other land use objectives (1995 ROD/RMP, pg. 61). Also, provide a harvest plan flexible enough to facilitate harvesting within a three year timber sale contract.

Adaptive Management Area

- Provide substantially to: well-distributed late-successional habitat outside reserves, retention of key structural elements of late-successional forests on lands subjected to regeneration harvest, restoration of riparian zones, and a stable timber supply (1995 ROD/RMP, pg. 32).

This analysis tiers to the assumptions and analysis of consequences provided by the following NEPA analyses:

- The 1994 *Final Supplemental Environmental Impact Statement* (FSEIS) *on Management of Habitat for Late-Successional and Old-Growth Related Species Within the Range of the Northern Spotted Owl*;
- The 2001 *Final Supplemental Environmental Impact Statement* (FSEIS) for *Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl*.

Survey & Manage

On December 17, 2009, the U.S. District Court for the Western District of Washington issued an order in *Conservation Northwest, et al. v. Sherman, et al.*, No. 08-1067-JCC (W.D. Wash.), granting Plaintiffs' motion for partial summary judgment and finding NEPA violations in the *Final Supplemental to the 2004 Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines* (USDA and USDI, June 2007). In response, parties entered into settlement negotiations in April 2010, and the Court filed approval of the resulting Settlement Agreement on July 6, 2011. Projects that are within the range of the northern spotted owl are subject to the survey and management standards and guidelines in the 2001 ROD, as modified by the 2011 Settlement Agreement.

The Little River MMX Project is consistent with the Roseburg District Resource Management Plan as amended by the 2001 *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (2001 ROD), as modified by the 2011 Settlement Agreement.

The 2011 Settlement Agreement states:

> *"For projects with signed Records of Decision, Decision Notices, or Decision Memoranda from December 17, 2009, through September 30, 2012, the Agencies will use either of the following Survey and Manage species lists:*
> *a. The list of Survey and Manage species in the 2001 ROD (Table 1-1, Standards and Guidelines, pages 41-51).*

b. *The list of Survey and Manage species and associated species mitigation, Attachment 1 to the Settlement Agreement."*

The Little River MMX Project applies a 2006 Exemption from a stipulation entered by the court in litigation regarding Survey and Manage species and the 2004 Record of Decision related to Survey and Manage Mitigation Measure in *Northwest Ecosystem Alliance v. Rey*, No. 04-844-MJP (W.D. Wash., Oct. 10, 2006). Previously, in 2006, the District Court (Judge Pechman) invalidated the agencies' 2004 RODs eliminating Survey and Manage due to NEPA violations. Following the District Court's 2006 ruling, parties to the litigation entered into a stipulation exempting certain categories of activities from the Survey and Manage standards and guidelines, including both pre-disturbance surveys and known site management. Also known as the Pechman Exemptions, the Court's Order from October 11, 2006 directs:

"Defendants shall not authorize, allow, or permit to continue any logging or other ground-disturbing activities on projects to which the 2004 ROD applied unless such activities are in compliance with the 2001 ROD (as the 2001 ROD was amended or modified as of March 21, 2004), except that this order will not apply to:

a. *Thinning projects in stands younger than 80 years old:*
b. *Replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;*
c. *Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement large wood, channel and floodplain reconstruction, or removal of channel diversions; and*
d. *The portions of project involving hazardous fuel treatments where prescribed fire is applied. Any portion of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and management requirements except for thinning of stands younger than 80 years old under subparagraph a. of this paragraph."*

Per the 2011 Settlement Agreement, the 2006 Pechman Exemptions remain in force:

"The provisions stipulated to by the parties and ordered by the court in Northwest Ecosystem Alliance v. Rey, No. 04-844-MJP (W.D. Wash. Oct. 10, 2006), shall remain in force. None of the following terms or conditions in this Settlement Agreement modifies in any way the October 2006 provisions stipulated to by the parties and ordered by the court in Northwest Ecosystem Alliance v. Rey, No. 04-844-MJP (W.D. Wash. Oct. 10, 2006)."

The Little River MMX Project meets Exemption A because it entails no regeneration harvest and entails thinning only in stands less than 80 years old. The forest stands in Little River MMX are 35-62 years old (q.v., pg. 25). Stand boundaries were determined from the Forest Operation Inventory (FOI). Stand ages were derived from stand exam information collected within the FOI boundaries. Breast height ages were sampled on dominant trees. Typically one tree per two acres was sampled. Total age was calculated by ORGANON using the breast height age and adjusting it to calculate how long that tree took to get to breast height 4.5 feet off the ground based on site productivity class. An average of the sample trees determined the stand age.

In addition, activities associated with the proposed thinning treatment include spur road construction, improvement, maintenance/renovation, and decommissioning as described below in *Chapter 2: Discussion of Alternatives* (pgs. 4, 7-9). Spur road construction would occur within the treated stands, where right-of-way widths would be typically less than the tree-spacing following harvest. Road improvement, maintenance/renovation, and decommissioning activities would occur on existing road facilities where habitat for Survey and Manage species is absent and would not be considered

habitat disturbing.

C. Decision Factors

Factors to be considered when selecting among alternatives would include:

- The degree to which the objectives previously described would be achieved, including: the retention of existing habitat features and potential for creating future habitat components for listed species, the manner in which thinning would be conducted with respect to cost, and the feasibility of project implementation;
- The nature and intensity of environmental impacts that would result from implementation and the nature and effectiveness of measures to mitigate impacts to resources including, but not limited to, wildlife and wildlife habitat, soil productivity, water quality, and the spread of noxious weeds;
- Compliance with management direction from the 1995 ROD/RMP;
- Compliance with applicable laws including, but not limited to, the Clean Water Act, the Endangered Species Act, O&C Act, and the National Historic Preservation Act; and
- Generating revenue to the government from the sale of timber resources in a cost efficient manner.

Chapter 2. Description of the Alternatives

This chapter describes the features of the *No Action Alternative* and the *Proposed Action Alternative* being analyzed in this EA. The BLM has developed a no action alternative and one action alternative.

Little River MMX includes lands within the AMA, GFMA, and Riparian Reserve land use allocations and would total approximately 1,504 acres (Table 1). In the Little River Fifth-field Watershed, the total Riparian Reserve width for perennial, fish-bearing streams would be 360 feet (two site potential tree heights on both sides of the stream). The total Riparian Reserve width would be 180 feet (one site potential tree height on both sides of the stream) for perennial, non-fish bearing streams and also for intermittent streams. The proposed units are located on Revested Oregon and California Railroad Lands (O&C Lands).

Table 1. Legal Description, Land Use Allocations, and Proposed Yarding Methods of Little River MMX Units.

Sale	Unit	Township-Range-Section	Acres	Land Use Allocation	Yarding Method(s)
Root Canal	17A	T27S-R02W-Sec. 16,17	49	AMA; Riparian Reserve	Cable; Ground-based
	17B	T27S-R02W-Sec. 17,20	35	AMA; Riparian Reserve	Cable; Ground-based
	18A	T27S-R02W-Sec. 18	16	AMA; Riparian Reserve	Cable; Ground-based
	21A	T27S-R02W-Sec. 21	29	AMA; Riparian Reserve	Cable; Ground-based
	21B	T27S-R02W-Sec. 21	5	AMA; Riparian Reserve	Ground-based
	23C	T27S-R03W-Sec. 23	31	AMA; Riparian Reserve	Cable; Ground-based
	25A	T27S-R03W-Sec. 25	57	AMA; Riparian Reserve	Cable; Ground-based
	28A	T27S-R02W-Sec. 28	42	AMA; Riparian Reserve	Cable; Ground-based
	28B	T27S-R02W-Sec. 28	35	AMA; Riparian Reserve	Cable; Ground-based
	29A	T27S-R02W-Sec. 29	90	AMA; Riparian Reserve	Cable; Ground-based
	30A	T27S-R02W-Sec. 30	112	AMA; Riparian Reserve	Cable; Ground-based
	30B	T27S-R02W-Sec. 30	28	AMA; Riparian Reserve	Cable; Ground-based
	30D	T27S-R02W-Sec. 30	11	AMA; Riparian Reserve	Cable; Ground-based
	32G	T27S-R02W-Sec. 32	6	AMA; Riparian Reserve	Cable
	SUB-TOTAL		***546***	***AMA; Riparian Reserve***	***Cable; Ground-based***
Baker Street	3A	T27S-R03W-Sec. 3	41	AMA; Riparian Reserve	Cable; Ground-based
	3B	T27S-R03W-Sec. 3	50	AMA; Riparian Reserve	Cable; Ground-based
	3C	T27S-R03W-Sec. 3	4	AMA; Riparian Reserve	Cable
	11A	T27S-R03W-Sec. 11	46	AMA; Riparian Reserve	Cable; Ground-based
	11B	T27S-R03W-Sec. 11	51	AMA; Riparian Reserve	Cable; Ground-based
	21A	T27S-R03W-Sec. 21	20	AMA; Riparian Reserve	Cable
	SUB-TOTAL		***212***	***AMA; Riparian Reserve***	***Cable; Ground-based***
Horseshoe	23A	T26S-R03W-Sec. 23	274	AMA; GFMA; Riparian Reserve	Cable; Ground-based
	25A	T26S-R03W-Sec. 25	12	AMA; Riparian Reserve	Cable; Ground-based
	26A	T26S-R03W-Sec. 26	14	AMA; Riparian Reserve	Cable
	26B	T26S-R03W-Sec. 26	35	AMA; Riparian Reserve	Cable; Ground-based
	27A	T26S-R03W-Sec. 27	38	AMA; Riparian Reserve	Ground-based
	35A	T26S-R03W-Sec. 35	89	AMA; Riparian Reserve	Cable
	35B	T26S-R03W-Sec. 35	53	AMA; Riparian Reserve	Cable; Ground-based
	1B	T27S-R03W-Sec. 1	8	AMA; Riparian Reserve	Cable; Ground-based
	1C	T27S-R03W-Sec. 1	19	AMA; Riparian Reserve	Cable
	SUB-TOTAL		***542***	***AMA; GFMA; Riparian Reserve***	***Cable; Ground-based***
Emile Islands	1A	T27S-R03W-Sec. 1	6	AMA; Riparian Reserve	Ground-based
	1C	T27S-R02W-Sec. 1	28	AMA	Cable
	1D	T27S-R03W-Sec. 1	41	AMA; Riparian Reserve	Cable
	3A	T27S-R02W-Sec. 3	25	AMA	Cable
	3B	T27S-R02W-Sec. 3	21	AMA; Riparian Reserve	Cable; Ground-based
	5I	T27S-R02W-Sec. 5	48	AMA; Riparian Reserve	Cable
	7F	T27S-R02W-Sec. 7	30	AMA; Riparian Reserve	Cable; Ground-based
	7G	T27S-R02W-Sec. 7	5	AMA; Riparian Reserve	Cable
	SUB-TOTAL		***204***	***AMA; Riparian Reserve***	***Cable; Ground-based***
	TOTAL		**1,504**	***AMA; GFMA; Riparian Reserve***	***Cable; Ground-based***

A. Terminology & Definitions

There are several terms whose definitions and meanings are integral to a clear understanding and comparison of the alternatives specific to the Little River MMX analysis. These definitions are

presented below, prior to the description of the *No Action* and *Proposed Action Alternative*. In addition, throughout this analysis acres (or percentages of the proposed units by treatment type) are presented and discussed; these numbers are approximations based on office planning and subsequent field review. These acres (and percentages) may change as additional information and further field review (e.g. global positioning system [GPS] locations) refines earlier approximations.

1. Silvicultural Terminology

Variable-density thinning (VDT) –a thinning method where at least two densities of retained trees are used to promote stand heterogeneity. Provision of conditions conducive to the initiation and growth of tree regeneration is an objective of VDT to encourage understory development for the development of two-storied or multi-layered stands. In addition, VDT includes unharvested areas (e.g. no-harvest stream buffers) and openings (e.g. clearing from road or landing construction).

Minor conifer –any conifer tree species other than Douglas-fir.

Passive Recruitment –the reliance on natural mortality processes to produce snags and down wood.

Active Recruitment –the reliance on natural mortality processes to produce snags and down wood, plus the artificial creation of snags and down wood via girdling and falling of live trees at or soon after the time of harvest.

2. Road Terminology

a) Road Maintenance/Renovation

Road maintenance/renovation includes road work to bring an existing road ***back to its original design***. Road maintenance/renovation includes work on any existing road that was designed - not just work on numbered roads currently in the BLM transportation system. Indicators of a designed road include a defined cut and fill, compacted surface, rock surfacing, and/or drainage structures. In some instances, trees and other plant species may have re-vegetated the road and it may be serving as wildlife habitat but it would still be considered road maintenance/renovation if the planned road work would bring the road back to its original design.

The amount of effort to bring the road back to its original design can vary dramatically from road to road. Typical activities that would be associated with road maintenance/renovation include:

- brushing,
- ditch cleaning,
- surface grading,
- replacing drainage structures, and/or
- replacing rock surfacing where needed where rock was included in the original design.

Typically, road maintenance/renovation that is performed by BLM staff is called "maintenance" while road maintenance/renovation performed by a timbersale purchaser or other contractor is called "renovation".

b) Road Improvement

Road improvement includes road work to take an existing road ***beyond its original design***. Road improvement includes work on any existing road that was designed - not just work on numbered roads currently in the BLM transportation system. Indicators of an existing road

include a defined cut and fill, compacted surface, rock surfacing, and/or drainage structures. In some instances, trees and/or other plant species may have re-vegetated the road and it may be serving as wildlife habitat but it would still be considered road improvement if the planned road work would take the road beyond its original design.

The amount of effort to bring the road beyond its original design can vary dramatically from road to road. Typical activities that would be associated with road improvement include:

- widening an existing road (e.g. new soil disturbance, new cut/fill slopes),
- adding drainage structures (e.g. culverts, cross drains),
- upgrading existing drainage structures (e.g. larger culvert) and/or
- adding rock surfacing where rock was *not* included in the original design specifications.

c) Road Construction

Road construction includes road work to build a road where a ***designed road did not exist previously***. Road work on a "jeep road" would be considered road construction since there is no previous design specification.

Typical activities that would be associated with road construction include:

- building cut/fill slopes,
- compacting the driving surface,
- surfacing with rock (in some instances but not all), and/or
- installing drainage structures (e.g. culverts, cross-drains).

B. No Action Alternative

The *No Action Alternative* provides a baseline for the comparison of the alternatives. This alternative describes the existing condition and continuing trends anticipated in the absence of the proposal but with the implementation of other reasonably foreseeable federal and private projects. If the no action alternative were selected there would be no thinning of timber or treatment of the stands within the 1,504 acres of the project area at this time and there would be no revenue generated from the sale of the timber.

Selection of this alternative would not constitute a decision to re-allocate these lands to non-commodity uses. Future harvesting in this area would not be precluded and could be considered again under a subsequent EA. Road work would be conducted as-needed to provide resource protection, accommodate reciprocal users, and protect the federal investment.

C. Proposed Action Alternative

The action alternative proposes the offering of four timbersales (i.e. Root Canal, Baker Street, Horseshoe and Emile Islands) located on O&C Lands. The proposed action would result in thinning approximately 1,504 acres of forest stands 35-62 years old in 37 units and provide approximately 27.2 million board feet of timber (Figures 1-5, Appendix G; q.v., pg. 75). Approximately 21 acres of the 1,504 acres would be cleared or brushed for spur right-of-ways or roads to access the treatment units. This section describes the project design features of the Proposed Action Alternative and those features are summarized in Table 2.

Table 2. Summary of the Design Features of the Individual Sales for Little River MMX.

Sale	Treatment Prescription		Proposed Road Work	
	Basal Area[1]	Acres	Activity	Miles
Root Canal	*Upland Treatment* = 120 sq. ft. basal area *Riparian Treatment* = 80 sq. ft. basal area	546	Maintenance/Renovation Improvement Construction Decommissioning	6.08 0 1.79 2.58
Baker Street	*Upland Treatment* = 120 sq. ft. basal area *Riparian Treatment* = 70-80 sq. ft. basal area	212	Maintenance/Renovation Improvement Construction Decommissioning	5.40 0.17 0.41 1.24
Horseshoe	*Upland Treatment* = 120 sq. ft. basal area *Riparian Treatment* = 80 sq. ft. basal area	542	Maintenance/Renovation Improvement Construction Decommissioning	11.67 0.68 2.65 4.12
Emile Islands	*Upland Treatment* = 90-120 sq. ft. basal area *Riparian Treatment* = 80-90 sq. ft. basal area	204	Maintenance/Renovation Improvement Construction Decommissioning	6.81 0 1.34 2.62
TOTAL	*Upland Treatment* = 90-120 sq. ft. basal area *Riparian Treatment* = 70-80 sq. ft. basal area	1,504	Maintenance/Renovation Improvement Construction Decommissioning	29.96 0.85 6.19 10.56

[1] "*Upland Treatments*" are generally AMA and GFMA lands; "*Riparian Treatments*" are generally Riparian Reserves and a portion of the designated Known Owl Activity Center (i.e. 100-acre KOAC) in Baker Street Unit 3B.

1. Timber Harvest

a) Treatment Prescription

Tree Marking

A variable density thinning prescription would be used to mark the trees in Little River MMX. In general, AMA and GFMA lands would be marked to retain 90-120 square feet of basal area per acre; these areas may also be referred to as "upland treatments" in the remainder of the analysis. Riparian Reserve and the 100 acre KOAC lands would be marked to retain 80-90 or 70 square feet of basal area per acre, respectively; these areas may also be referred to as "riparian treatments" in the remainder of the analysis.

Merchantable trees in the suppressed and intermediate crown classes would be the primary targets for removal, although some co-dominant and dominant trees would be removed where necessary to meet the residual density objective. Canopy openings would be created or enlarged to maintain trees with large limbs, full crowns, promote tree regeneration, shrubs, and forbs.

Minor conifer and hardwood species would be favored to maintain stand diversity. Some smaller shade tolerant trees, such as western red cedar and western hemlock, would be marked to maintain the existing species diversity if they are under-represented in the dominant and co-dominant classes.

All trees under 25 inches dbh would be removed within 25 feet of the drip line of all sugar pine trees.

Older remnant trees may be present, but are not the numerically predominant stand components and would generally be targeted for retention. Since thinning would focus on removal of intermediate and suppressed canopy layers, it is possible that suppressed trees designated for cutting may be older than the prevailing stand age.

Passive Recruitment of Snags & Coarse Woody Debris
In all land use allocations, conifer and hardwood snags would be reserved from cutting unless they are a safety concern. Conifer and hardwood snags 10 inches or larger in diameter breast height (dbh) and at least 16 feet in height would be marked for retention. Snags felled for safety reasons in the Riparian Reserve would be retained on site as coarse woody debris. Existing coarse woody debris in decay classes 3, 4, and 5 would be retained in AMA and GFMA lands, and all coarse woody debris would be retained in the Riparian Reserve.

The residual stands following harvest would provide a pool of candidate trees for future snag and coarse woody debris recruitment. Additional coarse woody debris and snags may be created incidentally through the harvest operations (e.g. damage leading to broken-out tops or individual tree mortality) or through weather damage (e.g. wind and snow break).

b) Stream Buffers

Perennial or Fish-bearing Streams
A "no-harvest" stream buffer extending 60 feet (slope distance) on either side of the edge of the stream channel, as measured from the ordinary high water line for perennial or fish-bearing streams, would limit thinning immediately adjacent to streams.

Intermittent Streams
A "no-harvest" stream buffer extending 35 feet (slope distance) on either side of the edge of the stream channel, as measured from the ordinary high water line for intermittent streams, would limit thinning immediately adjacent to streams.

c) Timber Cruising

Timber cruising would include 3P (Probability Proportional to Prediction) and 100 percent cruise methods to sample standing trees. The samples will be computed on form class tables for estimating volume in 16-foot lengths. The sample tree volume would be expanded to a total sale volume.

Additional timber would potentially be included as a modification to this project. These additions would be limited to the removal of individual trees or small groups of trees that are blown down, are a safety hazard, or trees needed to facilitate the proposed action. Historically, this addition has been less than ten percent of the estimated sale quantity.

d) Firewood

Firewood cutting and salvaging of logging debris (slash) could occur in cull decks, logging landings, and in the units, near roads, after thinning activities are completed.

2. Timber Yarding

Proposed units would require a mixture of skyline cable yarding and ground-based yarding (Table 1). Up to ten acres of additional, incidental ground-based logging within each of the four sales may also be necessary (i.e. removal of guyline anchor trees, isolated portions of units, etc.).

Prior to attaching any logging equipment to a reserve tree, precautions to protect the tree from damage would be taken. Examples of protective measures include tree plates, straps, or synthetic rope, and minimal notching (less than half the tree diameter). If it would be necessary to fall a reserve tree for safety reasons then it may be harvested or left as coarse woody debris at the discretion of the government's contract administrator.

Cable Yarding

Cable logging systems that limit ground disturbance would be used to obtain partial or full log suspension (1995 ROD/RMP, pg. 130). Intermediate supports would be used as necessary to obtain partial suspension at slope breaks. Where excessive soil furrowing occurs, it would be hand waterbarred and filled with limbs or other organic debris to control surface soil erosion in disturbed areas.

Where practical, cable yarding would require full suspension over streams.

At least 75 feet of lateral yarding capability would be required of cable equipment, with average spacing of 150 feet between cable corridors, whenever practicable, to reduce the number of yarding corridors and landings, and to reduce the amount of soil disturbance.

Additional Restrictions for Downhill Cable Yarding

Downhill cable yarding is planned where topography allows for adequate deflection and one-end suspension of logs during in-haul. In order to obtain adequate deflection, given the topography analyzed in Little River MMX, downhill cable yarding distances would be less than 750 feet horizontal distance. The authorized officer would suspend yarding operations if, in the opinion of the authorized officer in conjunction with the soil scientist, damage to the soil resource is excessive.

Downhill cable-yarding would *not* be allowed during the bark slip period (April 15th to July 15th) and whole tree yarding would *not* be allowed due to the increased risk for residual tree damage, unless waived by the authorized officer.

Ground-Based Yarding

Ground-based yarding would *not* be allowed during the bark slip period (i.e. April 15th to July 15th) or during the wet season (i.e. typically October 15th to May 15th, depending on weather conditions), unless waived by the authorized officer. If soil moisture levels would cause the amount of compaction and soil displacement to exceed ten percent or more of the ground-based area (including landings, log decks, and trails), operations would be suspended during unseasonably wet weather in the dry season. The soil scientist and the authorized officer would monitor soil moisture and compaction and displacement to determine when operations may need to be suspended.

Ground-based yarding equipment would be generally limited to slopes less than 35 percent (2001 Plan Maintenance; 2008 APS, pgs. 65-66). The location of landings (including log deck areas and equipment areas), skid trails, and large slash pile areas would be designed such that less than approximately ten percent of the ground-based harvest area would be affected. Ground-based equipment would be confined to designated skid trails and would re-use existing skid trails as much as practical. Skid trails would have an average spacing of at least 150 feet apart. In

addition, machines used for ground-based logging would be limited to a track width no greater than 12 feet.

(1) *Restrictions for Harvester/Forwarder Operations*

Cut-to-length harvesters would delimb the harvested trees in front of the harvester, so that the harvester trails are covered with slash for the machine to walk across, reducing ground pressure, and the potential for compaction. Harvester equipment would be limited to no more than two passes, in and out, over a trail, with spacing of trails at least 50 feet apart, to reduce soil compaction. Cut-to-length forwarder trails would be spaced an average of 100 to 150 feet apart depending on topography (every 2nd or 3rd harvester trail. Harvesters would cut trees so that stumps are no higher than 12 inches above the ground to allow subsoiling excavators to pass over the stumps.

Logging slash would be placed around reserve trees that are within five feet of harvester and forwarder trail segments to protect the large roots at or near the surface. If slash from processed trees is not adequate to cover the harvester and forwarder trails, additional slash would be placed as necessary in the trails in front of the equipment to reduce soil displacement and compaction.

3. Subsoiling

Native surface spur roads, main skid trails, and adjacent landings would be subsoiled (Figures 14 and 15, Appendix G). Logging slash would be placed over subsoiled areas, to replace some of the displaced duff and surface soil organic matter. Any main skid trails that are not subsoiled in Little River MMX would be mapped for later evaluation of subsoiling needs.

4. Timber Hauling

Roads with inadequate rock to support wet season or winter haul have been identified in Tables 4a – 4d. Prior to wet season haul on these roads, either the road surfacing would be improved (e.g. additional rock) or sediment reducing measures (e.g., placement of straw bales and/or silt fences and sediment filters) would be placed near stream crossings, if necessary, to prevent sediment from reaching the streams. Timber hauling would be suspended during wet weather if road run-off would deliver sediment at higher concentrations than existing conditions to the receiving stream.

5. Fuels Treatment

Activity slash at the landings would be machine-piled and burned. On designated roadways, activity slash would be hand-piled and burned. There would be 222 acres of machine-piled and 53.5 acres hand-piled in Little River MMX (Table 3). The fine fuels generated during the thinning process would remain scattered throughout the treatment units.

All prescribed burning (i.e. slash piles) would have an approved "Burn Plan," and be conducted under the requirements of the Oregon Smoke Management Plan and in a manner consistent with the requirements of the Clean Air Act (ODEQ & ODF, 1992).

Slash would be burned during the late-fall to mid-spring season when the soil, duff layer (soil surface layer consisting of fine organic material), and large down log moisture levels are high (1995 ROD/RMP, pg. 140).

Table 3. Hand-piling and Machine-piling of Acvity Fuels in Little River MMX.

Sale	Unit	Township-Range-Section	Acres	Hand-Pile[1] (acres)	Machine-Pile[2] (acres)
Root Canal	17A	T27S-R02W-Sec. 16,17	49	0	5
	17B	T27S-R02W-Sec. 17,20	35	0	4
	18A	T27S-R02W-Sec. 18	16	2.9	2
	21A	T27S-R02W-Sec. 21	29	4.3	3
	21B	T27S-R02W-Sec. 21	5	0	1
	23C	T27S-R03W-Sec. 23	31	2.9	3
	25A	T27S-R03W-Sec. 25	57	0	12
	28A	T27S-R02W-Sec. 28	42	10.7	4
	28B	T27S-R02W-Sec. 28	35	4.1	4
	29A	T27S-R02W-Sec. 29	90	0	18
	30A	T27S-R02W-Sec. 30	112	0	22
	30B	T27S-R02W-Sec. 30	28	0	3
	30D	T27S-R02W-Sec. 30	11	0	1
	32G	T27S-R02W-Sec. 32	6	0	1
	SUB-TOTAL		**546**	**24.9**	**83**
Baker Street	3A	T27S-R03W-Sec. 3	41	3.3	4
	3B	T27S-R03W-Sec. 3	50	4.2	5
	3C	T27S-R03W-Sec. 3	4	0	1
	11A	T27S-R03W-Sec. 11	46	6	5
	11B	T27S-R03W-Sec. 11	51	0	5
	21A	T27S-R03W-Sec. 21	20	4.8	2
	SUB-TOTAL		**212**	**18.3**	**22**
Horseshoe	23A	T26S-R03W-Sec. 23	274	0	54
	25A	T26S-R03W-Sec. 25	12	0	1
	26A	T26S-R03W-Sec. 26	14	0	1
	26B	T26S-R03W-Sec. 26	35	0	4
	27A	T26S-R03W-Sec. 27	38	0	4
	35A	T26S-R03W-Sec. 35	89	0	18
	35B	T26S-R03W-Sec. 35	53	1.7	10
	1B	T27S-R03W-Sec. 1	8	0	1
	1C	T27S-R03W-Sec. 1	19	0	2
	SUB-TOTAL		**542**	**1.7**	**95**
Emile Islands	1A	T27S-R03W-Sec. 1	6	0	1
	1C	T27S-R02W-Sec. 1	28	0	3
	1D	T27S-R03W-Sec. 1	41	0	4
	3A	T27S-R02W-Sec. 3	25	0	3
	3B	T27S-R02W-Sec. 3	21	4.1	2
	5I	T27S-R02W-Sec. 5	48	0	5
	7F	T27S-R02W-Sec. 7	30	4.5	3
	7G	T27S-R02W-Sec. 7	5	0	1
	SUB-TOTAL		**204**	**8.6**	**22**
	TOTAL		**1,504**	**53.5**	**222**

[1]Hand-Piling: acreage was calculated by length of road segment in feet x width of treatment (50 feet) = square feet which was then converted to acres.
[2]Machine-Piling: units under 50 acres = harvest unit acres x 10%; units over 50 acres = harvest unit acres x 20%.

6. Road Activities

The proposed project would include dry season and wet season logging activities and use existing roads to the greatest extent practical. Roads and landings would be located on geologically stable locations; e.g., ridge tops, stable benches or flats, and gentle-to-moderate side-slopes (1995 ROD/RMP, pg. 132). Roads and spurs would be designed no wider than needed for the specific use (i.e. 14 foot running surface) to minimize soil disturbance (1995 ROD/RMP, pg. 132). Approximately 21 acres would be cleared or brushed for spur right-of-ways or roads to access the harvest units.

Road construction, renovation, maintenance, overwintering, and decommissioning would be restricted to the dry season (normally May 15th to October 15th). The operating season could be adjusted if unseasonable conditions occur (e.g. an extended dry season beyond October 15th or wet season beyond May 15th). In-stream work, including culvert replacement and/or installation, would be limited to periods of low or no flow (between July 1st and September 15th).

Road Construction

Approximately 4.28 miles of native surfaced roads and spurs constructed in Little River MMX, which would be decommissioned (described below) following thinning operations. Approximately 1.91 miles of rocked roads would be constructed, 1.84 miles of which would be decommissioned following thinning operations (Tables 4a-4d). New cut and fill slopes would be mulched with weed-free straw, or equivalent, and seeded with a native or sterile hybrid mix.

Spur roads RC 10, RC15, EI8, and EI 10 (Tables 4a, 4d) may be rocked at purchaser's expense. Spurs that are rocked at purchaser's expense would be decommissioned by blocking with trench barriers and water barring. Existing roads may have additional rock placed at the purchaser's expense and would remain open following thinning. Constructed roads and spurs will be placed in dry areas to the extent possible. Spurs going through wet areas may need a rock base placed over filter cloth and rolling dips in order to maintain hydrologic function.

Road Improvement

Approximately 0.85 miles of existing, native surfaced roads would be improved by adding rock to the road surface and by brushing, grading, and replacing drainage structures as needed (Tables 4b, 4c). Road improvement would generally be performed by the purchaser.

Road Maintenance/Renovation

There would be a total of approximately 29.96 miles of renovation of existing roads in Little River MMX. Approximately 3.80 miles of existing, native surfaced roads in Little River MMX would be renovated by brushing, grading, and replacing drainage structures (Tables 4a-4d). Approximately 26.16 miles of existing, rock surfaced roads in Little River MMX would be renovated by brushing, grading, replacing drainage structures, and adding rock where needed (Tables 4a-4d). Road renovation would generally be performed by the purchaser.

Approximately 21.39 miles of existing roads would be maintained. Road maintenance would consist of brushing, grading, maintaining or replacing drainage structures (culverts and drainage ditches), and adding spot rock where needed (1995 ROD/RMP, pgs. 137-138). Road maintenance would generally be performed by the Roseburg BLM District maintenance crew.

Decommissioning

A total of approximately 10.56 miles of roads and spurs would be decommissioned following thinning operations. Approximately 2.01 miles of native surfaced roads and spurs would be decommissioned by water-barring, mulching with logging slash where available (or with straw if logging slash is not available), and blocking with trench barriers (Tables 4a-4d). Approximately 8.55 miles of rock surface roads and spurs would be decommissioned by water-barring and blocking with trench barriers (Tables 4a-4d).

Over-wintering

Over-wintering natural surface spur roads would be done by building, using, and winterizing natural surface spur roads prior to the end of the dry season. Over-wintering would include: installation of waterbars, mulching the running surface with weed-free straw, seeding and mulching bare cut and fill surfaces with native species (or a sterile hybrid mix if native seed is unavailable), and blocking.

Table 4a. Root Canal Roads & Spurs[1]

Spur/Road #	Construction (miles)	Improvement (miles)	Renovation (miles)	Decommission (miles)	Surfacing		Decommissioning
					Existing	Proposed	
27-2-3.1	0	0	0.64	0	Rock	Rock[2]	None
27-2-16.0	0	0	0.01	0	Rock	Rock	None
27-2-20.0	0.08	0	0.50	0	Rock	Rock	None
27-2-20.1	0	0	0.39	0	Rock	Rock	None
27-2-21.5	0	0	0.27	0	Rock	Rock	None
27-2-28.0	0	0	1.10	0	Rock	Rock	None
27-2-28.2	0	0	0.01	0.01	Native	Native	Water Bar, block & mulch
27-2-28.3	0	0	0.35	0	Rock	Rock	None
27-2-29.0	0	0	1.12	0	Rock	Rock	None
27-2-29.1	0	0	0.34	0	Rock	Rock	None
27-2-29.2	0	0	0.09	0	Rock	Rock	None
27-2-30.0	0	0	0.28	0	Rock	Rock[2]	None
27-2-30.3	0	0	0.47	0.47	Native	Native	Water Bar, block & mulch
27-3-14.1	0	0	0.10	0	Rock	Rock	None
27-3-25.0	0	0	0.08	0.08	Native	Native	Water Bar, block & mulch
27-3-25.12	0	0	0.08	0.08	Native	Native	Water Bar, block & mulch
Spur RC2	0.11	0	0	0.11	New	Rock	Water Bar, block
Spur RC 5	0.27	0	0	0.27	New	Native	Water Bar, block & mulch
Spur RC7	0.22	0	0	0.22	New	Native	Water Bar, block & mulch
Spur RC9	0.16	0	0	0.16	New	Rock	Water Bar, block
Spur RC10	0.07	0	0	0.07	New	Native[3]	Water Bar, block & mulch
Spur RC11	0.04	0	0.14	0.18	New	Native	Water Bar, block & mulch
Spur RC 12	0.27	0	0	0.27	New	Native	Water Bar, block & mulch
Spur RC 13	0.26	0	0	0.26	New	Native	Water Bar, block & mulch
Spur RC15	0.07	0	0	0.07	New	Native[3]	Water Bar, block & mulch
Spur RC17	0.25	0	0	0.25	New	Native	Water Bar, block & mulch
TOTAL	**1.79**	**0**	**6.08**	**2.58**			

[1]Approximately 7.25 miles of existing roads would be maintained for Root Canal in addition to the roads and spurs described in the table.
[2] Additional rock needed to support winter haul
[3]Allow purchaser to rock at their expense; block and water bar when harvest complete

Table 4b. Baker Street Roads & Spurs[1]

Spur/Road #	Construction (miles)	Improvement (miles)	Renovation (miles)	Decommission (miles)	Surfacing		Decommissioning
					Existing	Proposed	
27-3-3.0	0	0	0.13	0	Rock	Rock	None
27-3-10.1A-C	0	0	2.61	0	Rock	Rock[2]	None
27-3-10.1D	0	0.08	0	0.08	Native	Rock	Water Bar, block
27-3-11.1	0	0	1.00	0	Rock	Rock	None
27-3-17.0	0	0	1.00	0	Rock	Rock[2]	None
27-3-11.3	0	0	0.38	0.38	Native	Native	Water Bar, block & mulch
Spur BS1	0.29	0	0	0.29	New	Native	Water Bar, block & mulch
Spur BS2	0.08	0	0	0.08	New	Native	Water Bar, block & mulch
Spur BS 3A	0	0.09	0	0.09	Native	Rock	Water Bar, block
Spur BS 3B	0.04	0	0	0.04	New	Rock	Water Bar, block
Spur BS 4	0	0	0.28	0.28	Native	Native	Water Bar, block & mulch
TOTAL	**0.41**	**0.17**	**5.40**	**1.24**			

[1]Approximately 3.67 miles of existing roads would be maintained for Baker Street in addition to the roads and spurs described in the table.
[2] Additional rock needed to support winter haul

Table 4c. Horseshoe Roads & Spurs[1]

Spur/Road #	Construction (miles)	Improvement (miles)	Renovation (miles)	Decommission (miles)	Surfacing		Decommissioning
					Existing	Proposed	
27-3-1.0	0	0	0.09	0	Rock	Rock[2]	None
27-3-1.1	0	0	0.10	0	Rock	Rock[2]	None
27-3-2.0	0	0	0.91	0	Rock	Rock[2]	None
26-3-10.0	0	0.28	0	0	Native	Rock	None
26-3-15	0	0	2.76	0	Rock	Rock[2]	None
26-3-22.0	0	0	1.13	0	Rock	Rock[2]	None
26-3-22.3	0	0	1.27	0	Rock	Rock[2]	None
26-3-23.0	0	0	0.26	0	Rock	Rock[2]	None
26-3-23.0C	0	0	0	0.47	Native	Native	Water Bar, block & mulch
26-3-23.2	0	0	0.20	0.20	Native	Native	Water Bar, block & mulch
26-3-24.1	0	0.40	0	0	Native	Rock	None
26-3-26.0	0	0	0.34	0	Rock	Rock	None
26-3-27.0	0	0	0.32	0	Rock	Rock	None
26-3-34.1	0	0	0.49	0	Rock	Rock[2]	None
26-3-34.1	0	0	0.80	0.80	Native	Native	Water Bar, block & mulch
26-3-35	0	0	0.67	0	Rock	Rock	None
26-3-35.1	0	0	0.92	0	Rock	Rock	None
26-3-35.2	0	0	0.05	0	Rock	Rock	None
26-3-35.3	0	0	0.36	0	Rock	Rock	None
26-3-35.6	0	0	0.64	0	Rock	Rock	None
FIA	0	0	0.34	0	Rock	Rock	None
H1	0.31	0	0	0.31	New	Rock	Water Bar, block
H4	0.31	0	0	0.31	New	Rock	Water Bar, block
H6	0.23	0	0	0.23	New	Rock	Water Bar, block
H8	0.05	0	0	0.05	New	Native	Water Bar, block & mulch
H13	0.09	0	0	0.09	New	Native	Water Bar, block & mulch
H14	0.06	0	0	0.06	New	Native	Water Bar, block & mulch
H15	0.31	0	0	0.31	New	Rock	Water Bar, block
H16	0.09	0	0	0.09	New	Rock	Water Bar, block
H17	0.08	0	0	0.08	New	Rock	Water Bar, block
H18	0.72	0	0	0.72	New	Native	Water Bar, block & mulch
H19	0.34	0	0	0.34	New	Native	Water Bar, block & mulch
H20	0.06	0	0	0.06	New	Native	Water Bar, block & mulch
TOTAL	**2.65**	**0.68**	**11.67**	**4.12**			

[1]Approximately 5.83 miles of existing roads would be maintained for Horseshoe in addition to the roads and spurs described in the table.
[2] Additional rock needed to support winter haul.

Table 4d. Emile Islands Roads & Spurs[1]

Spur/Road #	Construction (miles)	Improvement (miles)	Renovation (miles)	Decommission (miles)	Surfacing		Decommissioning
					Existing	Proposed	
27-2-1.2	0	0	0.30	0	Rock	Rock	None
27-2-6.0	0	0	0.55	0	Rock	Rock	None
27-2-7.0	0	0	0.78	0	Rock	Rock[2]	None
27-2-7.1	0	0	0.90	0	Rock	Rock	None
27-2-7.2	0	0	0.28	0	Rock	Rock	None
27-2-7.3	0	0	1.27	1.27	Native	Native	Water Bar, block & mulch
2700-030 USFS	0	0	0.76	0	Rock	Rock	None
27-2-8.0	0	0	1.21	0	Rock	Rock[2]	None
Seneca Rd	0	0	0.76	0	Rock	Rock[2]	None
Spur EI 2	0.27	0	0	0.27	New	Native	Water Bar, block & mulch
Spur EI 3	0.19	0	0	0.19	New	Rock	Water Bar, block
Spur EI 5	0.21	0	0	0.21	New	Native	Water Bar, block & mulch
Spur EI 6	0.34	0	0	0.34	New	Native	Water Bar, block & mulch
Spur EI 8	0.17	0	0	0.17	New	Native[3]	Water Bar, block & mulch
Spur EI 9	0.09	0	0	0.09	New	Native	Water Bar, block & mulch
Spur EI10	0.08	0	0	0.08	New	Native	Water Bar, block & mulch
TOTAL	**1.34**	**0**	**6.81**	**2.62**			

[1]Approximately 4.49 miles of existing roads would be maintained for Emile Islands in addition to the roads and spurs described in the table.
[2] Additional rock needed to support winter haul
[3] Allow purchaser to rock at their expense; block and water bar when harvest complete.

Sediment Control Plan

In order to minimize or prevent sediment delivery to waters of the United States in compliance with the Clean Water Act of 1972 and its revisions, the following Best Management Practices (BMPs) would be incorporated in to project design and implementation. These BMPs would disconnect road surfaces from drainage ditches to minimize or reduce the conveyance and delivery of sediment to the waters of the United States. It is not intended that all of the BMPs listed will be selected for any specific management action or project site. Each activity is unique, based on site-specific conditions, and the selection of an individual BMP or a combination of BMPs would become the BMP design appropriate for the specific site condition in the project.

- Disconnect the road runoff to the stream channel by outsloping the road approach. If outsloping is not possible, use runoff control, erosion control and sediment containment measures. These may include using additional cross drain culverts, ditch lining, and catchment basins. Minimize ditch flow conveyance to stream through cross drain placement above stream crossing.

- Locate cross drains to prevent or minimize runoff and sediment conveyance to wetlands, riparian management areas, floodplains and waters of the state. Implement sediment reduction techniques such as settling basins, brush filters, sediment fences and check dams to prevent or minimize sediment conveyance.

- Space cross drain culverts at intervals sufficient to prevent water volume concentration and accelerated ditch erosion.

- Install underdrain structures when roads cross or expose springs, seeps, or wet areas rather than allowing intercepted water to flow down gradient in ditchlines.

- Effectively drain the road surface by using crowning, insloping or outsloping, grade reversals (rolling dips) and waterbars or a combination of these methods. Avoid concentrated discharge onto fill slopes unless the fill slopes are stable and erosion proofed.

- Locate surface water drainage measures (e.g., cross drain culverts, rolling dips, water bars) where water flow will be released on convex slopes or other stable and non-erosive areas that will absorb road drainage and prevent sediment flows from reaching wetlands, floodplains and waters of the state. Where possible locate surface water drainage structures above road segments with steeper downhill grade.

- Discharge cross drain culverts at ground level on non-erodible material. Install downspout structures and/or energy dissipaters at cross drain outlets or drivable dips where water is discharged onto loose material, erodible soils, fills, or steep slopes.

- Use slotted risers, over-sized culverts or build catch basins where floatable debris or sediments may plug cross drain culverts.

- Prior to the wet season, provide effective road surface drainage through practices such as machine cleaning of ditches, surface blading including berm removal, constructing sediment barriers, cleaning inlets and outlets.

- Avoid undercutting of cut-slopes when cleaning ditchlines.

- Retain ground cover in ditchlines, except where sediment deposition or obstructions require maintenance.

- Apply native seed and certified weed free mulch to cut and fill slopes, ditchlines, and waste disposal sites with the potential for sediment delivery to wetlands, riparian management areas, floodplains and waters of the state. Apply upon completion of construction and as early as possible to increase germination and growth. Reseed if necessary to accomplish erosion control. Select seed species that are fast growing, have adequate germination and provide ample ground cover and soil-binding properties. Apply mulch that will stay in place and at site specific rates to prevent erosion.

- Inspect and maintain culvert inlets and outlets, drainage structures and ditches before and during the wet season to diminish the likelihood of plugged culverts and the possibility of washouts.

- On active haul roads, during the wet season, use durable rock surfacing and sufficient surface depth toresist rutting or development of sediment on road surfaces that drain directly to wetlands, floodplains and waters of the state.

- Suspend commercial use where the road surface is deeply rutted or covered by a layer of mud or when runoff from the road surface is causing a visible increase in stream turbidity in the receiving stream.

- Do not allow wet season haul on natural surface roads or high sediment producing surfaced roads without practicable and effective mitigation.

D. Additional Project Design Features of the Action Alternative

1. Cultural Resources:

If any objects of cultural value (e.g. historic or prehistoric ruins, graves, fossils, or artifacts) are found during the implementation of the proposed action, operations would be suspended until the site has been evaluated to determine the appropriate mitigation action.

2. Noxious Weeds:

Manual, mechanical, or chemical treatments would be used to manage invasive plant infestations. Known infestations of, Scotch broom and Himalayan blackberry would be treated prior to thinning operations by the BLM.

Logging and road construction equipment would be required to be cleaned, with a pressure washer, and free of weed seed prior to entering BLM lands (BLM Manual 9015-Integrated Weed Management).

3. Special Status Plants and Animals:

Federally listed (Threatened or Endangered), or proposed, plants and animals and their habitats would be managed to achieve their recovery in compliance with the Endangered Species Act, approved recovery plans, and bureau special status species policies (1995 ROD/RMP, pg. 41). Bureau Sensitive species and their habitats would be managed so as not to contribute to the need to list, and to recover the species (1995 ROD/RMP, pg. 41).

If during implementation of the proposed action, any Special Status Species are found that were not discovered during pre-disturbance surveys; operations would be suspended as necessary and appropriate protective measures would be implemented before operations would be resumed.

Northern Spotted Owl (Federally Threatened Species)

Suitable spotted owl (*Strix occidentalis*) habitat is present within 65 yards of all Baker Street units except unit 21A; all Root Canal units except 18A, 25A, 28A, and 32G; all Horseshoe units except 1B and 1C; and all Emile Islands units except 1A (Figures 10-13, Appendix G). The entire project area, except for Baker Street unit 21A, has received at least one year of protocol spotted owl surveys and portions have received two or more consecutive years of protocol surveys. Based on current survey data, no spotted owl activity centers are located within 65 yards of any Little River MMX proposed units.

If future surveys locate a spotted owl, operations within applicable disruption threshold distances (e.g. 65 yards for harvest activities and 440 yards for prescribed burning) would be prohibited

from March 1st to July 15th, both days inclusive. This restriction could be waived until March 1st of the following year if surveys indicate owls are not nesting or have failed in a nesting attempt.

Peregrine Falcon (Bureau Sensitive Species)
A peregrine falcon (*Falco peregrinus*) eyrie is located in T. 27 S., R 3 W., Section 24 (Figure 16, Appendix G), of the Root Canal timber sale. Root Canal Units 18A and 23C fall within a one (1.0) mile protection buffer. A portion of Root Canal Unit 18A falls within a one-half (0.5) mile protection buffer.

A second peregrine falcon eyrie is located in T. 27 S., R 2 W., Section 6, near the Emile Islands and Horseshoe timber sales. Emile Islands Units 1A, 1D, 7F, 7G, 5I and Horseshoe Units 1C and 1B fall within a one (1.0) mile protection buffer. A portion of Emile Islands Unit 1A falls within a one-half (0.5) mile protection buffer.

A third potential peregrine falcon territory may be located in T. 27 S., R 2 W., Section 16 of the Root Canal timber sale. If a nest is confirmed, Root Canal Units 17A, 17B, and 21A would fall within a one mile protection buffer. Unit 17A would fall within a one half mile protection buffer. Surveys are planned to continue in 2012 to attempt to determine whether a nest exists or not.

The units within the one (1.0) mile protection buffer would be seasonally restricted from February 1st through August 15th, both days inclusive, for all harvest activities (e.g. falling, bucking, and yarding of timber), except hauling, to minimize visual and noise disturbance to the peregrine falcon (Cade and Enderson, 1996, pg. 68).

To avoid disturbance within the immediate vicinity of the peregrine site located in T. 27 S., R 3 W., Section 24, trucks/ vehicles may not stop along haul route on the 27-2-19.0 road within Section 24.

4. Petroleum Products or other Hazardous Material

The operator would be required to comply with all applicable State and Federal laws and regulations concerning the storage, use and disposal of industrial chemicals and other hazardous materials. All equipment planned for in-stream work (e.g. culvert replacement) would be inspected beforehand for leaks. Accidental spills or discovery of the dumping of any hazardous materials would be reported to the Authorized Officer and the procedures outlined in the "*Roseburg District Hazardous Materials (HAZMAT) Emergency Response Contingency Plan*" would be followed.

Hazardous materials (particularly petroleum products) would be stored in appropriate and compliant Underwriter's Laboratory (UL) listed containers and located so that any accidental spill would be fully contained and would not escape to ground surfaces or drain into watercourses. Other hazardous materials such as corrosives and/or those incompatible with flammable storage shall be kept in appropriate separated containment. All construction materials and waste would be removed from the project area.

E. Alternatives Considered but Not Analyzed in Detail

1. Additional Little River MMX Units

An alternative was considered that included additional units in Root Canal (Units 32A and 32B), Horseshoe (Units 21D and 21E), Emile Islands (Unit 7H), and an additional timber sale, Jungle Jim (Units 9F, 9H, 21C, 21D and 21E). These additional units are forest stands approximately 35-70 years old and totaled approximately 241 acres.

- Root Canal Units 32A and 32B have difficulties in establishing a reasonable haul route (e.g. steep slopes and and road junctions that cannot be reasonably made with a log truck) and Unit 32B additionally would have low estimated thinning volume available (8.6 MBF per acre).
- Horseshoe units 21D and 21E have legal access issues and are not currently accessible to the BLM for the proposed timbersale.
- Emile Islands Unit 7H would need a spur road constructed through a stand of 200 year old, suitable northern spotted owl habitat to gain access to the unit.
- Jungle Jim Units 9F, 9H, 21C, 21D and 21E currently have low standing volume (17.6-25.4 MBF per acre) and would have low estimated thinning volume available (3.5-6.0 MBF per acre). These units are not ready for thinning now and would seem better suited for a thinning treatment in approximately 10 years.

Consequently, these additional 10 units (241 acres) were deferred from further analysis in the Little River MMX EA for the reasons above.

2. Helicopter Yarding

An alternative was considered by the interdisciplinary team that would use helicopter (aerial) yarding and less road construction in lieu of ground-based and cable yarding. However, typical expenses for helicopter yarding are approximately $400 per 1,000 board feet (1MBF) in contrast to the cost for ground-based yarding systems and cable-yarding systems. In previous analyses done by the Swiftwater Field Offcie, the monetary expense for ground-based and cable yarding systems was estimated to be $102-$191 per 1MBF (Johnson Cleghorn Thinning EA, NEPA #: DOI-BLM-OR-R040-2011-011-EA, pg. 91). The logs that would be expected from the Little River MMX project would have an estimated pond-value of approximately $520-535 (3rd Quarter 2011 2S-3S Douglas-fir from Oregon Department of Forestry at http://oregon.gov/ODF/STATE_FORESTS/TIMBER_SALES/logpage).

Based on these expenses and values, extensive use of helicopter yarding would not produce an economically viable timbersale and it would therefore be unlikely that helicopter yarding of these units would be accomplished without the costs being subsidized by the government. Consequently, the use of helicopter yarding was not analyzed further in the Little River MMX EA due to economic reasons.

Chapter 3. Affected Environment & Consequences by Resource

This chapter discusses the specific resources potentially affected by the alternatives and the direct, indirect and cumulative environmental effects of the alternatives over time. Cumulative effects are the impacts of an action when considered with past, present, and reasonably foreseeable future actions (40 CFR 1508.7). This discussion is organized by individual resource, and provides the basis for comparison of the effects between alternatives.

The cumulative effects of the BLM timber management program in western Oregon have been described and analyzed in the 1994 *Final - Roseburg District Proposed Resources Management Plan / Environmental Impact Statement* (1994 PRMP/EIS), incorporated herein by reference.

A. Forest Vegetation

1. Affected Environment

Stand ages in the proposed Little River MMX units range from 35-62 years old. Stand boundaries were determined from the Forest Operation Inventory (FOI). Stand ages were derived from stand exam information collected using the FOI boundaries. Breast height ages were sampled on dominant trees. Typically one tree per two acres was sampled. Total age was calculated by ORGANON using the breast height age and adjusting it to calculate how long that tree took to get to breast height 4.5 feet off the ground based on site productivity class. An average of the sample trees determined the stand age.

The proposed units are predominantly Douglas-fir (*Pseudotsuga menziesii*) forested stands with other conifer species present in the stands including incense-cedar (*Calocedrus decurrens*), western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*), sugar pine (*Pinus lambertiana*), and grand fir (*Abies grandis*). Hardwoods and ground vegetation are common where there is sufficient light available (e.g. Pacific madrone [*Arbutus menziesii*], chinquapin [*Chrysolepis hjelmquist*], bigleaf maple [*Acer macrophyllum*], red alder [*Alnus rubra*], salal [*Gaultheria shallon*], Oregon-grape [*Mahonia sp.*], and sword fern [*Polystichum munitum*]). All of the proposed units were originally harvested in the 1950's or 1960's. Seventy-five percent of the stands had been pre-commercial thinned and ten percent of the stands had fertilization treatments. Stand 21A in Baker Street was under burned when a large fire went through the area in the mid-1980's. The fire scarred trees are in variable densities throughout the stand. The stands are classified as late-seral stage by the 1995 ROD/RMP (pg. 112); i.e. a stand from first merchantability to culmination of mean annual increment, or to 100 years of age. Current stand relative densities exceed or are near suppression related mortality thresholds (Curtis, 1982).

Mature sugar pine trees in the area have exhibited increasing amounts of mortality by mountain pine beetle (*Dendroctonus ponderosae,* Hopkins) infections. Prolonged drought, top and branch killing by white pine blister rust, and unfavorable stand conditions are major predisposing factors. Excessive competition between sugar pines and surrounding trees as a result of overstocking appears to be particularly significant in susceptibility to infections (Goheen, 1998). Units 1A and 3A in Emile Islands contain sugar pine trees and are 180 square feet of basal area or greater . Surveys indicate that Emile Islands Unit 1A has 18 sugar pines and Unit 3A has one sugar pine.

Stand specific inventories (stand exams) were used to identify current vegetation stand attributes for each area. Proposed units may contain one or more stands mapped in the District's forest

operations inventory (FOI), and may contain a mix of tree species, form, and distribution. The current stand conditions for the Little River MMX project are summarized below in Table 5.

Table 5. Current Stand Conditions in Little River MMX.

Sale	Stand Age (years)	Trees Per Acre[1]	Basal Area[1] (square feet)	Quadratic Mean Diameter[1] (inches)	Curtis Relative Density[1]	Canopy Cover[1,2] (%)	Live Crown Ratio[1] (%)
Baker Street	38-48	146-238	120-180	11.4-14.2	0.38-0.59	78-85	41-56
Horseshoe	41-61	125-222	120-335	11.6-18.0	0.43-0.92	73-100	31-52
Root Canal	35-56	88-392	80-240	9.7-15.1	0.25-0.8	65-100	34-58
Emile Islands	44-62	142-301	155-250	10.5-14.1	0.47-0.78	84-100	31-50
RANGE	***35-62***	***88-392***	***80-335***	***9.7-18.0***	***0.25-0.92***	***65-100***	***31-58***

[1] Data shown are for trees 6 inches dbh and larger.
[2] *Canopy Cover* is the proportion of the forest floor covered by the vertical projection of tree crowns adjusted for crown overlap.

2. No Action Alternative

In the absence of treatment, canopy cover would remain high, relative density would increase and the crowns of individual trees would continue to recede (Chan *et al*. 2006), resulting in increased suppression mortality and decreasing diameter growth as trees compete for water, nutrients, and sunlight (Oliver and Larson, 1996). Merchantable board foot production would be high (Curtis and Marshall, 1986). Table 6 (below) displays the predicted conditions of the stand in Little River MMX in 50 years in the absence of thinning.

High height to diameter ratios (≥ 80-100) can predispose trees to stem bending, windsnap, and windthrow. As trees increase in height, with little increase in diameter, they become unstable and more susceptible to damage (Wonn and O'Hara, 2001; Oliver and Larson, 1996). Within a few decades it is expected that trees within unharvested areas would exceed the above thresholds and become less resistant to stem bending, windsnap, and windthrow.

Inter-tree suppression or *regular* mortality would occur primarily in the smaller size classes of trees and would be the main source for passive snag and coarse woody debris recruitment. However, non-suppression *irregular* mortality from insects, disease, windthrow and stem breakage can occur across all crown classes at any age. As the stand ages, regular mortality from inter-tree competition would become less significant and irregular mortality factors would become more important (Oliver and Larson, 1996). Mortality is the source of snags and down wood. Since trees would not be removed under the *No Action Alternative*, this alternative would produce the highest amount of dead wood through passive recruitment, compared to the *Proposed Action Alternative*.

Based on ORGANON modeling, it is predicted that within the first two decades (0-20 years from now), approximately 27 trees per acre over six inches dbh would be dead within the proposed project area. The following three decades (21-50 years from now) are predicted to add another 34 dead trees per acre over six inches dbh. These dead trees would eventually fall and become coarse woody debris.

Shrub density and cover can be expected to remain stable in the short term (Chan *et al*., 2006). Long-term, shrubs and tolerant tree species (e.g. hemlock) would gradually increase as understory light increases due to receding overstory tree crowns and tree mortality (Oliver and Larson, 1990).

Live crown ratios of the overstory trees would continue to decrease from current levels as lower limbs are shaded out and die. Closely spaced trees with small crown ratios have reduced photosynthetic capacity, which results in decreased diameter growth and lower resistance to disease and insects. As trees increase in height, with little increase in diameter, they become unstable and more susceptible to wind damage (Oliver and Larson, 1996). Sugar pines within this project area may be at risk for insect infestation as research has shown pines to be at risk of bark beetle attack when basal areas are greater than 180 square feet per acre on good sites in Southwestern Oregon (Mallams, 2008)

A typical stand for each sale was selected and grown out 50 years. Current stand exam data was input into the ORGANON growth and yield model version 8.2. Table 6 (below) displays the predicted conditions of the stands in Little River MMX in 50 years in the absence of thinning.

Table 6. Stand Conditions in 50 Years under the *No Action Alternative* in Little River MMX.

Sale	Trees Per Acre[1]	Basal Area[1] (sq. ft./acre)	Quadratic Mean Diameter[1] (inches)	Curtis Relative Density[1]	Canopy Cover[1,2] (%)
Baker Street	140	320	20.4	0.83	94
Horseshoe	131	345	22.0	0.88	92
Root Canal	258	340	15.6	0.99	100
Emile Islands	194	330	17.7	0.91	87
RANGE	***131-258***	***320-345***	***15.6-22.0***	***0.83-0.99***	***87-100***

[1] Data shown are for trees 6 inches dbh and larger.
[2] *Canopy Cover* is the proportion of the forest floor covered by the vertical projection of tree crowns adjusted for crown overlap.

Note: Attributes are exemplified by a typical stand for each sale.

3. Proposed Action Alternative

Thinning increases tree diameter growth compared to unthinned controls. Diameter growth increases of 33-56 percent resulting from thinning over a twenty year period have been observed on very productive (SI_{50} >135) sites (Marshall *et al*., 1992). A retrospective study of 40-100 year-old stands which had previously been commercially thinned found that radial growth rates averaged about 36 percent greater in the thinned stands compared to unthinned stands at 10 to 23 years post-thinning (Bailey and Tappeiner, 1998).

Thinning can increase live crown ratios (Oliver and Larson 1996), maintain live crown ratios (Chan *et al*., 2006), or reduce the rate of live crown recession (Marshall and Curtis, 2002). Maintenance of live crown ratios greater than 30 percent prevents a substantial reduction in vigor and diameter growth (Smith 1962). Thinning can also result in an increase in crown ratio through

stimulation of epicormic branching in species such as Douglas-fir, true firs, and big-leaf maple (Tappeiner *et al*., 2007). Generally, trees selected for retention in Little River MMX would have at least a 30 percent live crown ratio. Trees with at least a 30 percent live crown ratio would be more likely to develop deeper crowns (i.e. increase live crown ratio) and accelerate diameter growth in response to thinning (Daniel, *et al*. 1979).

Thinned overstory canopy cover closes at a rate of about one percent a year based on simulation outputs. Canopy closure measured as skylight through the canopy decreases by two percent per year (Chan *et al*., 2006).

Thinning may stabilize or prevent height to diameter ratios from increasing above thresholds that predispose the stand to stem bending, windsnap, and windthrow (Wonn and O'Hara, 2001; Oliver and Larson, 1990). Thinning would also reduce stand susceptibility to disturbances such as wildfire, disease, or insect infestation (Fettig, 2006).

Thinning provides intermediate timber volume and revenue (Daniel *et al*., 1979).

Thinning may initially reduce the cover of shrubs and herbaceous vegetation due to disturbance caused by harvesting activities. However, cover and plant diversity would be expected to increase following thinning activities to levels beyond pre-treatment conditions (Chan *et al*., 2006; Bailey *et al*., 1998).

Natural regeneration of tree species is common after thinning, depending on availability of seed and other factors. Distribution and density are highly variable (Chan *et al*., 2006; Nabel, 2008). Seedling density and distribution generally increases with increasing intensity of thinning (Bailey and Tappeiner 1998; Nabel, 2008).

Variable-density thinning has been suggested as a method to promote the development of diverse, structurally complex stands through the manipulation of young even-aged stands (Carey, 2003).

The proposed spatial configuration of the different treatment intensities are depicted in Figures 6-9 (Appendix G). Uplands represented in the maps show the GFMA or AMA Land Use Allocations.

Under the Proposed Action Alternative, thinning would reduce relative densities to approximately 0.22 – 0.46 (Table 7). Stands that are lightly thinned to a relative density of 0.30-0.40 would produce moderately-high volume growth rates at the expense of individual tree diameter growth rates (Curtis and Marshall, 1986). Based on previous analysis by the Roseburg District, growth simulations of stands for 100 years post-thinning predict that merchantable board foot volume production is not substantially different than that of an unthinned stand at the end of that time period (from Johnson Cleghorn Thinning EA, pg. 33; NEPA# DOI-BLM-OR-R040-2011-011-EA). A single light thinning offers minimal opportunity to create diverse, multi-storied (i.e. layered structure) stands. Understory conifer and hardwood species vigor and survival would diminish as the overstory canopy closes (Chan *et al*., 2006; Cole and Newton, 2009).

Stands that are moderately thinned to relative density of 0.15-0.25 would produce high rates of diameter growth at the expense of volume production (Curtis and Marshall, 1986). It is uncertain that the overstory in moderately thinned stands would remain open enough without additional thinnings to maintain light levels that provide an environment conducive to the long-term survival and growth of understory vegetation that would produce a layered structure (Chan *et al*., 2006; Newton and Cole, 2009). There is some empiric evidence that development and persistence of a

layered structure is possible with a single moderate thinning combined with planting of a shade tolerant species for at least 50 years after thinning (Tappeiner *et al*. 2007).

Table 7. Immediate Post-Treatment Stand Conditions in Little River MMX.

Sale	Treatment (Upland or Riparian)	Trees Per Acre[1]	Basal Area[1] (sq. ft./acre)	Quadratic Mean Diameter[1] (inches)	Curtis Relative Density[1]	Canopy Cover[1,2] (%)	Live Crown Ratio[1] (%)
Baker Street	Upland	109-157	120	11.8-14.2	0.36-0.39	70-80	41-56
	Riparian	73-113	70-80	11.4-14.2	0.22-0.26	49-66	41-56
Horseshoe	Upland	68-164	120	11.6-18.0	0.33-0.46	60-80	31-52
	Riparian	45-109	80	11.6-18.0	0.22-0.26	40-63	31-52
Root Canal	Upland	125-233	120	9.7-13.3	0.37-0.34	50-86	34-58
	Riparian	64-156	80	9.7-15.1	0.24-0.28	59-72	34-58
Emile Islands	Upland	101-200	90-120	10.5-14.1	0.28-0.41	61-77	31-50
	Riparian	74-134	80-90	10.5-14.1	0.24-0.28	51-62	31-50
RANGE	Upland	68-233	90-120	9.7-18.0	0.28-0.46	50-86	31-58
	Riparian	45-156	70-90	9.7-18.0	0.22-0.28	40-72	31-58
	Overall	***45-233***	***70-120***	***9.7-18.0***	***0.22-0.46***	***40-86***	***31-58***

[1] Data shown are for trees 6 inches dbh and larger.
[2] *Canopy Cover* is the proportion of the forest floor covered by the vertical projection of tree crowns adjusted for crown overlap.

A reduction in stand density (such as with thinning) involves the tradeoff between maintaining or improving individual tree growth rates and reducing the accumulation of dead trees (such as snags and down wood) while promoting understory growth and a multi-layered stand structure. Even though the proposed action would capture most of the suppression mortality by harvesting, trees would continue to die due to competition and other factors. Based on ORGANON modeling, it is predicted that within the first two decades (0 – 20 years following thinning), approximately nine trees per acre over six inches DBH would be dead within the proposed project area. The following three decades (21 – 50 years following thinning) are predicted to add another 12 dead trees per acre over six inches DBH. These dead trees would eventually fall and become coarse woody debris.

Though fewer snags would develop over time when compared to the *No Action Alternative*, the snags developed post treatment are expected to be larger snags with more resiliency and limb structure (Reukema and Smith, 1987) than snags that develop under a more competitive stand condition (Nietro, 1985). As stated previously (*Treatment Prescription: Snags & Coarse Woody Debris*, pg. 10), conifer and hardwood snags 10 inches or larger in dbh and at least 16 feet in height would be marked for retention. Existing coarse woody debris in decay classes 3, 4, and 5 would be retained in AMA and GFMA lands, and all coarse woody debris would be retained in the Riparian Reserve (q.v., pg. 10).

Table 7 (above) shows the stand conditions in Little River MMX immediately following harvest and the stand conditions predicted to develop after 50 years are displayed in Table 8 (below).

Table 8. Stand Conditions in 50 Years under the *Proposed Action Alternative* in Little River MMX.

Sale	**Treatment** (Upland or Riparian)	**Trees Per Acre**	**Basal Area** (sq. ft./acre)	**Quadratic Mean Diameter** (inches)	**Curtis Relative Density**	**Canopy Cover**[1] (%)
Baker Street	Upland	120	295	21.2	0.76	91
	Riparian	85	230	22.3	0.58	81
Horseshoe	Upland	81	245	23.5	0.60	78
	Riparian	56	180	24.4	0.44	67
Root Canal	Upland	128	255	19.1	0.68	87
	Riparian	94	195	19.6	0.52	77
Emile Islands	Upland	95	240	21.6	0.62	80
	Riparian	68	180	22.2	0.46	71
RANGE	Upland	81-128	240-295	19.1-23.5	0.60-0.76	80-91
	Riparian	56-94	180-230	19.6-24.4	0.44-0.58	67-81
	Overall	***56-128***	***180-295***	***19.1-24.4***	***0.44-0.76***	***67-91***

[1] *Canopy Cover* is the proportion of the forest floor covered by the vertical projection of tree crowns adjusted for crown overlap.

B. Wildlife

1. Northern Spotted Owl

The northern spotted owl is present throughout the Roseburg District, inhabiting forests older than 80 years of age that provide habitat for nesting, roosting and foraging, commonly referred to as suitable habitat. Spotted owl habitat is categorized into three types: 1) suitable, 2) roosting and foraging, and 3) dispersal. As defined by Thomas *et al*. (1990), structural components that distinguish superior suitable spotted owl habitat from less suitable habitat include:

- a multi-layered, multi-species canopy dominated by large (>30 inches in diameter at breast height) conifer overstory trees, and an understory of shade-tolerant conifers or hardwoods;
- a moderate to high (60 to 80 percent) canopy closure;
- substantial decadence in the form of large, live coniferous trees with deformities – such as cavities, broken tops, and dwarf mistletoe infections;
- numerous large snags;
- ground-cover characterized by large accumulations of logs and other woody debris;
- canopy that is open enough to allow owls to fly within and beneath it.

Roosting and foraging habitat contains (FR 73; 47347-47348):

- moderate to high canopy closure (60 to 80 percent);
- a multi-layered and multi-species canopy;
- large accumulations of fallen trees and other woody debris on the ground;
- open space below the canopy for spotted owls to fly;
- lacks nesting structure.

Forest types described as dispersal habitat are essential to the dispersal of juvenile and non-territorial (e.g. single birds) northern spotted owls. Dispersal habitat can occur in intervening areas between or within blocks of nesting, foraging, and roosting habitat. Although suitable habitat also functions as dispersal habitat, these terms are used separately.

Thomas *et al.* (1990) defines dispersal habitat as conifer-dominated forest stands with canopy closures of 40 percent or greater and an average diameter at breast height of 11 inches or greater. Younger, conifer-dominated forest stands, 40 to79-years old provide dispersal habitat. Dispersal habitat may contain snags, coarse woody debris, and prey sources that allow owls to move and forage between blocks of suitable habitat (USDI USFWS, 2009). Dispersal habitat is essential to the movement of juvenile and non-territorial (e.g. single birds) northern spotted owls enabling territorial vacancies to be filled, and to providing adequate gene flow across the range of the species (USDI USFWS, 2008b). A canopy cover of 60-80 percent would provide roosting habitat conditions to provide for thermoregulation, shelter and cover to reduce predation risks while resting or foraging.

Habitat use by spotted owls is influenced by prey availability (Ward, 1990; Zabel *et al.,* 1995). The composition of the spotted owl's diet varies geographically and by forest type, but is primarily comprised of small mammals. Flying squirrels (*Glaucomys sabrinus*) are the most prominent prey for spotted owls in Douglas-fir and western hemlock (*Tsuga heterophylla*) forests (Forsman *et al*.1984), while woodrats *(Neotomas pp.*) are a major part of the diet in the Oregon Klamath province (Forsman *et al*. 1984; 2004; Ward *et al.* 1998).

Both flying squirrels and woodrats are present and likely are the key prey species for spotted owls in the Action Area. Flying squirrels are associated with several habitat components within

forests, including: high canopy cover; large trees, snags and coarse woody debris; abundant coarse woody debris; understory cover; patch-level changes in vegetation composition; and availability of fungi (Wilson, 2008). Woodrats, as well other prey species (i.e. brush rabbits and other rodents) are primarily associated with early-and mid-seral forest habitat (Maser *et al*. 1981, Sakai and Noon 1993, Carey *et al*. 1999).

a) Affected Environment

The extent of the analysis area for the northern spotted owl is defined by a 1.2-mile radius polygon around proposed timber sale units. The analysis area covers approximately 59,340 total acres, of which 26,715 acres (45 percent) are on Federal lands. There is no Critical Habitat as designated in 2008 (Fed. Register; Vol. 73 No. 157; Aug. 13, 2008; pgs. 47326-47374) within the spotted owl analysis area. There are 5,660 acres (21 percent) of spotted owl suitable habitat and 4,890 acres (18 percent) of dispersal habitat on Federal land within the analysis area (Figures 10-13, Appendix G).

Within the analysis area, historical annual surveys for spotted owls were completed from the mid 1980's thru the late 1990's. There was a survey gap at most sites during years 2000 thru 2006. Most recent surveys have been completed from 2007-2011 within the analysis area. Based on historical and current survey data, there are 14 known spotted owl sites within 1.2 miles of the proposed action area, which includes 23 activity centers (Figures 10-13, Appendix G). For the analysis of effects to owls and their habitat in the Little River MMX project area, only the most recently occupied activity centers and their corresponding home range circles were considered to determine habitat impacts for each owl site (Table 9).

Table 9 summarizes the status of each spotted owl site within the action area including survey history, last documented occupancy, reproduction, and barred owl status. There are 14 spotted owl sites present within the analysis area. 12 of the 14 spotted owl sites were established based on observations of spotted owl pairs. The remaining two sites were established based on two or more observations of a single resident adult spotted owl in a given year; spotted owl pairs have not been observed at either of these two sites (Cavitt Creek; IDNO 1549O and Lower Jim Creek; IDNO 2154O).

The Jim Creek activity center is located on private lands and was harvested in the 1990's and this activity center is not analyzed in detail. Of the 12 owl sites with documented pair status, eight sites have been occupied by spotted owls for at least one year during years 2007 thru 2011, of which reproduction was determined at six of those occupied sites. In addition, barred owls have been present at ten of the fourteen sites, of which four of these sites have documented occupancy and reproduction by spotted owls within the last five years. The presence of barred owls either causes effects to detectability rates during surveys and/or causes social instability among spotted owl pairs, thus affecting occupancy, reproduction, and survival at these sites (Olson *et al.*, 2005; Pearson and Livezey, 2003).

Table 9. Site Status for Northern Spotted Owls within the Action Area.

Spotted Owl Site (IDNOs within the analysis area)	Site Survey History	Site Status (2007 -2011)	Year of Last Known Pair Status (IDNO)	Year of Last Known Nesting (IDNO)	Year of Last Known Reprod. (IDNO)	Barred Owl Status (IDNO)	
						First Year Detected	Last Year Detected
Britt Creek (2143O, A)	1990-1996 2009-2011	Unoccupied (2009-2010) Single (2011)	1991 (2143A)	1991 (2143A)	1991 (2143A)	1992 Single	2010
Cavitt Creek (1549O)	1983-1992 2009-2011	Unoccupied	1985	None	None	None	None
Emile Creek (0509O, A-B)	1986-1998 2006-2011	Single (2007) Pair (2010-11)	2011 (0509A)	2010 (0509A)	2010 (0509A)	2007 (0509A)	2010 (0509O)
Engles Creek (2104O, A)	1989-1991 2004-2011	Unoccupied	1995 (2104A)	1994 (2104A)	1994 (2104A)	1997 (2104A)	2011 (2104O) Pair
Evarts Creek (0291O, A)	1987-1999 2008-2011	Pair (2008) Single (2011)	2008 (0291O)	2008 (0291O)	2008 (0291O)	2009 (0291A) Pair	2011 (0291O) Single
Greenman Creek (2532O)	1991-1998 2006-2011	Pair (2007-2009)	2009 (2532O)	1991 (2532O)	1991 (2532O)	1992 (2532O)	2011 (2532O) Single
Green Thunder (3099O)	1992-1997 2006-2011	Unoccupied	1993 (3099O)	None	None	1994 (3099A)	2011 (3099O) Pair
Leaping Wolf (2155O, A-B)	1989-1999 2009-2011	Pair (2009-2011)	2011 (2155O)	2010 (2155C)	2010 (2155C)	2009 (2155O)	2011 (2155O) Pair
Little Cavitt (4017O, A)	1993-1999 2010-2011	Pair (2010)	2010 (4017A)	2010 (4017A)	2010 (4017A)	2011 (4017O)	2011 (4017O) Single
Lookout Canyon (4015O)	1993-1998 2006-2011	Single (2007) Pair (2011)	2011 (4015O)	None	None	None	None
Lower Jim creek (2154O)	1989-1997 2008-2011	Unoccupied	None(site established based on resident female)	None	None	2009 (2154O)	2009 (2154O) Single
McKay Creek (4012O)	1994-1997 2010-2011	Pair (2010)	2010 (4012O)	2010 (4012O)	2010 (4012O)	None	None

Spotted Owl Site (IDNOs within the analysis area)	Site Survey History	Site Status (2007 -2011)	Year of Last Known Pair Status (IDNO)	Year of Last Known Nesting (IDNO)	Year of Last Known Reprod. (IDNO)	Barred Owl Status (IDNO)	
						First Year Detected	Last Year Detected
Red Pond (0360O)	1993-1997 2010-2011	Pair (2010-2011)	2011 (0360O)	2010 (0360O)	2010 (0360O)	None	None
Swift Cougar (2152O)	1989-2000 2006 2010-2011	Unoccupied	2000 (2152O)	1999 (2152O)	1999 (2152O)	2006 (2152A)	2011 (2152A) Pair

Disturbance/Disruption – Noise, human intrusion, and mechanical movement associated with an action are likely to cause some form of disruption or disturbance to the normal behavioral patterns of nesting, spotted owls. "Disruption" occurs closest to the nest and may cause a measurable change in nesting behavior (i.e. flushing from a nest or cause a feeding attempt to fail). Thus, the disruption threshold is the distance within which activities occurring during the critical breeding period could significantly disrupt the normal behavior pattern of individual animals or breeding pairs and could create a likelihood of injury (USDI 2004b:51). "Disturbance" occurs further from the nest site and the disturbance threshold is the distance within which the effects to spotted owl nesting behavior from noise, human intrusion, and mechanical movement associated with an action would be expected to be "discountable" or "insubstantial."

The closest spotted owl activity center (Cavitt Creek; IDNO 1549O) is currently located within the boundary of Baker Street unit 11A (Figure 11, Appendix G). However, historical survey data from 1983-1992 indicates no spotted owl pairs have been documented there since 1985 and nesting has never been documented. More recent surveys conducted from 2008-2011 have shown the site to be unoccupied by spotted owls. Therefore, disruption to nesting spotted owls would not occur at the Cavitt Creek activity center because none are known to be present based on the survey history at this site.

The other 13 activity centers are currently located approximately 202 to 2,435 yards (0.10 to 1.38 miles) away from proposed unit boundaries. Because the known sites are located outside of the disruption distance-thresholds (e.g. 65 yards), there would be no seasonal restriction requirements for harvest operations occurring during the spotted owl critical breeding season (March 1st-July 15th).

Known Owl Activity Centers (KOAC) – Known Owl Activity Centers have been designated to minimize impacts and protect nest sites found before 1994 (1995 ROD/RMP; pg. 48). There are nine KOACs located within the proposed project area, of which one KOAC will be treated under the proposed *Action Alternative*. There are 86 acres, including 50 acres of dispersal habitat and 36 acres of suitable habitat, within the KOAC associated with the Lower Jim Creek (IDNO 2154O) spotted owl site. The proposed project would treat all dispersal habitat within the KOAC, affecting 58 percent of the habitat within the KOAC. As stated above, the habitat where the Jim Creek activity center was originally located was removed

through harvest on private lands. Surveys have not documented a pair of spotted owls within the KOAC to date and determined a barred owl occupied the KOAC in 2009.

Spotted Owl Habitats

(*i) Suitable Habitat* – Forest types described as suitable habitat for the spotted owl is used for nesting and roosting and foraging. Stands with birthdates of 1931 or earlier were considered suitable habitat for this analysis. Roads are not considered suitable habitat. An average width of 20 feet was used for all roads included in the transportation database, and these acres were subtracted from the stand acres.

Up to six acres of suitable habitat would be treated under the proposed action (Emile Islands Unit 1A). Based upon field review, unit 1A of the Emile Island timber sale has been identified as low quality spotted owl nesting habitat. This stand was initially harvest around 1960 and has a substantial component of large diameter sugar pine and Douglas-fir (40+ inches DBH); coupled with the presence of some large diameter snags and down wood it was believed that this stand could support the minimal requirements for spotted owl nesting.

(ii) Dispersal Habitat – Conifer stands with birthdates of 40-79 were considered dispersal habitat for this analysis. With the exception of Emile Island unit 1A, all proposed thinning units are considered dispersal habitat because the stands contain relatively small tree sizes (quadratic mean diameter 9.7 to 18 inches) (*Forest Vegetation*, Table 5, pg. 26), high stand densities, and lack suitable habitat components (i.e. large snags, large remnant trees, and multiple canopy layers). Up to 1,498 acres of dispersal habitat would be treated under the proposed action.

Spotted owls and their prey base benefit more from larger snags and coarse woody debris (Thomas, *et al*. 1990). In addition, the majority of wildlife species (including flying squirrels) utilize larger snags > 18 inches diameter at breast height (Mellen *et al.* 2009), providing for multiple life cycle needs. Small diameter snags are used primarily as foraging habitat by wildlife (Hagar 2008, Mellan *et al.* 2009), including spotted owl prey species. Cary *et al*. (1999a) concluded that ≥ 10 percent cover of coarse woody debris is needed to ensure high prey populations for mustelids and owls in Douglas fir forests in southwestern Oregon (Carey and Harrington, 2001). Large down wood is present within some of the units, however the amounts within the units has not been quantified.

(iii) Designated Critical Habitat – Critical Habitat is a specific geographical area designated by the USFWS as containing habitat essential for the conservation of a threatened or endangered species. Critical Habitat for the northern spotted owl was re-designated in 2008 (Fed. Register; Vol. 73 No. 157; Aug. 13, 2008; pgs. 47326-47374). Little River MMX is outside of designated Critical Habitat for the spotted owl. The closest Critical Habitat Unit is located approximately four miles to the southeast of the analysis area.

Spotted Owl Analysis Areas– Effects of thinning on spotted owl habitat are discussed at three spatial scales based on the most recently occupied activity center (i.e. nest site): within a nest patch (300-meter radius), within a core area (0.5-mile radius), and within the home range (1.2-mile radius). Approximately 311 acres (21 percent of the Little River unit acres) do not fall within a nest patch, core area, or home range.

No suitable habitat (stand age ≥ 80 years) within the nest patch or core area of any known spotted owl activity center would be treated under the proposed action alternative. However, one unit proposed for treatment (i.e. Emile Islands Unit 1A) contains suitable habitat and is located within one spotted owl home range. The remaining 1,187 acres within the proposed thinning units contain dispersal-only habitat.

(i) Home Range – The home range for northern spotted owls in the Cascade Range Province is a 1.2 mile radius circle surrounding an activity center (i.e. nest site) and is used by spotted owls to obtain cover, food, mates, and to care for their young. The home ranges of several owl pairs may overlap and the habitat within them is commonly shared between adjacent owl pairs and by other dispersing owls. These areas are important for the survival and productivity of spotted owls because owls are non-migratory birds that remain in their home ranges year-round.

There are 14 known spotted owl activity centers within 1.2 miles of the proposed Little River MMX units (Tables 9 and 10). Of the 37 units, all but five of the proposed Little River MMX units (Root Canal units 21B, 28A, 28B, 32G; Emile Islands unit 7F) fall within the home range of a spotted owl activity center, affecting up to 1,187 acres of dispersal habitat and six acres of suitable habitat.

(ii)Core Area – Within the home range, the core area for spotted owls is a 0.5-mile radius circle around the spotted owl activity center used to describe the area most heavily utilized by spotted owls during the nesting season (USDI USFWS *et al*., 2008c). Core areas represent areas defended by territorial spotted owls and generally do not overlap the core areas of other spotted owl pairs. Ten proposed units (Baker Street units 3B, 3C, 11A, 11B; Horseshoe units 23A, 35A, 35B; Root Canal units 18A, 25A, 30B) fall within the core areas of sixknown spotted owl activity centers, affecting up to 282 acres of dispersal habitat(Tables 9 and 10; Figures 10-13, Appendix G).

(iii) Nest Patch – Within the core area, the nest patch is defined as a 300-meter radius circle around a known spotted owl activity center (USDI USFWS *et al*., 2008c). The two key elements of spotted owl habitat within a nest patch are: (1) canopy cover of dominant, co-dominant, and intermediate trees (conifers and hardwoods) and (2) the amount of down wood (USDI USFWS *et al*., 2008c; pg. 13). Activities within this area are considered likely to affect the reproductive success of nesting spotted owls and are used in determination of incidental take. Three units (i.e. Baker Street units 3B and 11A and Horseshoe unit 35A) would fall within three known spotted owl nest patches, affecting up to 47 acres of dispersal habitat (Tables 9 and 10; Figures 10-13, Appendix G).

Table 10. Northern Spotted Owl Habitat within Known Home Ranges near Little River MMX Commercial Thinning.

Northern Spotted Owl Site (IDNO)*		Federal Land (acres)	Habitat on Federal Lands Only (acres)			
			Suitable Habitat		Dispersal-Only Habitat	
			Current Condition	Habitat Modified through Proposed Action	Current Condition	Habitat Modified** through Proposed Action
BRITT CREEK (2143O)	Home Range (2,895 acres)	1242	390	0	391	337
	Core Area (502 acres)	335	128	0	22	20
	Nest Patch (70 acres)	66	56	0	0	0
CAVITT CREEK (1549O)	Home Range (2,895 acres)	753	279	0	183	150
	Core Area (502 acres)	246	40	0	70	64
	Nest Patch (70 acres)	59	0	0	33	30
EMILE CREEK (0509A)	Home Range (2,895 acres)	2406	1493	0	325	28
	Core Area (502 acres)	334	245	0	37	0
	Nest Patch (70 acres)	46	46	0	0	0
ENGLES CREEK (2104A)	Home Range (2,895 acres)	1172	729	0	301	285
	Core Area (502 acres)	297	133	0	114	110
	Nest Patch (70 acres)	41	34	0	7	6
EVARTS CREEK (0291A)	Home Range (2,895 acres)	1794	563	0	314	234
	Core Area (502 acres)	389	245	0	42	30
	Nest Patch (70 acres)	68	68	0	0	0
GREEN THUNDER (3099O)	Home Range (2,895 acres)	1205	440	6	433	50
	Core Area (502 acres)	292	109	0	103	0
	Nest Patch (70 acres)	70	59	0	3	0
GREENMAN CREEK (2532O)	Home Range (2,895 acres)	1304	435	0	180	47
	Core Area	352	160	0	0	0

Northern Spotted Owl Site (IDNO)*		Federal Land (acres)	Habitat on Federal Lands Only (acres)			
			Suitable Habitat		Dispersal-Only Habitat	
			Current Condition	Habitat Modified through Proposed Action	Current Condition	Habitat Modified** through Proposed Action
	(502 acres)					
	Nest Patch (70 acres)	68	67	0	0	0
LEAPING WOLF (2155O)	Home Range (2,895 acres)	2886	1456	0	454	56
	Core Area (502 acres)	499	328	0	20	0
	Nest Patch (70 acres)	69	60	0	0	0
LITTLE CAVITT (4017A)	Home Range (2,895 acres)	2492	1185	0	70	50
	Core Area (502 acres)	503	273	0	6	6
	Nest Patch (70 acres)	70	63	0	0	0
LOOKOUT CANYON (4015O)	Home Range (2,895 acres)	1148	648	0	190	13
	Core Area (502 acres)	379	262	0	19	0
	Nest Patch (70 acres)	70	70	0	0	0
LOWER JIM CREEK (2154O)	Home Range (2,895 acres)	837	191	0	311	188
	Core Area (502 acres)	252	90	0	85	81
	Nest Patch (70 acres)	52	12	0	11	11
MCKAY CREEK (4012O)	Home Range (2,895 acres)	791	423	0	80	20
	Core Area (502 acres)	425	328	0	22	0
	Nest Patch (70 acres)	70	63	0	0	0
RED POND (0360O)	Home Range (2,895 acres)	1011	506	0	50	44
	Core Area (502 acres)	251	148	0	0	0
	Nest Patch (70 acres)	61	37	0	0	0
SWIFT COUGAR	Home Range (2,895 acres)	1219	757	0	113	57

Northern Spotted Owl Site (IDNO)*		Federal Land (acres)	Habitat on Federal Lands Only (acres)			
			Suitable Habitat		Dispersal-Only Habitat	
			Current Condition	Habitat Modified through Proposed Action	Current Condition	Habitat Modified** through Proposed Action
(2152O)	Core Area (502 acres)	420	236	0	52	0
	Nest Patch (70 acres)	70	58	0	5	0

*Activity center (based on most recent spotted owl use) within an owl site that was used for the habitat analysis.
** Under the Proposed Action dispersal-only habitat would have a reduction in quality but would maintain its function.

Table 11. Northern Spotted Owl Habitat within Little River MMX Proposed Units.

Sale	Unit	Unit Acres	Unit Acres within…						Unit Total	
			Nest Patch		Core Area		Home Range			
			Suitable Habitat	Dispersal -only Habitat	Suitable Habitat	Dispersal -only Habitat	Suitable Habitat	Dispersal -only Habitat	Suitable Habitat	Dispersal -only Habitat
BAKER STREET	3A	41	0	0	0	0	0	41	0	41
	3B	50	0	11	0	50	0	50	0	50
	3C	4	0	0	0	3	0	4	0	4
	11A	46	0	30	0	46	0	46	0	46
	11B	51	0	0	0	18	0	51	0	51
	21A	20	0	0	0	0	0	20	0	20
SUB-TOTAL		***212***	***0***	***41***	***0***	***117***	***0***	***212***	***0***	***212***
HORSE-SHOE	23A	274	0	0	0	20	0	274	0	274
	25A	12	0	0	0	0	0	12	0	12
	26A	14	0	0	0	0	0	14	0	14
	26B	35	0	0	0	0	0	35	0	35
	27A	38	0	0	0	0	0	31	0	38
	35A	89	0	6	0	63	0	89	0	89
	35B	53	0	0	0	47	0	53	0	53
	1B	8	0	0	0	0	0	8	0	8
	1C	19	0	0	0	0	0	16	0	19
SUB-TOTAL		***542***	***0***	***6***	***0***	***130***	***0***	***532***	***0***	***542***
ROOT CANAL	17A	49	0	0	0	0	0	41	0	49
	17B	35	0	0	0	0	0	15	0	35

Sale	Unit	Unit Acres	Unit Acres within…						Unit Total	
			Nest Patch		Core Area		Home Range			
			Suitable Habitat	Dispersal -only Habitat	Suitable Habitat	Dispersal -only Habitat	Suitable Habitat	Dispersal -only Habitat	Suitable Habitat	Dispersal -only Habitat
	18A	16	0	0	0	6	0	16	0	16
	21A	29	0	0	0	0	0	29	0	29
	21B	5	0	0	0	0	0	0	0	5
	23C	31	0	0	0	0	0	10	0	31
	25A	57	0	0	0	1	0	57	0	57
	28A	42	0	0	0	0	0	0	0	42
	28B	35	0	0	0	0	0	0	0	35
	29A	90	0	0	0	0	0	17	0	90
	30A	112	0	0	0	0	0	100	0	112
	30B	28	0	0	0	28	0	28	0	28
	30D	11	0	0	0	0	0	11	0	11
	32G	6	0	0	0	0	0	0	0	6
SUB-TOTAL		***546***	***0***	***0***	***0***	***35***	***0***	***324***	***0***	***546***
EMILE ISLANDS	1A	6	0	0	0	0	6	0	6	0
	1C	28	0	0	0	0	0	28	0	28
	1D	41	0	0	0	0	0	26	0	41
	3A	25	0	0	0	0	0	2	0	25
	3B	21	0	0	0	0	0	11	0	21
	5I	48	0	0	0	0	0	48	0	48
	7F	30	0	0	0	0	0	0	0	30
	7G	5	0	0	0	0	0	4	0	5
SUB-TOTAL		***204***	***0***	***0***	***0***	***0***	***0***	***119***	***6***	***198***
TOTAL		**1504**	**0**	**47**	**0**	**282**	**6**	**1187**	**6**	**1498**

b) Environmental Consequences

(1) No Action Alternative

The quality and availability of northern spotted owl habitat would be unaffected under the *No Action alternative*. Six acres of suitable habitat and 1,498 acres of dispersal habitat included in the proposed Little River MMX units would continue to function as suitable habitat and dispersal habitat, respectively. Spotted owl nest patches, core areas, and home ranges within the proposed action area would continue to function at current levels because habitat would not be modified.

Without treatment, the six acres of suitable habitat within Emile Island unit 1A would continue to provide nesting, roosting, and foraging opportunities for the spotted owl. As described under the *No Action Alternative* of the *Forest Vegetation* section (pg. 27), without a thinning treatment around the sugar pines, some of these trees may be at risk for infestation by the bark beetle which would eventually cause the trees to die- creating additional suitable habitat characteristics, particularly large snags and downed wood. As trees die and fall, gaps would create growing conditions that would foster the development of additional forbs and shrubs within the understory, thus creating additional niche habitat for prey species.

The 1,498 acres of homogenous Douglas fir stands included in the proposed Little River MMX units would continue to function as dispersal habitat. However, without silvicultural treatment or natural disturbance, canopies would remain closed and individual tree growth would slow even as stand growth continues. Stand diversity would decrease over time as hardwoods and shrubs (where they currently exist), important components of owl habitat, are lost due to suppression as previously mentioned in the *Forest Vegetation: No Action Alternative*. Stands would be slower to develop the structural complexity to provide for nesting, or gaps large enough to provide growth of diverse grass, forbs, shrubs, and hardwoods that would support abundant prey populations. The development of multiple canopy layers and structural diversity would continue but at a slower rate than with the proposed thinning treatment, thus delaying the development of suitable habitat characteristics in proximity to or within northern spotted owl home ranges, core areas and nest patches.

Since trees would not be removed under the *No Action Alternative*, this alternative would produce the highest amount of dead wood through passive recruitment, compared to other proposed alternative. Suppression mortality would occur primarily in the smaller size classes of trees and would be the main source for snag and coarse woody debris recruitment. Dead trees would stand for a relatively short time and ultimately fall, but would not create openings as in late-seral stands because of the small size of the snags. Though there would be a recruitment of snags and coarse woody debris, a large number of small snags and coarse woody debris would provide foraging habitat, but would provide fewer opportunities for nesting or denning for spotted owl prey species. The remaining dominant trees would soon expand their crowns into the newly-available growing space, limiting development of understory vegetation. Multiple waves of such competition mortality would likely need to occur before dominant tree density would be low enough to allow understory re-initiation. Thus, a continuous closed canopy would limit the opportunity for increasing the horizontal and vertical heterogeneity in vegetation structure and species diversity in vascular plant composition which would provide habitat complexity important for small mammals (Carey and Harrington, 2001).

(2) *Proposed Action Alternative*

Disruption/Disturbance - For all harvest activities associated with this proposed action, there would be no disruption concerns for spotted owls. Effects associated with noise arising from thinning activities would be discountable because all activities would either be conducted outside of the minimum disruption thresholds established by the U.S. Fish and Wildlife Service (e.g. chainsaw use is 65 yards, heavy equipment use is 35 yards), from any known spotted owl site or unsurveyed suitable habitat, or would be subject to a seasonal restriction from March 1st to July 15th, both dates inclusive. This would ensure

that noise disruption would not cause spotted owls to abandon nests or fledge prematurely.

Cable yarding uses trees for tailholds and guyline anchors. For the proposed action alternative, these tailholds and guyline anchor trees may be located within suitable habitat outside of the unit boundaries. To the extent possible, trees with suitable nesting structure would be avoided. To ensure that tree removal does not directly affect spotted owls, seasonal restrictions would be implemented unless clearance surveys have been conducted and it has been determined by a BLM biologist that there are no active spotted owl activity centers within the disruption threshold.

Scientific opinions on the actual effects of thinning on the spotted owl are varied. Meiman *et al*. (2003) suggested that heavy thinning reduces stand use by spotted owls. Spotted owls are likely to increase the size of their home ranges to utilize untreated stands in preference to newly treated stands both during and after harvest (Meiman *et al*., 2003). Factors that reduce the quality of habitat within a home range or cause increased movement by owls in order to meet prey requirements may decrease the survival and reproductive fitness of owls at that site (Meiman *et al*., 2003).

In contrast, work by Forsman *et al*. (1984) in older late-successional forests and by Lee and Irwin (2005) in younger forests indicates that lightly thinned stands receive moderate to high use by spotted owls. More recent, preliminary research in southwest Oregon and northern California has indicated that spotted owls did not vacate their home ranges and generally foraged within thinned forest stands as applied on BLM timberlands (unpublished draft, NCASI, 2008). Generally, research data supports the notion that spotted owls will continue to use thinned stands for foraging when overall canopy cover remains above 50 to 60 percent (Forsman 1994, Hanson *et al*., 1993).

Although much of this work refers to treatments inside stands with nesting, roosting and foraging components, they illustrate the variability of responses of the owls to treatments. Where canopy cover exceeds 50 percent it is expected that those thinning units would continue to provide foraging and dispersal opportunities. Within those stands where post-harvest canopy cover is between 40-50 percent (Table 7, pg. 29), owls may avoid these stands until canopy cover conditions recover to at least 50 percent. A conservative assumption based on the ORGANON model output is that crown cover will recover about one percent per year following treatment. However, closure as measured by percent skylight should recover faster, up to two percent per year (q.v. *Forest Vegetation*, pg. 28).

Variable density thinning, in contrast to even-spaced thinning, may accelerate development of suitable habitat and denser prey populations (Carey 1995, 2000), particularly when components like snags, cavity trees, and coarse woody debris are taken into account. It enhances tree growth, understory development, and understory flower and fruit production for prey species, while maintaining more canopy connectivity, woody plant diversity, and spatial variability (Carey in Courtney *et al*. 2004; Carey 2000). Although general effects of thinning on the physical parameters of habitat can be quantified, actual effects on spotted owl behavior and use of habitat in nest patches and core areas are not fully known. Thinning opens the forest canopy, may change environmental conditions such as temperature and humidity, and may increase risk of predation.

Known Owl Activity Centers (KOAC) –Baker Street unit 3B (50 acres) is partially located within an 86-acre KOAC associated with the Lower Jim Creek (IDNO 2154O) owl site. All 50 acres of dispersal habitat within the KOAC are proposed for thinning. Because of the KOAC designation, this unit would be treated as Late-Successional Reserve (LSR) to create forest conditions that would accelerate the development of suitable habitat characteristics, including a multi-species and multi-layered canopy, large trees with complex canopies and large limbs, and eventually larger snags and down wood. A post-treatment canopy cover of 52 percent would allow this stand to continue functioning as dispersal habitat for spotted owls.

Thinning treatment within the KOAC would cause an indirect beneficial effect in the long term by improving dispersal habitat conditions as canopy cover increases and multi-canopy and multi-species layers develop, creating more favorable roosting and foraging habitat. As structural components used by spotted owls continue to develop, such as large diameter trees and snags, multiple canopy layers, large coarse woody debris, and hunting perches, the amount of nesting habitat within the KOAC would increase for the spotted owl over time.

Spotted Owl Habitat

(i) Suitable Habitat –Up to six acres of suitable habitat would be treated under the proposed action (Emile Islands unit 1A). Commercial thinning in Unit 1A of the Emile Islands timber sale would result in reducing canopy cover from 92 percent pre-harvest to approximately 77 percent post-harvest. Even though the overall canopy cover in the stand would not be reduced below suitability for spotted owls (e.g. 60 percent); the canopy cover reduction would be focused around individual sugar pine trees (q.v., *Treatment Prescription*, pg. 10) many of which are nesting and roosting components within the stand. Thinning activities may also result in the loss of large snags that may be cut for safety reasons. Removing canopy cover and large snags would reduce the stand's capability of providing the conditions necessary to support nesting habitat, temporarily downgrading six acres of suitable habitat to dispersal-only habitat. However, this particular stand is surrounded by young stands that do not currently meet the requirements for dispersal habitat for spotted owls, which results in a small isolated island of habitat that is not likely capable of supporting a pair of nesting spotted owls.

In the long-term, thinning treatment around the sugar pines would reduce the risk for infestation by the bark beetle, maintaining the large live tree component within the stand. In addition, removing the small diameter trees around the sugar pines would create growing conditions that would foster development of additional forbs and shrubs, thus creating additional niche habitat and forage for prey species. As canopy cover recovers, expected within approximately 10 years post-harvest, the stand would be capable to support nesting habitat.

(ii) Dispersal Habitat –Though the quality of 1,498 acres of dispersal habitat within the proposed units would be temporarily reduced by the thinning treatments, the capability of the habitat to function for dispersing spotted owls would be maintained. Vertical and horizontal cover would be reduced within the proposed units through the reduction in overstory canopy cover with varying levels of residual tree density. Under the proposed action, the post-treatment canopy closure would be maintained between 40-86 percent and the quadratic mean diameter would be between 9.7 and 18 inches (q.v. *Forest Vegetation*; Table 7, pg. 29). Large remnant trees and

dominant and co dominant hardwoods would be reserved. Snags and coarse woody debris would be protected to the extent practicable. Thinning may initially reduce the cover of shrubs and herbaceous vegetation due to disturbance caused by harvesting activities. However, cover and plant diversity would be expected to increase following thinning activities to levels beyond pre-treatment conditions (Chan *et al*., 2006; Bailey *et al*., 1998). Thus, treated stands are expected to maintain dispersal function because a minimum of 40 percent canopy closure and other structural elements important for spotted owl dispersal will be retained.

Variable density thinning treatments would cause an indirect beneficial effect in the long term by improving dispersal habitat conditions as canopy cover increases and multi-canopy and multi-species layers develop, creating more favorable roosting and foraging habitat conditions. Those portions of stands not harvested in the future would continue to develop the structural components used by spotted owls, such as multiple canopy layers, large diameter trees and eventually large snags and coarse woody debris, increasing the amount of nesting habitat for the spotted owl over time. Over time, the proposed silvicultural treatments are expected to enhance NRF habitat, improve habitat connectivity in the action area and reduce the risk of loss of habitat due to stand-replacing wildfires. Consequently, the proposed action alternatives would have an indirect beneficial effect to the spotted owl and their habitat in the long-term.

Spotted owl prey species would also be affected by the proposed thinning. Species such as brush rabbits, woodrats, and other rodents are primarily associated with early- and mid-seral forest habitat (stands < 80 years of age) (Maser *et al.*, 1981; Sakai and Noon, 1993; Carey *et al.*, 1999), and could benefit from increased understory and shrub development (Carey, 2001; Carey and Wilson, 2001; Haveri and Carey, 2000). This could indirectly benefit spotted owls by providing more prey available for capture.

Variably-density thinning can have rapid, positive effects for many forest-floor prey species (e.g., mice, voles, chipmunks) especially due to increased understory development (Carey 2001, Carey and Wilson 2001, Haveri and Carey 2000). However, variable-density thinning may keep flying squirrel populations suppressed and may do so for several decades until long-term ecological processes provides sufficient structural complexity in the mid-story and overstory favorable to squirrels (Wilson 2010). However, Wilson (2010) suggests a few considerations to reduce short-term effects to flying squirrels while trying to create more forest complexity that would benefit them in the long-term. The action alternative incorporates some of those considerations, including:

- retention of existing large decadent trees and snags;
- retention of no-treatment areas (e.g. no treatment buffers in Riparian Reserves) to provide travel corridors from adjacent late seral habitats and across the landscape;
- retention of a range of tree size classes throughout the stand;
- improvement of foraging opportunities by promoting the development of understory and shade-tolerant tree species throughout the stand; and
- maintenance of canopy cover within the stands (e.g., lightly and moderately thinned areas) which would provide protective cover from predators, as well as

provide a tree density that allows squirrels to adequately glide between trees and move through a stand in order to access foraging areas.

The residual stands following harvest would provide a pool of candidate trees for future snag and coarse woody debris recruitment. Additional coarse woody debris and snags would be created incidentally through the harvest operations (e.g. damage leading to broken-out tops or individual tree mortality) or through weather damage (e.g. wind and snow break). Although fewer snags would develop over time when compared to the *No Action Alternative*, they would be larger snags with more resiliency and limb structure (Reukema, 1987) than snags that develop under a more competitive stand condition (Nietro, 1985). In the meantime, the action alternatives would provide other ecological benefits by allowing trees to grow larger and faster, and to develop other suitable wildlife habitat characteristics, such as large limbs and crowns. These trees would then become a future source for large snags and downed wood.

The proposed treatment of Baker Street Unit 3B, located within a designated KOAC for the spotted owl, is designed to accelerate the development of late-seral characteristics used by spotted owls, and is consistent with the Final Northern Spotted Owl Recovery Plan (USFWS 2008).Thinning treatments would cause an indirect beneficial effect in the long term by improving dispersal habitat conditions as canopy cover increases and multi-canopy and multi-species layers develop, creating more favorable roosting and foraging habitat.

Spotted Owl Analysis Areas

(*i) Home Range* – Dispersal habitat would be modified by thinning activities within the home ranges of 13 known spotted owl sites (Table 10). Approximately six acres of suitable habitat (Emile Islands unit 1A) would be downgraded by thinning activities within the home range of one known spotted owl site (Greenthunder; IDNO 3099O), affecting less than one percent of the home range. The last known pair of spotted owls to occupy this site was in 1993. The Greenthunder site has been occupied by a pair of nesting barred owls since 2007; therefore, it is unlikely that spotted owls are present within the same stand occupied by barred owls. As described above in the affects to suitable habitat, this particular unit is surrounded by young stands that do not currently meet the requirements for dispersal habitat for spotted owls, which results in a small isolated island of habitat that is not likely capable of supporting a nesting pair of spotted owls. Therefore, downgrading these six acres of suitable habitat to dispersal-only is not expected to cause a decline in productivity or of use of the home range by spotted owls in the near term.

(ii) Core Area –A total of 282 acres of dispersal-only habitat are proposed for thinning within the core areas associated with six spotted owl activity centers (Tables 10 and 11). Table 12 summarizes the acres of suitable habitat, dispersal habitat, and acres of dispersal habitat affected by thinning treatments within the 502-acre core areas associated with the six spotted owl sites.

Table 12. Effects to Northern Spotted Owl Core Areas.

Northern Spotted Owl Site (IDNO)	Suitable Habitat Present		Dispersal Habitat Present		Treated Acres of Dispersal Habitat	
	Acres	Percent of Core Area	Acres	Percent of Core Area	Acres	Percent of Core Area
Britt Creek (2143O)	128	25	22	4	20	4
Cavitt Creek (15490)	40	8	70	14	64	13
Engles Creek (2104A)	133	26	114	23	110	22
Evarts Creek (0291A)	245	49	42	8	30	6
Little Cavitt (4017A)	273	54	6	1	6	1
Lower Jim Creek (2154O)	90	17	85	17	81	16

Where thinning is conducted in a core area with less than 50 percent suitable habitat, owl use of the stands would be expected to decline in the near term (USDI USFWS 2009). The core area associated with the Little Cavitt (IDNO 4017A) owl site contains more than 54 percent suitable habitat (Table 10). Therefore, thinning of six acres of dispersal habitat is not expected to cause a decline in productivity or of use by spotted owls within the Little Cavitt core area in the near term.

The core area associated with the Evarts Creek (IDNO 0291A) activity center contains 49 percent suitable habitat, just below the 50 percent threshold. The site was last occupied by a reproductive pair of spotted owls in 2008 within the original activity center (IDNO 0291O). In 2011 a single spotted owl was detected in an alternate activity center (IDNO 0291X) located within the same stand. A pair of barred owls was first documented in an alternate activity center (IDNOX) in 2009 and has persisted through 2011, last occupying the original activity center, either causing effects to detectability rates during surveys and/or social instability among spotted owl pairs at the site.

The remaining four of the six core areas where thinning treatment is proposed, does not meet the 50 percent threshold of suitable habitat. Although core areas associated with the Cavitt Creek (IDNO 1549O) and Lower Jim Creek (IDNO 2154O) sites contain less than 50 percent suitable habitat (Table 10), surveys at both sites have never documented a pair of spotted owl at either site (Table 9). Surveys have determined both sites to be unoccupied since 2009 and 2008, respectively.

Spotted owl pairs and reproduction was last documented at the Britt Creek and Engles Creek sites in 1991 and 1995, respectively. The Britt Creek (IDNO 2143O) site was unoccupied in 2009-2010 and was occupied by a resident single male in 2011. The Engles Creek (IDNO 2104A) sites has been unoccupied by spotted owls

since 2004. Barred owls are present at the Britt Creek, Engles Creek, and Lower Jim Creek sites.

Thinning will not limit spotted owl movement through these stands because post-harvest stand average canopy closure will be 52-82 percent, maintained above the 40 percent canopy closure threshold. Therefore, within the five core areas that contain less than 50 percent suitable habitat, thinning is not expected to cause a decline in productivity or of use by spotted owls in the near term.

(iii)Nest Patch –Current research indicates that dispersal habitat within 300 meters (a 70 acre patch) of a spotted owl site is particularly important (Meiman, *et al*. 2003, Glenn, *et al*. 2004). Within this high-use area, any modification of dispersal habitat may downgrade its suitability as a spotted owl activity center. Under the proposed thinning prescription, a total of 47 acres of dispersal-only habitat are proposed to be treated within the nest patch associated with three separate spotted owl sites, including the Cavitt Creek (IDNO 1549O), Engles Creek (IDNO 2104A), and Lower Jim Creek (IDNO 2154O) (Tables 10 and 11) owl activity centers.

Approximately 30 acres of Baker Street Unit 11A are within the nest patch (IDNO 1549O) associated with the Cavitt Creek owl site, proposing treatment of 43 percent of the nest patch. However, the Cavitt Creek nest patch does not currently contain suitable habitat or the two key elements necessary to sustain a nesting pair of spotted owls, including: (1) canopy cover of dominant, co-dominant, and intermediate trees (conifers and hardwoods) and (2) sufficient amount of down wood (USDI USFWS *et al*., 2008c; pg. 13). This assertion is supported by the survey data indicating spotted owl pairs have not been documented at this activity center since 1985 and nesting has never been documented. More recent surveys conducted from 2008-2011 have shown the site continues to be unoccupied by spotted owls. Therefore, thinning within the nest patch is not expected to cause a decline in productivity or of use by spotted owls in the near term.

Approximately six acres of the Horseshoe Unit 35A are within the nest patch of one activity center (IDNO 2104A) associated with the Engles Creek owl site, proposing treatment of less than one percent of that nest patch. There are currently only seven acres of dispersal-only habitat in the Engles Creek nest patch and six of those are proposed for thinning. The proposed thinning project may require yarding landings and corridors to also be built within the nest patch, which will decrease the amount of dispersal habitat by creating openings. This activity center was established based on a pair of nesting spotted owls in 1992 and was occupied by spotted owls as recently as 2008. Surveys conducted in 2009 showed the activity center as occupied by barred owls. The historical Engles Creek male was located more than seven miles away in another owl site in 2010.

Approximately 11 acres of Baker Street Unit 3B are within the nest patch associated with the Lower Jim Creek owl site (IDNO 2154O), proposing treatment of 16 percent of the nest patch. The forest stand comprising Unit 3B is aged at 46 years (stand initiation date = 1965) and does not fit the requirements for suitable owl habitat-lacking large trees/snags, nesting structures, and multi-layered multi-species canopy; but the stand does meet the requirements for dispersal habitat because canopy closure is over 40 percent and the average tree diameter at breast height is11 inches). The last known occupancy by spotted owls was in 1989. Surveys in 2008-2011 have shown

the site to be unoccupied by spotted owls. Disturbance or disruption to nesting spotted owls would not occur because none are known to be present based on survey history.

(3) *Cumulative Effects to Northern Spotted Owls*

Approximately 95 percent of the Little River MMX unit acres (1,431 of 1,504 acres) occur within the Little River Fifth-field Watershed. Approximately 46 and 8 acres occur within the Middle North Umpqua and Lower North Umpqua Fifth-field Watersheds, respectively. Of the 131,950 acres (federal and private) within the Little River Fifth-field Watershed, there are approximately 48,710 acres (37 percent) of suitable habitat and 24,598 acres (19 percent) of dispersal-only habitat on Federal lands. Within the past ten years, approximately 3,800 acres of thinning has occurred and approximately 3,820 acres of thinning is planned within the next ten years on Federal lands (Forest Service and BLM), collectively affecting 0.01 percent of the suitable habitat and 31 percent of the dispersal-only habitat within the watershed. The proposed *Action Alternative* would modify approximately 0.01 percent and 5.8 percent of suitable and dispersal habitat, respectively, within the watershed. Including this proposed action, approximately 9,118 acres (37 percent) of dispersal habitat and 6 acres of suitable habitat (0.01 percent) would be modified within the watershed spanning 20 years.

Adverse effects to spotted owls would likely continue within the action area. To date, the Oregon Forest Practices Act requires protection of a 70-acre area around occupied nest sites, and does not provide any protection or conservation of other surrounding habitat. Removal of suitable and dispersal habitat on private lands may also increase the risk to the persistence of the species in the action area.

Although the proposed action may temporarily reduce the quality of dispersal habitat within the project area, it would still continue to function for the dispersal of spotted owls. Therefore, the proposed project would not preclude or appreciably reduce spotted owl movement within the watershed, between Critical Habitat Units, or within the Physiographic Province.

2. Marbled Murrelet (*Federally Threatened*)

The proposed Little River MMX project is located outside of the distribution range (within 50 miles of the Oregon coast) of the marbled murrelet *(Brachyramphus marmoratus)*. Therefore, this project would have no effect to the marbled murrelet or its designated Critical Habitat.

3. Special Status Wildlife Species

a) Affected Environment

For each Special Status Species, *Appendix A: Bureau Sensitive & Bureau Strategic Species* summarizes general habitat requirements, status of species within the project area, and impacts of proposed action to the species. Other *Bureau Sensitive* and *Bureau Strategic* species suspected to occur on the Roseburg District BLM but not in the project area are also listed in *Appendix A*. Within the proposed action area, there are seven *Bureau Sensitive* terrestrial species associated with conifer forest habitats, of which four are associated with late-successional forests.

Even though these species are associated with conifer forest habitats, they are not a concern for the following reasons:

- **American Peregrine Falcon** *(Falco peregrinus anatum)* – Primarily associated with cliffs, rock outcrops with open habitats for hunting birds. Known sites are present in T27S-R03W-Section 24 within Root Canal and T27S-R02W-Section 6 within Emile Islands. Peregrines have also been observed in T27S-R02W-Section 16 within Root Canal, but follow-up surveys have not located a nest site to date. The proposed project would have no affect to nesting habitat. Implementation of PDFs (pg. 23) would avoid disturbance impacts to nesting peregrines within one mile of the known nest sites. In addition, although peregrine falcons likely forage within the proposed project area, the proposed action is not expected to cause measurable effects to foraging habitat.
- **Purple martin** *(Progne subis)* – There is a lack of suitable nesting habitat (snags in forest openings) within the project area. However, the species is expected to forage above the forest habitat. The proposed action is not expected to cause measurable effects to foraging habitat.
- **Foothill yellow-legged frog** *(Rana boylii) – Primarily associated with low gradient streams and rivers with* rocky, gravelly, or sandy substrates and sunny banks. Within the project area, this species has been documented in the North Umpqua River, Little River and Susan Creek, and is expected to occur within Cavitt Creek. The proposed action is not expected to have measurable effects due to project design features (e.g. "no-harvest" stream buffers) that would protect micro climate conditions within streams.

The following species are primarily associated with late-successional conifer forest habitat and would be expected to occur within adjacent suitable habitat.

- **Bald eagle** *(Haliaeetus leucocephalus)*–There is a known nest located 2.5 miles west of Horseshoe Unit 27A. Based on numerous observations of bald eagles and the presence of suitable habitat, it is suspected (but not confirmed) there are other bald eagle nest sites located within the project area. For unknown nesting eagles within one mile of a harvest unit, noise or visual (line-of-sight) disturbance caused by harvest operations could occur during the bald eagle's breeding season (January 1st through August 31st). The proposed action would not affect suitable nesting or roosting habitat (late-seral habitat or large trees along river corridors within approximately one mile of a major water source) or known nest sites.
- **Fisher** *(Martes pennanti)* – Fisher would be expected to use the forest habitat within the proposed units for dispersal. However, fisher has not been documented within the watershed in recent years and the closest documented sighting in1998 was approximately 30 miles south of the watershed and the proposed project area. No effects to suitable denning and foraging habitat within late-successional conifer and mixed conifer hardwood forests. Fisher would be expected to use the forest habitat within the proposed units for dispersal.
- **Fringed myotis** *(Myotis thysanodes)* – Other potential habitats (caves, mines, or rock outcrops) do not occur within the proposed units. This bat species would be expected to forage within the units; however, there would be no measurable effects to foraging habitat.
- **Townsend's big-eared bat** *(Corynorhinus townsendii)* – This species would be expected to forage within the proposed project area; however, there would be no measurable effects to foraging habitat.

b) *Environmental Consequences*

(1) <u>No Action Alternative</u>

Under the *No Action Alternative*, no forest habitat features would be affected. *Special Status Species* within the project area would be expected to persist at their current levels. It is expected that the forest habitat currently present within the proposed units would continue to function in its current capacity. The development of suitable habitat characteristics that would benefit the bald eagle, fisher, Townsend's big-eared bats and fringed myotis such as multi-layered and multi-species canopy with large overstory trees, large snags and coarse woody debris, and a well-developed understory, would occur more slowly than compared to the proposed action.

Due to closed canopy conditions and without treatment or natural disturbances, a multi-layered and multi-species canopy would not be well-developed within 50 years. Though there would be a recruitment of snags and coarse woody debris, a large number of small snags and coarse woody debris would provide foraging opportunities, but would not be as beneficial as large snags and coarse woody debris. Lack of these structural attributes would limit the amount of diversity and micro habitats used for foraging, denning, or roosting.

(2) <u>Proposed Action Alternative</u>

Special Status wildlife species that are associated with structurally complex forests would benefit from treatment under the *Proposed Action Alternative*. However, the development of suitable habitat components within a stand is dependent on the intensity of the treatments. Under conditions of high tree densities in the uplands under the *Action Alternative*, post-harvest conditions would limit the ability to create diverse, multi-storied stands because canopy cover would recover to pre-harvest conditions 10 to 20 years. Large trees or snags containing large limbs or structural characteristics would not develop or develop at a slower rate due to a higher post-harvest tree density and tree competition. In the Riparian Reserves, more structural components would be expected to develop because those areas will be treated with greater intensity and variability.

In the long term, as structural components continue to develop, such as multiple canopy layers with a diverse understory of forbs and shrubs, large diameter trees and eventually large snags and coarse woody debris, the amount of diverse micro habitats would increase for these species associated with late-successional forest habitat. In addition, the amount of interior habitat would increase as suitable habitat structure develops adjacent to existing suitable habitat. Larger blocks of forested habitat support larger numbers of wildlife, including the fisher, and provide a larger diversity of micro habitats, increasing species diversity and richness.

This proposed project is not expected to cause cumulative effects to *Special Status Species*. The intended outcome of the proposed project is to create structural diversity and complexity within stands that are currently lacking these components. An increase of characteristics associated within late-seral forests would increase the amount of habitat available to the species.

4. Landbirds

a) Affected Environment

Guidance for meeting agency responsibilities under the Migratory Bird Treaty Act and Executive Order 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds" is provided by Instruction memorandum OR-2008-050 (USDI BLM 2008c). The guidance identifies lists of "Game Birds Below Desired Condition", the "Birds of Conservation Concern", and the "Bald and Golden Eagle Protection Act" to be addressed during environmental analysis of agency actions and plans. Appendix B addresses specific impacts to 20 species of land birds expected within the project area.

Of the 20 species of land birds addressed in Appendix B, nine of these species are associated with mature and old-growth *stands. The remaining 11 species are generally found in forested stands less than 80 years of age.*

b) Environmental Consequences

(1) <u>*No Action Alternative*</u>

Under the *No Action Alternative*, no forest habitat features would be affected. Species that use young (40-50 year old) forest habitats with closed canopy conditions would continue to persist. Until suppression mortality creates gaps within the overstory canopy, these stands would continue to be unsuitable for species dependent on an abundance of flowering plants and shrubs because of the lack of understory development.

For the species that rely on older, more structurally complex forest habitat, these stands would remain unsuitable because they would continue to lack characteristics typically found in mature or old-growth forests (≥80 years of age). These stands will continue to develop as relatively homogeneous and even-aged stands that are primarily single-storied in nature and dominated by Douglas-fir. Formation of canopy gaps and stratification of the canopy into multiple layers would generally not occur. Level of sunlight reaching the forest floor would be insufficient to support establishment and survival of a robust community of shrubs, forbs, grasses and herbaceous plants, a component important for nesting and foraging for species that occur within the understory. Suppression mortality would occur primarily in the smaller size classes of trees and would be the main source for snag and coarse woody debris recruitment, which would provide a source of foraging habitat for some avian species.

(2) <u>*Proposed Action Alternative*</u>

Disturbance– Nests, eggs, and/or nestlings could be destroyed if nest sites are present and units are thinned during the breeding season (April – July). There may noise disturbance impacts associated with timber harvest activities within 0.25 mile of suitable habitat (stands ≥ 80 years of age) for the bald eagle, golden eagle or northern goshawk during the nesting season (January through August). It is unknown if these species are present within the late-successional stands adjacent to the units.

Habitat–Potential loss of nesting and foraging habitat for some species would occur. The thinning treatments would modify habitat for species that use young (40-50 year old) forest with closed canopy conditions. Retention of remnant trees, snags, and down wood would benefit some species that rely on these features, regardless of stand age.

Species that flourish in more open forest stands with a well-developed understory would benefit from thinning treatment under the *Action Alternative* in the short-term (10-20 years). Those species dependent on more closed stand conditions would see a temporary reduction in habitat suitability post-harvest, until the canopy cover increases and closes in 10 to 20 years.

Conditions of high tree densities, such as those in the proposed thinning units and expected to occur post-harvest in the light-thinning portions of the units, would limit the ability to create diverse, multi-storied stands because canopy cover would recover to pre-harvest conditions 10 to 20 years. Large trees or snags containing large limbs or structural characteristics would not develop or develop at a slower rate due to a higher post-harvest tree density and tree competition.

This proposed project is not expected to cause significant cumulative effects to land birds. The intended outcome of the proposed project is to create more diversity and structure within stands that are currently homogenous Douglas fir stands. More stand diversity would increase micro site habitat conditions, which would increase species diversity and richness within the stands. Although there would be ground-disturbing activities and potential for disturbance to nesting birds, potential adverse impacts to populations of the species discussed above is not expected.

C. Soils

1. Soil Disturbance & Productivity

a) Affected Environment

Based on 1959 and 1964 aerial photo interpretation, previous ground-based yarding occurred on about 50 percent of the project area, primarily on the gentle to moderate slopes. Heavy compaction is still present in some skid trails, decking areas, and landings 40 to 45 years later. Soil productivity is recovering very slowly where the topsoil had been displaced and highly compacted, clayey subsoil is exposed. Some organic matter incorporation and recovery of soil compaction is occurring on skid trails where native understory vegetation is growing well.

Currently, little in-unit erosion is occurring because: (1) vegetation and woody debris dissipate rainfall energy, (2) natural soil structure and porosity outside of roads and old ground-based yarding features (i.e. trails; log decking areas) allow high water infiltration rates into the soil, and (3) the near absence of new disturbance.

Landslide aerial photo inventories within the Swiftwater Resource Area show a declining number of landslides during the past 25 years. The declining number of landslides corresponds with improved management practices. The rate of road-related landslides has declined the most. Fluctuations occur because of variations in weather and levels of management activity. Because of improvements in land management practices, the distribution of landslides in time and space, and their effects, more closely resemble those within relatively unmanaged forests (Skaugset and Reeves, 1998).

In the Little River MMX project area, 34 small- to medium-sized failure scars (0.01 to 0.43 acres) were identified from field investigations and interpretation of aerial photographs dating back to 1965 (Appendix C; Table C-2). The combined extent of these 34 landslides is approximately 3.3 acres. Twenty six of these landslides likely resulted from timber harvest and the other seven from roads, one occurred naturally. Most of the identified landslides occurred over 40 years ago under clear-cut or early-seral conditions. The one naturally occurring landslide failed between 1996 and 1999 and was found in an area classified as non-suitable which would be included in the stream buffer.

The soils on the steep to very steep slopes are classified as fragile due to the steep to very steep slope gradients. These sites are subject to soil and organic matter losses from surface erosion or mass soil movements, such as shallow, rapid soil failures, as a result of forest management activities, unless measures such as project design features and best management practices are used to protect the soils/growing site (USDI/BLM, 1986).

b) No Action Alternative

Under the *No Action Alternative*, there would be no direct effect on the soils in the project area. There would be no soil displacement or compaction associated with spur and landing construction, cable yarding or ground-based yarding. The duff layer and soil organic matter would continue to increase slowly with the accumulation of needles, twigs and small branches, and decomposing larger woody material, absent a fire of sufficient intensity to consume the material.

The compacted soils on the old skid trails and skid roads would recover slowly, especially at lower depths, such as below 6 inches (Amaranthus *et al*., 1996; Powers *et al*., 2005). These compacted soils would recover slowly as processes of freezing and thawing, the penetration of plant roots, and burrowing of small animals would gradually break up compaction and incorporate organic matter into the soils (Amaranthus, *et al*. 1996; Powers, *et al*. 2005).

There would be no change in the stability of the soils, since there would be no soil disturbance. Oregon Department of Forestry found that landslide numbers were lowest in stands 31-100 years old following the intense 1996 storms (ODF Forest Practices Technical Report No. 4, 1999, pg. 64). There could be occasional shallow, rapid slope failures during storm events.

c) Proposed Action Alternative

(1) <u>*Soil Displacement and Compaction*</u>

Severe soil compaction can reduce soil productivity, resulting in reduced height and volume growth of conifer species (Wert and Thomas 1981). Extensive displacement of the mineral surface soil and gouging can result in degradation of site quality by exposing unfavorable subsoil material, which is generally denser, and lower in nutrients and organic matter. Extensive soil displacement can also alter slope hydrology, increasing the potential for surface soil erosion (Page-Dumroese *et al*., 2009).

Compaction is defined for this analysis as a 15 percent increase in density or an alteration of soil structure to platy or massive to a depth of four inches or greater.

(i) Ground-Based Yarding

Past monitoring of ground-based harvest systems on the Roseburg District from fiscal years 2000 through 2011 has shown that with the proposed project design features in Little River MMX, the amount of ground affected by harvest machinery ranged from 3 to 9 percent of the harvest area. This includes effects that resulted in detrimental soil conditions, which include high compaction deeper than 4 inches depth, and/or soil displacement deeper than the organic enriched surface soil layer. The effects of ground-based yarding varies by the type of equipment used, number of equipment passes over the trails, the terrain, access routes, climatic conditions, and operator skill.

The project design features would limit the total surface area displaced and compacted in ground-based yarding areas to a range of 12-44 acres (depending on the equipment used and number of landings and large pile areas). Ground-based yarding on designated trails and on slopes generally less than 35 percent would reduce soil displacement and the extent of area affected.

Harvester forwader systems tend to be the least impacting ground-based yarding system affecting 3-6 percent of the ground-based acreage (pers. obs., W.Fong, 2008-2009/ pers. obs.; Barner, 2009/2010). Thinning by harvester/forwarder systems would have less soil displacement (in area and depth) and less soil compaction (in degree and depth) compared to tractors, since the harvesters and the forwarders generally drive on top of slash from the processed trees (USDI/BLM, 2000, pgs. 94-

96). Harvesters that travel over a bed of slash, and making only one to two passes over a trail do not generally cause detrimental soil disturbance.

Thinning harvest by tractor, rubber tired skidder, and shovel loader systems would affect 3-9 percent of the ground-based harvest area with detrimental soil impacts (USDI/BLM, 2000, pgs. 94-96; USDI/BLM, 2004, pg. 90; USDI/BLM, 2007, pg. 98). Feller-buncher systems are not commonly used on the Roseburg District but one feller-buncher operation that was monitored created 7-9 percent detrimental compaction (pers. obs., A.Barner, 2011).

(ii) Cable Yarding

Past monitoring of timber sales with cable yarding systems on the Roseburg District (i.e. FY2006-2010) has shown that the amount of ground affected by cable systems ranged from 2 to 3 percent of the harvest unit when using the proposed project design features (USDI/BLM, 2007, pg. 97; USDI/BLM, 2008, pgs. 86-87; 2008 FEIS Chapter- 4, pg. 838; USDI/BLM, 2009, pgs. 72-73; pers. comm., W. Fong, 2006 and 2010). This monitoring was based on cable yarding conducted uphill on gentle to very steep slopes (i.e. slopes up to 90 percent) and downhill yarding on gentle to moderate slopes (i.e. slopes less than 40 percent). Based on this monitoring, 2-3 percent of downhill cable-yarding areas (on less than 40 percent slopes) and uphill cable-yarding areas (irrespective of slope) would be detrimentally displaced and/or compacted. Soil disturbance from cable-yarding would vary by topography (e.g. convex vs. concave slope, slope steepness, and the presence or absence of pronounced slope breaks) and by the volume of logs yarded.

Downhill cable-yarding areas that do not have favorable corridor deflection or downhill cable-yarding on moderate to very steep slopes (i.e. greater than 40 percent) would have detrimental soil displacement or compaction greater than the 2-3 percent expected when uphill yarding. Downhill cable-yarding generally would produce more soil disturbance than uphill yarding on equivalent slopes because there would be less control of the logs on the ground surface. Downhill cable yarding would have greater potential for residual tree damage (due to less control of the logs) than uphill cable yarding or ground-based yarding (pers. comm. M. Vallance; 2010). Disturbed soil, gravel, and slash material would be more easily moved downward by gravity with the downward movement of the logs. Increased soil disturbance increases the potential for surface soil erosion on the steeper slopes.

Cable yarding (either uphill or downhill) would generally produce localized areas of soil disturbance, such as duff removal or displacement, of the top 1-3 inches of soil along the yarding corridors, with up to 5 inch depth displacement in small pockets. The greatest soil disturbance would be within 100-150 feet of the landings. Low to moderate soil compaction would be concentrated in the center of the corridors at shallow depth of 3-4 inches, with high compaction down to 6 inches in small pockets.

The project design feature to obtain a minimum of one-end suspension would reduce the degree of soil displacement and compaction in the yarding corridors. This would also help reduce the potential for shallow, rapid slope failures by minimizing the surface soil disturbance. The project design features that require lateral yarding capability of at least 75 feet and average corridor spacing of 150 feet would reduce the number of yarding corridors and landings, thus reducing the spatial extent of soil disturbance and compaction.

(2) <u>Slope Stability</u>

The overall effect on slope stability from the proposed harvest activities in Little River MMX would be low for various reasons including retention of residual canopy elements and current road practices.

The stands in Little River MMX are 35-62 years old and would have a low risk for slope failure or landslides. With regard to shallow, rapid slope failures, the Oregon Department of Forestry studied stands 0-100 years of age and older that were previously clear-cut or replaced by fire (Robison *et al*., 1999). They found that after the extreme storms of 1996 forested areas 10-100 years old were amongst those that typically had the lowest landslide densities and erosion (Robison *et al*., 1999).

Trees transpire water and intercept moisture in their canopies, and live roots increase soil strength, both of which increase slope stability (USDI/BLM, 2008d; pg. 348). Thinning proposed in Little River MMX would retain residual trees to intercept rainfall and transpire water through the tree canopy, along with live roots to retain soil strength. The thinning treatments would accelerate the growth of the residual trees, with increased canopy and root coverage. The gradual loss of soil holding strength from decaying roots of the cut trees would be compensated over time by the increased root coverage of the residual trees.

In addition to residual canopy and root elements, areas of concern would be avoided which reduces the overall effect of thinning. The 2008 FEIS reported that the relative landslide density is expected to decrease overtime towards a more natural rate (those occurring in the absences of management activities) on managed lands (Chapter-4, pg. 770). This is expected because current management practices are improved and are designed to avoid areas of instability. However, shallow, rapid slope failures occur on a small percentage of forest lands, over a variety of forest types, whether managed or unmanaged (USDI/BLM, 2008d). The highest risk for shallow, rapid slope failures was found on slopes of over 70 percent, depending on landform and geology.

Improvement of road building practices has also decreased the risk for in unit landslides. However, proposed Spur H6 would be located in an area with the potential for slump-earth flow movements (USDI/BLM, 1986) although no slope instability indicators were found. The remaining spur construction would be located on stable positions that are: (1) ridge tops and gently to moderately sloping locations (near level to 35 percent) and (2) have no apparent signs of potential instability, such as highly curved or pistol-butted conifer boles or instability such as, tension cracks, scarps, or jack-strawed trees that indicate active slope movement.

On landslide-prone portions of the landscape, timber harvest can increase the probability of landslides, but only if a damaging storm occurs in the vegetation re-growth period: up to 10 years following harvest (USDI 2008, pg. 769). These areas most commonly occur within the steep inner-gorge of some streams. However, in the *Proposed Action Alternative*, these areas would be buffered with no-treatment areas.

In Little River MMX, the most likely slope failure would be occasional shallow (3 feet or less in depth), rapid slope failures as noted in the affected environment. If a slope failure were to occur on the steep to very steep slopes, the travel distance of the failed material would depend on a variety of factors, including the initial failure size (amount of

material), the initial and down slope steepness, proximity to stream channels, the downstream channel junction angles, stream channel gradients and the riparian condition along the resulting debris flow path (Robison *et al*., 1999; Benda and Cundy 1990).

(3) *Soil Productivity*

The creation and use of landings and roads would displace and compact soil, thereby decreasing soil productivity.

The proposed spur construction in Little River MMX would create approximately eight acres of new soil displacement and compaction where soil impacts due to past management are currently light or non-existent. Widening partially existing trails into proposed spurs RC 7, RC11 RC13, RC17 H15 would re-disturb approximately two acres where there is currently moderate to heavy residual soil impact and varying degrees of re-vegetation. Proposed spur H16 is on an existing rocked road and re-disturbance of soil would be minor.

Spur H6, as proposed, runs mid-slope and parallel to the 26-3-34.1 road. This mid-slope spur would be full bench in some areas and create between 0.44 acres and 1.8 acres of new disturbance. Alternatively, the 15 acres of timber could also be accessed by downhill yarding to the 26-3-35.6 or the 26-3-26.0 road. Downhill yarding is expected to cause more ravel and soil movement than uphill yarding; thus, detrimental compaction and loss of soil productivity would be three percent or about 0.5 acres (Megahan and Kidd, 1972).

New road cut and fill slopes would be mulched with weed-free straw (or its equivalent) and seeded to prevent surface soil erosion from new road. With the project design features described in Chapter 2, resulting soil erosion would be limited to localized areas, and any reduction of soil productivity due to erosion would be minor. Approximately 2.01 miles native surface roads and spurs would be mulched with logging slash, to help initiate soil recovery and help replace duff and surface soil organic matter.

Selected units, as depicted in Figures 14-15 (Appendix G), would be sub-soiled with several offset passes of tilling equipment to reduce compaction, and covered with logging slash to reduce the risk of erosion and unauthorized vehicular use. Although it will not remedy soil displacement or bring about 100 percent recovery from soil compaction, tilling can bring about greater than 80 percent soil fracturing, and is an important step in recovery (Luce, 1997). Tillage also helps prevent runoff and erosion by reducing compaction and increasing water infiltration.

D. Hydrology, Aquatic Habitat, & Fisheries

1. Affected Environment

The Little River MMX project area lies within the Lower Cavitt Creek, Middle Little River, Lower Little River and Upper Little River 12-digit Hydrologic Unit Code (HUC) Sub-Watersheds which are part of the Little River 10-digit HUC Watershed.

Approximately 27 acres of the project lies in the Bradley Creek-North Umpqua River 12-digit HUC Subwatershed, which is part of the Lower North Umpqua River Watershed and 45 acres lie within the Susan Creek-North Umpqua 12-digit HUC Subwatershed, which is part of the Middle North Umpqua River Watershed. Proposed activities in the Lower North Umpqua River and Middle North Umpqua Watersheds cover an area approximately 0.03% of each watershed. These actions are expected to have negligible effects on hydrology within their respective watersheds because of their ridge top location and due to the small area affected within the watershed. Therefore, hydrologic effects of Little River MMX on the Middle North Umpqua River and the Lower North Umpqua River 5th Field Watersheds will not be analyzed further in detail within this document.

Within the four Little River Subwatersheds containing the project area, there are approximately 323 miles of streams. Of these 323 miles of stream, approximately 25 miles are within proposed thinning units. Of these 25 miles, 65 percent are 1st and 2nd order headwater streams and 35 percent are 3rd order or higher streams. Approximately 27 percent of the streams in the surrounding drainages are classified as perennial (i.e. surface water flows year-round with the channels passing some volume of water throughout the year) and 73 percent are classified as intermittent (i.e. they stop flowing in the dry season and surface water is no longer transported downstream).

Within the project area, Rattlesnake Creek, Jim Creek, Cavitt Creek, Wolf Creek, Emile Creek, and Little River had previously been placed on the Oregon Department of Environmental Quality (ODEQ) 303(d) list as being water quality limited. These streams were listed due to excessive summer temperature. Little River and Cavitt Creek were also included on Oregon's 303(d) list for sedimentation. In an effort to achieve compliance with water quality standards in the Umpqua Basin, these streams are now covered under ODEQ's 2001 Little River Total Maximum Daily Load (TMDL) and Water Quality Management Plan (WQMP) which were approved by the U.S. Environmental Protection Agency on January 29, 2002.

The potentially affected beneficial uses of water within the project area are: resident fish and aquatic life, salmonid spawning and rearing, and public and private domestic water supply. Within one mile downstream of the project area there are 27 points of diversion for domestic water supply. This includes a point of diversion and related infrastructure inside Unit 3B of Emile Islands. This site is completely within a 60 foot "no-harvest" buffer and would not be affected by the project. Most of the Little River MMX project area lies within the municipal drinking water source area for the City of Roseburg, Oregon approximately 27 miles downstream. A portion of the project area is also in the Glide Water Association source area (approximately 5 miles downstream) and a portion is within the USFS Wolf Creek Job Corps source area (approximately 1 mile downstream).

Average annual precipitation in the Little River MMX project area ranges from 51 to 65 inches, occurring primarily between October and April. Precipitation occurs mostly as rainfall in the project area since most of the area is less than 2,100 feet in elevation (i.e. below the rain-on-snow

zone). Elevations in the Little River MMX project area range from 700 to 4,200 feet in elevation. The majority (70%) of the project area lies within the rain dominated hydroregion where shallow snow accumulations are uncommon and the dominate precipitation pattern is in the form of rain while the rest of the project area (30%) lies within the rain on snow area (2,100' – 4,000' in elevation) where some snow accumulation is expected to transiently occur throughout the wet season.

A variety of anadromous (sea run) fish are found within the project area, including coho salmon (*Oncorhynchus kisutch*), winter steelhead trout (*O. mykiss*), coastal cutthroat trout (*O. clarki clarki*), and Pacific lamprey (*Lampetra tridentata*). In addition, a variety of non-anadromous (resident) fish are also found within the project area, including resident forms of rainbow and cutthroat trout (*O. mykiss and O. clarki clarki*), sculpin (*Cottus sp.*), dace (*Rhinichthys sp.*), brook lamprey (*Lampetra richardsoni*), and redside shiner (*Richardsonius balteatus*).

On February 4, 2008 NOAA Fisheries listed the Oregon coast coho salmon evolutionary significant unit (ESU) as threatened under the Endangered Species Act. This included the designation of critical habitat for Oregon Coast (OC) coho salmon. The OC coho salmon is the only fish species on the Roseburg District currently listed under the ESA. The coho bearing portions of Little River, Cavitt Creek, Jim, Creek, Evarts Creek, and Wolf Creek within the project area are considered to be critical habitat for OC coho salmon (Figure 17, Appendix G).

Streams and habitat that are currently or were historically accessible to Chinook and coho salmon are considered essential fish habitat. Essential fish habitat is designated for fish species of commercial importance by the Magnuson-Stevens Fishery Conservation and Management Act of 1996 (Federal Register 2002, Vol. 67/No. 12). Within the Little River analysis area, there are approximately 18.1 miles of essential fish habitat (Figure 17, Appendix G).

The anadromous version of the coastal cutthroat trout and the Pacific lamprey have very similar habitat needs to the coho salmon, and are also found in the fish bearing portions of the streams within the project area. Steelhead trout are listed as a BLM Sensitive species in Oregon. Chum salmon and Umpqua chub are also listed as Sensitive species on the BLM's Special Status Species list, but these fish are not found within the project area.

The analysis for this project area includes the proposed thinning units and haul routes to the nearest paved road. There are approximately 13,200 feet (2.5 miles) of haul route in the Baker Street project located within 50 to 300 feet of a fish bearing stream (Jim Creek). Ditch banks along the haul route are well vegetated and there are no direct connections to fish-bearing streams. Spur RC13 in the Root Canal project would cross a fish bearing stream (Evarts Creek). Evarts Creek contains resident cutthroat trout.

ODFW habitat surveys in Jim Creek, West Fork Wolf Creek, and Engles Creek indicate an average of greater than 200 pieces of large wood per mile of stream habitat (ODFW, 1999). Habitat surveys in Evarts Creek, Bond Creek, and Greenman Creek indicate an average of greater than 140 pieces of large wood per mile (ODFW, 1999). Streams with greater than 70 pieces of large wood per mile are considered in excellent condition.

2. Water Quantity & Water Quality

a) Affected Environment

Stream flows are dependent upon the capture, storage, and runoff of precipitation. Timber harvest can alter the amount and timing of peak flows by changing site-level hydrologic

processes. These hydrologic processes include changes in evapotranspiration of forest trees, forest canopy interception of water, snow and snowmelt rates, roads intercepting surface and subsurface flow, and changes in soil infiltration rates and soil structure (2008 Final EIS, pg. 352). Based on a compilation of watershed studies in the Northwest, completed in small catchments, a peak flow response is only detected where at least 29 percent of the drainage area is harvested (Grant *et al*., 2008). There are no peak-flow experimental study results in the rain dominated hydroregion showing a peak-flow increase where less than 29 percent of a drainage area is harvested (2008 Final EIS, pg. 353). None of the 12 digit HUC Subwatersheds, in which the analysis area lies, are considered susceptible to increases in peak flow stemming from unrecovered canopy openings (2008 Final EIS; pg. 755).

Research by Poggi *et al*. (2004) suggests that forest thinning treatments maintains normal patterns of snow accumulation and have little effect on snowmelt rates during rain-on-snow events (2008 Final EIS, pg. 355). Increases in the peak flow of rain-on-snow hydroregions can also be found when oads and other impermeable areas occupy more than 12 percent of a catchment scale watershed (2008 Final EIS, pg. 355). Within the project area, roads occupy approximately 3.2 percent of the area and do not pose a risk to peak flow enhancement.

According to Reid (1981) and Reid and Dunne (1984), forest roads can be a major contributor of fine sediment to streams, through down cutting of ditch lines and erosion of unprotected road surfaces by overland flow. Roads are highly compacted which affects water infiltration rates and drainage patterns. Assuming a 30-foot average width, roads occupy approximately 3.2 percent of the total acreage of the 12 digit HUC Subwatersheds that comprise the project area. Road maintenance and improvement associated with this project would improve road drainage and add additional cross drains along the haul route to disconnect the road from the stream system (q.v., *Sediment Control Plan*, pgs. 20-21). This would reduce the amount of sediment currently entering streams in the project area.

b) Environmental Consequences

(1) <u>*Canopy Opening Impacts on Peak Flow Susceptibility*</u>

The proposed sale units in the Little River MMX project area are all forest thinning treatments. It is presumed that hydrologic impacts such as peak flow increases would decrease with the intensity of treatment (i.e. regeneration harvest having the greatest impact and thinning treatments having the least impact) although past experimental studies in the Pacific Northwest did not fully examine the differences (Grant *et al*., 2008; 2008 Final EIS, pg. 353).

The 2008 Final EIS (pgs.753-759) analyzed peak flow effects from forest management at sixth field subwatersheds across western Oregon. Although some subwatersheds would be susceptible to increases in peak flows, this does not automatically imply adverse effects on stream form. Stream flow runoff normally fluctuates with climate, and over time channels have developed under a wide range of stream flows including infrequent peak flows. These stream flows have the potential to affect the frequency of sediment transport and the depth of scour. However, the potential for peak flow effects would vary for different stream types (Grant *et al*., 2008). The 2008 Final EIS (pg. 758) indicates that within the high gradient cascade and step-pool stream types there is little potential to affect sediment transport and peak flow enhancement. All of the streams within the Little River MMX project area are high gradient cascade and step-pool stream types of streams.

(2) <u>*Road Impacts on Peak Flow Susceptibility*</u>

There would be no effective increase in road density within the project areas sub-watersheds since 6.19 miles of roads and spurs would be constructed but 10.56 miles would be decommissioned after use (q.v., pgs. 15-16; Tables 4a-4d). Although the net amount of roads within the project area would decrease, the resulting percent of road surface within the project area Sub-Watersheds would remain unchanged at 3.2 percent, which is well below the 12 percent threshold where measurable increases in peak flows would be expected (Harr, *et al*. 1975). As described previously (Tables 4a – 4d), road decommissioning would result in water-barring, mulching with logging slash where available (or with straw if logging slash is not available), and blocking with trench barriers. Some rock surface roads and spurs would be decommissioned by water-barring and blocking with trench barriers (Tables 4a – 4d). By decommissioning roads the potential for peak flow effects and sediment routing would be diminished.

(3) *Sedimentation from Roads*

Under the *No Action Alternative*, routine road maintenance would not fully repair existing sediment sources (e.g. culvert failures, natural surface road erosion, roadcut failures, etc.) The lack of road maintenance would be most prominent on roads that are not well used or on roads that have been blocked. Existing infrastructure is subject to ongoing degradation or failure in the event of a storm as these structures age. Most road or culvert failures would result in direct inputs of sediment to the drainage network. The amount of introduced sediment would vary depending on the size of the storm event and the infrastructure's condition, stability and proximity to a stream.

The proposed haul routes cross streams on existing roads with adequate drainage structures and before timber hauling begins. Timber hauling could occur in both the dry and wet seasons.

During the dry season there is no mechanism for sediment transport from the roads to the streams. However, with the first seasonal rains there could be a small pulse of sediment at stream crossings. During the wet season, sediment carried by runoff from road surfaces to ditchlines can ultimately result in sediment transport and delivery to the aquatic system. This sediment has potential to impact water clarity by increasing turbidity if it is not trapped. Potential total sediment inputs from existing roads would be expected to be negligible, because these roads should have well vegetated ditchlines that serve to filter and trap sediments when the project is implemented. Past monitoring of timber haul and sediment delivery on similar road systems (McEnroe, 2010) indicates that vegetated ditchlines are effective at filtering sediment from water in road ditchlines.

In addition, timber hauling would be suspended during wet weather if road run-off would deliver higher sediment concentrations than seen prior to haul. Therefore, the combination of well vegetated ditches along with project design features, such as silt fencing or geofabric rolls in ditchlines, and the ability to suspend wet weather haul is expected to arrest any sediment prior to delivery to the aquatic system.

There would be potential for localized soil disturbance and erosion associated with road renovation/maintenance and road improvement proposed within Riparian Reserves under the Proposed Action. Under the Proposed Action Alternative, there would be six temporary stream crossings that would require entry into the "no harvest" buffer. All of these entries would be on existing skid trails and few trees would be cut to facilitate road construction. Spurs RC7, RC12, RC13, BS1, H4 and H19 would be constructed for use during the dry season and decommissioned after use. Of the six stream crossings, three

cross perennial streams (spurs RC 7, RC13, and H19) and three cross intermittent streams (RC 12, BS1, H4). Besides those six temporary stream crossings, none of the road construction in Riparian Reserves would have any direct hydrologic connectivity to streams, since they are either proposed in stable, ridge top locations or are separated from the nearest stream by another road. The nearest segment of road construction to OC coho salmon habitat is located roughly 1,100 feet away. As mentioned above, well vegetated ditches and the implementation of project design features, such as silt fencing and geofabric rolls in ditchlines, would serve to trap any sediment mobilized as a result of this work. Therefore, this material is not expected to be delivered to fish bearing streams.

(4) <u>*Sedimentation from Harvesting/Yarding Operations*</u>

The risk of harvest related sediment contribution to the aquatic system comes primarily from potential increases in landslide frequency and road activities like renovation, new construction, and haul of timber in close proximity to streams.

Under the *No Action Alternative* the Riparian Reserves would not be treated. Because harvest would not occur adjacent to streams, harvest activities would not contribute sediment to the stream network.

Areas deemed unstable by the project Soil Scientist would be included in the Riparian Reserve Land Use Allocation. Thinning harvest prescriptions in these areas were modified or eliminated as necessary to maintain slope stability. This, coupled with no-harvest riparian buffers adjacent to all stream channels, would result in a low risk of increasing landslide activity as a result of thinning harvest (q.v. *Slope Stability*, pgs. 56-57).

There would be potential for localized soil disturbance and erosion associated with harvest and yarding operations under *the Proposed Action Alternative* within Riparian Management Areas. However, full suspension of timber would be required, where practical, when yarding across streams (q.v., pg. 11) under the *Proposed Action Alternative*. This would reduce the risk of sedimentation arising from streambank and channel disturbance.

Under the *Proposed Action Alternative*, the BLM would apply a "no-harvest" buffer of 35 feet (slope distance) either side of intermittent stream channels, as measured from the high water line, to filter sediment. The BLM would apply a "no-harvest" buffer of 60 feet either side of perennial and fish-bearing streams, as measured from the ordinary high water line. Rashin *et al*., 2006, found that sediment delivery is unlikely when potential erosion features (skid trails, yarding corridors, etc) are sited more than 10 meters (33 feet) from stream channels. As such, these buffers reduce ground disturbance near streams and maintain an intact duff layer that would be effective at intercepting and filtering any sediment from upslope sites, as long as it was not concentrated in gullies or yarding/skidding trails (Rashin *et al*., 2006).

(5) <u>*Stream Temperature Impacts*</u>

Under all alternatives, shade that regulates water temperature in streams would be maintained. Under the *No Action Alternative*, effective stream shade would be maintained since there would be no thinning within the Riparian Reserve.

Under the *Action Alternative*, effective stream shade would be maintained because of the no-harvest buffers. Vegetation that provides primary shading for stream channels that have the potential for summer flow (i.e. perennial streams) would be protected by 60-foot no-treatment areas. Maintaining approximately 40-72 percent canopy closure outside of this buffer within the Riparian Reserve (Table 7) is also essential in preventing increases of stream and air temperatures (2008 FEIS, p. 761).

(6) *Cumulative Impacts*

In Summary, "no-harvest" buffers and the project design features referenced above would prevent disturbance to stream channel and stream banks. These measures would also intercept surface runoff and prevent sedimentation of streams, such that there would be no cumulative degradation to water quality in the project area or to the beneficial uses of water and municipal drinking water sources within or downstream of the project area.

3. Woody Structure in Streams and Riparian Vegetation Conditions

a) Affected Environment

From an aquatic habitat perspective, there are generally two major components of woody material – small functional wood (< 20 inches diameter), and large wood (≥ 20 inches diameter and ≥ 50 feet long). Large wood, as defined here, is also classified as "key pieces". These key pieces are necessary in fish bearing streams to trap and store smaller pieces of wood. Because wood decay rate and probability of displacement are a function of size, large pieces have a greater influence on habitat and physical processes than small pieces (Dolloff and Warren, 2003).

(1) *Small Functional Wood*

Nearly all wood that falls into stream channels has the capacity to influence habitat and aquatic communities (Dolloff and Warren, 2003). Therefore, smaller woody material that enters stream channels is important to overall channel function because it can store sediment and organic material, contribute nutrients, and provide temporary pool habitat and slow-water refugia. It is important to note, however, that pools formed by smaller wood generally are not as deep or complex as those formed by large wood. In addition, small wood does not persist for long periods of time because it deteriorates quickly and is more likely to be flushed from the system (Naiman *et al*., 2002, Keim *et al*., 2002).

Small functional wood is generally lacking in the larger, fish bearing channels throughout the project area. Based on professional judgment, this is likely due to the lack of stable large wood available to trap and store this material, not a lack of available small functional wood for recruitment.

In smaller streams adjacent to previously harvested stands, field surveys (McEnroe, 2010) indicated that relatively large amounts of existing (in-stream) and potential (standing) small functional wood are present. Field surveys also indicate that the vast majority of the down wood in these areas originated from within 50 feet of the stream channel. This is consistent with findings by Minor (1997), who found that in second-growth coniferous riparian forests, 70-84 percent of the total in-stream wood was recruited from within 15 meters (49 feet) of the channel. In addition, McDade *et al*. (1990) and Welty *et al*. (2002) found that 80 percent and 90 percent, respectively, of the wood loading occurred within 20 meters (66 feet) of the stream channel in coniferous forests.

Current stand densities in the proposed units average 208 trees per acre (TPA). Based on studies in the Oregon Coast range by Tappenier *et al* (1997), conifer stands initiated and grew at relatively low densities with little self-thinning; reported stand densities ranged from 40-50 TPA. This suggests that the available source of small functional wood was naturally lower in these areas, and that the current average stand density is 4 to 5 times higher than what was likely found here prior to harvest, when the previous stands were of a similar age.

(2) <u>*Large wood*</u>

Based on field surveys within the analysis area (McEnroe, 2010), large wood levels are moderate in all channel sizes, and in all areas adjacent to previously harvested stands. Small pockets of in-stream large wood are present in the project area, and are associated with mature or old growth riparian areas that have not been previously harvested, and do not have roads in close proximity to the stream. In those areas with in-stream large wood, aquatic habitat conditions are substantially different than in areas without large wood. These areas are dominated by gravel and cobble substrates, deep scour pools, point bars, and an abundance of habitat diversity where fish and other organisms can find suitable cover throughout the year.

Within previously harvested stands in the project area, standing conifers have not yet reached the size necessary to be considered potential large wood. These riparian trees are on average 13 inches DBH, and average 90 feet in height (Moser, 2010), and would be considered as small functional wood if they entered adjacent stream channels.

b) Consequences of the No Action Alternative

The *No Action Alternative* does not propose any thinning within Riparian Reserves. It is well documented that thinning younger stands results in increased growth in the remaining trees, thereby speeding attainment of larger diameter trees (Boyer *et al*, 2003). As a result of no thinning, tree growth rates in these areas would continue on their current trajectory – leading to increased suppression mortality and decreasing diameter growth (q.v. *Forest Vegetation*; pg. 19).

(1) <u>*Small Functional Wood*</u>

The *No Action Alternative* would maintain existing stand densities throughout the untreated areas. These densities average 208 trees per acre (TPA). Therefore, this alternative would result in no reduction of small functional wood available to enter stream channels in the future.

(2) <u>*Large Wood*</u>

Based on the trend of increasing suppression mortality and decreasing diameter growth in these stands, the *No Action Alternative* would result in an increase in the time needed for average stand diameters to attain values of 20 inches or greater, when compared to the *Proposed Action Alternative* that decreases stand density, which as a result would increase tree growth rates.

c) *Consequences of the Proposed Action Alternative*

(1) Small Functional Wood

The *Proposed Action Alternative* would retain variable width no-harvest buffers along all stream channels, and thin remaining outer portions of the Riparian Reserve to varying densities. For the fisheries and aquatic habitat analysis, "outer portions of the Riparian Reserve" is that area between the 35 or 60 foot no-harvest stream buffer and the full extent of the Riparian Reserve (i.e. 180 or 360 feet).

No-harvest buffers ranging from 35 or 60 feet in width would maintain existing stand densities (averaging 208 trees per acre) in the near stream region and would maintain the existing short-term source of small functional woody material necessary to maintain aquatic complexity. Riparian thinning proposed in the outer portions of Riparian Reserves in these alternatives would reduce the amount of standing small functional wood that would be available to fall, and potentially enter stream channels. Stand densities in thinned areas would average from 45-156 TPA (Table 7). When the density of the no-harvest buffer is combined with the density of the thinned portions of the Riparian Reserve, the average stand density in the entire Riparian Reserve would range from 99-173 TPA. Based on the findings of Tappenier (1997) discussed earlier, these post-thinning stand densities would still be in the high range of what was likely found there prior to the original harvest. As a result, these thinned areas would provide contributions of small functional wood to the aquatic system at levels that are likely higher than what was seen historically in stands of the same age

(2) Large Wood

The *Proposed Action Alternative* would thin the outer portions of the Riparian Reserve. Based on a retrospective study of similar stand treatments (as referenced in the Forest vegetation section) average growth rates of residual conifers in the thinned areas increased by 36 percent when compared to unthinned stands at 10 to 23 years post-thinning. This increased conifer growth would result in the residual conifers attaining larger diameters sooner than in the absence of thinning. Thus, trees in the project area would attain sufficient diameter sizes to have large trees ($\geq$ 20 inches dbh) available for recruitment as large wood in a shorter amount of time.

4. Riparian Vegetation Conditions

The *No Action Alternative* with its lack of riparian treatments, would result in riparian areas that continue to be dominated by dense, single age stands of Douglas fir. Individual tree growth rates would continue to decline and suppression mortality would increase. Over time, these areas would be expected to diversify naturally as individual trees or small groups of trees die, and natural processes leading to structural and vegetative diversity occur. These areas would attain late-successional characteristics over a longer time frame when compared to the *Proposed Action Alternative.*

As riparian thinning treatments are carried out in the *Proposed Action Alternative,* riparian vegetative and structural diversity would be improved from the existing condition. Thinning treatments would gradually result in riparian areas that are more resilient to disturbance from wind, flood, and fire. In addition, as discussed in the *Forest Vegetation* section, as tree growth rates, structural and species diversity increase, these areas would be expected to attain late seral characteristics in a shorter period of time than if left untreated in their current state.

5. Fish Populations

There are no anticipated direct effects to aquatic habitat from any of the alternatives. Therefore, no direct effects on fish populations are anticipated.

The indirect effects to fish populations would roughly parallel the indirect effects previously discussed for small functional wood, large wood, and riparian vegetation conditions. Actions that have a positive or negative impact on those three attributes are likely to result in similar impacts to aquatic habitat, and ultimately, fish populations. This is not a direct correlation, however, because freshwater fish population variability is influenced by numerous other factors beyond local habitat conditions, including predation, floods, droughts, ocean conditions, disease, and recreational and commercial harvest. In addition, the processes of small and large wood entry, as well as changes to riparian vegetative diversity, take decades or more to be realized, and then decades more for those changes to actually influence physical stream habitat conditions.

Therefore, there is an inherently low probability of the action alternative resulting in a measureable impact on fish habitat and/or fish populations.

In addition, as discussed previously, remaining stand densities after thinning treatments would be higher than those that likely existed prior to the original harvest. Therefore, amounts of small functional wood entry into stream channels are expected to be relatively high post-thinning, and still near the high end of the range of natural variability in these areas (Tappenier *et al*, 1997). Furthermore, the majority of instream wood entry is triggered by disturbance events, such as windstorms, fire, floods, and landslides, not simple suppression mortality, and random tree fall (May and Gresswell, 2003). Therefore, while there would be a small reduction in the amount of standing small functional wood in the outer Riparian Reserve, it is not likely that this would translate into a measureable impact to aquatic habitat. As a result, no impacts to fish populations would be anticipated.

Under the *Proposed Action Alternative* the time required for trees to attain large wood size classes (>20 inches DBH) is expected to decrease. In addition, riparian vegetative diversity is expected to increase. The cumulative increase in the availability of large wood to enter streams, coupled with increasing vegetative diversity in Riparian Reserves (discussed previously) would contribute positively to the trend of gradually improving habitat in the Little River Watershed. When compared to the *No Action Alternative* that does not include riparian thinning, this alternative would hasten the attainment of healthy aquatic habitat capable of supporting the natural fish species mix and population variability typical of healthy coastal ecosystems. For the same reasons discussed above, these changes would be immeasurable at the site scale, and are therefore best considered at the cumulative scale across a fifth-field watershed

6. Aquatic Conservation Strategy

Based on the information presented in Appendix B: Aquatic Conservation Strategy Assessment, the proposed action alternatives would meet ACS objectives at the site and watershed scale. In addition, based upon the restorative nature of the action, this project would not retard or prevent attainment of ACS objectives; it would actually speed attainment of these objectives. Therefore, this action is consistent with the ACS and its objectives at both the site and watershed scales.

E. Botany

1. Federally Listed Species

a) Kincaid's Lupine

Kincaid's Lupine (*Lupinus sulphureus* ssp. kincaidii), is a Federally Listed Threatened species of vascular plant. Habitat for Kincaid's Lupine in Douglas County is likely to be shaded with canopy cover as high as 50 to 80 percent. Tree and shrub species that dominate known sites of Kincaid's lupine include Douglas fir (*Pseudotsuga menziesii*), California black oak (*Quercus kelloggii*), Pacific madrone (*Arbutus menziesii*), ponderosa pine (*Pinus ponderosa*), incense cedar (*Calocedrus decurrens*), hairy manzanita (*Arctostaphylos columbiana*), and poison oak (*Toxicodendron diversilobum*).

The proposed units in Little River MMX contain habitat matching this description for for Kincaid's lupine sites within Douglas County. In spring and summer 2010, surveys were conducted in the proposed thinning units and Kincaid's lupine was not discovered. Therefore, Kincaid's lupine will not be discussed further in this analysis.

b) Rough Popcorn Flower

Rough popcorn flower (*Plagiobothrys hirtus*) is a Federally Listed Endangered species of vascular plant. The rough popcorn flower is found only in the Umpqua River drainage in Douglas County at sites ranging from 328 to 755 feet in elevation. The northern most site is near Yoncalla, Oregon and the southernmost at Wilbur, Oregon. The species range extends about 10 miles east and 5 miles west of Sutherlin.

Little River MMX is outside of the described range of the rough popcorn flower and therefore there is neither suspected habitat nor sites for this species within the proposed project. Therefore, rough popcorn flower will not be discussed further in this analysis.

2. Bureau Sensitive Species

a) Carex gynodynama

(1) Affected Environment

Botanical surveys conducted in spring and summer found eight *Carex gynodynama* populations along proposed haul routes and within the proposed thinning units. The populations occur in Horseshoe Units 1B, 1C, 21A, 23A, and 35B, Emile Islands Unit 27-3-1C, Baker Street Unit 11B and Root Canal Unit 25A. *Carex gynodynama* inhabit seeps, moist meadows, open woodlands and ditches, and are generally found in disturbed sites with partial shade (Wilson *et al*., 2008).

(2) No Action alternative

Under the No Action Alternative, the *Carex gynodynama* populations that are in habitat with partial canopy cover would persist at their current levels. It is expected that the forest habitat currently present within the proposed units would continue to function in its current capacity. Those populations that occur under full conifer canopy cover would continue to exist in small scattered clumps suppressed by the lack of sunlight.

(3) Proposed Action Alternative

Two *Carex gynodynama* populations are located along roads that are either proposed for renovation (i.e. 27-3-25.0 road in Root Canal Unit 25A) or along the drainage ditch of proposed haul routes (i.e. 27-3-11.1 road in Baker Street Unit 11B). Proposed road activity to renovate or maintain these roads, respectively, would extirpate these local populations of *Carex gynodynama* through physical crushing and disturbance of the plants themselves.

In addition, six *Carex gynodynama* populations are located in wet areas and seeps within Emile Island Unit 1C and Horseshoe Units 1B, 1C, 23A, and 35B. These wet areas and seeps are included within no-harvest buffers as described in *Stream Buffers* (q.v., pg. 10) so the *Carex gynodynama* populations would be protected from physical disturbance. However, thinning the adjacent forest canopy would benefit these populations by decreasing canopy shade thereby increasing the amount of sunlight available to them.

b) Chaenotheca subroscida

(1) *Affected Environment*

Chaenotheca subroscida, a pin lichen, was found on conifer bark in Root Canal Unit 17A and Horseshoe Unit 23A during surveys in 2010. The habitat of the Root Canal population is a north facing slope near Wolf Creek and the lichens were found on scattered, older conifers in the stand. The other population is on an individual, older conifer within the Oregon ash dominated wet area found in Horseshoe Unit 23A; with *Carex gynodynama* in the same wet area (described above).

(2) *No Action alternative*

Under the *No Action Alternative*, the *Chaenotheca subroscida* populations would persist at their current levels. It is expected that the forest habitat currently present within the proposed units would continue to function in its current capacity.

(3) *Proposed Action Alternative*

Falling trees that are the substrate for *Chaenotheca subroscida* or falling other trees against the substrate trees would destroy these local populations within the proposed thinning units. Although the population within the wet area in Horseshoe Unit 23A would be afforded some protection from physical damage since it would be within a no-harvest stream buffer.

c) Eucephalis vialis

(1) *Affected Environment*

A single population of *Eucephalis vialis*, the wayside aster – a vascular plant, was found on Emile Islands Unit 1A. This population is on the southernmost edge of the unit in a relatively dry, upland location where the trees are widely-spaced and there is open grassy ground between the trees. The road along the eastern edge of the population and a recent clearcut on private lands has disturbed this population and exposed it to risk of invasion by noxious weed species.

(2) *No Action alternative*

The recent disturbance at this site provides ground disturbance that would allow the establishment of new noxious weed populations which would compete against the

Eucephalis vialis for resources. Monitoring the status of this *Eucephalis vialis* population is planned contingent on available funding and other workload priorities.

(3) <u>*Proposed Action Alternative*</u>

Under the *Proposed Action Alternative*, thinning activities such as ground-based yarding would expose individual plants in this population to mastication and crushing. In contrast, thinning activities that would not fall trees directly onto the population would not impact this population.

d) Calachortus umpquaensis

(1) <u>*Affected Environment*</u>

Calochortus umpquaensis, the Umpqua mariposa lily – a vascular plant, occurs in the serpentine meadow adjacent to Baker Street Unit 3B in a transitional zone between forest and grassland. This is a sub-population of one of the five known populations for this species.

(2) <u>*No Action alternative*</u>

Under the *No Action Alternative*, the *Calachortus umpquaensis* sub-population would persist at its current level. It is expected that the habitat currently present within the proposed unit would continue to function in its current capacity. This sub-population of *Calachortus umpquaensis* has few invasive plant species competing against it and there are few habitat disturbances so the habitat is relatively stable.

(3) <u>*Proposed Action Alternative*</u>

Habitat disturbance and modification is a threat to the *Calachortus umpquaensis*. Activities associated with the proposed thinning such as ground-based yarding or tree falling would result in soil disturbance that would degrade the habitat and render it vulnerable to infestation by noxious weed species. Yarding activities at the location of this sub-population would crush and destroy individual *Calachortus umpquaensis* plants.

3. Bureau Strategic Species

a) Leptogium rivale

(1) <u>*Affected Environment*</u>

Leptogium rivale, an aquatic lichen, was found during botanical surveys (2010) in Root Canal Unit 30B. The population of *Leptogium rivale* was found growing on rocks within the stream in this unit. This species of aquatic lichen is thought to be restricted to streams with unpolluted water with no scouring disturbance and little-to-no siltation.

(2) <u>*No Action alternative*</u>

Under the *No Action Alternative*, the *Leptogium rivale* population would persist at its current level. It is expected that the habitat currently present within the proposed unit would continue to function in its current capacity.

(3) <u>*Proposed Action Alternative*</u>

The proposed action is not expected to have measurable effects due to project design features (e.g. "no-harvest" stream buffers) that would protect micro climate conditions and water quality within streams (q.v. *Water Quantity & Water Quality*, pgs. 61-64).

4. Noxious Weeds

a) Affected Environment

Surveys for noxious weeds in the Little River MMX proposed units and along proposed haul routes located: tansy ragwort (*Senecio jacobaea*), Scotch broom (*Cytisus scoparius*), Canada thistle (*Cirsium arvense*), Himalayan blackberry (*Rubus aremeniacus*), meadow knapweed (*Centaurea pratensis*), perennial peavine (*Lathyrus latifolius*), English hawthorn (*Crataegus monogyna*) and bull thistle (*Cirsium vulgare*) infestations. Biocontrols, primarily insects, are widespread and present on most populations of Scotch broom, meadow knapweed, Canada thistle, bull thistle, and tansy ragwort.

Approximately two-thirds of the noxious weed populations occur along roads. The other third of the noxious weed populations occur within the boundaries of the proposed thinning units. Table 13 (below) shows the relative amount of noxious weed infestations associated with each proposed thinning.

Table 13. Noxious Weed Infestations within Little River MMX.

Sale Name	Noxious Weed Infestation (acres)							
	Canada Thistle	Himalayan Blackberry	Perennial Pea	Scotch Broom	English Hawthorn	Meadow Knapweed	Tansy Ragwort	Bull Thistle
Baker Street	0.03	0.08	0	0.35	0	0	0.54	0
Emile	0.01	1.46	0.10	2.13	0	0.61	0.09	0
Horseshoe	0.03	0.61	0.01	7.21	0.01	0.05	0	0
Jungle Jim	0	0.50	0	0	0	0	0	0.01
Root Canal	3.23	0.07	0	1.83	0	0.84	11.60	0
TOTAL	***3.30***	***2.72***	***0.15***	***11.52***	***0.01***	***1.50***	***12.23***	***0.01***

b) No Action Alternative

Noxious weeds within the project area are managed under the Roseburg District's Noxious Weed Program. Weed populations in this area would be monitored and evaluated for treatment at regular intervals (USDI, BLM 1995). Control of weed populations within the district is contingent on funding and workload priorities. Priority would be given to weed species with long lived seeds and those tolerant of shade. They have the greatest potential to persist in a stand with a dense canopy.

Noxious weed populations would decline as the stand matured. Greater shading and longer period of time between disturbances would tend to favor native vegetation.

c) Proposed Action Alternative

Existing infestations of Scotch broom and Himalayan blackberry would be treated, prior to thinning operations, in order to limit the development and spread of seeds during the planning and logging of the timber sale units. In addition, implementing *Additional Project Design Features* (q.v., pg. 9) to wash equipment prior to entering BLM-administered lands would limit the spread of weed seed. Washing logging and construction equipment removes weed seed and other plant propagules that can be transported onto new sites by way of the dirt and vegetation that can cling to various parts of the equipment. Following the timber sale action

the noxious weed populations would be monitored, evaluated, and treated under the Roseburg District's Noxious Weed Program.

Soil disturbance associated with thinning operations (e.g. ground-based yarding, cable-yarding corridors, spur construction, and slash pile burning) would create areas of exposed mineral soil, which would provide excellent conditions for seed germination and seedling establishment for noxious weeds. New weed infestations on exposed mineral soil would be expected as long as openings in the canopy and available seed sources are present. The noxious weeds would decrease in abundance as the conifer canopy closes and native understory species eventually overtop and out-compete weeds for sunlight, soil moisture, and soil nutrients. Therefore, new weed infestations that take advantage of the soil exposed from the proposed action would be short-lived due to competition from the residual forest stand coupled with continued monitoring, evaluation, and treatment under the Roseburg District's Noxious Weed Program.

Himalayan blackberry, Scotch broom and English hawthorn are all competitive with shrubs and young trees. Himalayan blackberry and Scotch broom would be treated along roadsides prior to project initiation to reduce the opportunity for seed and plant propagules to be introduced onto the units. English hawthorn was found as a single tree that would be treated before the project is initiated.

Canada thistle, meadow knapweed, tansy ragwort and bull thistle are not generally competitive in forested environments. In addition all of these species host a biological control agent to reduce the impact of the species on the environment. For these species the biological control would be the primary source for the management of the species. Only where populations are at a high risk for invading special status plant areas or nearby openings would these species be treated with other controls.

Both units with perennial peavine would be evaluated and treated under the Roseburg District Noxious Weed Program and not as part of Little River MMX.

F. Carbon Storage

Climate change and greenhouse gas emissions have been identified as an emerging resource concern by the Secretary of the Interior (Secretarial Order No. 3226; January 16, 2009), the OR/WA BLM State Director (IM-OR-2010-012; January 13, 2010), and by the general public through comments on previous, recent analyses.

Forster *et al*. 2007 (pgs. 129-234), incorporated here by reference, reviewed scientific information on greenhouse gas emissions and climate change and concluded that human-caused increases in greenhouse gas emissions are extremely likely to have exerted a substantial warming effect on global climate. Literature, however, has not yet defined any specifics on the nature or magnitude of any cause and effect relationship between greenhouse gases and climate change.

The U.S. Geological Survey, in a May 14, 2008 memorandum (USDI USGS, 2008) to the U.S. Fish and Wildlife Service, summarized the latest science on greenhouse gas emissions and concluded that it is currently beyond the scope of existing science to identify a specific source of greenhouse gas emissions or sequestration and designate it as the cause of specific climate impacts at a specific location. Given this uncertainty, this analysis is focused on calculating greenhouse gas emissions and carbon storage, in the context of carbon release and sequestration.

Forests store carbon through photosynthesis, and release carbon through respiration and decay, affecting atmospheric concentrations of carbon dioxide, and thereby affecting global climate. Forest management can be a source of carbon emissions through deforestation and conversion of lands to non-forest condition, or store carbon through forest growth or afforestation (2008 Final EIS, pg. 220).

Values presented in this analysis, in terms of carbon stored and carbon released, are expressed as tonnes (metric tons). This is the unit of measure that is most commonly used in scientific literature to express carbon storage and release. One tonne of carbon is equivalent to 3.67 tons of carbon dioxide (U.S. EPA, 2005).

The 2008 Final EIS (pgs. 488-490), incorporated by reference, described current information on predicted changes in regional climate. That description concluded the regional climate has become warmer and wetter with reduced snowpack and continued change is likely. The description also concluded that changes in resource impacts as a result of climate change would be highly sensitive to specific changes in the amount and timing of precipitation, but those changes are too uncertain to predict at this time. Because of this uncertainty, it is not possible to predict changes in vegetation types and condition, wildfire frequency and intensity, streamflow, or wildlife habitat in the project area.

Even though a causal link between a specific project, such as Little River MMX, and specific climate change effects can not be made, the amount of carbon released or stored can be estimated for this project. Site specific data from stands exams was input into the ORGANON Growth Model (Hann *et al*., 2005) and the output from that model was used to calculate the amount of carbon that would be released or sequestered and the resulting net carbon balance. The values presented in this analysis are estimates based on modeled outputs and should be considered approximations.

This analysis was modeled out to 100 years as was done for carbon analysis in the 2008 Final EIS. The net carbon balance for Little River MMX was analyzed by calculating: the amount of carbon held in live trees and other components of the forest stands, the amount of carbon held in wood products and logging slash that gradually releases that carbon over time, and the amount of carbon released by the burning of fossil fuels and slash burning by the proposed action alternative. The methodology

used in the calculations to estimate the net carbon balance is described in *Appendix E: Carbon Storage Analytical Methodology*.

1. Affected Environment

Current global emissions of carbon dioxide total 6.8 billion tonnes of carbon (based on Denman *et al*. 2007) and current U.S. emissions of carbon dioxide total 1.7 billion tonnes (based on EPA, 2010; Table 2-3). In 2008, forest management in the United States resulted in the net carbon sequestration of 196 million tonnes (based on EPA, 2010; Table 2-9), which represents an offset of approximately 11 percent of total U.S. carbon dioxide emissions.

On lands managed by the Salem, Eugene, Roseburg, Coos Bay, and Medford districts of western Oregon and on the Klamath Falls Resource Area of the Lakeview District there are 222 million tonnes of carbon currently stored in live trees (2008 Final EIS, pg. 221). For this same area, the amount of carbon stored in other than live trees (includes shrubs, brush, snags, woody debris, and organic carbon in the soil) is calculated at 195 million tonnes (2008 Final EIS, pg. 222).

Currently, there are 216,676 tonnes of carbon held within the stands that comprise the Little River MMX project. This carbon is held in either the pool of "standing, live trees" (113,827 tonnes) or in the pool of "other than live trees" (102,849 tonnes) (refer to *Current Condition* in Tables 14 or 15). The amount of carbon currently held in Little River MMX (216,676 tonnes) represents approximately 0.05 percent of the total carbon stored on BLM administered lands in western Oregon (417 million tonnes) as described previously.

In the 2008 Final EIS (pg. 538), the No Action Alternative (Northwest Forest Plan) would result in 596 million tonnes of carbon stored on BLM administered lands in western Oregon in the year 2106. The No Action Alternative described in the 2008 Final EIS (pg. 22) would be continued management under the six District resource management plans that were approved in 1995 and subsequently amended.

2. No Action Alternative

Under the *No Action Alternative*, the stands in the proposed units would continue to develop and grow as described under *Forest Vegetation* (pgs. 26-27). Carbon would be released through the decay of snags, woody debris, and dead vegetation but it would also be sequestered as living, growing trees and other vegetation pull carbon dioxide from the atmosphere. The proposed units in Little River MMX would, on average over 100 years, sequester 5,119 tonnes of carbon per year and the net carbon balance would steadily increase over time. In 100 years, it is estimated, the total amount of carbon stored on-site would more than triple from 216,676 tonnes to 728,566 tonnes (Table 14).

In addition, wood products would not be produced, fossil fuels would not be consumed for the purposes of timber harvest, and there would be no burning of slash since none would be generated under the No Action Alternative. Consequently, there would be no carbon release from these sources or carbon storage in wood products.

Under the *No Action Alternative*, Little River MMX would sequester an average of 5,119 tonnes of carbon annually. Therefore, Little River MMX would represent an offset of 0.00008 percent of current global emissions (5,119 tonnes out of 6.8 billion tonnes) and 0.0003 percent of current U.S. emissions (5,119 tonnes out of 1.7 billion tonnes). Little River MMX would constitute 0.003 percent of the net sequestration represented by forest management in the United States (5,119 tonnes out of 196 million tonnes). In roughly 100 years (ca. 2106), Little River MMX

would represent 0.1 percent of the carbon stored on BLM administered lands in western Oregon (728,566 out of 596 million tonnes).

Table 14. Carbon Storage in Little River MMX under the No Action Alternative.

Time Step	Carbon Storage						
	Standing, Live Trees (tonnes)	Other Than Live Trees (tonnes)	Logging Slash (tonnes)	Wood Products (tonnes)	Fossil Fuels (tonnes)	Slash Burning (tonnes)	Net Carbon Balance (tonnes)
Current Condition	113,827	102,849	0	0	0	0	216,676
+10 years	170,040	102,849	0	0	0	0	272,889
+20 years	229,853	102,849	0	0	0	0	332,702
+50 years	399,723	129,037	0	0	0	0	528,760
+100 years	589,874	138,692	0	0	0	0	728,566

3. Proposed Action Alternative

Under the *Proposed Action Alternative*, thinning would be prescribed with variable retention of 70-120 square feet of basal area (q.v., *Treatment Prescription*, pgs. 9-10) and carbon would consequently be released from harvest-related sources. Based on ORGANON modeling, 27,167,600 board feet (27.2 MMBF) would be harvested from Little River MMX. Consequently, 67,189 tonnes of carbon would be moved from the standing, live tree pool into:

- the "logging slash" pool (28,814 tonnes; Table 15),
- the "wood products" pool as pulpwood and saw logs (32,690 tonnes; Table 15),
- the "slash burning" pool which would release carbon into the atmosphere (556 tonnes; Table 15),
- or would be immediately released into the atmosphere following harvest (5,129 tonnes).

Based on (Smith *et al*., 2006), 13.5 percent of the gross saw log carbon and 14.8 percent of the gross pulpwood carbon would be immediately released into the atmosphere following harvest (for Little River MMX this would be 5,129 tonnes of carbon). In addition, it is estimated that the consumption of 144,184 gallons of fossil fuels would release another 394 tonnes of carbon as a direct consequence of harvest operations (Table 15).

Logging slash that would not be burned and wood products would store less carbon over time as these sources decay and expel carbon into the atmosphere. Logging slash and wood products would decay and expel carbon at rates from Smith *et al*. (2006) and DOE (2007) as presented in the 2008 Final EIS (Appendix E, Tables E-3 and E-4). Over the course of 100 years following harvest, a total of 31,187 tonnes of carbon would be emitted from logging slash and wood products or an average of 312 tonnes of carbon per year.

While logging slash and wood products are emitting carbon, the standing live trees would simultaneously continue to grow; removing carbon from the atmosphere and sequestering it within additional standing volume on-site. The amount of carbon stored in "other than live trees" would also increase over time (Table 15). The "standing live trees" and "other than live trees" pools in Little River MMX would, on average, sequester 3,338 tonnes of carbon per year from the atmosphere under the *Proposed Action Alternative* over the 100 years following harvest. The net carbon balance would more than double from 216,676 tonnes currently to 580,829 tonnes in 100 years after harvest (Table 15).

Direct carbon emissions resulting from the proposed action would total 6,079 tonnes of carbon through the burning of fossil fuels (394 tonnes), slash burning (556 tonnes), and immediate release of carbon at time of harvest (5,129 tonnes). Therefore, the emissions from the proposed action would constitute 0.00009 percent of current global emissions (6,079 tonnes out of 6.8 billion tonnes) and 0.0004 percent of current U.S. emissions (6,079 tonnes out of 1.7 billion tonnes). The emissions from the proposed action would represent an offset of 0.003 percent of the net sequestration by forest management in the United States (6,079 tonnes out of 196 million tonnes). In roughly 100 years (ca. 2106), Little River MMX would represent 0.01 percent of the carbon stored on BLM administered lands in western Oregon (580,829 out of 596 million tonnes).

Clark *et al*. (2011, pg. 50), reported that carbon levels in forest stands that have been thinned with a silvicultural prescription do not attain the carbon levels of comparable, unthinned forest stands within the 50 year timeframe that was modeled. That finding is consistent with the analysis presented here for Little River MMX where the thinned stands under the *Proposed Action Alternative* have a smaller net carbon balance at 50 years (i.e. 408,834 tonnes; Table 15) than under the *No Action Alternative* (i.e. 528,760 tonnes; Table 14). Similarly, in this analysis, stands under the *Proposed Action Alternative* have a smaller, net carbon balance (i.e. 580,829 tonnes, Table 15) than under the *No Action Alternative* (i.e. 728,566 tonnes; Table 14) in 100 years as well.

Table 15. Carbon Storage in Little River MMX under the Proposed Action Alternative.

Time Step	Carbon Storage						
	Standing, Live Trees (tonnes)	**Other Than Live Trees** (tonnes)	**Logging Slash** (tonnes)	**Wood Products** (tonnes)	**Fossil Fuels** (tonnes)	**Slash Burning** (tonnes)	**Net Carbon Balance** (tonnes)
Current Condition	113,827	102,849	0	0	0	0	216,676
Harvest Time (0 years)	47,194	102,849	28,814	32,690	-394	-556	210,597
+10 years	80,537	102,849	24,076	29,985	0	0	237,447
+20 years	117,955	102,849	20,515	28,654	0	0	269,973
+50 years	240,646	129,037	12,688	26,464	0	0	408,834
+100 years	411,820	138,692	5,708	24,609	0	0	580,829

G. Resources Considered but not Analyzed in Detail

1. Resources Not in Project Area

The following resources or concerns are not present and would not be affected by either of the alternatives: Areas of Critical Environmental Concern (ACECs), Research Natural Areas (RNAs), prime or unique farm lands, floodplains/wetlands, solid or hazardous waste, Wild and Scenic Rivers, Wilderness, and lands with Wilderness Characteristics.

The proposed action is consistent with Executive Order 12898 which addresses Environmental Justice in minority and low-income populations. The BLM has not identified any potential impacts to low-income or minority populations, either internally or through the public involvement process. No Native American religious concerns were identified by the team or through correspondence with local tribal governments.

2. Fire and Fuels Management

Horseshoe, Emile Islands, Baker Street and part of Root Canal are within the Wildland Urban Interface (WUI) boundary as identified in the Roseburg District Fire Management Plan. Current fuel conditions are best described by photos 1-MC-2 and 1-MC-3 in *Photo Series for Quantifying Natural Forest Residues in Common Vegetation Types of the Pacific Northwest* (Maxwell and Ward, 1980). Based on this photo series, the estimate for downed woody debris in these project areas is 7-11 tons per acre, although there are some areas that have lighter or heavier fuel loads.

This low fuel loading in the Little River MMX proposed sales indicates that the current risk of wildfire is low to moderate because there is a low to moderate chance of the area supporting wildfire spread if a fire is ignited.

Under the *No Action Alternative*, downed fuels would continue to gradually accumulate adding to the existing fuel conditions of 7-11 tons per acre although there would be no increase in fuel loading associated with timber activities. As stands mature, suppression mortality would occur among the smaller trees which would be the main source for passive snag and woody debris recruitment and would also contribute to fuel loading (q.v. Forest Vegetation, pg. 26). The estimated increase in fuel loading over the next 2-3 decades may be described by photos 2-MC-3 or 3-MC-3 which has larger trees and approximately 20-40 tons per acre downed woody material (Maxwell and Ward 1980). The risk of wildfire would also gradually increase as fine fuels continue to accumulate.

Under the *Proposed Action Alternative*, the down woody debris would increase from 11 tons per acre to approximately 15 tons per acre as depicted in the photo 2-DF-3-PC from *Photo Series for Quantifying Forest Residues in the Coastal Douglas-Fir – Hemlock Type* (Maxwell and Ward, 1976) following thinning. The down woody debris created at landings by the proposed action would be machine piled and burned to reduce concentrated fuel loads. In addition, debris approximating 3-6 inches in diameter would be hand piled and burned in a 50 foot buffer from major roadways in the following units: Horseshoe 26-3-35B; Emile Islands 27-2-7 and 27-2-3B; Baker Street 27-3-3A, 27-3-3B, 27-3-11A, and 27-3-21A; Root Canal 27-3-23C, 27-2-18A, 27-2-17A, 27-2-17B, 27-2-28A, 27-2-28B, and 27-2-21A. The remaining fuels created by the proposed action would be predominately small (i.e. less than three inches in diameter) and scattered over the harvest area.

The additional amount of down woody debris (i.e. four tons per acre) would not dramatically increase the fire risk to the area. The primary carrier of fires is the fine fuels of less than three

inches in diameter. These fine fuels generated in the harvest process would mostly degrade within two years after harvest. Therefore, there would be an increase in fire risk in the area for approximately two years before these additional fine fuels degrade.

3. Cultural Resources

Cultural Resource inventories within proposed harvest units and locations of proposed road construction for the Little River MMX have been completed. One newly identified cultural resource site (OR-10-290) and two previously identified sites (35DO43 and 35DO362) are located within the proposed project area and would be affected by the project. Archaeological evaluations determined the three sites to be ineligible for listing on the National Register of Historic Places.

There are nine previously identified sites (35DO634, 35DO824, 35DO825, 35DO841, 35DO983, 35DO984, 35DO986, 35DO1031, 35DO1038) and four newly identified sites (OR-10284, OR-10-288, OR-10-291, OR-10-292) located within the project area that have been excluded from the proposed units by modification of unit boundaries. An additional five sites (35DO56, 35DO587, 35DO823, 35DO985, OR-10-293) are located near the project area and will be avoided as well. As a consequence, there would be no effect to any eligible cultural or historic resources or National Register properties in the project area.

In accordance with BLM policy and legal requirements, the locations of these sites are not disclosed in public documents in order to diminish the potential for violations of the Archaeological Resources Protection Act. It was determined that there would be no effect to any cultural resources since no unmitigated sites would be included within the Little River MMX sales. The BLM is in compliance with Section 106 of the National Historic Preservation Act under the guidance of the 1997 National Programmatic Agreement and the 1998 Oregon Protocol.

4. Visual Resource Management

The Visual Resource Management (VRM) classification for this area is generally Class IV. The basic elements of form, line, color and texture as required by the 1995 ROD/RMP (pg. 52) would be maintained under the proposed action. However, an area of approximately four acres in Root Canal Unit 17A is located in VRM Class II. Through analysis using viewshed tools in Geographic Information Systems (GIS) and a site visit to the Wolf Creek Falls Trail, it is determined the four acre area would remain hidden from the user's view on the trail due to topography and dense vegetation. Therefore, no additional mitigating measures would be required to screen timber activities from the trail and the basic characteristics allowing for low levels of change to VRM Class II lands would be followed.

5. Energy Transmission or Transport Facilities

A high-voltage transmission line is within Horsehoe Unit 35A (Figure 4, Appendix G). No adverse effect on energy resources would be anticipated because no commercially usable energy sources are known to exist in the proposed units, trees would be felled away from the transmission lines, and ground-based equipment would not be allowed to operate within the transmission line corridor, except on designated skid trails and roads.

Chapter 4. Contacts, Consultations, and Preparers

A. Agencies, Organizations, and Persons Consulted

The Agency is required by law to consult with certain federal and state agencies (40 CFR 1502.25).

1. Threatened and Endangered (T&E) Species Section 7 Consultation

The Endangered Species Act of 1973 (ESA) requires consultation to ensure that any action that an Agency authorizes, funds or carries out is not likely to jeopardize the existence of any listed species or destroy or adversely modify critical habitat.

a) U.S. Fish & Wildlife Service

Consultation with the U.S. Fish & Wildlife Service (USWFS) for the Little River MMX Thinning project (including the individual sales Root Canal, Baker Street, Horseshoe, and Emile Islands) has been completed. The *Biological Opinion Regarding the effects of the Roseburg District Bureau of Land Management's proposed fiscal year 2011-2013 timber sale program and associated activities on the Northern Spotted Owl, the Marbled Murrelet and their designated critical habitats* (FWS Ref. No. 13420-2011-F-0012) was received from the USFWS dated December 28, 2010. The Biological Opinion concluded (pg. 82) that the District's 2011-2013 timber sale program and associated activities are ***not likely to jeopardize the continued existence*** of the spotted owl. This conclusion was warranted because the proposed action:

- is not likely to adversely affect the ability of designated critical habitat to provide for reproducing spotted owls;
- is likely to maintain a sufficient amount and distribution of dispersal habitat to facilitate natal and spotted owl dispersal; and
- is not likely to completely eliminate mammalian and other prey species within the project area (BO, pgs. 82-83).

Little River MMX is outside of designated Critical Habitat for the spotted owl (q.v., pg. 36). Therefore, no destruction or adverse modification of currently designated critical habitat would occur.

b) NOAA Fisheries Service

The Swiftwater fisheries staff has determined that any impacts to water temperature, substrate/sediment quality, large wood, pool quality, or habitat access within the project area would be non-existent or immeasurable above background levels. Aquatic habitat in Little River, Cavitt Creek, Jim Creek, Evarts Creek, Wolf Creek and their tributaries would be unaffected, except for short-term reductions in the amount of large and small functional wood available to the stream. Due to the high volume of wood already in the streams and the high density of trees in the no-harvest buffers, fish species and populations in the streams in the project area would be unaffected. Therefore, the proposed project ***would not have an effect*** on Oregon Coast coho salmon or its habitat and further consultation with the NOAA Fisheries Service is not required.

B. Public Notification

1. Notification of Landowners

Concurrent with the publication of this EA, a letter was sent to **adjacent landowners**, **landowners along the proposed haul route**, **registered water-rights users**, and **tribal governments** (Confederated Tribes of Grand Ronde, Confederated Tribes of Siletz, and Cow Creek Band of Umpqua Tribe of Indians).

2. Roseburg District Planning Updates

The **general public** was notified of the Little River MMX Thinning project in the quarterly *Roseburg District Planning Updates* since December 8, 2009 (i.e. publication of the Winter 2009 planning update). These planning updates were published, and are still available, on the Roseburg District BLM Internet website. Electronic notification of the availability of the Roseburg District Planning was sent to approximately 40 addressees. These addressees consist of members of the public that have expressed interest in Roseburg District BLM projects.

3. Scoping

Scoping for the Little River MMX project ensued with the publication of the Roseburg District's Winter 2009 Quarterly Planning Update on December 8, 2009. One set of scoping comments were received specific to Little River MMX. Key topics raised in the scoping process were reflected in the development of project design features analyzed in this EA. For how specific topics were incorporated into the alternatives, please refer to the *Executive Summary*.

4. State, County, and Local Government Agencies

This EA, and its associated documents, would be provided to certain **State, County and local government** offices including: U.S. Fish & Wildlife Service, NOAA Fisheries Service, Oregon Department of Environmental Quality, and the Oregon Department of Fish and Wildlife. If the decision is made to implement this project, the Decision Document and FONSI would be sent to the aforementioned State, County, and local government offices.

5. Public Comment Period

A 30-day **public comment period** is established for review of this EA. A Notice of Availability will be published in *The News-Review, scheduled for* January 31, 2012. The public comment period began with publication of the notice published in *The News-Review* on January 31, 2012 and ends close of business March 1, 2012. Comments must be received during this period to be considered for the subsequent decision. If the decision is made to implement this project, a notice will be published in *The News-Review* and notification sent to all parties who request it.

C. List of Preparers

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Appendix A. Bureau Sensitive & Bureau Strategic Wildlife Species

Project: Little River MMX Thinning
Prepared By: Elizabeth Gayner
Date: November 5, 2011; updated January 11, 2012
SSSP List Date: December 1, 2011 (IM-OR-2012-018)

The following tables include those species which are documented or suspected to occur within the Roseburg District BLM. Those *Bureau Sensitive* or *Bureau Strategic wildlife species* which are suspected or documented to occur within the project area are detailed below.

Bureau Sensitive Species
BLM districts are responsible to assess and review the effects of a proposed action on *Bureau Sensitive* species. To comply with Bureau policy, Districts may use one or more of the following techniques:

a. Evaluation of species-habitat associations and presence of potential habitat.
b. Application of conservation strategies, plans, and other formalized conservation mechanisms.
c. Review of existing survey records, inventories, and spatial data.
d. Utilization of professional research and literature and other technology transfer methods.
e. Use of expertise, both internal and external, that is based on documented, substantiated professional rationale.
f. Complete pre-project survey, monitoring, and inventory for species that are based on technically sound and logistically feasible methods while considering staffing and funding constraints.

When Districts determine that additional conservation measures are necessary, options for conservation include, but are not limited to: modifying a project (e.g. timing, placement, and intensity), using buffers to protect sites, or implementing habitat restoration activities (IM-OR-2003-054).

Bureau Strategic Species
If sites are located, collect occurrence data and record in corporate database.

Table A-1. Bureau Sensitive& Strategic Wildlife Species.

Species	General Habitat Requirements	Present in Project Area?	Impacts to Species	
			No Action	Proposed Action
BUREAU SENSITIVE				
American Peregrine Falcon *Falco peregrines anatum*	Cliffs, rock outcrops; open habitats for hunting birds. Known sites in T27S-R03W-Section 24 within Root Canal and T27S-R02W-Section 6 within Emile Islands. Suspected site in T27S-R02W-Section 16 within Root Canal. Peregrine falcons likely forage within the proposed project area	Documented	No Effects	No effects to nesting habitat. Improve forest habitat conditions for avian species, thus increasing foraging opportunities and prey species diversity. Implementation of PDFs (pg. xx) will avoid disturbance impacts to nesting peregrines within one mile of known eyries.
Bald Eagle *Haleaeetus leucocephalus*	Late-successional forests with multi-canopies, generally within two miles of a major water source;	Documented	No Effects	No effects to nesting habitat within two miles of a major water source.
California Shield-backed Bug *Vanduzeeina borealis California*	A tall grass prairie specialist, this subspecies inhabits high elevation (e.g. 900 meters) natural balds and meadows (Applegarth 1995). *(Xerces Society)*	No Habitat	No Effects	
Chace Sideband *Monadenia chaceana*	Rocky, talus habitats in the Klamath Province and southwards.	Out of Range	No Effects	
Columbian White Tailed Deer *Odocoileus virginianus leucurus*	Bottomlands, oak/hardwood forests; cover for fawning.	Out of Range	No Effects	

Species	General Habitat Requirements	Present in Project Area?	Impacts to Species	
			No Action	Proposed Action
Crater Lake Tightcoil *Pristiloma arcticum crateris*	Perennially wet areas in late-seral forests above 2,000 feet elevation and east of Interstate-5; seeps, springs, riparian areas.	Suspected	No Effects	No measurable effects to habitat due to 60-foot buffer along perennial streams within Riparian Reserve.
Fisher *Martes pennanti*	Natal and foraging habitat consists of structurally complex forests; mature open forests with large live trees, snags, and down wood.	Suspected	No Effect	No effects to suitable natal and foraging habitat.
Foothill Yellow-legged Frog *Rana boylii*	Low gradient streams/ponds; gravel/cobble, bedrock pools.	Suspected	No Effect	PDFs (e.g. "no-harvest" stream buffers) would protect micro climate conditions within streams.
Franklin's Bumblebee *Bombus franklini*	Known only from southern Oregon and northern California between the Coast and Sierra-Cascade Ranges. Requires habitat in proximity to water with a sufficient supply of floral resources to provide continuous blooming throughout the colony season. Additionally, probably requires abandoned rodent borrows or clumps of grass for nesting, population sites may be limited by the abundance of rodents and the presence of undisturbed grassland. Closest known documentation of species is in Roseburg and just west of Sutherlin at Ford's Pond. *(Xerces Society)*	No Habitat	No Effect	
Fringed Myotis *Myotis thysanodes*	Late-successional forest features (e.g. snags or trees with deeply furrowed bark, loose bark, cavities), caves, mines, bridges, rock crevices. Suitable habitat is located adjacent to units. Expected to forage in or above units.	Suspected	No Effect	PDFs would retain existing snags ≥ 10 inches dbh and ≥ 16 feet tall.
Green Sideband *Monadenia fidelis beryllica*	Coast Range, riparian forests at low elevations; deciduous trees & shrubs in wet, undisturbed forest.	Out of Range	No Effect	
Harlequin Duck *Histrionicus histrionicus*	Mountain Streams in forested areas on west slope of the Cascade Mountains in swift, rocky, large streams or rivers. Nest under rock overhangs, vegetation or streamside debris. Late spring migrant or summer visitor. North Umpqua and Little River contain suitable nesting and brooding habitat. Adults with broods have been documented on the North Umpqua River.	Suspected	No Effect	No effects to suitable nesting habitat along the North Umpqua and Little River.
Lewis' Woodpecker *Melanerpes lewis*	Open woodland habitat near water; open woodland canopy and large diameter dead/dying trees, snag cavities.	No Habitat	No Effect	
Oregon Shoulderband *Helminthoglypta hertleini*	Talus and rocky substrates, grasslands or other open areas with low-lying vegetation.	No Habitat	No Effect	
Oregon Vesper Sparrow *Pooecetes gramineus affinis*	Open habitats such as grasslands, meadows, farmlands.	No Habitat	No Effect	
Pacific Pond Turtle *Actinemys marmorata*	Ponds, low gradient rivers; upland over-wintering habitat, CWD. Ponds within Horseshoe and Root Canal project areas.	Suspected	No Effect	Ponds buffered to the extent of riparian vegetation.
Pallid Bat *Antrozous pallidus*	Usually rocky outcroppings near dry open areas; occasionally near evergreen forests; cliffs within Root Canal & Emile Islands project areas, but not within units.	Suspected	No Effect	No effect to potential roost sites in cliff area.
Purple Martin *Progne subis*	Snags cavities in open habitats (e.g. grasslands, brushlands, open woodlands); foraging habitat in	Suspected	No Effect	No measurable effect to foraging habitat.

Species	General Habitat Requirements	Present in Project Area?	Impacts to Species	
			No Action	Proposed Action
	units.			
Rotund Lanx *Lanx subrotundata*	Major rivers and large tributaries with cold, well-aerated water and rocky substrate.	Out of Range	No Effects	
Townsend's Big-eared Bat *Corynorhinus townsendii*	Late-successional forest features (e.g. snags or trees with deeply furrowed bark, loose bark, cavities), caves, mines, buildings, bridges, tunnels. Suitable habitat is located adjacent to units. Expected to forage in or above units.	Suspected	No Effect	Snags retained in units, to the extent possible.
Western Bumblebee *Bombus occidentalis*	Sufficient supply of floral resources to provide continuous blooming throughout the colony season.	Unknown	No Effect	Tree removal would create openings where flowering vegetation important for foraging would persist until the canopy cover increases and closes in 10 to 20 years.
Western Ridgemussel *Gonidea angulata*	Creeks, rivers, coarse substrates; Umpqua R. and possibly major tributaries.	Out of Range	No Effects	
White-Tailed Kite *Elanus leucurus*	Open grasslands, meadows, emergent wetlands, farmlands, lightly, wooded areas; wooded riparian habitats close to open hunting; tall trees and shrubs.	No Habitat	No Effects	
BUREAU STRATEGIC				
Broadwhorl Tightcoil *Pristiloma johnsoni*	Moist forest sites, typically with deciduous component; Coast/Cascades in WA, Coast Range in OR, as far south as Lane County.	Out of Range	No Effects	
Klamath Tail-Dropper *Prophysaon sp. nov.*	Moist, open areas along streams or springs in Ponderosa Pine forests; as far North as Crater Lake.	Out of Range	No Effects	
Merlin *Falco columbarius*	Coniferous forests adjacent to open habitats, along forest edges; units within winter range.	No Habitat	No Effect	
Oregon Giant Earthworm *Driloleirus macelfreshi*	Deep, moist, undisturbed soils of riparian forests.	Out of Range	No Effect	

Appendix B. Landbirds

Project: Little River MMX Thinning
Prepared By: Elizabeth Gayner
Date: November 5, 2011

Game Birds
"*Game Birds Below Desired Condition*" identifies six species documented or suspected on the Roseburg District. Three of the six game bird species are suspected or known to occur within the Little River MMX project area. The band-tailed pigeon is also identified as a focal species.

Birds of Conservation Concern
The most recent *"Birds of Conservation Concern"* list (USDI USFWS 2008d) identifies thirty-two species of concern in Region 5 (North Pacific Rainforest), an area that includes the Roseburg District BLM. Of those thirty-two species, 11 species are suspected or known to occur within the project area. Four of these species, including the bald eagle, peregrine falcon, and marbled murrelet are also *Special Status Species* and addressed previously.

Focal Avian Species
Partners In Flight is an international coalition of government agencies, conservation groups, academic institutions, private organizations, and citizens dedicated to long-term maintenance of healthy populations of native landbirds. Their *Conservation Strategy for Landbirds in Coniferous Forests of Western Oregon and Washington* (Altman 1999) provides information on habitat used by species native to the Pacific Northwest, and is one additional plan that may be used as a guideline by the BLM. Fourteen species were identified as focal species to consider during forest management actions. The rufous hummingbird is also identified as a species of conservation concern and is addressed in the relevant section.

Bald and Golden Eagles
The bald eagle and the golden eagle are protected by the *Migratory Bird Treaty Act* and the *Bald Eagle and Protection Act*. The bald eagle is also listed as a Bureau Sensitive Species and is addressed previously in the *Special Status Species* section.

Table B-1. Effects of the Little River MMXCommercialThinning Project on Landbirds.

Species	General Habitat Requirements	Impacts to Species	
		***No Action* Alternative**	***Proposed Action* Alternative**
GAME BIRDS			
Band-tailed Pigeon *(Columba fasciata)*	Nest primarily in closed Douglas-fir stands with canopy cover above 70 percent. Key food sources are red elder and cascara species. Mineral springs.	Continuous canopy within the stands would preclude the development of forage species.	Increase of forage species due to decreased canopy cover in more heavily thinned areas (e.g. Riparian Reserve) may allow establishment of shrubs such as red elder and cascara.
Mourning Dove *(Zeneida macroura)*	Inhabit forest, desert, shrub/scrub, suburban areas and agricultural lands. Forage in areas with little ground cover and nest in edge-habitats between forest/shrubs and open areas.	Continuous canopy would preclude nesting within the stands, except along habitat edges (e.g. roads)	Creation of gaps due to roads and landings may create edge habitat suitable for nesting.
Wood Duck *(Aix sponsa)*	Nest in tree cavities in the vicinity of wooded swamps, flooded forest, marsh, rivers, or ponds. Expected to occur along Little River and Cavit Creek.	No Effect	Project design criteria for streams and riparian areas would protect habitat.
BIRDS OF CONSERVATION CONCERN			
Olive-sided Flycatcher *(Contopus cooperi)*	Associated with natural or man-made openings with tall trees or snags available for perching and singing. In the Oregon	Suitable habitat condition would continue to be absent until suppression mortality created gaps	Variable density thinning would create more diverse stand conditions and accelerates growth of larger trees that may become

Species	General Habitat Requirements	Impacts to Species	
		***No Action* Alternative**	***Proposed Action* Alternative**
	Coast Range, closely associated with edges of older stands with tall trees and snags greater than 21 inches diameter breast height and broken canopy. Conditions are generally absent within the proposed thinning units but often present in adjacent or nearby older stands.	and edge habitat.	snags. Forest gaps would increase understory growth, contributing to increased insect production over the next 20 years. Increased forest edge habitat would also enhance foraging opportunities. Gaps created by thinning corridors and landings may allow foraging until the canopy eventually closes again and these opportunities are lost.
Purple Finch *(Carpodacus purpureus)*	Prefer open areas or edges of low to mid-elevation mixed coniferous-deciduous forests, frequently breeding in mixed conifer-deciduous forest, on edges of bogs, in riparian corridors, deciduous forests, orchards, and other areas with scattered conifers and shrubs.	A continuous overstory and lack of deciduous tree and plant species would preclude the species from using these stands.	Long term benefits by treatment proposed would create additional nesting habitat as canopy layers and hardwoods develop in the areas with lower residual tree densities (e.g. Riparian Reserve).
Rufous Hummingbird *(Selasphorus rufus)*	Primarily associated with forest edges and openings with a diversity of flowering plants for feeding and open space Frequently occurs in open habitats that are shrub-dominated, and late-successional forest with a highly developed and diverse understory of herbaceous plants and shrubs, particularly within large openings. Need flowering plants and shrubs.	Stands would continue to be unsuitable because of the lack of understory development until suppression mortality created gaps and edge habitat allowing for the development of forage habitat.	Tree removal would create openings where flowering vegetation important for foraging would persist until the canopy cover increases and closes in 10 to 20 years.
FOCAL AVIAN SPECIES			
Brown Creeper (*Certhia americana*)	Optimal habitat appears to be mature and old-growth unmanaged forests where large treesand snags for foraging and nesting are relatively abundant due to natural processes.	Stands would remain unsuitable. May forage away from adjacent suitable habitat in managed stands where large remnant Douglas fir trees and snags are present.	Benefits most from long-term effects of thinning treatments resulting in lower tree densities, which would best create conditions fostering the development of suitable habitat, including large conifers with deep furrowed bark Also would benefit from retention of large remnant trees and snags.
Hermit Warbler (*Dendroica occidentalis*)	Conifer forests with a high level of canopy cover. It is not associated with a particular forest age class, and is common in stands greater than 30 years in age and dominated by Douglas-fir where dense canopy provides foraging and nesting habitat.	Continue to use the dense young forests for nesting.	Thinning would modify and partially remove stand overstory, reducing foraging and nesting opportunities over the short term, until forest canopy closes in 10 to 20 years.
Hutton's Vireo (*Vireo huttoni*)	Strongly associated (i.e., preferentially selected) with pole forest conditions among younger and older forested stands in all elevations of managed forests of the central Oregon Coast Range.	Where present, would continue to persist in stands where a deciduous component is present.	Would benefit from variable thinning under, which would allow understory development of deciduous shrubs and trees.
Pacific-sloped Flycatcher (*Empidonax difficilis*)	Optimal habitat appears to be low elevation (<3,000 ft) riparian forest in late-successional coniferous forest with a deciduous component and/or wet site coniferous trees such as western hemlock and western red cedar. Also can be found throughout coniferous forests with some open space beneath or in the canopy.	Where present, would continue to persist in portions of stands where open space with a deciduous component is available.	Would benefit from thinning treatments, which would create stand conditions that would create open space for foraging and promote understory development.
Pileated Woodpecker *(Dryocopus pileatus)*	Strongly associated with mature and old-growth stands (stands ≥ 80 years) with a multi-layered canopy. Nests in large snags and decadent live trees in mature and old-growth forests. Younger forests can be used for foraging if snags and/or down logs are present. Dependent on snags and down wood.	Stands would remain unsuitable for nesting and most foraging activities. May forage away from adjacent suitable habitat where large snags and down wood are present in managed stands.	Benefits most from long-term effects of thinning treatments resulting in lower tree densities which would best create conditions fostering the development of suitable habitat, including large trees, and eventually large snags and down wood. Also would benefit from retention of remnant trees and snags.

Species	General Habitat Requirements	Impacts to Species	
		***No Action* Alternative**	***Proposed Action* Alternative**
Red Crossbill (*Loxia curvirostra*)	Optimal habitat is late-successional forest with high productivity of conifer cone-producing trees.	Stands would remain unsuitable until stand differentiation and late-successional characteristics developed (large conifers).	Benefits most from long-term effects of thinning treatments resulting in lower tree densities (e.g. Riparian Reserve) which would best create conditions fostering the development of suitable habitat, including large trees with deep crowns.
Swainson's Thrush (*Catharus ustulatus)*	Primarily associated with a deciduous subcanopy and understory in young closed-canopy forests.	Where present, would continue to persist in portions of stands where open space with a deciduous component is available.	Thinning would be beneficial because canopy cover would be reduced to enhance growth of understory vegetation.
Varied Thrush (*Ixoreus naevius*)	Mature forests with high canopy closure, high-stem density, multiple tree layers, a deciduous tree component, and a relatively open low understory and forest floor with much debris in patches. Fruit bearing shrub and tree species, and wet sites with deciduous vegetation	Stands would remain unsuitable until multiple tree layers and deciduous tree component develop.	Light, variable spaced thinning in the uplands may enhance development of tree layers, but moderate thinning would reduce too much canopy, and likely enhance development of understory shrubs more than mid-story trees. Because of need for high canopy closure, stem density, and tree layering, and indications that it may be area sensitive, this species may respond negatively to any type of timber harvest.
Vaux's Swift (*Chaetura vauxi*)	Associated with late-successional forests and large, hollow snags used as nest and roost trees. Availability of suitable large hollow snags and trees is a major limiting factor.	Stands would remain unsuitable until late successional characteristics develop, including open, multi-layered canopy and the presence of large, hollow snags.	Benefits most from long-term effects from thinning treatments resulting in lower tree densities (e.g. Riparian Reserves) which would best create conditions fostering the development of suitable habitat, including large trees, and eventually large snags, as well as a multi-layered canopy.
Wilson's Warbler (*Wilsonia pusilla*)	Deciduous shrub and sub-canopy layers in a wide range of forest age classes.	Would not likely occupy stands with high canopy cover which would preclude growth of herbs and forbs, shrubs, and trees in the understory.	Nesting opportunities would be reduced by partial overstory removal. Secondary canopy layers and shrubs could be damaged and/or removed, decreasing foraging opportunities. Hagar *et al*. (2004) noted that thinning was relatively neutral in impact to the Wilson's warbler. Additional habitat would become available for nesting as understory vegetation develops in treated areas.
Winter Wren (*Troglodytes troglodytes*)	Most commonly found in older and more in structurally complex areas in the forest. Requires forest floor complexity -shrubs, rootwads, down logs, ferns, and herbaceous vegetation. May persist in units with newly recruited or remnant down woody material and shrub habitat.	Where present, would continue to persist in portions of stands where newly recruited or remnant down woody material and shrub habitat is present. Where stands are lacking large down wood and an understory component, habitat would continue to be unsuitable for wrens until such components develop within the stand.	Species would benefit from thinning in areas where there is existing large down wood and where canopies are reduced which would facilitate the development of an understory of herbs and forbs, shrubs, and trees.
EAGLE PROTECTION ACT			
Golden Eagle *(Aquila chrysaetos)*	Associated with open and semi-open habitats. Nest on cliffs, in the upper one-third of deciduous and coniferous trees, or on artificial structures (e.g. artificial nesting platforms, electricity transmission towers, windmills).On the Roseburg District, primarily documented to nest in large conifer trees within late-seral forests near open habitats (e.g. meadows, valleys, and clearcuts)	High density of trees would limit the stand's ability to create diverse, multi-storied stands. Large trees or snags containing large limbs or structural characteristics to support a nest would be slow to develop.	With the exception of the stand of suitable habitat (Emile Island 1A), post-harvest conditions (high canopy cover) would limit the stand's ability to create diverse, multi-storied stands. Large trees or snags containing large limbs or structural characteristics to support a nest would not develop.

Appendix C. Soils

Project: Little River MMX Thinning
Prepared By: Allie Barner
Date: July 30, 2010

Table C-1. Timber Production Capability Classification (TPCC).

Sale	Unit	FGR[1] (acres)	FPR[2] (acres)	FSR[3] (acres)	FGNW[4] (acres)	FPNW[5] (acres)	Category 1[6] (acres)
Root Canal	17A	0	17	NA	0	0	NA
	17B	0	0	NA	0	0	NA
	18A	0	0	NA	0	0	NA
	21A	0	0	NA	0	0	NA
	21B	0	0	NA	0	0	NA
	25A	0	0	NA	0	0	NA
	30D	0	0	NA	0	0	NA
	32G	0	0	NA	0	0	NA
	23C	4	0	NA	0	0	NA
	28A	0	0	NA	0	11	NA
	28B	10	0	NA	0	0	NA
	29A	0	0	NA	0	0	NA
	30A	0	0	NA	0	0	NA
	30B	0	0	NA	0	0	NA
	SUB-TOTAL	***14***	***17***	***NA***	***0***	***11***	***NA***
Baker Street	3A	40	0	NA	0	0	NA
	3B	50	0	NA	0	0	NA
	3C	0	0	NA	0	0	NA
	11A	0	0	NA	0	0	NA
	11B	15	0	NA	0	0	NA
	21A	0	0	NA	0	0	NA
	SUB-TOTAL	***105***	***0***	***NA***	***0***	***0***	***NA***
Horseshoe	21D	0	0	NA	0	0	NA
	21E	0	0		0	0	NA
	23A	13	0		0	0	NA
	25A	0	0		0	0	NA
	26A	0	0		0	0	NA
	26B	0	0		0	0	NA
	27A	0	0		0	0	NA

Sale	Unit	FGR[1] (acres)	FPR[2] (acres)	FSR[3] (acres)	FGNW[4] (acres)	FPNW[5] (acres)	Category 1[6] (acres)
	35A	0	24		0	0	NA
	35B	0	0		0	0	NA
	1B	0	0		0	0	NA
	1C	0	0		0	0	NA
	SUB-TOTAL	***13***	***24***		***0***	***0***	***NA***
Emile Islands	1C	2	0		0	0	NA
	3A	0	0		0	0	NA
	3B	0	0		0	0	NA
	5I	35	0		0	0	NA
	7F	0	0		0	0	NA
	7G	0	0		0	0	NA
	1A	0	0		0	0	NA
	1D	0	10		0	0	NA
	SUB-TOTAL	***0***	***0***		***0***	***0***	***NA***
TOTAL		***167***	***61***	***NA***	***0***	***0***	***NA***

[1] **FGR** = fragile soils that are subject to unacceptable soil and organic matter losses from surface erosion or mass soil movements as a result of forest management activities, unless mitigating measures are used to protect the soil.
[2] **FPR** = fragile soils that may contain tension cracks and/or sag ponds; because of the slow rate of movement, forest management is feasible.
[3] **FSR** = fragile soils that typically have loamy fine sands and sandy loam textures with high amounts of coarse fragments (i.e. rock); they generally have between one and ½ inch of available water holding capacity in the top 12 inches (i.e. water deficiency).
[4] **FGNW** = fragile soils where unacceptable soil and organic matter losses could occur from surface erosion or mass soil movements as a result of forest management activities; these losses cannot be mitigated even using best management practices.
[5] **FPNW** = fragile soils that have active, deep-seated slump-earth flow types of mass movement; because of the rapid rate of movement, forest management is not feasible on these sites.
[6] **Category 1** = soils that are highly sensitive to broadcast burning due to shallow soil depths, that have A horizons less than 4 inches in depth, and/or that are on slopes over 70 percent.

Table C-2. Mass Wasting & Landslides within Little River MMX Units. An analysis of mass wasting events initiating inside the proposed thinning units was done using aerial photo interpretation covering 1959 to 2004 and field reconnaissance. Documented are landslides that occurred after clear-cut harvest.

Sale Name	# Debris Torrents	# Landslides[1]			
	Large (>0.5 acre)	Small (< 0.1 acre)	Medium (0.1-0.5 acre)	Large (> 0.5 acre)	All
Root canal	0	6	4	0	1.3
Baker Street	0	10	1	0	0.5
Horseshoe	0	0	4	0	0.73
Emile Islands	0	5	4	0	0.8
Probability of occurrence expected within units:					
No Action Alternative	none	low	low	low	low
Proposed Action Alternative	low	low to moderate	low	low	low
Cumulative Effects	Unchanged[2]	Unchanged[2]	Unchanged[2]	Unchanged[2]	Unchanged[2]

[1] Eight of the identified landslides were road-related and 13 were harvest-related.
[2] "Unchanged" indicates that the current conditions and current probabilities of mass wasting or landslide events are expected to be essentially the same at the 6th field watershed scale.

Appendix D. Aquatic Conservation Strategy Assessment

Project: Little River MMX Thinning
Prepared By: Dan Dammann and Jeff McEnroe
Date: November 4, 2011

The Aquatic Conservation Strategy (ACS) was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands. The ACS must strive to maintain and restore ecosystem health at watershed and landscape scales to protect habitat for fish and other riparian-dependent species and resources and restore currently degraded habitats. This approach seeks to prevent further degradation and restore habitat over broad landscapes as opposed to individual projects or small watersheds. (Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl, page B-9).

ACS Components:

(1) Riparian Reserves (ACS Component #1)

Riparian Reserves were established. The ROD/RMP (pg. 24) specifies Riparian Reserve widths equal to the height of two site potential trees on each side of fish-bearing streams and one site-potential tree on each side of perennial or intermittent non-fish bearing streams, wetlands greater than an acre, and constructed ponds and reservoirs. The height of a site-potential tree for the Little River Watershed has been determined to be the equivalent of 180 feet (Middle and Upper Smith River Watershed Analysis, pg. 46). One of the objectives of this project is to accelerate the development of late seral characteristics in the Late Successional Reserve (pg. 3).

(2) Key Watersheds (ACS Component #2)

Key Watersheds were established "as refugia . . . for maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species [ROD/RMP, pg. 20]." The Little River watershed is not considered a key watershed.

(3) Watershed Analysis (ACS Component #3) and other pertinent information:

In developing the project, the Little River Watershed Analysis (1995) was used to evaluate existing conditions, establish desired future conditions, and assist in the formulation of appropriate alternatives. The Little River Watershed Analysis is available for public review at the Roseburg District office or can be viewed under "Plans & Projects" on the Roseburg District website at www.blm.gov/or/districts/roseburg/index.php.

Existing watershed conditions are described in the *Hydrology*, *Aquatic Habitat, & Fisheries* sections of the EA (q.v., pgs. 40-41) and also in the Little River Watershed Analyis. The short and long term effects to aquatic resources are also described in these sections of the EA.

(4) Watershed Restoration (ACS Component #4)

One of the purposes of this project is to reduce stand stocking in a manner that produces commercial timber in a cost-efficient manner while enhancing habitat for the northern spotted owl and improves vigor in the residual stand (q.v., pg. 1). Therefore, the proposed action is considered to be a watershed restoration project.

Additionally, since 1994, numerous stream enhancement projects have been implemented in the Little River Watershed. This includes placing instream structures (e.g. logs, boulders, root wads, etc…) to improve aquatic habitat in streams, replacing culverts identified as barriers to fish passage to open up access to additional habitat, or improving or decommissioning roads to reduce

road sediment impacts to aquatic systems. This work has been done in a collaborative effort with private timber companies, the Partnership for the Umpqua Rivers, the United States Forest Service and the Oregon Department of Fish and Wildlife. Future opportunities for restoration are discussed in the Little River Watershed Analysis. This work would be implemented as budgets allow.

Range of Natural Variability within the Watershed:

Based on the dynamic, disturbance-based nature of aquatic systems in the Pacific Northwest, the range of natural variability at the site scale would range from 0-100 percent of potential for any given aquatic habitat parameter over time. Therefore, a more meaningful measure of natural variability is assessed at scales equal to or greater than the fifth-field watershed scale. At this scale, spatial and temporal trends in aquatic habitat condition can be observed and evaluated over larger areas, and important cause/effect relationships can be more accurately determined.

Natural disturbance events to aquatic systems in the Pacific Northwest include wildfires, floods, and landslides. Average fire return intervals at the drainage scale for the Little River Watershed were calculated between 20 and 100 years (prior to the advent of fire suppression).

Most of the Little River Watershed is dominated by the Little Butte Volcanic formation and the Colestin formation. The granitic terrain found in the Little Butte Volcanic Formation has historically had a landslide density of 12.1 landslides per square mile while the Colestin formation has had a history of 7.9 landslides per square mile (Little River Watershed Analysis)

Timber harvesting and road construction over the past 50 years have substantially increased the frequency and distribution of landslides above natural levels in the Little River Watershed. However, there is a downward trend in landslide incidence over the last 50 years that is associated with improved management practices. On BLM land, future landslides, mostly during large storm events, are expected to deliver large wood and rock fragments to lower-gradient streams because of BLM Riparian Reserves. These events would more closely resemble landslides within relatively unmanaged forests. These disturbance events are the major natural sources of sediment and wood to a stream system and are very episodic in nature.

Due to the dynamic nature of these disturbance events, stream channel conditions vary based on the time since the last disturbance event. This results in a wide range of aquatic habitat conditions at the site level. Site level habitat conditions can be summarized by Oregon Department of Fish and Wildlife (ODFW) habitat surveys. Surveys have been conducted throughout the Little River Watershed, mostly in the third through sixth-order streams. Approximately 21 stream reference reaches in the Little River Sub-Basin of the Umpqua Basin were used to compare against all surveyed streams. These relatively unmanaged reaches represent the variability of conditions within natural stream systems as well as characteristics desirable for a variety of fish species (including salmonid habitat). When compared to these “reference streams”, aquatic habitat survey data from the Little River Watershed indicates that most of the tributaries are lacking large woody debris. While this condition is considered typical at any given site scale, it is considered atypical for most streams to be devoid of wood at the larger fifth-field scale. Therefore, at this larger scale, aquatic habitat conditions are considered to be outside the range of natural variability.

Because of its dynamic nature, sediment effects to streams can only be described in general terms. It is important to remember that ODFW instream habitat data is a snapshot in time. When compared to reference reaches, sediment conditions in most of the tributaries of Little River Watershed appear to be similar to the reference reaches in that they fall in the low to low-moderate erosion risk class (Little River Watershed Analysis).

Stream temperatures vary naturally in this watershed as a result of variation in geographic location, elevation, climate, precipitation, and distance from the source water. Stream temperatures also naturally vary as a response to the natural disturbance events mentioned in the previous paragraphs, as well as current practices on private forest, agricultural, and residential properties. Due to the large amount of riparian clearing that has occurred over the last 150 years (converting forest into farmland), coupled with management-induced channel widening, irrigation withdrawals, and loss of gravels, it is likely that stream temperature increases have been greater over larger spatial and temporal scales than observed naturally. One of BLM's objectives for managing Riparian Reserves is to maintain and enhance shade providing vegetation along streams.

Changes in stream flow can result from consumptive withdrawals and effects of land use activities on storm water runoff, infiltration, storage and delivery. Agricultural and domestic withdrawals are common along Little River and its tributaries. Many tributaries within the Little River Watershed have also been cleaned (had large wood removed) or salvage logged. BLM Forest management in the Little River Watershed would be designed to reduce or prevent watershed impacts.

Table D-1. Individual Aquatic Conservation Strategy Objective Assessment.

ACS Objective	Site/Project Scale Assessment	Fifth-Field Watershed Scale Assessment
	Scale Description: Units identified in this project are located in 16 separate seventh-field drainages (detailed below*) distributed throughout the watershed totaling roughly 44,180 acres in size. The BLM manages approximately 18,531 acres in these drainages (42%). Units proposed for treatment represent 3.4% of the total drainage area, and 8.1% of the BLM-managed lands in the drainage.	Scale Description: This project is located in the Little River fifth-field watershed. This watershed is roughly 131,853 acres in size. The BLM manages approximately 19,802 acres in this watershed (15%). Units proposed for treatment represent less than 1.1% of the total watershed area, and 6.7% of the BLM-managed lands in the watershed.
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.	Within the drainages, the proposed action would result in approximately 686acres of thinned riparian stands. Trees within these treated stands would attain larger heights and diameters in a shorter amount of time than if left untreated. PDF's such as variable width "no-harvest" buffers established along streams would retain shading and therefore maintain water temperature. "No-harvest" buffers established on streams in or adjacent to proposed units would prevent disturbance to stream channels and stream banks and intercept surface run-off allowing sediment transported by overland flow to be filtered out before reaching active waterways (q.v., pgs. 43-44) and would prevent impacts to aquatic resources. This treatment would speed attainment of this objective.	This treatment would also speed attainment of this objective at the watershed scale.
2. Maintain and restore spatial and temporal connectivity within and between watersheds	Within the project drainages, the proposed project would have no influence on aquatic connectivity. Therefore this treatment would maintain the existing connectivity condition at	Within the watershed, the proposed project would have no influence on aquatic connectivity. Therefore this treatment would maintain the existing connectivity

ACS Objective	Site/Project Scale Assessment	Fifth-Field Watershed Scale Assessment
	the site scale.	condition at the watershed scale.
3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations	Treatments would not reduce canopy closure to an extent that could potentially influence in-stream flows (q.v., pg. 45). In addition, "no-harvest" buffers established on all streams in or adjacent to proposed units would prevent disturbance to stream channels and stream banks (q.v., pgs. 43-44). Therefore, these treatments would maintain the physical integrity of the aquatic system at the site scale.	This treatment would also maintain the physical integrity of the aquatic system at the watershed scale.
4. 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.	Project design features (PDF) would ensure that water quality would not be adversely impacted by the proposed action. PDF's such as variable width "no-harvest" buffers established along streams would retain shading and hence maintain water temperature. "No-harvest" buffers established on streams in or adjacent to proposed units would prevent disturbance to stream channels and stream banks and intercept surface run-off allowing sediment transported by overland flow to be filtered out before reaching active waterways (q.v., pgs. 43-44). Therefore, this treatment would maintain the existing water quality at the site scale.	Based on the information discussed at the site scale, this project would also maintain water quality at the watershed scale.
5. Maintain and restore the sediment regime under which aquatic ecosystems evolved.	As mentioned above, "no-harvest" buffers established on streams in or adjacent to proposed units would prevent disturbance to stream channels and stream banks and intercept surface run-off allowing any management related sediment transported by overland flow to settle out before reaching active waterways (q.v., pgs. 43-44). Therefore, this project would maintain the existing sediment regime.	This project would maintain the existing sediment regime at the watershed scale as well.
6. 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.	Treatments would not reduce canopy closure to an extent that could potentially influence in-stream flows (q.v., pg. 45). On average, the project would involve partial removal of vegetation on areas constituting less than five percent of each all combined project 7th field HUC drainages In addition, new road construction would not extend the drainage network, or contribute to a potential increase in peak flow because the new roads would be located on ridge tops or stable side slopes with adequate cross drain structures. There are 5 proposed stream crossings; it is believed that any sediment contributions from these crossings would be	As discussed at the site scale, thinning treatments would not reduce canopy closure to an extent that could potentially influence in-stream flows. Therefore, at the larger watershed scale, this treatment would also maintain stream flows within the range of natural variability.

ACS Objective	Site/Project Scale Assessment	Fifth-Field Watershed Scale Assessment
	negligible when compared to the amount of sediment contributed along the entire length of the stream from all natural sources and from first seasonal rains, and they would be indistinguishable from background levels resulting in no measureable change to water quality (q.v., pg. 43). Therefore, this treatment would maintain stream flows within the range of natural variability at the site scale.	
7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and woodlands.	As discussed in #6 above, this project would maintain stream flows within the range of natural variability at the site scale. Therefore, it would also maintain stream interactions with the floodplain and respective water tables at the site scale.	At the watershed scale, this project would also maintain stream interactions with the floodplain and respective water tables within the range of natural variability.
8. Maintain and restore the species composition 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 distributions of coarse woody debris sufficient to sustain physical complexity and stability.	The proposed treatment is designed to return riparian stands to a more natural density and growth trajectory. Therefore this treatment would serve to restore plant species composition and structural diversity at the site scale.	The proposed treatment is designed to return riparian stands to a more natural density and growth trajectory. Therefore this treatment would serve to restore plant species composition and structural diversity at the larger watershed scale as well.
9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.	As mentioned previously, one of the objectives of this project is to restore riparian stand conditions in the proposed treatment areas. Implementation of riparian restoration projects will help restore adequate habitat to support riparian-dependent species at the site and watershed scales.	As mentioned previously, the intent of this project is to restore riparian stand conditions in the proposed treatment areas. Implementation of riparian restoration projects will help restore adequate habitat to support riparian-dependent species at the site and watershed scales.

*Detailed scale description of the 16 seventh-field drainages: Hill Creek, Emile Creek Campground, Shivigny Creek, Wolf Creek, Greenman Creek, Little Creek, Bond Creek, Boundary Creek, Evarts Creek, Cavitt Creek, Lower Cavitt Creek, Jim Creek, Engles Creek, Rattlesnake Creek, Britt Creek and Williams Creek-Little River

1) The **Hill Creek** drainage is roughly 6,074 acres in size. The BLM manages approximately 2,887 acres in this drainage (47.5%). Units proposed for treatment represent 0.8% of the total drainage area, and 1.6% of the BLM-managed lands in the drainage.
2) The **Emile Creek Campground** drainage is roughly 1,058 acres in size. The BLM manages approximately 383 acres in this drainage (36.2%). Units proposed for treatment represent 2.8% of the total drainage area, and 7.8% of the BLM-managed lands in the drainage.
3) The **Shivigny Creek** drainage is roughly 2,431 acres in size. The BLM manages approximately 1,004 acres in this drainage (41.2%). Units proposed for treatment represent 1.6% of the total drainage area, and 3.9% of the BLM-managed lands in the drainage.

4) The **Greenman Creek** drainage is roughly 1,857 acres in size. The BLM manages approximately 1,000 acres in this drainage (53%). Units proposed for treatment represent 2.4% of the total drainage area, and 4.4% of the BLM-managed lands in the drainage.
5) The **Wolf Creek** drainage is roughly 5,840 acres in size. The BLM manages approximately 3,485acres in this drainage (59.6%). Units proposed for treatment represent 7.2% of the total drainage area, and 12.1% of the BLM-managed lands in the drainage.
6) The **Little Creek** drainage is roughly 2,197 acres in size. The BLM manages approximately 502 acres in this drainage (22.8%). Units proposed for treatment represent 1% of the total drainage area, and 4.4% of the BLM-managed lands in the drainage.
7) The **Bond Creek** drainage is roughly 987 acres in size. The BLM manages approximately 197 acres in this drainage (20%). Units proposed for treatment represent 3.3% of the total drainage area, and 16.7% of the BLM-managed lands in the drainage.
8) The **Boundary Creek** drainage is roughly 3,414 acres in size. The BLM manages approximately 1,932 acres in this drainage (56.5%). Units proposed for treatment represent 1.3% of the total drainage area, and 2.3% of the BLM-managed lands in the drainage.
9) The **Evarts Creek** drainage is roughly 2,293 acres in size. The BLM manages approximately 1,110 acres in this drainage (48.4%). Units proposed for treatment represent 5.5% of the total drainage area, and 11.4% of the BLM-managed lands in the drainage.
10) The **Cavitt Creek Falls** drainage is roughly 5,057 acres in size. The BLM manages approximately 1,375 acres in this drainage (27%). Units proposed for treatment represent 0.3% of the total drainage area, and 1.3% of the BLM-managed lands in the drainage.
11) The **Lower Cavitt Creek** drainage is roughly 1,715 acres in size. The BLM manages approximately 633 acres in this drainage (36.9%). Units proposed for treatment represent 3.0% of the total drainage area, and 8.1% of the BLM-managed lands in the drainage.
12) The **Jim Creek** drainage is roughly 2,754 acres in size. The BLM manages approximately 1,193 acres in this drainage (43.3%). Units proposed for treatment represent 0.6% of the total drainage area, and 1.3% of the BLM-managed lands in the drainage.
13) The **Engles Creek** drainage is roughly 1,058 acres in size. The BLM manages approximately 704 acres in this drainage (66.5%). Units proposed for treatment represent 13.7% of the total drainage area, and 20.6% of the BLM-managed lands in the drainage.
14) The **Britt Creek** drainage is roughly 1,961 acres in size. The BLM manages approximately 734 acres in this drainage (37.4%). Units proposed for treatment represent 1.4% of the total drainage area, and 3.8% of the BLM-managed lands in the drainage
15) The **Rattlesnake Creek** drainage is roughly 1,193 acres in size. The BLM manages approximately 620 acres in this drainage (52%). Units proposed for treatment represent 26.1% of the total drainage area, and 50.2% of the BLM-managed lands in the drainage.
16) The **Williams Creek-Little River** drainage is roughly 4,285 acres in size. The BLM manages approximately 604 acres in this drainage (14.1%). Units proposed for treatment represent 2.2% of the total drainage area, and 15.4% of the BLM-managed lands in the drainage.

Appendix E. Carbon Storage/Release Analytical Methodology

Project: Little River MMX Thinning
Prepared By: Rex McGraw
Date: December 11, 2011

Analysis of Carbon Storage

It is recognized that there is considerable variety available in the scientific literature regarding the quantitative measures and additional factors that may be used in calculating carbon storage that can influence the outcome of this analysis. However, the methodology described here provides a consistent means to compare the relative effects of the alternatives considered in Little River MMX Thinning and not necessarily the absolute amount of carbon that would be stored or released under the alternatives.

The analysis of carbon storage modeled the amount of carbon stored in the forest and harvested wood products, and the amount of carbon released into the atmosphere to harvest those wood products. The analysis divided carbon storage/release into six pools:

- Standing, Live Trees
- Other Than Live Trees
- Wood Products
- Slash Burning
- Logging Slash
- Fossil Fuels

The carbon in these six pools was summed at each time step to calculate the Net Carbon Balance by alternative.

Carbon Storage in Standing, Live Trees

The carbon pool of "Standing, Live Trees" represents the live trees that are developing currently and would develop in the future within the proposed units.

1. Standing, live tree carbon was derived in this analysis using the outputs from the ORGANON model (Hann *et al*., 2005) for standing tree volume in the proposed units over time for each alternative.

2. Standing tree volumes measured in board feet per acre were converted to cubic feet using a conversion factor of 6.00 board feet/cubic foot (2008 Final EIS, Appendices-28).

3. The cubic foot tree volumes per acre were converted to pounds of biomass using a conversion factor of 35 pounds of biomass/cubic foot (2008 Final EIS, Appendices-28, Table C-1). Biomass was assumed to be Douglas-fir in this analysis.

4. The pounds of biomass per acre derived from tree volumes were expanded to a total biomass for entire trees (including branches, bark, roots, etc…) per acre by multiplying by 1.85 (2008 Final EIS, Appendices-28).

5. The expanded biomass for entire trees per acre was converted to pounds of carbon per acre by multiplying by 0.50 (2008 Final EIS, Appendices-28).

6. Pounds of carbon in whole trees per acre were converted to tonnes of carbon in whole trees per acre by dividing by 2200 (2008 Final EIS, Appendices-28).

7. The tonnes of carbon in whole trees per acre were converted to tonnes of carbon in whole trees within each proposed unit by multiplying by the size of the unit in acres.

8. The tonnes of carbon in whole trees within the project were derived by summing the tonnes of carbon in whole trees within each unit. It is this summation that is shown in Tables 14 and 15 (pgs. 75, 76) as "Standing, Live Trees".

Carbon Storage in Forests Other than Live Trees

The carbon pool of "Other than Live Trees" represents shrubs, brush, snags, woody debris, and organic carbon in the soil within the proposed units.

1. Carbon in other than live trees for each unit was derived by multiplying the unit acreage by the tonnes of carbon per acre shown in Table E-1 (which was adapted from Table C-2 in the 2008 Final EIS, Appendices-29). The stands in Little River MMX were aged based on the time steps used in the analysis (i.e. 10, 20, 50, and 100 years after the current condition) and the corresponding tonnes of carbon per acre was used in the calculations of other than live tree carbon. Under the "current condition", stands in Clever Beaver were 35-62 years old.

2. The tonnes of carbon within the project were derived by summing the tonnes of carbon within each unit. It is this summation that is presented in Tables 14 and 15 (pgs. 75, 76) as "Other Than Live Trees".

Table E-1. Forest Ecosystem Carbon (Excluding Live Trees) By Structural Stage*.

Age of Stand(s)	Structural Stage	Tonnes of Carbon per Acre
5-34 years	Stand Establishment	67.8
35-94 years	Young	70.3
95-124 years	Mature	88.2
≥ 125 years	Developed Structurally Complex	94.8

* adapted from 2008 Final EIS, Appendices-29.

Carbon Storage in Wood Products

The carbon pool of "Wood Products" represents the amount of carbon that would be converted from standing, live trees into either saw logs or pulpwood, collectively referred to as wood products under the proposed action. There would be no carbon pool of wood products under the No Action Alternative since wood products would not be generated.

1. The tonnes of carbon in whole trees were derived previously in Steps 1-7 under "Standing, Live Trees" for the time steps used in this analysis. The difference between the tonnes of carbon in whole trees at "current condition" and at "harvest time" would be the tonnes of carbon in whole trees that would be harvested.

2. The tonnes of carbon in whole trees that would be harvested per unit were summed to provide the total for the project.

3. The tonnes of carbon in whole trees that would be harvested were converted to tonnes of carbon in saw logs by dividing by 1.85 (2008 Final EIS, Appendices-28). *Note:* this reversed the calculation that expanded biomass of harvested logs into the biomass of whole trees performed previously (derived in Step 4 of "Standing, Live Trees").

4. At harvest time, 13.5 percent of the saw log's carbon would immediately be released Smith *et al*. (2006); but afterwards the carbon in saw logs would be gradually released over time. The tonnes of carbon held in saw logs were then decayed over time by multiplying the tonnes of carbon in saw logs harvested by the values shown in Table E-2 which were adapted from the 2008 Final EIS, Appendices-30 and Smith *et al*. (2006).

5. Additional tonnes of carbon held in pulpwood (e.g. chips) were derived by multiplying the tonnes of carbon in saw logs (derived in Step 3 above) by five percent (2008 Final EIS, Appendices-30). *Note*: Pulpwood tonnage is five percent *in addition to* the saw logs not five percent *of* the saw logs.

6. At harvest time, 14.8 percent of the pulpwood's carbon would immediately be released Smith *et al*. (2006); but afterwards the carbon in pulpwood would be gradually released over time. The tonnes of carbon held in pulpwood were then decayed over time by multiplying the tonnes of carbon in pulpwood by the values shown in Table E-2 which were adapted from the 2008 Final EIS, Appendices-30 and Smith *et al*. (2006).

7. The sum total of the tonnes of carbon immediately released from saw logs (derived in Step 4 above) and from pulpwood (derived in Step 6 above) represent the total amount of carbon released by "Wood Products" at harvest time. The sum total of the tonnes of carbon held in saw logs (derived in Step 4 above) and held in pulpwood (derived in Step 6 above) at each time step represent the amount of carbon stored in "Wood Products" as shown in Table 15 (pg. 76).

Table E-2. Fraction of Carbon Remaining or Captured as an Alternative Energy Source*.

Timestep	Saw Logs	Pulpwood
Harvest Time (0 years)	0.865	0.852
+10 years	0.796	0.730
+20 years	0.761	0.691
+50 years	0.702	0.655
+100 years	0.651	0.645

* These fractions include; wood products in use, wood products in the landfill, and wood products emitted as energy in lieu of fossil fuels (adapted from 2008 Final EIS, Appendices-30 and Smith *et al*., 2006).

Carbon Release in Slash Burning

The carbon pool of "Slash Burning" represents the amount of slash generated by the proposed timber harvest that is consumed through prescribed pile burning. There would be no carbon pool of slash burning under the No Action Alternative since logging slash would not be generated and therefore not burned.

1. The reported amount of slash, in tons of biomass per acre, which was scheduled for prescribed burning in 42 commercial thinning and/or density management units within the Swiftwater Resource Area was available for this analysis (K.Kosel, pers. comm., 2009). The tons of slash biomass per acre were converted to tonnes of biomass per acre by using a conversion factor of 0.909 tons/tonne.

2. It was assumed that prescribed fire would consume 90 percent of the slash scheduled for burning (K.Kosel, pers. comm., 2009); thereby releasing carbon. The tonnes of slash biomass per acre consumed were derived by multiplying the tonnes of slash biomass per acre by 0.90.

3. The tonnes of slash biomass consumed per acre were converted to tonnes of carbon released per acre by using a conversion factor of 0.50 tonnes of biomass/tonne of carbon.

4. Within the Swiftwater Resource Area, it was calculated that an average of 0.382 tonnes of carbon would be released per acre of commercial thinning and/or density management unit scheduled for piling and burning using prescribed fire.

5. The tonnes of carbon that would be released under the proposed action were derived by multiplying the acreage of the project by 0.382 tonnes per acre (derived in Step 4 above) and are shown in Table 15 (pg. 76) as "Slash Burning" at harvest time.

Carbon Storage in Logging Slash

The carbon pool of "Logging Slash" represents the limbs, fine branches, leaves/needles, stumps, and roots of trees that are left on-site in the proposed units after harvest operations that are not consumed during slash burning. There would be no carbon pool of logging slash under the No Action Alternative since logging slash would not be generated.

1. The tonnes of logging slash remaining on-site was calculated by subtracting the following three amounts of carbon from the total tonnes of carbon in whole trees that would be harvested from the project (derived in Step 2 under "Wood Products"):
    - the tonnes of carbon immediately released from wood products (derived in Step 7 of "Wood Products"),
    - the tonnes of carbon stored in wood products at harvest time (derived in Step 7 of "Wood Products"), and
    - the tonnes of carbon released from slash burning (derived in Step 5 under "Slash Burning").

2. The tonnes of logging slash on-site were then multiplied by the fraction of Douglas-fir slash remaining at each time step as shown in Table E-3 (based on Janisch *et al*. 2005). This represents the amount of carbon stored in "Logging Slash" as it decayed and released carbon over time as shown in Table 15 (pg. 76).

Table E-3. Decay Rates of Carbon from Douglas-fir Slash*.

Timestep	Fraction of Carbon Remaining in Douglas-fir Slash
Harvest Time (0 years)	1.000
+10 years	0.852
+20 years	0.726
+50 years	0.449
+100 years	0.202

* based on Janisch *et al*. 2005.

Carbon Release in Fossil Fuels

The carbon pool of "Fossil Fuels" represents the amount of carbon that would be released through the consumption of gasoline and diesel fuel by various harvest-related activities under the proposed action such as: timber falling, timber yarding, log hauling, and road construction and renovation. There would be no carbon pool of fossil fuels under the No Action Alternative since no harvest-related activities would occur.

1. The gallons of fuel that would be consumed during harvest operations (i.e. timber felling and yarding) were estimated based on the production rates and fuel efficiencies shown in Table E-4. For the fossil fuels portion of the analysis, it was assumed that the 1,504 acre project would be cable-yarded and a loader would handle logs at the landings.

Table E-4. Fossil Fuel Consumption during Harvest Operations.

Equipment	Production Rate[a]	Fuel Efficiency[b]		Fuel Consumed
	(acres/day)	(gallons/hour)	(gallons/day)	(gallons)
Chainsaw (gasoline)	0.4	-	1	3,760
Motorized Carriage (gasoline)	1	-	3	4,512
Cable/Skyline Yarder (diesel)	1	2.3	19.55	29,403
Loader (diesel)	1	4.5	38.25	57,528

[a] based on experience of BLM Contract Administrators and Crusier/Appraisers.
[b] based on World Forestry Institute (1997).

2. For the hauling of logs, this analysis assumed an average log-truck load of 4,000 BF (based on experience of BLM Contract Administrators and Crusier/Appraisers) and a fuel efficiency of 6.0 miles per gallon. It was also assumed that the total timber volume in Little River MMX was 27,167,600 BF (based on ORGANON modeling) and the length of haul (round-trip) was 40 miles. It was estimated that 45,279 gallons of diesel would be consumed during log hauling for this project.

3. For road construction it was assumed that 588 gallons of diesel would be consumed per mile (5,280 feet) of road constructed and 73 gallons per mile of road improved (based on Loeffler *et al*., 2009). In Little River MMX, there would be 6.19 miles of road construction (Tables 4a-4d) corresponding to 3,640 gallons of diesel consumed and 0.85 miles of road improvement (Tables 4a-4d) corresponding to 62 gallons of diesel consumed.

4. The gallons of fuel that would be consumed by harvest operations (derived in Step 1), log hauling (derived in Step 2), and road construction and improvement (derived in Step 3) were summed to provide the total fuel consumption for the project (Table E-5). The total gallons of fuel that would be consumed were converted to tonnes of carbon that would be released using the conversion factors shown in Table E-5. The total amount of carbon that would be released by the proposed action is shown in as "Fossil Fuels" in Table 15 (pg. 76).

Table E-5. Total Fossil Fuel Consumption and Associated Carbon Release.

Fuel Use	Fuel Consumption (gallons)	Pounds CO_2 per Gallon[a]	CO_2 Released[b] (tonnes)	Carbon Released[c] (tonnes)
Harvest Operations (gasoline)	8,272	19.4	73	20
Harvest Operations (diesel)	86,931	22.2	877	239
Log Hauling (diesel)	45,279	22.2	457	125
Road Construction & Improvement (diesel)	3,702	22.2	37	10
Total	**-**	**-**	**1,444**	**394**

[a] based on experience of BLM Contract Administrators and Crusier/Appraisers.
[b] conversion rate of 2,200 pounds per tonne (2008 Final EIS, Appendices-28).
[c] One tonne of carbon is equivalent to 3.67 tons of carbon dioxide (U.S. EPA, 2005).

Appendix F. Botany Summary

Project: Little River MMX Thinning
Prepared By: Julie Knurowski
Date: November 23, 2011
SSSP List Date: February 8, 2008 (IM-OR-2008-038)

Those Bureau Sensitive or Bureau Strategic species which are suspected or documented to occur within the Roseburg District BLM area are detailed below.

Bureau Sensitive Species. BLM districts are responsible to assess and review the effects of a proposed action on *Bureau Sensitive* species. To comply with Bureau policy, Districts may use the following techniques:

a. Evaluation of species-habitat associations and presence of potential habitat.
b. Application of conservation strategies, plans, and other formalized conservation mechanisms.
c. Review of existing survey records, inventories, and spatial data.
d. Utilization of professional research and literature and other technology transfer methods.
e. Use of expertise, both internal and external, that is based on documented, substantiated professional rationale.
f. Complete pre-project survey, monitoring, and inventory for species that are based on technically sound and logistically feasible methods while considering staffing and funding constraints.

When Districts determine that additional conservation measures are necessary, options for conservation include, but are not limited to: modifying a project (e.g. timing, placement, and intensity), using buffers to protect sites, or implementing habitat restoration activities (IM-OR-2003-054).

Strategic Species. If sites are located, collect occurrence data and record in the corporate database.

Table F-1. Federally Listed & Bureau Sensitive Botanical Species.

Species	Within species range?	Habitat Present?	Species Present?	Reason for concern or no concern	Surveys Completed	Mitigation Measures
Threatened & Endangered Species						
Lupinus sulphureus ssp. *kincaidii* Kincaid's lupine(T)	**Yes**	**Yes**	No	Surveys performed, not detected.	May-July 2010	N/A
Plagiobothrys hirtus Rough popcorn flower (E)	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Sensitive Species						
Chiloscyphus gemmiparus Liverwort	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Diplophyllum plicatum Liverwort	**Yes**	No	No	No habitat present	May-July 2010	N/A
Entosthodon fascicularis Moss	**Yes**	No	No	No habitat present	May-July 2010	N/A
Gymnomitrion concinnatum Liverwort	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Helodium blandowii Moss	**Yes**	No	No	No habitat present	May-July 2010	N/A
Meesia uliginosa Moss	**Yes**	No	No	No habitat present	May-July 2010	N/A
Schistostega pennata Moss	**Yes**	No	No	No habitat present	May-July 2010	N/A
Tayloria serrata Moss	**Yes**	**Yes**	No	No sites present in project area.	May-July 2010	N/A
Tetraphis geniculata Moss	**Yes**	No	No	No habitat present	May-July 2010	N/A

Species	Within species range?	Habitat Present?	Species Present?	Reason for concern or no concern	Surveys Completed	Mitigation Measures
Tetraplodon mnioides Moss	**Yes**	**Yes**	No	Surveys performed, not detected.	May-July 2010	N/A
Tomentypnum nitens Moss	**Yes**	No	No	No habitat present	May-July 2010	N/A
Tortula mucronifolia Moss	**Yes**	No	No	No habitat present	May-July 2010	N/A
Trematodon boasii Moss	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Bridgeoporus nobilissimus Giant polypore fungus	**Yes**	No	N/A	Surveys Not Practical. [1]	N/A	N/A
Cudonia monticola *Fungi*	**Yes**	No	N/A	Surveys Not Practical. [1]	N/A	N/A
Dermocybe humboldtensis Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Gomphus kauffmanii Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Helvella crassitunicata Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Leucogaster citrinus Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Otidea smithii Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Phaeocollybia californica Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Phaeocollybia dissiliens Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Phaeocollybia gregaria Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Phaeocollybia olivacea Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Phaeocollybia oregonensis Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Phaeocollybia pseudofestiva Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Phaeocollybia scatesiae Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Phaeocollybia sipei Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Phaeocollybia spacidea Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Pseudorhizina californica Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Ramaria amyloidea Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Ramaria gelatiniaurantia Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Ramaria largentii Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Ramaria rubella var. blanda Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Ramaria spinulosa var. *diminutiva* Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A

Species	Within species range?	Habitat Present?	Species Present?	Reason for concern or no concern	Surveys Completed	Mitigation Measures
Rhizopogon chamalelotinus Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Rhizopogon exiguus Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	May-July 2010	N/A
Sowerbyella rhenana Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	May-July 2010	N/A
Bryoria subcana Lichen	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Calicium adspersum Lichen	**Yes**	No	No	No habitat present	May-July 2010	N/A
Chaenotheca subroscida Lichen	**Yes**	**Yes**	Yes	Population sites mitigated.	May-July 2010	Remove from unit
Dermatocarpon meiophyllizum Lichen	**Yes**	Yes	No	Surveys performed, not detected..	May-July 2010	N/A
Hypogymnia duplicata Lichen	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Lobaria linita Lichen	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Pannaria rubiginosa Lichen	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Pilophorus nigricaulis Lichen	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Stereocaulon spathuliferum Lichen	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Adiantum jordanii California maiden-hair	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Arabis koehleri var. *koehleri* Koehler's rockcress	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Arctostaphylos hispidula *Hairy manzanita*	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Asplenium septentrionale Grass-fern	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Bensoniella oregana Bensonia	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Botrychium minganense Gray moonwort	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Calochortus coxii Crinite mariposa-lily	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Calochortus umpquaensis Umpqua mariposa-lily	**Yes**	Yes	Yes	Population sites mitigated.	May-July 2010	Eliminate actions that damage habitat.
Camassia howellii Howell's camas	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Carex comosa Bristly sedge	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Carex gynodynama Hairy sedge	**Yes**	**Yes**	Yes	Population sites mitigated.	May-July 2010	Remove habitat from unit or allow impacts that do not damage population.
Carex serratodens Saw-tooth sedge	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Cicendia quadrangularis Timwort	**Yes**	No	No	No habitat present	May-July 2010	N/A
Cimicifuga elata var. elata Tall bugbane1	**Yes**	**Yes**	No	Surveys performed, not detected.	May-July 2010	N/A

Species	Within species range?	Habitat Present?	Species Present?	Reason for concern or no concern	Surveys Completed	Mitigation Measures
Cypripedium fasciculatum Clustered lady slipper	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Delphinium nudicaule Red larkspur	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Epilobium oreganum Oregon willow-herb	**Yes**	No	No	No habitat present	May-July 2010	N/A
Eschscholzia caespitosa Gold poppy	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Eucephalus vialis Wayside aster	**Yes**	Yes	Yes	Population sites mitigated.	May-July 2010	Remove habitat from the unit.
Horkelia congesta ssp. *congesta* Shaggy horkelia	**Yes**	No	No	No habitat present	May-July 2010	N/A
Horkelia tridentata ssp. *tridentate* Three-toothed horkelia	**Yes**	No	No	No habitat present	May-July 2010	N/A
Iliamna latibracteata California globe-mallow	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Kalmiopsis fragrans Fragrant kalmiopsis	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Lathyrus holochlorus Thin-leaved peavine	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Lewisia leana Lee's lewisia	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Limnanthes gracilis var. *gracilis* Slender meadow-foam	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Lotus stipularis Stipuled trefoil	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Meconella oregana *White fairypoppy*	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Pellaea andromedifolia Coffee fern	**Yes**	**Yes**	No	Surveys performed, not detected.	May-July 2010	N/A
Perideridia erythrorhiza Red-rooted yampah	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Polystichum californicum California sword-fern	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Romanzoffia thompsonii *Thompson's mistmaiden*	**Yes**	Yes	No	Surveys performed, not detected.	May-July 2010	N/A
Schoenoplectus subterminalis Water clubrush	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Scirpus pendulus *Drooping rush*	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Sisyrinchium hitchcockii Hitchcock's blue-eyed grass	**Yes**	No	No	No habitat present.	May-July 2010	N/A
Utricularia gibba Humped bladderwort	**Yes**	Yes	No	Surveys performed, not detected.	May-July 2010	N/A
Utricularia minor Lesser bladderwort	**Yes**	Yes	No	Surveys performed, not detected.	May-July 2010	N/A
Wolffia borealis Dotted water-meal	**Yes**	Yes	No	Surveys performed, not detected.	May-July 2010	N/A
Wolffia columbiana Columbia water-meal	**Yes**	Yes	No	Surveys performed, not detected.	May-July 2010	N/A

[1] Surveys are considered not practical for these species based on the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guideline (Standards and Guidelines, pg. 9)..

Table F-2. Bureau Strategic Botanical Species.

Scientific Name	Roseburg Occurrence?	Occurrence in the Project Area?
Bryophytes		
Cephaloziella spinigera	Suspected	None Observed
Grimmia anomala	Suspected	None Observed
Scouleria marginata	Suspected	None Observed
Fungi		
Cazia flexiascus	Suspected	Surveys Not Practical. [1]
Choiromyces alveolatus	Suspected	Surveys Not Practical. [1]
Clavariadelphus subfastigiatus	Documented	Surveys Not Practical. [1]
Endogone oregonensis	Documented	Surveys Not Practical. [1]
Glomus pubescens	Suspected	Surveys Not Practical. [1]
Gymnomyces monosporus	Documented	Surveys Not Practical. [1]
Helvella elastica	Documented	Surveys Not Practical. [1]
Hygrophorus albicarneus	Suspected	Surveys Not Practical. [1]
Mycena quinaultensis	Suspected	Surveys Not Practical. [1]
Nolanea verna var. *isodiametrica*	Suspected	Surveys Not Practical. [1]
Plectania milleri	Suspected	Surveys Not Practical. [1]
Psathyrella quercicola	Suspected	Surveys Not Practical. [1]
Ramaria abietina	Documented	Surveys Not Practical. [1]
Ramaria bothryis var. aurantiiramosa	Suspected	Surveys Not Practical. [1]
Ramaria concolor f. tsugina	Suspected	Surveys Not Practical. [1]
Ramaria conjunctipes var. sparsiramosa	Suspected	Surveys Not Practical. [1]
Ramaria coulterae	Suspected	Surveys Not Practical. [1]
Ramaria rubribrunnescens	Suspected	Surveys Not Practical. [1]
Ramaria suecica	Documented	Surveys Not Practical. [1]
Ramaria thiersii	Suspected	Surveys Not Practical. [1]
Rhizopogon brunneiniger	Suspected	Surveys Not Practical. [1]
Rhizopogon clavitisporus	Suspected	Surveys Not Practical. [1]
Rhizopogon flavofibrillosus	Documented	Surveys Not Practical. [1]
Rhizopogon variabilisporus	Suspected	Surveys Not Practical. [1]
Sarcodon fuscoindicus	Documented	Surveys Not Practical. [1]
Lichens		
Buellia oidalea	Suspected	None Observed
Lecanora pringlei	Suspected	None Observed
Lecidea dolodes	Suspected	None Observed
Leptogium rivale	Documented	Present.
Leptogium teretiusculum	Documented	None Observed
Peltula euploca	Suspected	None Observed
Vezdaea stipitata	Documented	None Observed
Vascular Plants		
Camissonia ovata	Suspected	None Observed
Frasera umpquaensis	Suspected	None Observed
Piperia candida	Documented	None Observed

[1] Surveys are considered not practical for these species based on the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guideline (Standards and Guidelines, pg. 9).

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Figure 1. Little River MMX Thinning Vicinity Map.

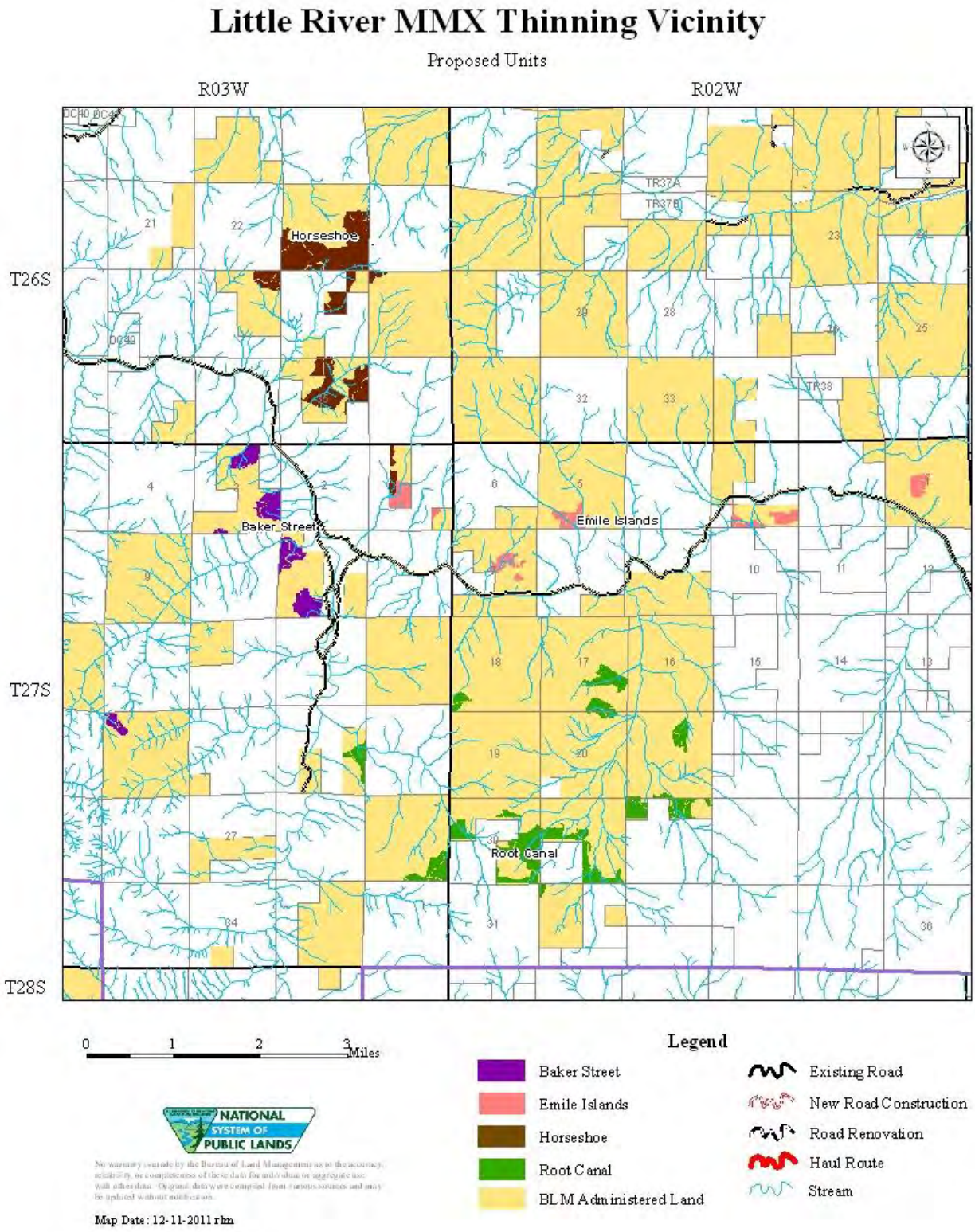

Figure 2. Root Canal Thinning Proposed Units & Roads.

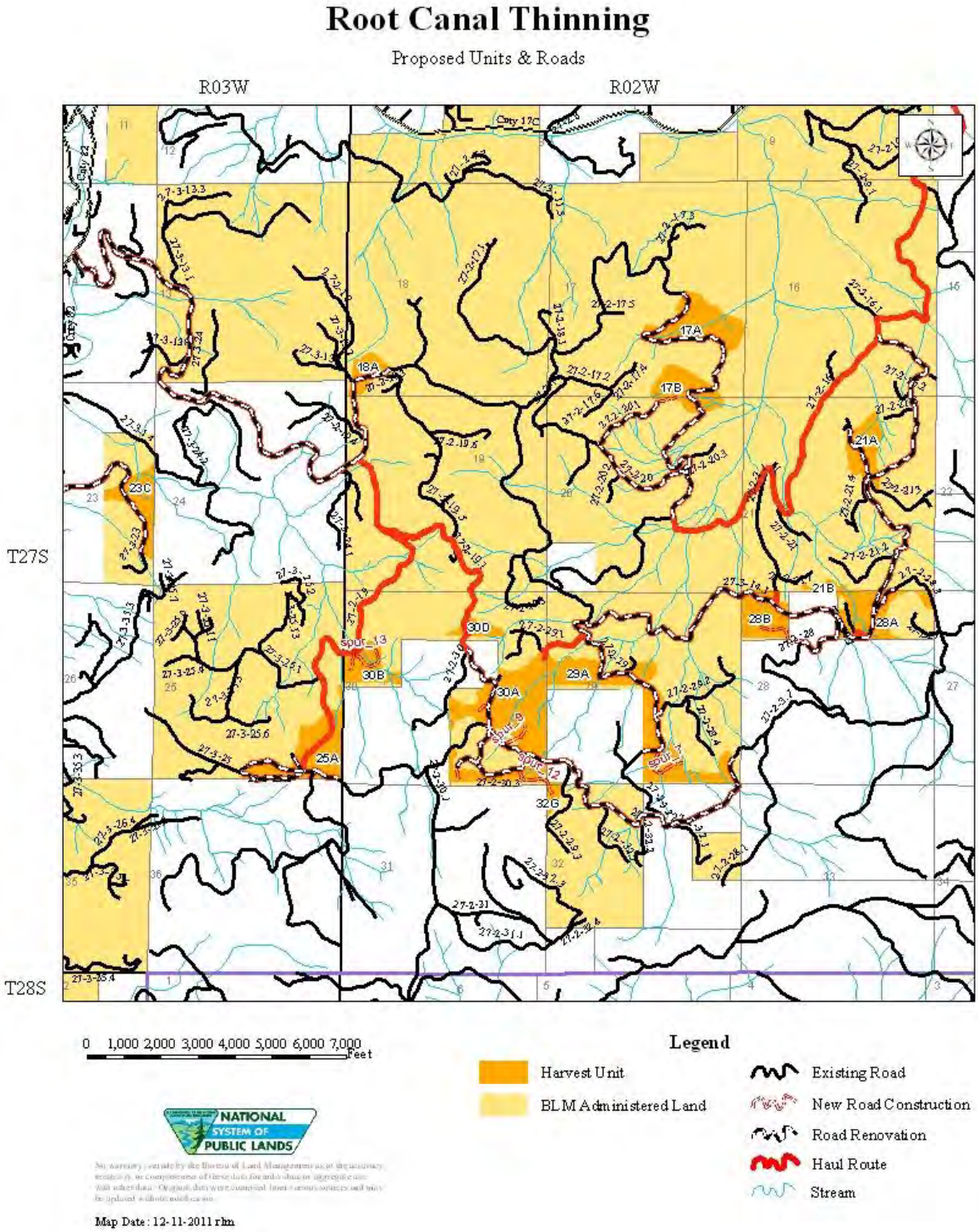

Figure 3. Baker Street Thinning Proposed Units & Roads.

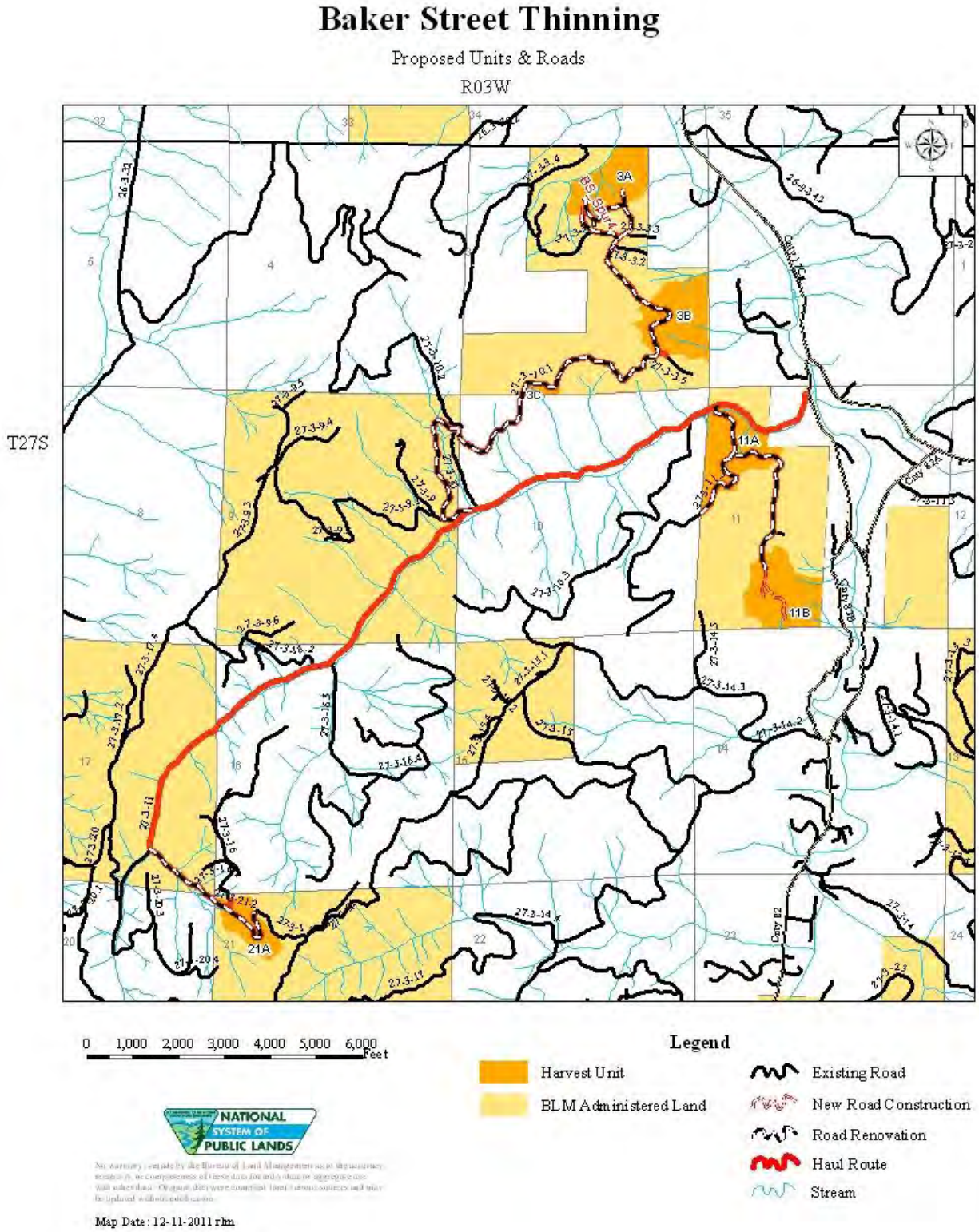

Figure 4. Horseshoe Thinning Proposed Units & Roads.

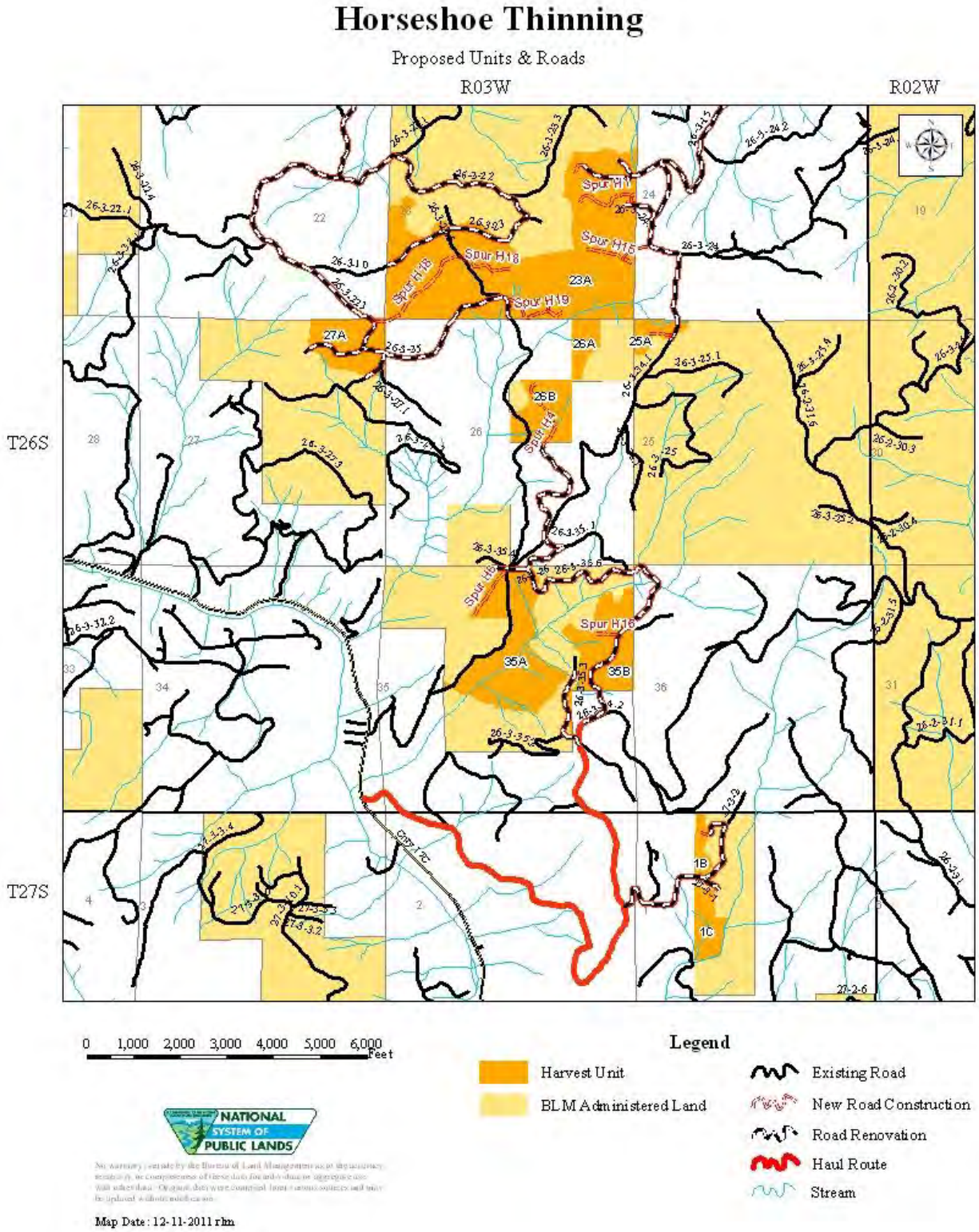

Figure 5. Emile Islands Thinning Proposed Units & Roads.

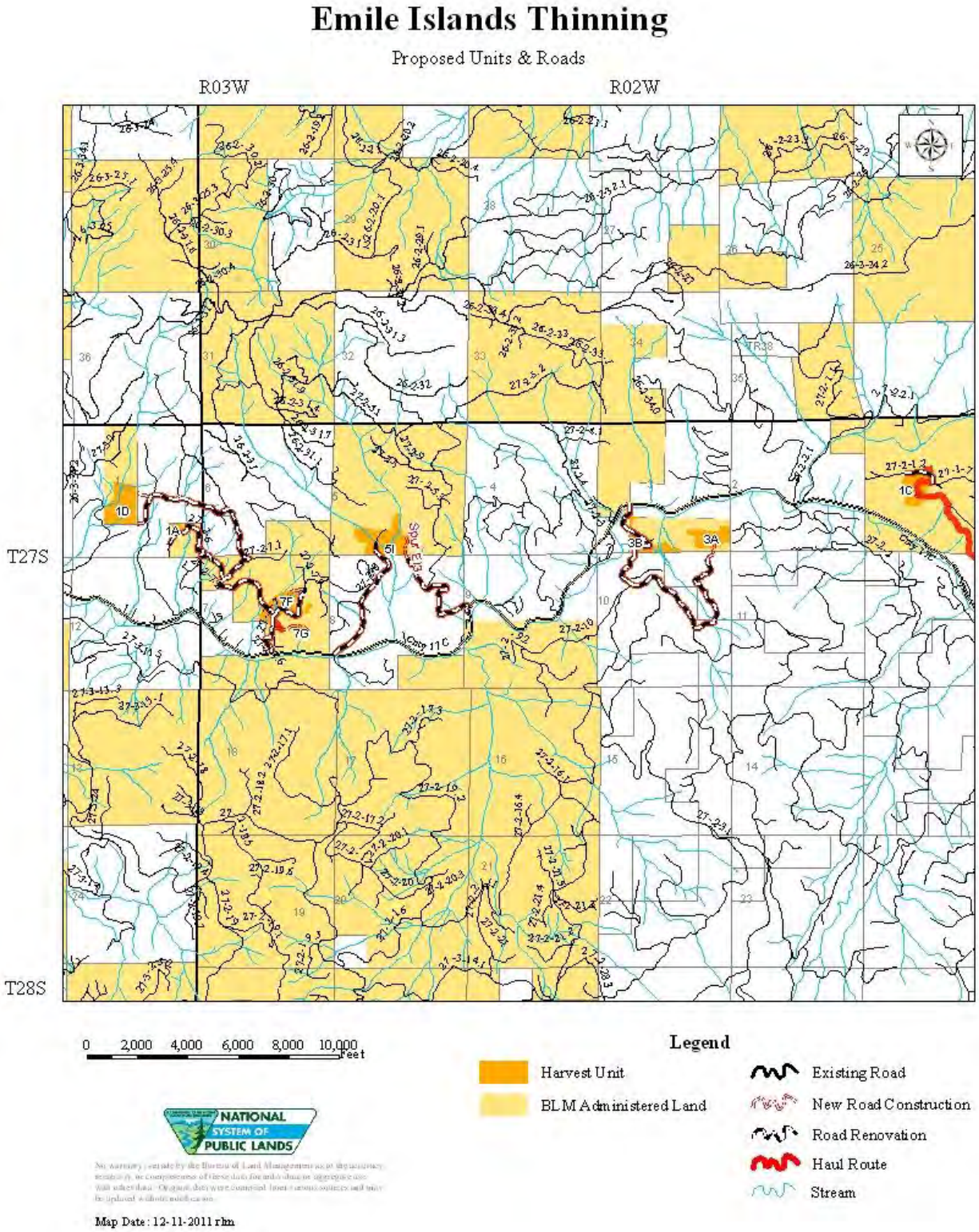

Figure 6. Root Canal Thinning Prescription Map.

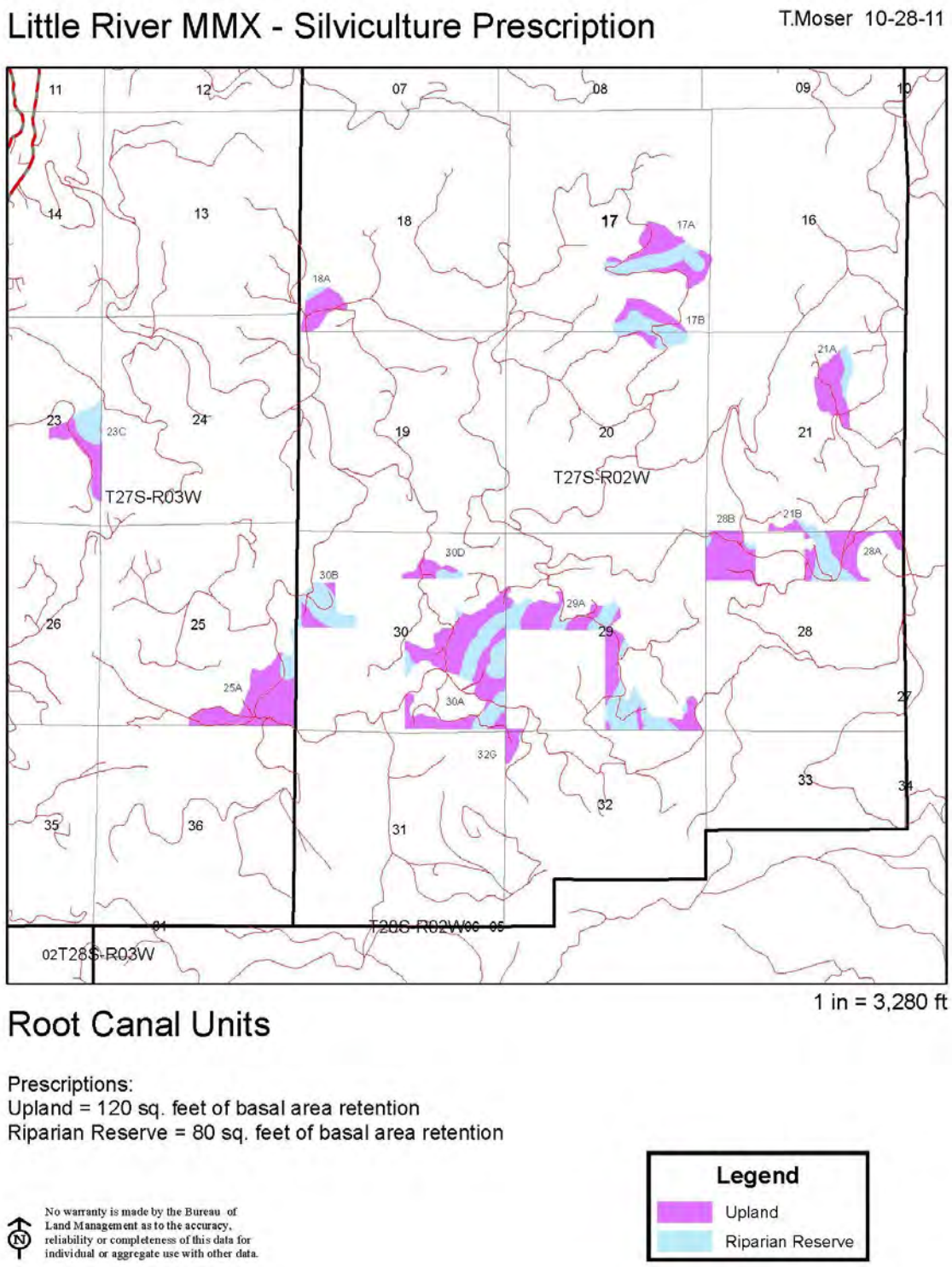

Figure 7. Baker Street Thinning Prescription Map.

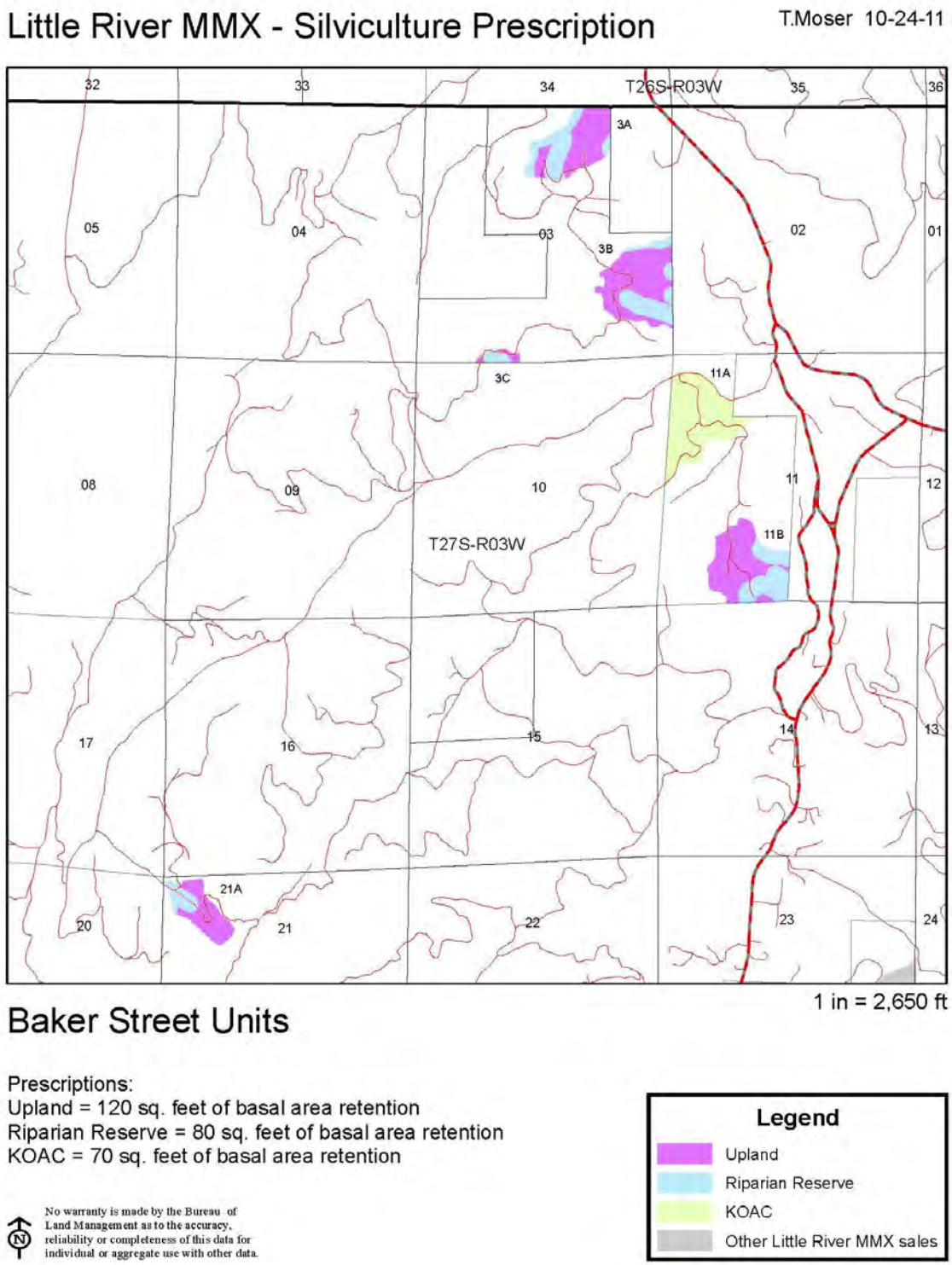

Figure 8. Horseshoe Thinning Prescription Map.

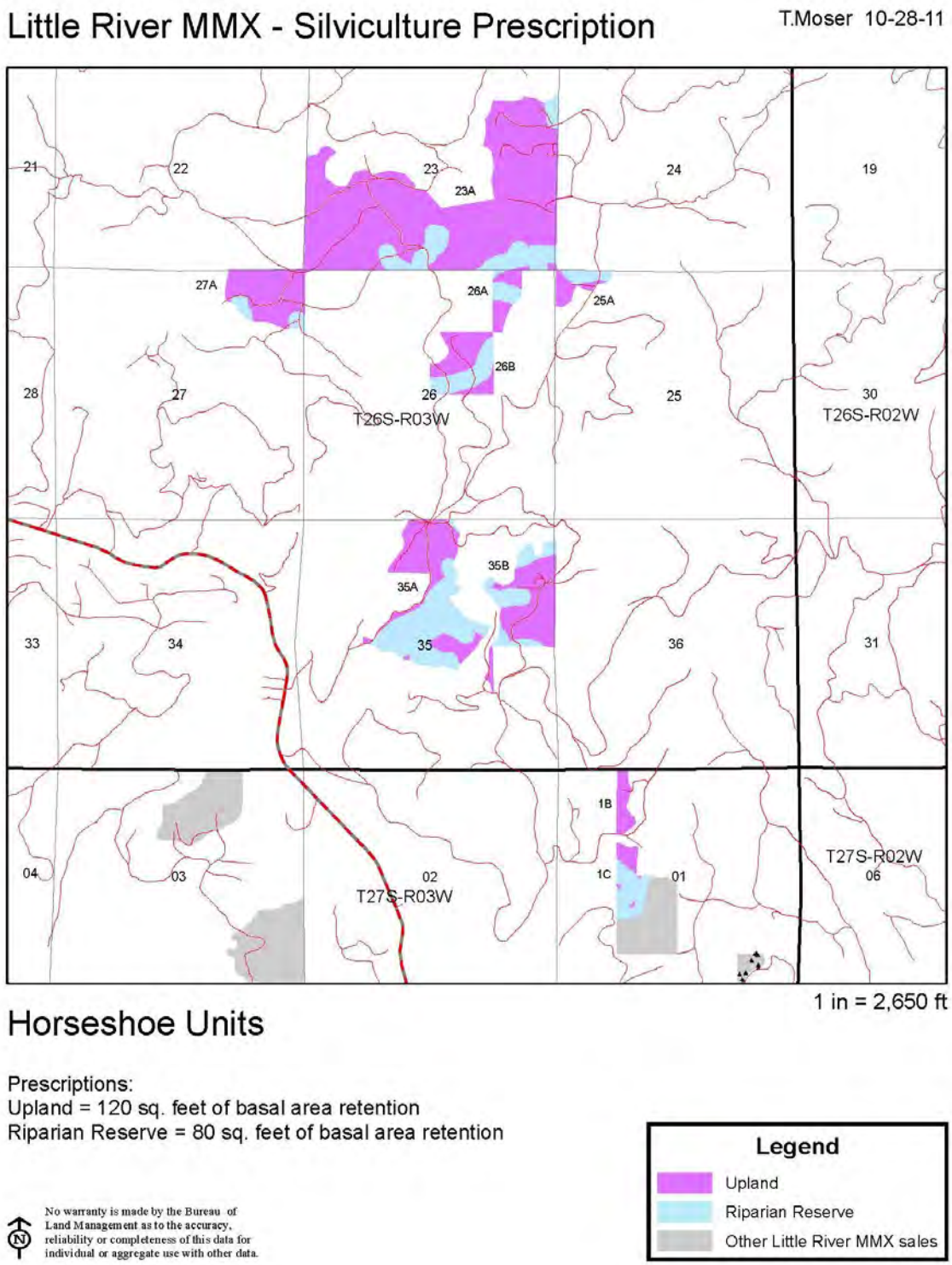

Figure 9. Emile Islands Thinning Prescription Map.

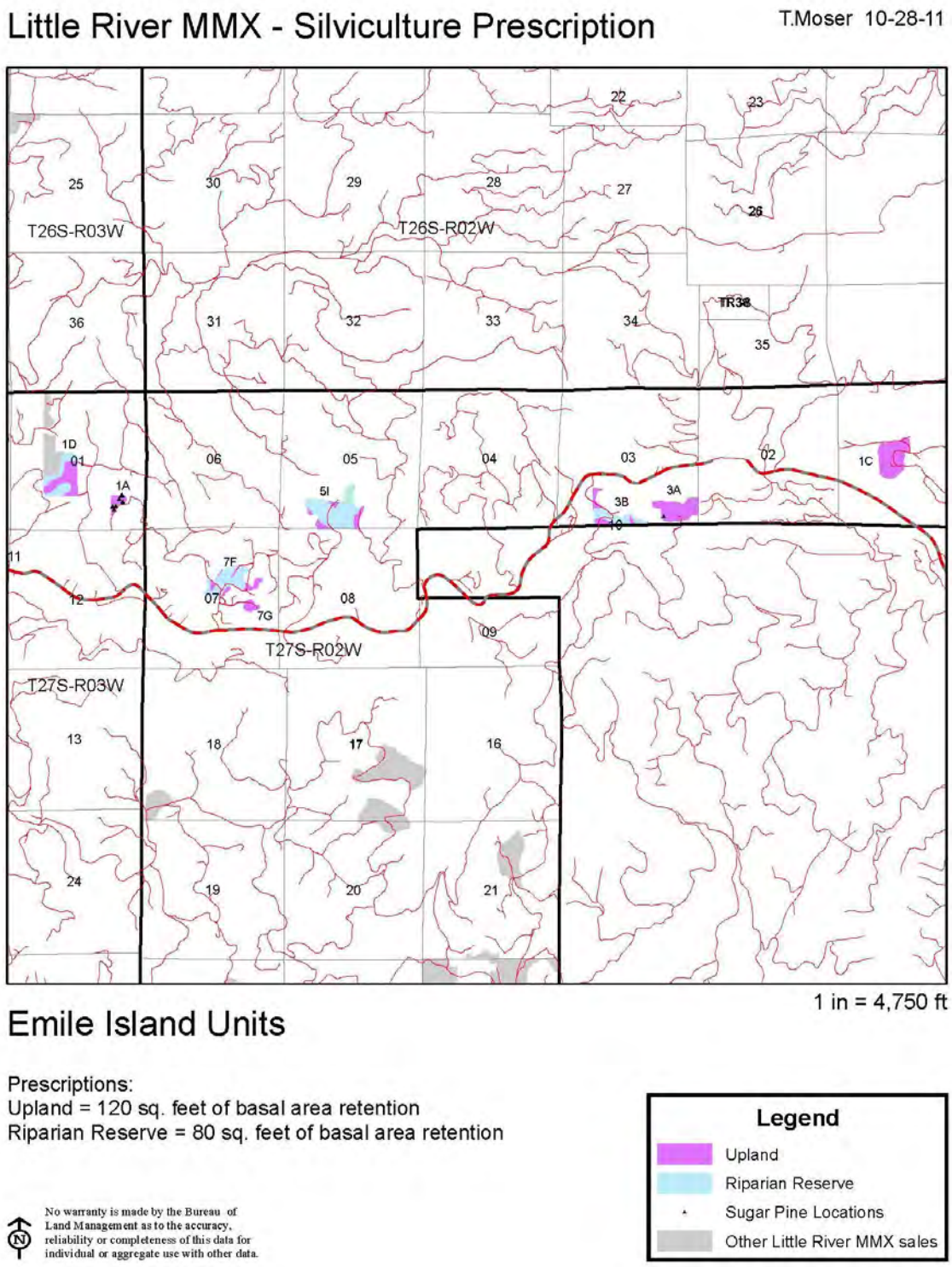

Figure 10. Northern Spotted Owl Habitat in Root Canal Sale Area.

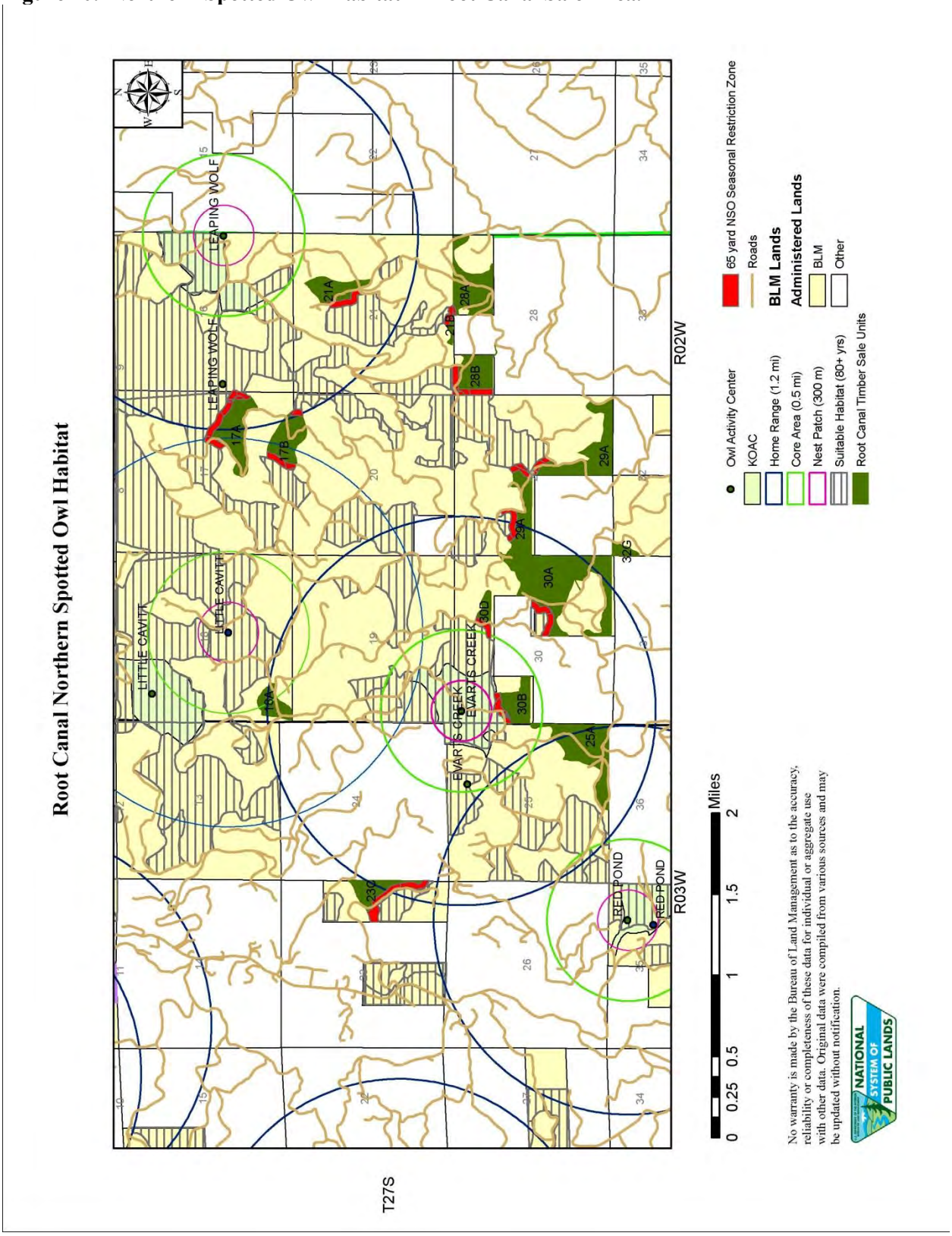

Figure 11. Northern Spotted Owl Habitat in Baker Street Sale Area.

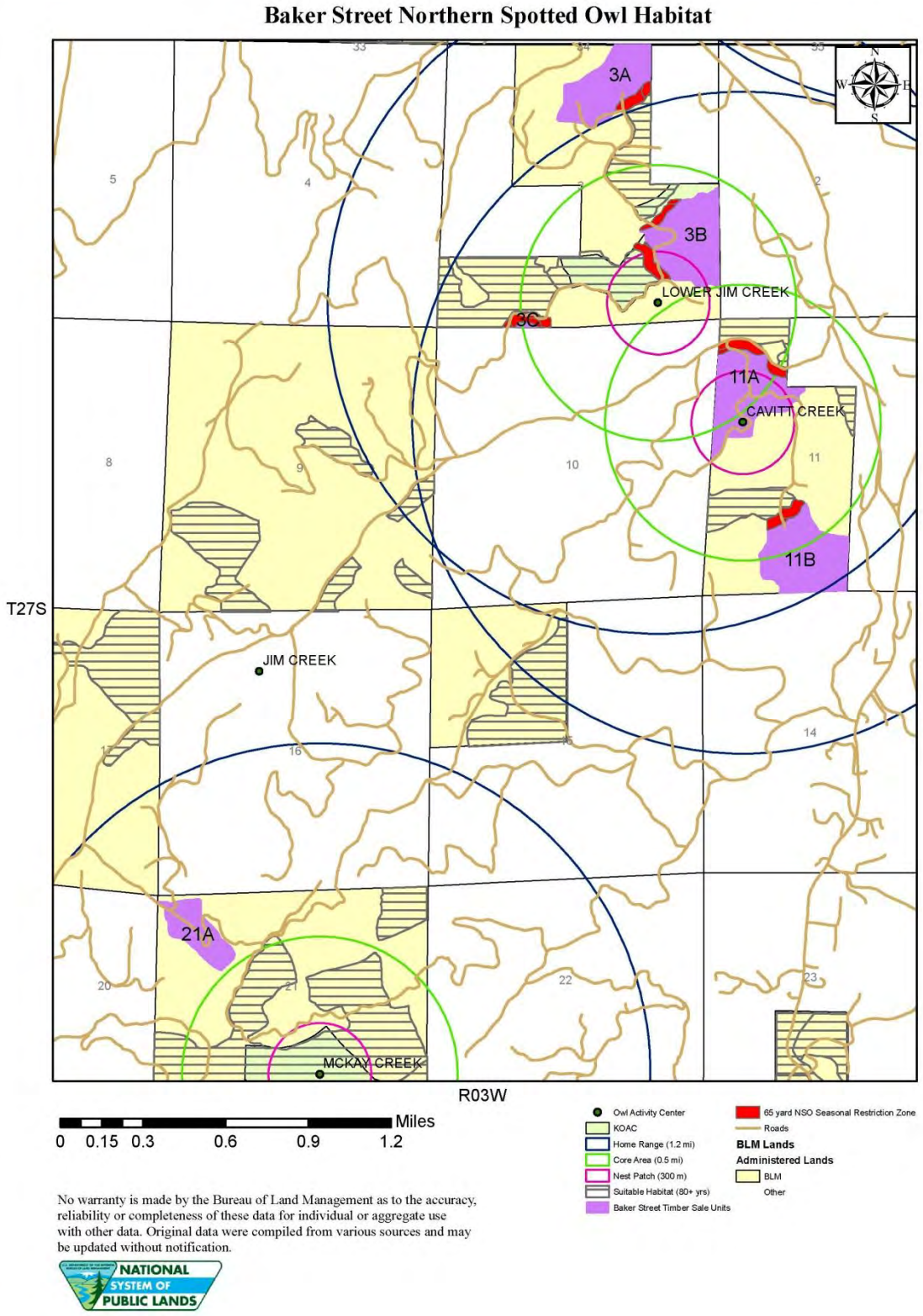

Figure 12. Northern Spotted Owl Habitat in Horseshoe Sale Area.

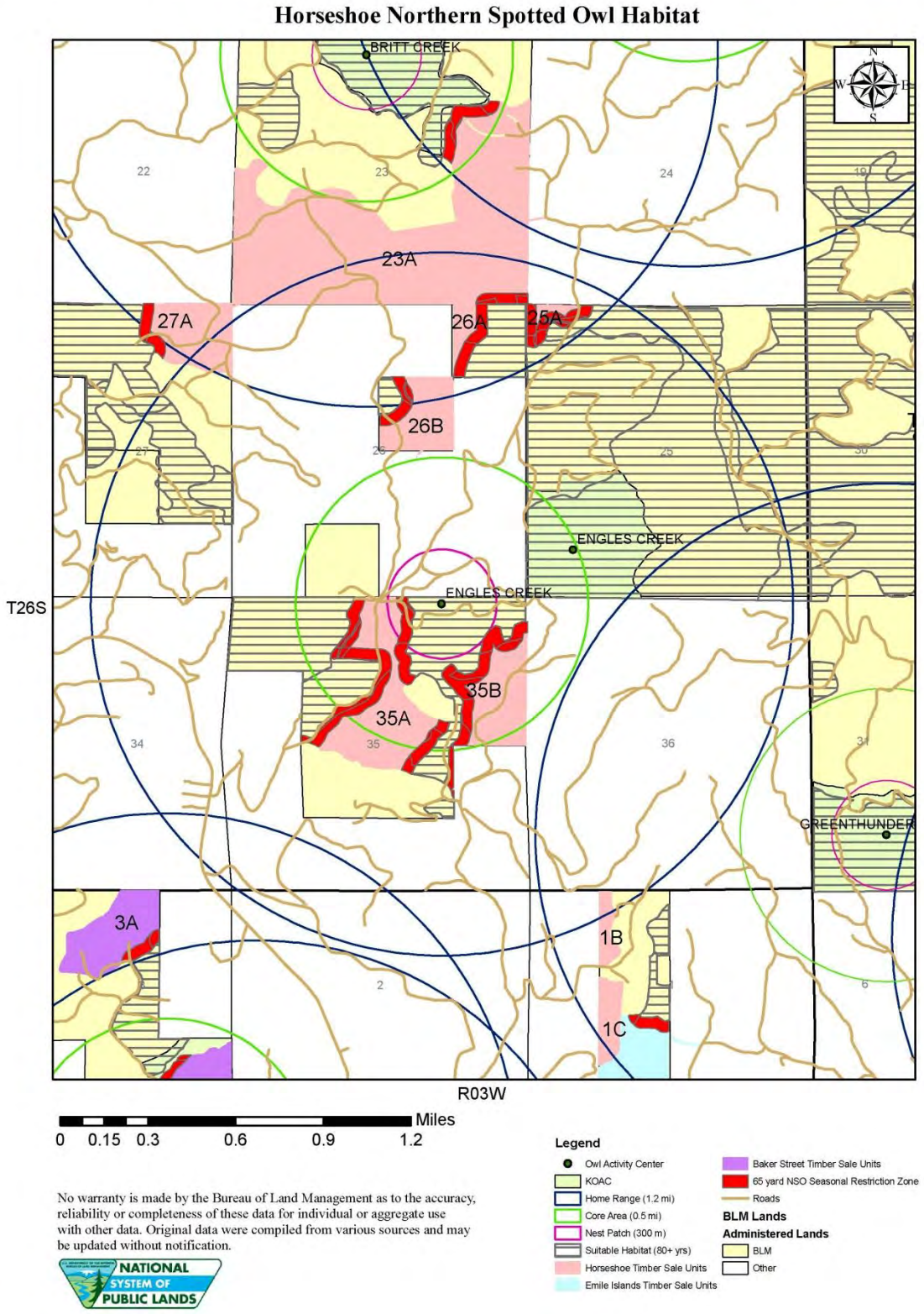

Figure 13. Northern Spotted Owls Habitat in Emile Islands Sale Area.

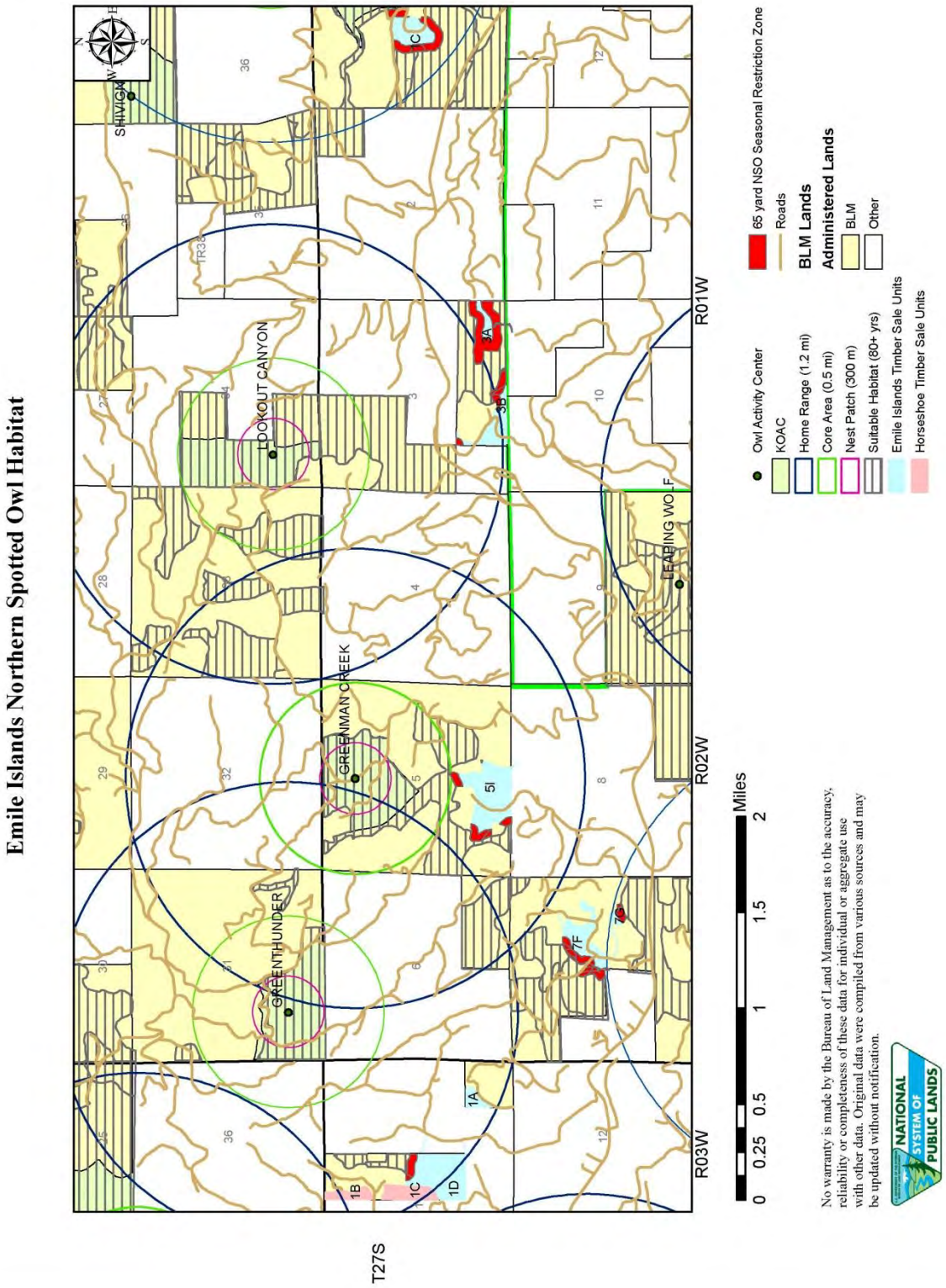

Figure 14. Proposed Subsoiling in Root Canal Sale Area.

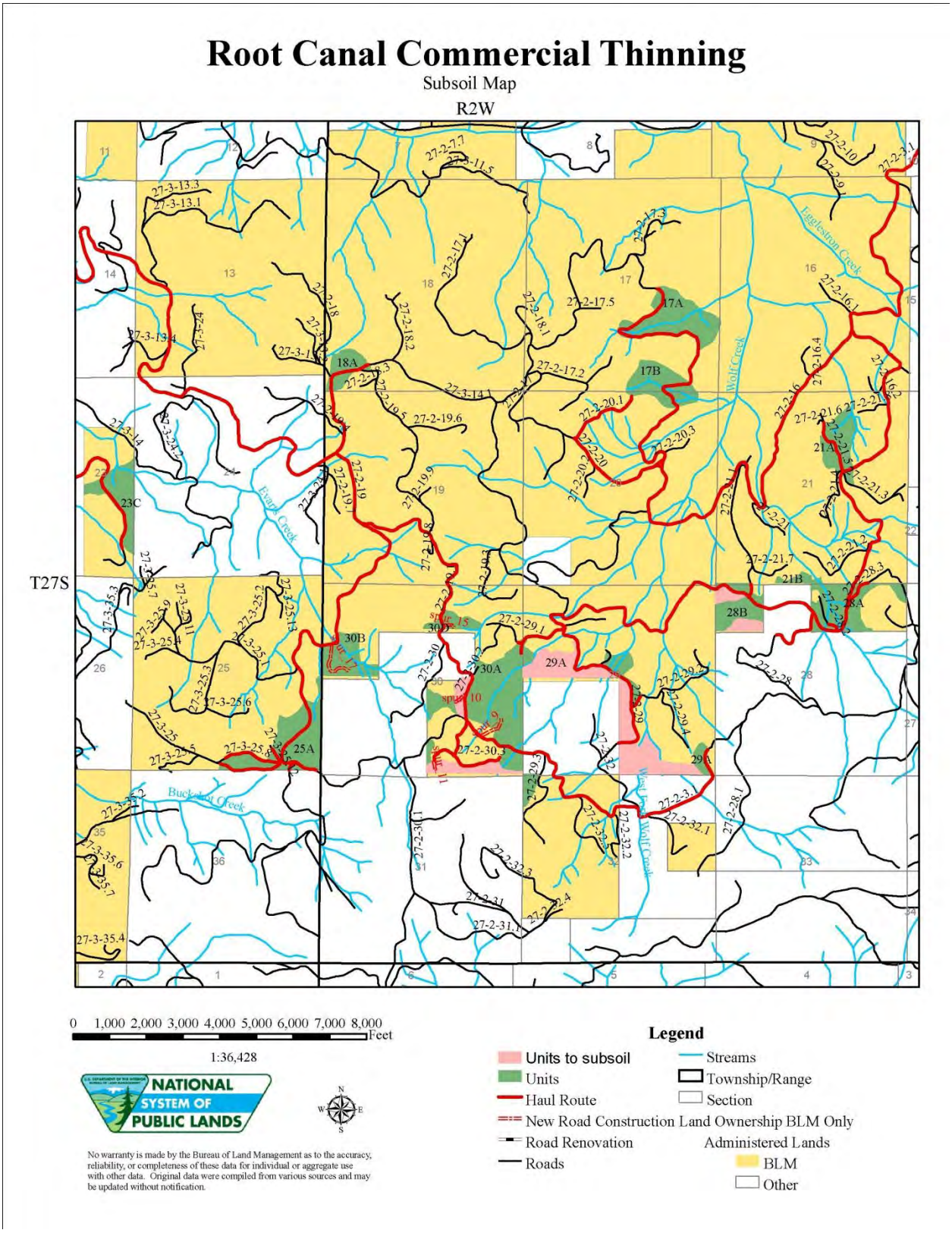

Figure 15. Proposed Subsoiling in Horseshoe Sale Area.

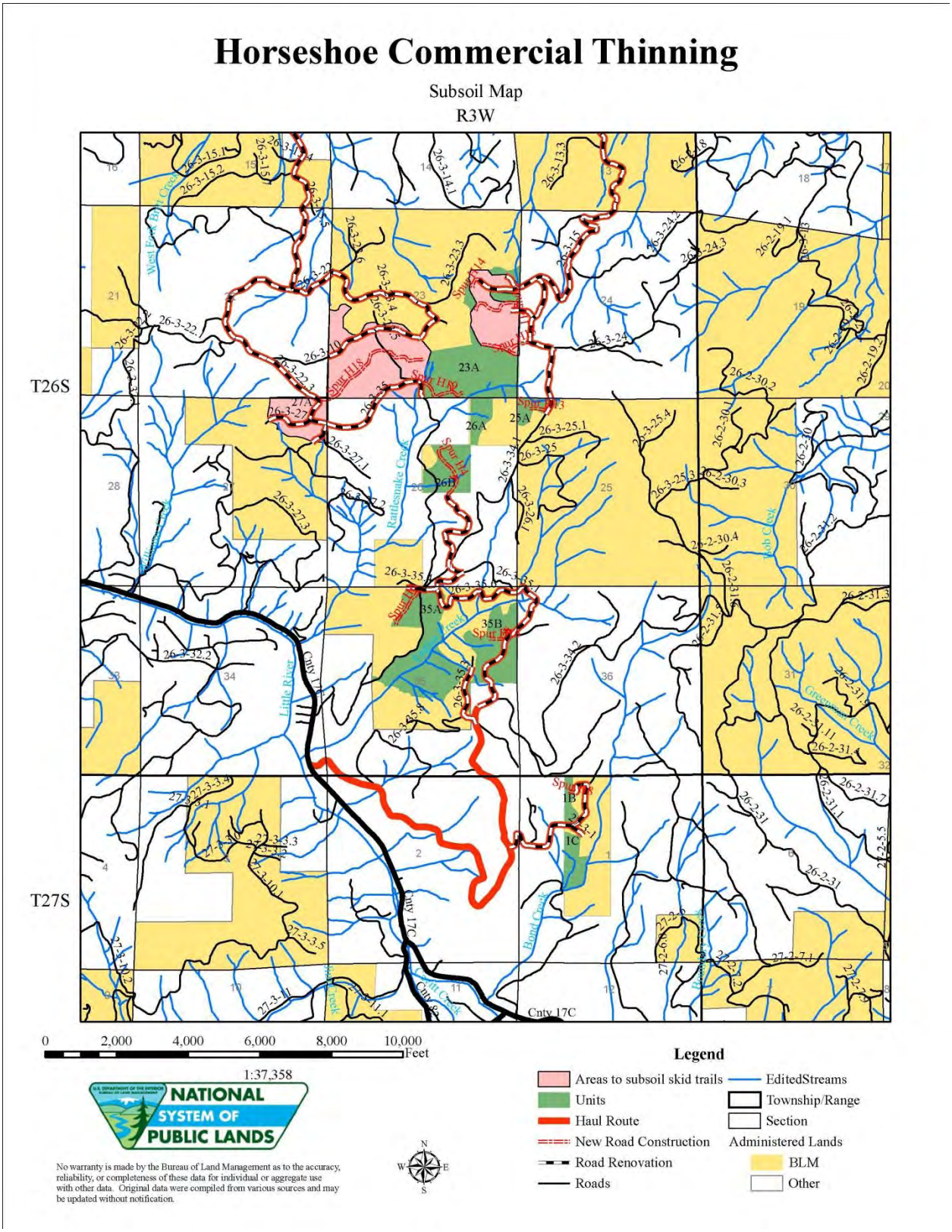

Figure 16. Peregrine Falcon Disturbance Buffers in Little River MMX.

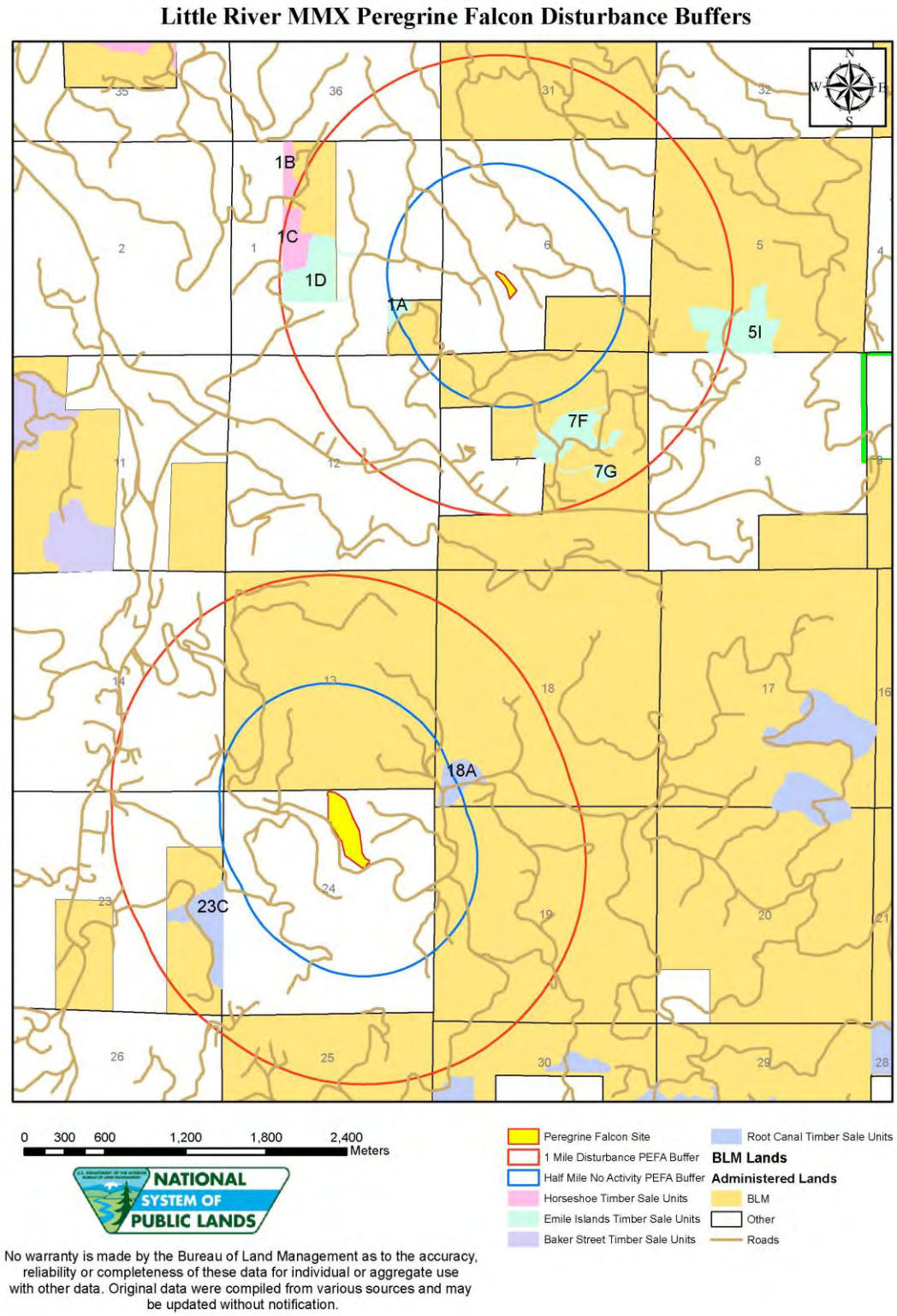
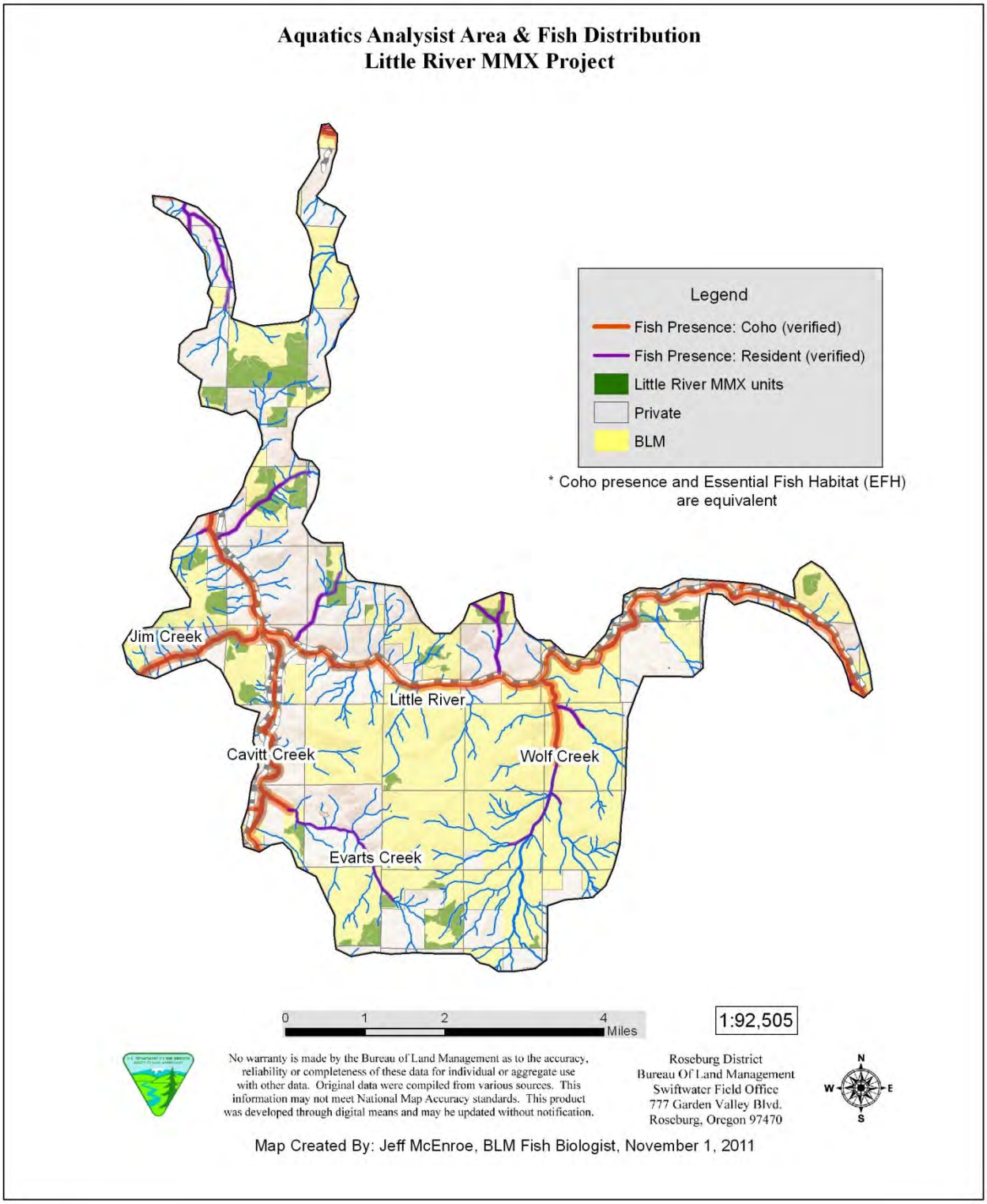
Figure 17. Aquatics Analysis Area & Fish Distribution.