Johnson Cleghorn
Thinning
Environmental Assessment

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U.S. Department of Interior
Bureau of Land Management
Roseburg District
Swiftwater Field Office
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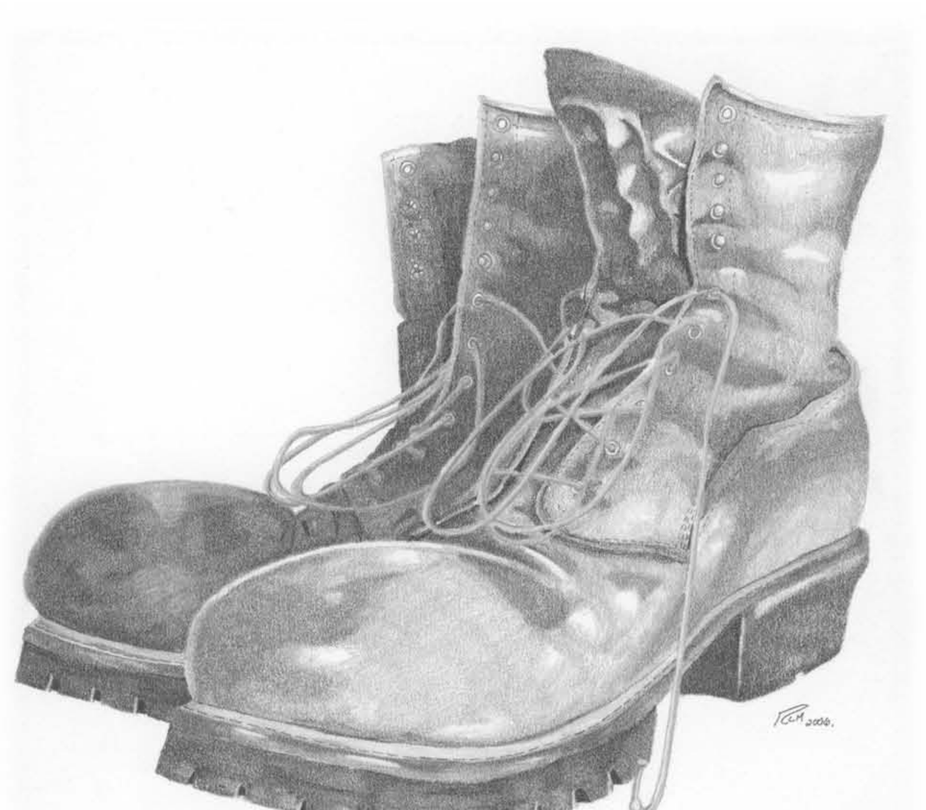

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Executive Summary

In February 2010, the Roseburg District Bureau of Land Management (BLM) initiated a collaborative forestry pilot to explore opportunities for forest management in moist forest types to:

- Accelerate the development of habitat components for the northern spotted owl *(Strix occidentalis caurina)* and marbled murrelet *(Brachyramphus marmoratus)*, and
- Provide reliable and substantial timber volume.

The Johnson Cleghorn project is a result of this collaborative effort. The Johnson Cleghorn project area occurs within T. 21S., R. 7 W., Sections 4, 5, 7, 8, 9, and 18 on General Forest Management Area (GFMA) and Riparian Reserve lands administered by the Swiftwater Field Office, Roseburg District Office and Late Successional Reserve (LSR) lands administered by the Umpqua Field Office, Coos Bay District BLM. This Environmental Assessment (EA) considers five alternative treatments (including No Action) on approximately 428 acres of forest stands, 42-51 years old, in the proposed Johnson Cleghorn timber sale and the effects of those treatments. See *Table i* (*Comparison of the Key Findings and Effects of the 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 February 24, 2010 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 extensive collaborative process were used in the development of the design features of the alternatives in Johnson Cleghorn. Nineteen public meetings and field trips were held between February 2010 and October 2010. Examples of key scoping comments and how they were incorporated into design features of one or more of the alternatives is highlighted in *Table ii* (*Incorporation of Collaborative Scoping Comments into the Alternatives*).

Table i: Comparison of the Key Findings and Effects of the Alternatives.

Key Finding/Effect		No Action Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Proposed Thinning	Project Size	0 acres	148 acres	352 acres	386 acres	395 acres
	Thinning Prescription	None	Skips (280 ac) Light Thin (148 ac)	Skips (76 ac) Light Thin (87 ac) Moderate Thin (118 ac) Heavy Thin (107 ac) Gap Creation (40 ac)	Skips (42 ac) Light Thin (102 ac) Moderate Thin (130 ac) Heavy Thin (111 ac) Gap Creation (43 ac)	Skips (33 ac) Light Thin (272 ac) Moderate Thin (123 ac)
	Ground-based Yarding	0 acres	52 acres	78 acres	80 acres	81 acres
	Uphill Cable Yarding	0 acres	84 acres	206 acres	278 acres	283 acres
	Downhill Cable Yarding	0 acres	12 acres	68 acres	28 acres	31 acres

Key Finding/Effect		No Action Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	Proposed Road Maintenance or Renovation	0 miles	3.79 miles	3.92 miles	3.82 miles	3.82 miles
	Proposed Road Improvement	0 miles	0 miles	0.58 miles	0.55 miles	0.55 miles
	Proposed Road Construction	0 miles	0 miles	0 miles	1.40 miles	1.40 miles
	Proposed Road Decommissioning	0 miles	1.04 miles	0.37 miles	1.18 miles	1.18 miles
Forest Vegetation	**Development of Structural Complexity**	Low potential for stand differentiation	Low potential for stand differentiation	High potential for stand differentiation	High potential for stand differentiation	Low potential for stand differentiation
Forest Vegetation	**Snags & Downed Wood Recruitment**	Would produce greatest amount of snags and downed wood over 100 year period	Relative to *No Action*, would produce: • 80% of snags • 90% downed wood	Relative to *No Action*, would produce: • 40% of snags • 50% downed wood	Relative to *No Action*, would produce: • 50% of snags • 40% downed wood	Relative to *No Action*, would produce: • 70% of snags • 50% downed wood
Forest Vegetation	**Snags & Downed Wood Recruitment**	No active recruitment (creation) of snags or downed wood	No active recruitment (creation) of snags or downed wood	No active recruitment (creation) of snags or downed wood	Active recruitment would contribute to the total amount of snag and downed wood for approx. 70 years post-harvest	No active recruitment (creation) of snags or downed wood
Forest Vegetation	**Post-Harvest Canopy Cover**	No harvest 90-100%	83-100%	44-84%	44-84%	69-79%
Northern Spotted Owls	**Thinning within Nest Patch** (300 meter radius)	0 acres	0 acres	0 acres	0 acres	0 acres
Northern Spotted Owls	**Thinning within Core Area** (0.5 mile radius)	0 acres	0 acres	71 acres	68 acres	65 acres
Northern Spotted Owls	**Thinning within Home Range** (1.2 mile radius)	0 acres	148 acres	352 acres	386 acres	395 acres
Northern Spotted Owls	**Suitable Habitat**	None would be modified	None would be modified	None would be modified	None would be modified	None would be modified
Northern Spotted Owls	**Dispersal Habitat**	None would be modified	148 acres	352 acres	386 acres	395 acres
Northern Spotted Owls	**Critical Habitat Modified**	0 acres	148 acres	352 acres	386 acres	395 acres
Northern Spotted Owls	**Seasonal Restrictions**	Known sites are located outside of threshold distances for disruption or disturbance; no seasonal restrictions necessary				
Marbled Murrelets	**Habitat**	0 acres	0 acres	0 acres	0 acres	0 acres
Marbled Murrelets	**Critical Habitat Modified**	0 acres	2.0 acres	3.2 acres	3.2 acres	3.2 acres
Marbled Murrelets	**Seasonal Restrictions**	None	April 1st through August 5th	April 1st through August 5th	April 1st through August 5th	April 1st through August 5th
Marbled Murrelets	**Daily Operating Restrictions**	None	August 6th through September 15th	August 6th through September 15th	August 6th through September 15th	August 6th through September 15th

Key Finding/Effect		No Action Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Soils	**Detrimental Compaction** (3-9% of the ground-based yarding area; 2-3% of the cable yarding area)	0 acres	5-14 acres	10-32 acres	11-35 acres	11-35 acres
	Roads, spurs, trails, or landings that would be built or used	0 acres	3.1 acres	4.7 acres	11.6 acres	11.7 acres
	Roads, spurs, trails, or landings that would be subsoiled	0 acres	0 acres	1.8 acres	4.2 acres	2.5 acres
Hydrology, Aquatic Habitat & Fisheries	**No-harvest Stream Buffer Widths**	None	• 200 feet perennial, non-fish bearing streams & intermittent streams • 400 feet perennial, fish-bearing streams	• 35 feet intermittent streams • 60 feet perennial & fish-bearing streams	• 35 feet intermittent streams • 60 feet perennial & fish-bearing streams	• 35 feet intermittent streams • 60 feet perennial & fish-bearing streams
	Canopy Openings in Analysis Area (Equivalent Clearcut Area; peak flow response detectable when > 29%)	8.3%	8.3%	8.5%	8.5%	8.3%
	Net Roaded Area within Johnson Cleghorn (peak flow response detectable when > 12%)	3.66%	3.66%	3.63%	3.80%	3.80%
	Stream Temperature	Stream temperature regimes would remain unchanged under all alternatives				
	Sediment Regime	Sources of chronic fine sediment from roads would be reduced under all action alternatives				
	Fish Populations	No impacts to fish populations would be anticipated				
Logging Economics	**Volume Harvested**	0 MBF	2,107 MBF	10,288 MBF	10,949 MBF	7,538 MBF
	Logging Cost	No harvest	$298.88 / MBF	$182.35 / MBF	$176.88 / MBF	$236.14 / MBF
Carbon Storage	**Change at Harvest Time**	No harvest	-630 tonnes	-2,275 tonnes	-2,479 tonnes	-1,958 tonnes
	Carbon Storage in +100 years	215,656 tonnes	214,937 tonnes	219,005 tonnes	219,291 tonnes	221,227 tonnes

Table ii: Incorporation of Collaborative Scoping Comments into the Alternatives. Topic Areas and key scoping comments were excerpted from the synthesis contained in the *Roseburg District Collaborative Forestry Scoping Report* (published 9/29/2010).

Key Scoping Comments: Topic Area	Key Scoping Comments: Comment	Where Incorporated into Alternative(s)
Habitat	Retain existing snags and coarse wood in clumps and in dispersed manner.	Common to *Alternatives 1, 2, 3,* and *4* (pg. 11): • Existing snags would be reserved from cutting. • Existing coarse woody debris in decay classes 3, 4, and 5 would be retained in GFMA lands, and all coarse woody debris would be retained in the LSR and Riparian Reserve.
	Retain special habitat features such as trees with cavities, forked tops, broken tops, leaning trees, etc.	
	All existing snags ≥ 6"-9" should be reserved and protected by green trees if necessary.	
	Mitigate for the loss of large woody material input by retaining extra snags and wood in riparian areas.	
	Need higher density areas for emphasis of future snag production.	Common to *Alternatives 1, 2, 3,* and *4* (pgs. 10, 18, 20, 23, 26) there would be "skips" which would be areas designated as reserved from harvest, i.e. "no treatment" areas.
	Retain closed canopy forest corridors between patches of owl habitat to facilitate movement by the owls and their prey.	
	Avoid creating large areas with canopy cover less than 40% canopy cover within ½ mile away of a spotted owl.	Under *Alternative 1* (pgs. 10, 53) there would be no thinning within northern spotted owl core areas (1/2 mile radius).
	"Feather" treatments (full or high retention) within 100 feet of suitable marbled murrelet habitat.	Under *Alternatives 1, 2, 3,* and *4* (pgs. 10, 18, 20, 23, 26) there would be no treatment or light thinning within 100 feet of suitable habitat .
	Create openings to spur new growth that provides nutritious feed for fauna and increases the "edge effect" areas favored by most varieties of creatures.	Under *Alternatives 2* and *3*(pgs. 10, 20, 23) there would be "gaps" which would be areas where all or nearly all overstory trees are harvested. Gaps are also commonly referred to as "patch cuts" and "group selections".
Timber Production / Economics	Stop thinning from below and remove overstory/co-dominant trees to begin creating openings and increase the volume of harvest and revenue.	Under *Alternatives 2* and *3* (pgs. 10, 20, 23) there would be a variety of thinning intensities (light, moderate, and heavy), "gap" creation, and group retention within "skips".
	Thin heavy enough to stimulate development of understory vegetation, but don't thin "too heavy".	
	Try group retention approaches rather than the thinning the BLM usually does.	
Landscape & Land Use Allocations	Do not allow log hauling during the wet season.	Common to *Alternatives 1, 2, 3,* and *4* (pg. 14), sediment reducing measures would be placed near stream crossings, if necessary, to prevent sediment from reaching streams. Hauling would be suspend ed during wet weather if road run-off would deliver sediment at higher concentrations than existing conditions to the receiving stream.
	Avoid all thinning within spotted owl core areas (½ mile radius).	Under *Alternative 1* (pgs. 10, 53) there would be no thinning within northern spotted owl core areas (1/2 mile radius).
Riparian Management	Outer half of Riparian Reserve should be managed for "connectivity" (fish bearing streams only).	Under *Alternative 1* (pg. 18) there would be no thinning within Riparian Reserves.

Key Scoping Comments		Where Incorporated into Alternative(s)
Topic Area	**Comment**	
	Inner half of Riparian Reserve (closest to stream) should be managed for aquatic restoration (on fish bearing streams only).	Under *Alternatives 2, 3,* and *4* (pgs. 21, 24, 26-27), thinning would not be applied within a "no-harvest" buffer that would extend 60 feet on either side of the stream channel for perennial or fish-bearing streams. Also, thinning would not be applied within a "no-harvest" buffer that would extend 35 feet on either side of the stream channel for intermittent streams.
	Buffer streams from the effects of heavy equipment and loss of bank trees and trees that provide shade.	
Diversity	Consider more patch cuts.	Under *Alternatives 2* and *3*(pgs. 10, 20, 23) there would be "gaps" which would be areas where all or nearly all overstory trees are harvested. Gaps are also commonly referred to as "patch cuts" and "group selections".
	Retain and protect under-represented conifer and non-conifer trees and shrubs. Stay within the natural range of species diversity.	Common to *Alternatives 1, 2, 3,* and *4* (pgs. 18, 20, 23, 26), minor conifer and hardwood species would be favored to maintain stand diversity. Older remnant trees (e.g. larger trees) may be present and would generally be targeted for retention.
	Retain some diversity of trees sizes.	
	Enhance hardwood species to increase within stand variability.	
	Generally retain all the largest trees, then implement "free thin from below" retaining some smaller trees in all age-size classes.	Under *Alternatives 2* and *3* (pgs. 10, 20, 23) there would be a variety of thinning intensities (light, moderate, and heavy), "gap" creation, and group retention within "skips".
	Variability should be implemented at numerous scales, i.e. within unit at individual tree, topographic etc. and within the broader landscape.	
	Plant sugar pine in young stands, especially on south slopes.	Under *Alternative 2, 3,* and *4* (pgs. 20, 23, 26), some areas will be planted with an average of approximately 130 conifer seedlings per acre of western hemlock, western red cedar, and Douglas-fir to promote development of a layered stand structure.
	Plant cedar in creek bottoms.	
Roads & Off-Highway Vehicles (OHV)	Use slash to block roads to limit OHV access.	Under *Alternatives 1, 2, 3,* and *4* (pgs. 19, 22, 25), road decommissioning would include mulching with logging slash and using the slash as a blocking device as identified on a road-by-road basis.
	Build new roads to a smaller standard (narrower width).	Common to *Alternatives 1, 2, 3,* and *4* (pg. 15), roads would generally be designed with a 14 foot wide road surface.
	New roads should not be designated as temporary if there is a roadbed remaining and a hydrologic impact still present. Do a more thorough job of decommissioning.	Under *Alternatives 1, 2, 3,* and *4* (pgs. 19, 22, 25), roads are not designated as "temporary" or "long-term". Instead, how the road would be decommissioned, or not, following thinning activities is described on a road-by-road basis.
	Plan long-term roads. Use for treatment, then plant with native species as cover until needed again in the future.	

Chapter 1. Purpose and Need for Action

A. Introduction

In February 2010, the Roseburg District Bureau of Land Management (BLM) initiated a collaborative forestry pilot to explore opportunities for forest management based on three desired outcomes:

- Accelerate the development of habitat components across the landscape to support the conservation and recovery of the northern spotted owl *(Strix occidentalis caurina)* and marbled murrelet *(Brachyramphus marmoratus)*.
- Reduce the hazard of uncharacteristically large or intense wildfire in the dry forest types as needed to support landscape and community fire resiliency/resistance.
- Provide reliable and substantial timber volume to support employment, income, and public services.

Specifically, the BLM asked the collaborative group to scope the design and implementation of at least one habitat development project in a moist forest type. The Johnson Cleghorn project is a result of this effort. The Johnson Cleghorn project area occurs within T. 21S., R. 7 W., Sections 4, 5, 7, 8, 9, and 18 on General Forest Management Area (GFMA) and Riparian Reserve lands administered by the Swiftwater Field Office, Roseburg District Office and Late Successional Reserve (LSR) lands administered by the Umpqua Field Office, Coos Bay District BLM. The BLM proposes thinning approximately 428 acres of forest stands, 42-51 years old, in the proposed Johnson Cleghorn timber sale.

B. Need & Purpose

The stands in the Johnson Cleghorn project area are densely stocked, simple structured stands that are currently at or beyond the appropriate relative density for thinning. The *need* for action, based on collaborative pilot goals, is to accelerate development of habitat components for the spotted owl and marbled murrelet, and provide substantial timber volume in support of the local economy.

The *purpose* of the action is to reduce stand stocking in a manner that enhances habitat for the spotted owl and marbled murrelet and improves vigor in the residual stand, while producing commercial timber in a cost-efficient manner.

C. Conformance

The Roseburg District initiated planning and design for this project on February 24, 2010 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 four Action Alternatives to explain the environmental effects of each in the decision-making process. The purpose and need 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:

Late Successional Reserve

- Plan and implement silvicultural treatments to be beneficial to the creation of late-seral habitat (1995 Coos Bay District ROD/RMP, pg. 19).
- Protect and enhance conditions of late-successional and old-growth forest ecosystems, which serve as the habitat for the northern spotted owl, marbled murrelet, and other late-successional and old growth species (1995 Coos Bay District ROD/RMP, pg. 18).

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.

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.

Johnson Cleghorn is consistent with the Roseburg District Resource Management Plan/Forest Land and 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 proposed Johnson Cleghorn project is consistent with Court Orders relating to the Survey and Manage mitigation measure of the Northwest Forest Plan, as incorporated into the Roseburg District's 1995 ROD/RMP.

The Johnson Cleghorn Thinning 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)."

Johnson Cleghorn Thinning meets Exemption A because it entails no regeneration harvest and entails thinning only in stands less than 80 years old (i.e. thinning only in stands 42-51 years old; q.v. pg. 1).

D. 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; and
- 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.

E. Scoping & Issues for Analysis

Scoping for the Johnson Cleghorn project ensued with the initiation of the collaborative forestry pilot on February 24, 2010. Fifteen public meetings and four public field trips have been held through the pilot; at least three of these have been dedicated solely to the Johnson Cleghorn project, including a full-day field trip on March 6, 2010 with extensive public participation. For more detail on this process, please go to the website at: http://www.blm.gov/or/districts/roseburg/plans/collab_forestry/.

Key topics raised in the scoping process were reflected in the range of alternatives analyzed in this EA. For how specific topics were incorporated into the alternatives, please refer to the *Executive Summary*.

The Johnson Cleghorn project was also listed in the past five Roseburg District Quarterly Planning Updates since Summer 2010 (published May 24, 2010). The BLM received numerous scoping comments via letter, email, and during public meetings. These comments were used by the interdisciplinary team and management in identifying resource issues for analysis.

The following issues, or questions, were identified for detailed analysis:

- To what extent will each alternative affect the Northern Spotted Owl including effects to: 1) during its critical breeding period, 2) suitable habitat within the home range, core area, and nest patch, 3) dispersal-only habitat within the home range, core area, and nest patch, and 4) Critical Habitat?

- To what extent will each alternative affect the Marbled Murrelet including effects to: 1) during its critical breeding period, 2) suitable habitat, and 3) Critical Habitat?
- What are the potential effects to soil productivity from each alternative from ground disturbing activities? These activities could include construction of roads and landings, and ground based and cable yarding of logs. More downhill cable yarding is proposed in some alternatives, in lieu of building roads and uphill cable yarding. Related to soil productivity is the effect of ground disturbing activities on soil slope stability.
- To what extent would each alternative influence fish habitat and fish populations? Specifically:
    - How would amounts of large and small wood available for delivery to BLM-managed streams vary by alternative?
    - How would sediment delivery to stream channels vary by alternative?
    - How would potential changes in stream temperature vary by alternative?
- To what extent would each alternative influence stand conditions in Riparian Reserves? Specifically:
    - How would vegetative species diversity vary by alternative?
    - How would vegetative structural diversity vary by alternative?
    - How would these changes fit within the range of natural variability seen in Riparian Reserves?
- Will any of the alternatives lead to increases in canopy openings beyond the threshold for peak stream flow enhancement?
- Will any of the alternatives increase the roaded area within the analysis area beyond the threshold for peak stream flow enhancement?
- How will each of the alternatives affect carbon storage through time, in the project area?
- Will there be a difference in the logging costs on a per thousand board feet (MBF) basis amongst the alternatives?
- To what extent will each alternative provide a commodity in terms of timber volume and revenue?

Chapter 2. Description of the Alternatives

This chapter describes the features of the No Action Alternative and the four action alternatives being analyzed in this EA. The BLM has developed a no action alternative, and four action alternatives that vary in the amount of proposed road activities and the intensity of silvicultural treatments. The alternatives analyzed in detail in this EA are summarized below in Table 1.

Johnson Cleghorn includes lands within the GFMA and Riparian Reserve land use allocations and would total approximately 428 acres (Table 1). There would be 254 acres within GFMA, 171 acres within Riparian Reserves, and 3 acres within LSR. In the Upper Smith River Fifth-field Watershed, the total Riparian Reserve width for perennial, fish-bearing streams would be 800 feet (two site potential tree heights on both sides of the stream). The total Riparian Reserve width would be 400 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 and Land Use Allocations of Johnson Cleghorn Units.

Unit	Township-Range-Section	Acres	Land Use Allocation
4A	T21S-R07W-Sec. 04	56	GFMA; Riparian Reserve
5A	T21S-R07W-Sec. 05	54	GFMA; Riparian Reserve
7A	T21S-R07W-Sec. 07	62	GFMA; Riparian Reserve
7B	T21S-R07W-Sec. 07	17	GFMA; Riparian Reserve
7C	T21S-R07W-Sec. 07, 18	32	GFMA; LSR; Riparian Reserve
7D	T21S-R07W-Sec. 07	34	GFMA; Riparian Reserve
8A	T21S-R07W-Sec. 08	45	GFMA; Riparian Reserve
8B	T21S-R07W-Sec. 08	37	GFMA; Riparian Reserve
8C	T21S-R07W-Sec. 08, 09	54	GFMA; Riparian Reserve
9A	T21S-R07W-Sec. 09	12	GFMA; Riparian Reserve
9B	T21S-R07W-Sec. 04, 09	25	GFMA; Riparian Reserve
Total		**428**	

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 Johnson Cleghorn analysis. These definitions are presented below, prior to the description of the No Action and Proposed Action Alternatives. 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**

Relative Density (RD) – a means of describing the level of competition among trees or the site occupancy in a stand relative to some theoretical maximum based on tree size and species composition. For this project "RD" refers to Curtis relative density (Curtis, 1982).

Light Thinning –tree density is reduced to a residual RD of 30–40. For the Johnson Cleghorn project this equates to an average residual tree density of about 100 trees per acre with a range from 75–155.

Moderate Thinning –tree density is reduced to a residual relative density of 15–25. For the Johnson Cleghorn project this equates to an average residual tree density of about 60 trees per acre with a range from 40–80.

Heavy Thinning –tree density is reduced to a residual relative density of 8–10. For the Johnson Cleghorn project this equates to an average residual tree density of about 25 trees per acre with a range from 15–30.

Gaps –areas where all or nearly all overstory trees are harvested. Gaps are also commonly referred to as "patch cuts" and "group selections" (Helms, 1998). Gaps for this project are between approximately one-quarter and two acres in size with an average size of about one acre. Gaps may contain one or more "character" trees (e.g. wolf-trees, larger than average trees, etc…), but there is no minimum number of trees required to be retained in gaps. Gaps are located more than one-site-potential tree height (i.e. 200 feet) away from suitable marbled murrelet habitat.

Skips –areas designated as reserved from harvest, i.e. "no treatment" areas. Depending on the alternative these areas may include entire stands or relatively small portions of stands. Skips include various designated stream and wildlife habitat buffers. Depending on the alternative and harvest operability, yarding corridors may be established through designated skips.

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 skips and gaps in the prescription.

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

Two-storied or layered stands – A forest stand would be considered a two-storied or layered stand when at least 30 percent of that stand is comprised of layered areas (adapted from Oregon Department of Forestry, 2010). An area would be considered "layered" when at least one of the following are met:

- Sixty percent of the vertical space from the top of the main tree canopy to the forest floor is filled with live tree crowns from *both* overstory and understory trees (i.e. a two-storied condition). Understory trees must be at least 30 feet tall in order to satisfy this criterion.
- Thirty percent of the stand is comprised of gaps containing trees at least 30 feet tall.
- A combination of conditions 1 *and* 2.

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
- adding additional rock surfacing where needed (i.e. spot rock) 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 additional 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).

Table 2. **Summary of the Features of the Alternatives for Johnson Cleghorn.**

Alternative	Treatment Prescription	LSR Treatments		GFMA Treatments		Riparian Reserve Treatments		Proposed Road Work		Snags & Woody Debris Treatments	Wildlife Treatments
		Acres	%	Acres	%	Acres	%		Miles		
No Action	None	3	100	254	100	171	100	Maintenance/Renovation	0	None	None
1	Skips Light Thin Moderate Thin Heavy Thin Gaps	1 2 0 0 0	33 67 0 0 0	108 146 0 0 0	43 57 0 0 0	171 0 0 0 0	100 0 0 0 0	Maintenance/Renovation	3.79	Passive Recruitment	**Marbled Murrelet:** no treatment or light thin within 100ft suitable habitat. **Northern Spotted Owl:** no treatment within known core areas (1/2 mile).
2	Skips Light Thin Moderate Thin Heavy Thin Gaps	0 1 2 0 0	0 33 67 0 0	24 48 72 77 33	9 19 29 30 13	52 38 44 30 7	30 22 26 18 4	Maintenance/Renovation Improvement	3.92 0.58	Passive Recruitment	**Marbled Murrelet:** no treatment or light thin within 100ft suitable habitat.
3	Skips Light Thin Moderate Thin Heavy Thin Gaps	0 1 2 0 0	0 33 67 0 0	8 56 75 80 35	3 22 30 31 14	34 45 53 31 8	20 26 31 18 5	Maintenance/Renovation Improvement Construction	3.82 0.55 1.40	Active Recruitment: 1.2 trees/acre for snags 1.0 tree/acre for down woody debris	**Marbled Murrelet:** no treatment or light thin within 100ft suitable habitat.
4	Skips Light Thin Moderate Thin Heavy Thin Gaps	0 3 0 0 0	0 100 0 0 0	0 254 0 0 0	0 100 0 0 0	33 15 123 0 0	19 9 72 0 0	Maintenance/Renovation Improvement Construction	3.82 0.55 1.40	Passive Recruitment	**Marbled Murrelet:** no treatment or light thin within 100ft suitable habitat.

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 428 acres of the project area at this time.

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. Design Features Common to Proposed Action Alternatives 1, 2, 3, and 4

This section identifies the project design features of Johnson Cleghorn that would apply under *Alternatives 1, 2, 3,* and *4*. There are some differences amongst the proposed action alternatives that are identified below and then described in detail in subsequent sections that are unique to each alternative. Generally, these differences are based on the relative amount and intensity of the proposed treatment prescription as well as the amount and type of road activities.

1. Timber Harvest

a) Treatment Prescription

The proposed treatment prescription varies amongst *Alternatives 1, 2, 3,* and *4*. The prescription for each alternative is presented in the description of features unique to that alternative in subsequent sections (refer to pgs. 15, 17, 20, and 23 respectively). However, passive recruitment of snags and coarse woody debris is common to *Action Alternatives 1, 2, 3,* and *4;* as described below. *Alternative 3* also includes active recruitment of snags and coarse woody debris as described later (q.v., pg. 23) for that alternative.

<u>*Passive Recruitment of Snags & Coarse Woody Debris*</u>

In all land use allocations, conifer and hardwood snags would be reserved from cutting unless they are a safety concern. Snags felled for safety reasons in the LSR or 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 GFMA lands, and all coarse woody debris would be retained in the LSR and 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

The proposed treatment prescription within the Riparian Reserve varies amongst *Alternatives 1, 2, 3,* and *4*. The prescription within the Riparian Reserve for each alternative is presented in the description of features unique to that alternative in subsequent sections (refer to pgs. 15-16, 18, 21, and 23-24 respectively).

c) Timber Cruising

Timber cruising would include methods to select sample trees or by individual tree measurements using a 100 percent cruise. 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.

A small amount of additional timber could 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 the thinning activities are completed.

2. Timber Yarding

The amount and extent of each timber yarding method varies amongst *Alternatives 1, 2, 3,* and *4* (Figures 2, 4, 6, and 8 respectively); but, the alternatives share common design features for timber yarding.

Proposed units would require a mixture of skyline cable yarding and ground-based yarding as presented in the *Soils* analysis (q.v. Table 36, pg. 69). Up to ten acres of additional, incidental ground-based logging within Johnson Cleghorn may 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, where possible, and minimal notching (less than half the tree diameter) where necessary. 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.

a) 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 100 feet of lateral yarding capability would be required of cable equipment, with average spacing of 200 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 in corridors longer than 700 feet would *not* be allowed during the bark slip period (i.e. April 15^{th} to July 15^{th}) or during the wet season (i.e. typically October 15^{th} to May 15^{th} depending on weather conditions); conversely, downhill cable yarding longer than 700 feet would typically be allowed from July 15^{th} to October 15^{th}. Waivers could be granted to operate downhill yarding on corridors longer than 700 feet from October 15th to April 15th, if the yarding operations would not result in excessive soil disturbance and erosion. Granting waivers would depend on the specific yarding equipment, operator skill, yarding profile, topography, and other factors involved. If the residual tree damage and the amount of soil disturbance are acceptable, then the downhill yarding for the particular unit or area may continue.

Downhill cable-yarding in corridors shorter than 700 feet would *not* be allowed during the bark slip period (i.e. April 15th to July 15th); conversely, downhill cable yarding shorter than 700 feet would be allowed from July 15th to April 15th.

The contract sale administrator would have the authority to stop yarding activities during storm events if the soils become saturated and there is a risk of adverse soil impacts from downhill yarding. Whole tree yarding will not be allowed, due to the risk for high residual tree damage.

b) 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); conversely, ground-based yarding would be allowed from July 15th to October 15th. In addition, ground-based yarding may be allowed during periods of low soil moisture at the discretion of the Authorized Officer (1995 ROD/RMP, pg. 131).

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 contract administrator 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 and forwarder 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).

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.

(2) <u>Feller Bunchers</u>

Feller bunchers would not be allowed as harvesters due to the following reasons:

- The ground based units contain areas of low rock content, and high-clay content soils that have high susceptibility for soil compaction.
- The feller buncher would carry a heavier load while travelling off designated trails. The feller buncher would not process the cut trees, but would cut and carry the whole tree, while cutting and gathering other trees, until the grapples are full. Consequently, the risk for compaction would be higher than with a harvester, since the equipment would not travel over a slash mat (USDI/BLM, 2000, pgs. 94-96; USDI/BLM, 2007, pgs. 97-98).
- The feller buncher would travel off of the designated main skid trails to cut every tree; consequently, the spacing of the travelled areas off of the main skid trails would be closer together and would be susceptible to compaction (USDI, FY2007, pg.97-98; FY2000, pg. 94-96).

c) Subsoiling

Native surface spur roads, main skid trails, and adjacent landings in areas proposed for moderate to heavy thinning or gaps would be subsoiled; especially in areas with high amounts of clay soils (Tables 6 and 8). 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 Johnson Cleghorn would be mapped for later evaluation of subsoiling needs.

In addition, Unit 7D has a high percentage of compacted skid trails from the previous harvest entry and these would also be subsoiled if the unit undergoes moderate to heavy thinning or gap treatments.

3. Timber Hauling

Prior to any wet season haul on surfaced roads, 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.

4. Fuels Treatment

Prescribed burning (burning under the direction of a written site specific prescription or "Burn Plan") of machine-piled slash would occur at landings. 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 (Oregon Department of Environmental Quality and Oregon Department of Forestry, 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).

5. **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 to minimize soil disturbance (1995 ROD/RMP, pg. 132). Roads would generally be designed with a 14 foot wide road surface and would have an average road clearing width of 40 feet. However, road shoulders, landings, vehicle turnouts, and curve widening could result in road surfaces as wide as 60 feet.

Road construction, improvement, maintenance/renovation, 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).

The extent of road construction, improvement, maintenance/renovation, and decommissioning vary amongst *Alternatives 1, 2, 3,* and *4*. The road activities proposed for each alternative are presented in the description of features unique to that alternative in subsequent sections (refer to pgs. 16, 18-19, 21-22, and 24 respectively).

a) Over-wintering

Over-wintering would be done by maintaining/renovating, 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.

6. **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.

7. **Noxious Weeds**

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

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).

8. **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 measures would be implemented before operations would resume.

a) Northern Spotted Owl

Suitable northern spotted owl habitat is present within 65 yards of the eleven Johnson Cleghorn units (Appendix E, Figures 9, 10, 11, and 12). The proposed project area is located within the Tyee Demography Study Area and stands of suitable habitat within the proposed project area have had annual northern spotted owl surveys since the early 1990s. However, based on current (2010) protocol survey data, there are no active northern spotted owl activity centers within the 65 yard disruption threshold for harvest activities. Therefore, none of the proposed units in Johnson Cleghorn would require seasonal restrictions until March 1, 2013, unless future surveys locate spotted owls within 65 yards of a proposed unit(s). Since this project is located within the Tyee Demography Study Area, annual surveys are expected to continue as funding allows.

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.

b) Marbled Murrelet

Suitable marbled murrelet habitat is present within 100 yards of the Johnson Cleghorn units (Appendix E, Figures 13, 14, 15, and 16); however pre-project clearance surveys have not been completed. Because there is unsurveyed suitable habitat adjacent to all proposed units, to avoid disruption to nesting marbled murrelets, disturbance effects would be mitigated during the nesting season. Thus, seasonal restrictions from April 1st through August 5th and daily operating restrictions from August 6th through September 15th would be applied to all harvest operations and prescribed burning that occurs within 100 yards and 440 yards of suitable habitat, respectively.

There is one potential suitable nest tree in Unit 7A that is located within the proposed unit boundary and would be protected from damage under the Residual Habitat Guidelines (USDI USFWS & BLM, 2004). This potential nest tree and those trees immediately adjacent with interlocking canopies would be retained to maintain micro-site conditions around the suitable nest tree.

9. 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 intended to be used 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 UL-Listed containers and located so 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.

D. Design Features Unique to Proposed Action Alternative 1

1. Timber Harvest

a) Treatment Prescription

Thirty-five percent of the project area (148 acres) would be treated with a light thinning harvest and 65 percent (280 acres) would not be treated (i.e. 65 percent retained as skips). A breakdown of treatments by land use allocation is shown below in Table 3 (below) as well as in Table 2 (pg. 7) and Figure 1 (Appendix E).

In the thinned areas, 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. Minor conifer and hardwood species would be favored to maintain stand diversity. Older remnant trees may be present, but are not the numerically predominant stand components and would generally be targeted for retention.

Table 3. Treatment Prescription for Johnson Cleghorn Alternative 1.

Unit	Treatment Intensity (acres)												
	Riparian Reserve						LSR* & GFMA						Unit Total
	Gap	Heavy	Moderate	Light	Skip	Sub-Total	Gap	Heavy	Moderate	Light	Skip	Sub-Total	
4A	0	0	0	0	20.0	20.0	0	0	0	35.0	1.0	36.0	56.0
5A	0	0	0	0	18.0	18.0	0	0	0	0	36.0	36.0	54.0
7A	0	0	0	0	14.0	14.0	0	0	0	41.0	7.0	48.0	62.0
7B	0	0	0	0	16.0	16.0	0	0	0	0	1.0	1.0	17.0
7C*	0	0	0	0	0.2	0.2	0	0	0	20.0	12.0	32.0	32.0
7D	0	0	0	0	11.0	11.0	0	0	0	12.0	11.0	23.0	34.0
8A	0	0	0	0	24.0	24.0	0	0	0	6.0	15.0	21.0	45.0
8B	0	0	0	0	16.0	16.0	0	0	0	21.0	0	21.0	37.0
8C	0	0	0	0	31.0	31.0	0	0	0	0	23.0	23.0	54.0
9A	0	0	0	0	12.0	12.0	0	0	0	0	0.2	0.2	12.0
9B	0	0	0	0	9.0	9.0	0	0	0	13.0	3.0	16.0	25.0
Total	**0**	**0**	**0**	**0**	**171.0**	**171.0**	**0**	**0**	**0**	**148.0**	**109.0**	**257.0**	**428.0**

* Approximately 3.4 acres of Unit 7C is within LSR; 2.4 acres would be light thinning and 1.0 acre would be a skip.

b) Stream Buffers

There would be no harvest within Riparian Reserves under *Alternative 1*.

<u>*Perennial, Fish-bearing Streams*</u>

The treatment prescription would not be applied within the Riparian Reserve on either side (400 feet) of the edge of the stream channel, as measured from the ordinary high water line for perennial, fish-bearing streams.

Perennial, Non-fish Bearing Streams & Intermittent Streams
The treatment prescription would not be applied within the Riparian Reserve on either side (200 feet) of the edge of the stream channel, as measured from the ordinary high water line for perennial, non-fish bearing streams and intermittent streams.

2. Road Activities

Under *Alternative 1*, there would be approximately 3.79 miles of road maintenance/renovation and no road improvement or road construction (Table 4, Figure 1). As indicated in Table 4, the surfacing on three of the existing, rocked roads is currently inadequate for winter haul and additional rock may be added to bring the road up to winter haul standards (Table 4).

Following harvest operations, there would be 1.04 miles of road decommissioning (Table 4). Road decommissioning could include one or more of the following methods: removing drainage structures or culverts, subsoiling, adding waterbars where needed, mulching with logging slash where available (or with straw if logging slash is not available), blocking with trench barrier(s), and/or using the logging slash mulch as the blocking device. Which decommissioning methods the BLM proposes for specific roads under *Alternative 1* is presented below in Table 4.

Table 4. Road Activities under Johnson Cleghorn Alternative 1.

Road No.	**Construction** (miles)	**Improvement** (miles)	**Maintenance/ Renovation** (miles)		**Surfacing**		**Season of Haul**	**Decommissioning**	
			Within Riparian Reserve	Total Length	Existing	Proposed		**Length** (miles)	**Method**
21-7-7.0	0	0	0.32	0.94	Rock	Rock*	Dry*	0	None
21-7-7.1 (portion)	0	0	0	0.47	Rock	Rock	Wet or Dry	0	None
21-7-7.1 (portion)	0	0	0.07	0.35	Rock	Rock*	Dry*	0	None
21-7-7.2	0	0	0	0.11	Native	Native	Dry	0.11	Waterbar, mulch with slash, block with trench barrier.
21-7-8.1	0	0	0.13	0.38	Native	Native	Dry	0.38	Remove culvert, waterbar, mulch with slash, use slash as block.
21-7-9.0	0	0	0.20	0.55	Native	Native	Dry	0.55	Remove culvert/cross drains, waterbar, mulch with slash, block with trench barrier.
21-7-9.2	0	0	0.07	0.14	Rock	Rock	Wet or Dry	0	None
21-7-17.0	0	0	0.40	0.85	Rock	Rock*	Dry*	0	None
Total	**0**	**0**	**1.19**	**3.79**	-	-	-	**1.04**	-

* Existing rock surfacing is inadequate for winter haul; additional rock may be added to bring road up to winter haul standards.

E. Design Features Unique to Proposed Action Alternative 2

1. Timber Harvest

a) Treatment Prescription

Twenty percent of the project area (87 acres) would be treated with a light thinning harvest, 27 percent (118 acres) with a moderate thinning harvest, 25 percent (107 acres) with a heavy thinning harvest, 10 percent (40 acres) with gap creation, and 18 percent (76 acres) would be retained as skips. A breakdown of treatments by land use allocation is shown below in Table 5 (below) as well as in Table 2 (pg. 7) and Figure 3 (*Appendix E*).

In the thinned areas, merchantable trees in the suppressed and intermediate crown classes would be the primary targets for removal. As thinning intensity increased more of the co-dominant and dominant crown classes would be removed to meet the residual density objective. Minor conifer and hardwood species would be favored for retention to maintain stand diversity. Older remnant trees may be present, but are not the numerically predominant stand components and would generally be targeted for retention.

Within one year of harvest, gaps, moderate and heavy thinned areas (i.e. a total of 265 acres) would be planted with an average of approximately 130 conifer seedlings per acre in mixture of 60 percent western hemlock, 20 percent western red cedar, and 20 percent Douglas-fir to promote development of a layered stand structure.

Table 5. Treatment Prescription for Johnson Cleghorn Alternative 2.

Unit	Treatment Intensity (acres)												
	Riparian Reserve						LSR* & GFMA						Unit Total
	Gap	Heavy	Moderate	Light	Skip	Sub-Total	Gap	Heavy	Moderate	Light	Skip	Sub-Total	
4A	0.9	2.8	10.1	3.2	2.9	20.0	5.4	11.6	11.7	6.7	0.2	36.0	56.0
5A	1.0	4.4	4.1	4.3	3.9	18.0	4.7	11.2	11.4	8.3	0	36.0	54.0
7A	0.8	2.8	4.6	3.5	2.4	14.0	7.2	14.0	14.3	9.3	3.4	48.0	62.0
7B	0	0	0	10.8	5.1	16.0	0	0	0	1.0	0	1.0	17.0
7C*	0	0	0	0	0.2	0.2	3.6	7.0	9.6	7.0	5.2	32.0	32.0
7D	0	0.9	0	0.6	9.8	11.0	2.0	8.9	0	1.6	10.7	23.0	34.0
8A	1.6	5.6	7.9	0	8.6	24.0	2.5	6.1	8.0	3.3	1.3	21.0	45.0
8B	0.8	2.9	5.7	4.2	2.4	16.0	2.8	6.2	5.2	5.6	0.9	21.0	37.0
8C	1.0	4.4	7.6	6.8	11.2	31.0	3.2	6.7	8.8	3.9	0.2	23.0	54.0
9A	0.6	5.5	0	2.5	3.4	12.0	0	0.1	0	0.1	0	0.2	12.0
9B	0.4	1.0	3.5	1.9	2.0	9.0	2.0	4.9	4.5	2.6	1.6	16.0	25.0
Total	**7.0**	**30.0**	**44.0**	**38.0**	**52.0**	**171.0**	**33.0**	**77.0**	**74.0**	**49.0**	**24.0**	**257.0**	**428.0**

* Approximately 3.4 acres of Unit 7C is within LSR; there would be 1.0 acre of light thinning and 2.4 acres of moderate thinning.

b) Stream Buffers

Perennial Streams & Fish-bearing Streams

Under *Alternative 2*, the thinning prescription would not be applied within a "no-harvest" buffer that would extend 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.

Intermittent Streams

Under *Alternative 2*, the thinning prescription would not be applied within a "no-harvest" buffer that would extend 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.

2. Road Activities

Under *Alternative 2*, there would be approximately 0.58 miles of road improvement, 3.92 miles of road maintenance/renovation, and no road construction (Table 6, Figure 3). As indicated in Table 6, the surfacing on four of the existing, rocked roads is currently inadequate for winter haul and additional rock may be added to bring the road up to winter haul standards.

Following harvest operations, there would be 0.37 miles of road decommissioning (Table 6). Road decommissioning could include one or more of the following methods: removing drainage structures or culverts, subsoiling, adding waterbars where needed, mulching with logging slash where available (or with straw if logging slash is not available), blocking with trench barrier(s), and/or using the logging slash mulch as the blocking device. Which decommissioning methods the BLM proposes for specific roads under *Alternative 2* is presented below in Table 6.

Table 6. Road Activities under Johnson Cleghorn Alternative 2.

Road No.	Construction (miles)	Improvement (miles)		Maintenance/ Renovation (miles)		Surfacing		Season of Haul	Decommissioning	
		Within Riparian Reserve	Total Length	Within Riparian Reserve	Total Length	Existing	Proposed		Length (miles)	Method
21-7-5.5	0	0	0	0	0.51	Rock	Rock*	Dry*	0	None
21-7-7.0	0	0	0	0.32	0.94	Rock	Rock*	Dry*	0	None
21-7-7.1 (portion)	0	0	0	0	0.47	Rock	Rock	Wet or Dry	0	None
21-7-7.1 (portion)	0	0	0	0.07	0.35	Rock	Rock*	Dry*	0	None
21-7-7.2	0	0	0	0	0.11	Native	Native	Dry	0.11	Waterbar, mulch with slash, block with trench barrier.
21-7-8.1	0	0	0	0.13	0.38	Native	Native	Dry	0.09	Remove culvert.
21-7-9.0	0	0.20	0.55	0	0	Native	Rock	Wet or Dry	0	None
21-7-9.2	0	0	0	0.07	0.14	Rock	Rock	Wet or Dry	0	None
21-7-17.0	0	0	0	0.40	0.85	Rock	Rock*	Dry*	0	None
Spur 5A-1	0	0	0	0.07	0.17	Native	Native	Dry	0.17	Remove culvert, subsoil, mulch with slash, use slash as block.
Spur 8C-1	0	0.03	0.03	0	0	Native	Rock	Wet or Dry	0	None
Total	**0**	**0.23**	**0.58**	**1.06**	**3.92**	-	-	-	**0.37**	-

* Existing rock surfacing is inadequate for winter haul; additional rock may be added to bring road up to winter haul standards.

F. Design Features Unique to Proposed Action Alternative 3

1. Timber Harvest

a) Treatment Prescription

Twenty-four percent of the project area (102 acres) would be treated with a light thinning harvest, 30 percent (130 acres) with a moderate thinning harvest, 26 percent (111 acres) with a heavy thinning harvest, 10 percent (43 acres) gap creation, and 10 percent (42 acres) would be retained as skips. A breakdown of treatments by land use allocation shown below in Table 7 (below) as well as in Table 2 (pg. 7) and Figure 5 (Appendix E).

In the thinned areas, merchantable trees in the suppressed and intermediate crown classes would be the primary targets for removal. As thinning intensity increased more of the co-dominant and dominant crown classes would be removed to meet the residual density objective. Minor conifer and hardwood species would be favored for retention to maintain stand diversity. Older remnant trees may be present, but are not the numerically predominant stand components and would generally be targeted for retention.

Within one year of harvest, gaps, moderate and heavy thinned areas (i.e. a total of 284 acres) would be planted with an average of approximately 130 conifer seedlings per acre in mixture of 60 percent western hemlock, 20 percent western red cedar, and 20 percent Douglas-fir to promote development of a layered stand structure.

In addition to passive recruitment for snags and coarse woody debris, *Alternative 3* would also include active recruitment. Active recruitment for snags and coarse woody debris would entail the felling of one tree per acre to create down woody debris and the killing (e.g. girdling) of 1.2 trees per acre to create snags within one year following harvest.

Table 7. Treatment Prescription for Johnson Cleghorn Alternative 3.

Unit	Treatment Intensity (acres)												
	Riparian Reserve						LSR* & GFMA						Unit Total
	Gap	Heavy	Moderate	Light	Skip	Sub-Total	Gap	Heavy	Moderate	Light	Skip	Sub-Total	
4A	0.9	2.8	10.1	3.2	2.9	20.0	5.4	11.6	11.7	6.7	0.2	36.0	56.0
5A	1.0	4.4	4.1	4.3	3.9	18.0	4.7	11.2	11.4	8.3	0	36.0	54.0
7A	0.8	2.8	4.6	3.5	2.4	14.0	7.2	14.0	14.3	10.4	2.4	48.0	62.0
7B	0	0	0	10.8	5.1	16.0	0	0	0	1.0	0	1.0	17.0
7C*	0	0	0	0	0.2	0.2	3.9	9.8	9.5	7.6	1.6	32.0	32.0
7D	0.4	1.6	3.4	3.4	2.5	11.0	3.4	8.9	5.3	5.5	0	23.0	34.0
8A	1.6	5.6	10.7	2.5	3.4	24.0	2.5	6.1	8.0	3.3	1.3	21.0	45.0
8B	0.8	2.9	5.7	4.2	2.4	16.0	2.8	6.2	5.2	5.6	0.9	21.0	37.0
8C	1.0	4.4	10.1	8.5	6.9	31.0	3.2	6.7	8.1	4.3	0.7	23.0	54.0
9A	0.6	5.5	0	2.5	3.4	12.0	0	0.1	0	0.1	0	0.2	12.0
9B	0.4	1.0	4.3	1.9	1.1	9.0	2.0	5.4	3.8	3.8	0.7	16.0	25.0
Total	**8.0**	**31.0**	**53.0**	**45.0**	**34.0**	**171.0**	**35.0**	**80.0**	**77.0**	**57.0**	**8.0**	**257.0**	**428.0**

* Approximately 3.4 acres of Unit 7C is within LSR; there would be 1.0 acre of light thinning and 2.4 acres of moderate thinning.

b) Stream Buffers

Perennial Streams & Fish-bearing Streams

Under *Alternative 3*, the thinning prescription would not be applied within a "no-harvest" buffer that would extend 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.

Intermittent Streams

Under *Alternative 3*, the thinning prescription would not be applied within a "no-harvest" buffer that would extend 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.

2. Timber Yarding

There are two potential stream crossings with ground-based yarding equipment under *Alternative 3*. The following, additional project design features would apply to stream-crossings with ground-based equipment:

- Minimize the number of temporary stream crossings on a particular stream.
- Avoid disturbance of unstable banks, headwalls and areas with a high water table.
- Use existing skid roads wherever possible and limit new skid trails to slopes less than 35 percent.
- Restrict tractor operations to these trails and limit operations to periods of low soil moisture, when soils have the most resistance to compaction (dry season).
- Locate stream crossing sites where channels are well defined, unobstructed and straight.

3. Road Activities

Under *Alternative 3*, there would be approximately 1.40 miles of road construction, 0.55 miles of road improvement, and 3.82 miles of road maintenance/renovation (Table 8, Figure 5). Approximately 0.42 miles of the roads to be constructed would be rocked roads that would remain open following harvest (Table 8). As indicated in Table 8, the surfacing on five of the existing, rocked roads is currently inadequate for winter haul and additional rock may be added to bring the road up to winter haul standards. In addition, Spurs 7A-1 and 8B-1 are optional operator spurs; they may be built at the purchaser's request and at their expense.

Following harvest operations, there would be 1.18 miles of road decommissioning (Table 8). Road decommissioning could include one or more of the following methods: removing drainage structures or culverts, subsoiling, adding waterbars where needed, mulching with logging slash where available (or with straw if logging slash is not available), blocking with trench barrier(s), and/or using the logging slash mulch as the blocking device. Which decommissioning methods the BLM proposes for specific roads under *Alternative 3* is presented below in Table 8.

Table 8. Road Activities under Johnson Cleghorn Alternatives 3 & 4*.

Road No.	Construction (miles)		Improvement (miles)		Maintenance/ Renovation (miles)		Surfacing		Season of Haul	Decommissioning	
	Within Riparian Reserve	Total Length	Within Riparian Reserve	Total Length	Within Riparian Reserve	Total Length	Existing	Proposed		Length (miles)	Method
21-7-5.5	0	0	0	0	0	0.51	Rock	Rock**	Dry**	0	None
21-7-7.0	0	0	0	0	0.32	0.94	Rock	Rock**	Dry**	0	None
21-7-7.1 (portion)	0	0	0	0	0	0.47	Rock	Rock	Wet or Dry	0	None
21-7-7.1 (portion)	0	0	0	0	0.07	0.35	Rock	Rock**	Dry**	0	None
21-7-7.2	0	0	0	0	0	0.11	Native	Native	Dry	0.11	Waterbar, mulch with slash, block with trench barrier.
21-7-8.1	0	0	0	0	0.13	0.38	Native	Native	Dry	0.09	Remove culvert.
21-7-8.2	0	0	0	0	0	0.07	Rock	Rock**	Dry**	0	None
21-7-9.0	0	0	0.20	0.55	0	0	Native	Rock	Wet or Dry	0	None
21-7-9.2	0	0	0	0	0.07	0.14	Rock	Rock	Wet or Dry	0	None
21-7-17.0	0	0	0	0	0.40	0.85	Rock	Rock**	Dry**	0	None
Spur 5A-2	0	0.12	0	0	0	0	Non-existing	Native	Dry	0.12	Waterbar, mulch with slash, use slash as block.
Spur 7A-1*	0	0.12	0	0	0	0	Non-existing	Native	Dry	0.12	Subsoil*, waterbar, mulch with slash, use slash as block.
Spur 7D-1	0.04	0.23	0	0	0	0	Non-existing	Rock	Wet or Dry	0	None
Spur 7D-2	0	0.02	0	0	0	0	Non-existing	Rock	Wet or Dry	0	None
Spur 8A-1	0.10	0.41	0	0	0	0	Non-existing	Native	Dry	0.41	Subsoil first 500 feet, waterbar, mulch with slash, use slash as block.
Spur 8A-2	0.01	0.03	0	0	0	0	Non-existing	Native	Dry	0.03	Waterbar, mulch with slash, use slash as block.
Spur 8B-1*	0	0.06	0	0	0	0	Non-existing	Native	Dry	0.06	Subsoil*, waterbar, mulch with slash, use slash as block.
Spur 8C-2	0.02	0.02	0	0	0	0	Non-existing	Rock	Wet or Dry	0	None
Spur 8C-3	0.03	0.24	0	0	0	0	Non-existing	Native	Dry	0.24	Remove culvert, subsoil, waterbar, mulch with slash, use slash as block.
Spur 9B-1	0	0.10	0	0	0	0	Non-existing	Rock	Wet or Dry	0	None
Spur 9B-2	0	0.02	0	0	0	0	Non-existing	Rock	Wet or Dry	0	None
Spur 9B-3	0	0.02	0	0	0	0	Non-existing	Rock	Wet or Dry	0	None
Total	**0.20**	**1.40**	**0.20**	**0.55**	**0.99**	**3.82**	-	-	-	**1.18**	-

* The only difference between *Alternative 3* and *Alternative 4* is that Spurs 7A-1 and 8B-1 would not include subsoiling as part of their decommissioning methods under *Alternative 4*. In addition, Spurs 7A-1 and 8B-1 are optional operator spurs; they may be built at the purchaser's request and at their expense.

** Existing rock surfacing is inadequate for winter haul; additional rock may be added to bring road up to winter haul standards.

G. Design Features Unique to Proposed Action Alternative 4

1. Timber Harvest

a) Treatment Prescription

Sixty-three percent of the project area (272 acres) would be treated with a light thinning harvest, 29 percent (123 acres) with a moderate thinning harvest, and 8 percent (33 acres) would be retained as skips. A breakdown of treatments by land use allocation is shown below in Table 9 as well as in Table 2 (pg. 7) and Figure 7 (Appendix E).

In the thinned areas, merchantable trees in the suppressed and intermediate crown classes would be the primary targets for removal. As thinning intensity increased more of the co-dominant and dominant crown classes would be removed to meet the residual density objective. Minor conifer and hardwood species would be favored for retention to maintain stand diversity. Older remnant trees may be present, but are not the numerically predominant stand components and would generally be targeted for retention.

Within one year of harvest, the moderate thinned areas (i.e. a total of 123 acres) would be planted with an average of approximately 130 conifer seedlings per acre in mixture of 60 percent western hemlock, 20 percent western red cedar, and 20 percent Douglas-fir to promote development of a layered stand structure.

Table 9. Treatment Prescription for Johnson Cleghorn Alternative 4.

Unit	Treatment Intensity (acres)												
	Riparian Reserve						LSR* & GFMA						Unit Total
	Gap	Heavy	Moderate	Light	Skip	Sub-Total	Gap	Heavy	Moderate	Light	Skip	Sub-Total	
4A	0	0	13.5	3.3	3.0	20.0	0	0	0	36.1	0.2	36.0	56.0
5A	0	0	13.9	0	3.9	18.0	0	0	0	35.5	0	36.0	54.0
7A	0	0	10.0	1.6	2.5	14.0	0	0	0	48.4	0	48.0	62.0
7B	0	0	9.2	1.5	5.2	16.0	0	0	0	1.0	0	1.0	17.0
7C*	0	0	0.1	0.1	0	0.2	0	0	0	32.4	0	32.0	32.0
7D	0	0	7.7	1.8	1.7	11.0	0	0	0	23.0	0	23.0	34.0
8A	0	0	19.4	1.3	3.3	24.0	0	0	0	21.1	0	21.0	45.0
8B	0	0	13.3	0	2.8	16.0	0	0	0	20.6	0	21.0	37.0
8C	0	0	21.6	3.2	6.3	31.0	0	0	0	23.0	0	23.0	54.0
9A	0	0	8.2	0.7	3.2	12.0	0	0	0	0.2	0	0.2	12.0
9B	0	0	6.0	1.6	1.1	9.0	0	0	0	15.6	0	16.0	25.0
Total	**0**	**0**	**123.0**	**15.0**	**33.0**	**171.0**	**0**	**0**	**0**	**257.0**	**0.2**	**257.0**	**428.0**

* Approximately 3.4 acres of Unit 7C is within LSR; there would be 3.4 acres of light thinning.

b) Stream Buffers

Perennial Streams & Fish-bearing Streams

Under *Alternative 4*, the thinning prescription would not be applied within a "no-harvest" buffer that would extend 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.

Intermittent Streams

Under *Alternative 4*, the thinning prescription would not be applied within a "no-harvest" buffer that would extend 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.

2. Timber Yarding

There are two potential stream crossings with ground-based yarding equipment under *Alternative 4*. The following, additional project design features would apply to stream-crossings with ground-based equipment:

- Minimize the number of temporary stream crossings on a particular stream.
- Avoid disturbance of unstable banks, headwalls and areas with a high water table.
- Use existing skid roads wherever possible and limit new skid trails to slopes less than 35 percent.
- Restrict tractor operations to these trails and limit operations to periods of low soil moisture, when soils have the most resistance to compaction (dry season).
- Locate stream crossing sites where channels are well defined, unobstructed and straight.

3. Road Activities

The road activities under *Alternative 4* are identical to those under *Alternative 3* (Table 8, Figure 7) except for how Spur 7A-1 and Spur 8B-1 are proposed for decommissioning. Under *Alternative 4*, these two spurs would be decommissioned by waterbarring as needed, mulching with logging slash (or with straw if logging slash is not available), and blocked by using the logging slash as the blocking device; but, they would not be subsoiled.

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).

A. Forest Vegetation

1. Affected Environment

The proposed project units are forest stands between the ages of about 42 to 51 years-old and originated as a result of timber harvest in the 1950s and 1960s. The proposed units are within the western hemlock vegetation zone (Hickman, 1994) and classified as the western hemlock plant series (McCain and Diaz, 2002). The stands are best described as even-aged, single-story structure (Daniel et al., 1979), although some remnants of an older age class may be present. 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).

Stand specific inventories (stand exams) were used to identify current vegetation stand attributes for each area. See *Appendix A* for a description of the assumptions and methodology used to analyze changes in forest vegetation. 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 Johnson-Cleghorn project are summarized below in Tables 10 and 11.

Douglas-fir is the predominant overstory tree species on all units. Other overstory tree species in the stands include western hemlock, western red cedar, big leaf maple, and red alder. The amount of the other tree species varies by unit and ranges between approximately 1-25 percent. Crown ratios of dominant and co-dominant trees are currently in the 30-60 percent range indicating moderate to high vigor and good potential for response to thinning. The average height to diameter ratio of the forty largest trees per acre is approximately seventy-five indicating a moderate level of stand structural stability. Understory vegetation is common, spatially variable, and generally consists of sword fern, salal, vine maple, Oregon grape, and huckleberry.

Table 10. Current Stand Conditions: Live Trees[1] in Johnson Cleghorn.

Unit #	FOI Unit #	Unit Acres	Stand Age (years)	Trees Per Acre[2]	Basal Area[2] (feet/acre)	Average Diameter[3] (inches)	Curtis Relative Density	Scribner Volume[4] (MBF/acre)	Canopy Cover[5] (%)	Minor Species[6] (%)	Site Class[7]
4A	30755	56	51	144	211	15	55	49	95	4	1
5A	30763	53	46	240	286	14	76	59	100	1	1
7A	30781	62	48	192	208	12	61	45	100	13	1
7B	30786	17	43	164	186	14	50	47	90	25	1
7C	30788	33	45	177	183	14	49	39	95	3	1
7D	30787	34	48	170	198	13	54	41	100	7	2
8A	30794	45	49	200	252	10	79	44	100	4	2
8B	30797	37	47	405	250	13	70	58	100	4	1
8C	30793	54	46	221	195	12	55	39	95	13	1
9A	30801	13	42	195	227	13	64	44	100	18	1
9B	30757 30812	24	44	157	150	13	41	30	90	7	1
Range	**-**	**-**	***42-51***	***144-405***	***150-286***	***10-15***	***41-79***	***30-59***	***90-100***	***1-25***	***1-2***

[1] Data shown are for trees ≥ 4.5feet tall except as otherwise noted.
[2] Trees ≥ 6 inches diameter breast height
[3] *Average Diameter* denotes the diameter of the tree of average basal area in the stand measure 4.5 feet above the ground, i.e. the quadratic mean diameter.
[4] *Scribner Volume* denotes volume of all conifer trees ≥ 7 inches diameter breast height on a per acre basis.
[5] *Canopy Cover* is the proportion of the forest floor covered by the vertical projection of tree crowns adjusted for crown overlap.
[6] *Minor Species* denotes any tree species than Douglas-fir; percent of representation in the stand is calculated based on basal area.
[7] *Site Class* is an index of forest productivity potential; 1 being the highest, 5 being the lowest.

NOTE: The terms and concepts described in the preceding seven footnotes apply to the numerous tables describing current and future stand conditions in Johnson Cleghorn.

Table 11. Current Stand Conditions: Dead Trees in Johnson Cleghorn

Unit #	FOI Unit #	Unit Acres	Snag Density (snags/acre)					Coarse Woody Debris			
			4-11" DBH	12-15" DBH	16-19" DBH	> 20" DBH	Sub-Total	Percent Cover	Decay Class 1-5 (feet^3/acre)	Decay Class 1-3 (feet^3/acre)	Decay Class 4-5 (feet^3/acre)
4A	30755	56	0	0	1	0	1	3	1,558	317	1,241
5A	30763	53	14	0	0	0	14	2	656	521	605
7A	30781	62	no data	no data	no data	no data	no data	no data	no data	no data	no data
7B	30786	17	0	0	0	0	0	4	2,617	93	2,524
7C	30788	33	0	4	0	0	4	no data	no data	no data	no data
7D	30787	34	no data	no data	no data	no data	no data	no data	no data	no data	no data
8A	30794	45	7	0	0	0	7	2	953	25	928
8B	30797	37	0	0	0	0	0	3	1,495	87	1,408
8C	30793	54	0	0	8	0	8	no data	no data	no data	no data
9A	30801	13	39	0	0	0	39	no data	no data	no data	no data
9B	30757 30812	24	0	0	0	0	0	4	1,268	79	1,189
Range	-	-	*0-39*	*0-4*	*0-8*	*0*	*0-39*	*2-4*	*656-2,617*	*25-521*	*605-2,524*

2. Environmental Consequences

a) *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, 1990). Merchantable board foot production would be high (Curtis and Marshall, 1986). Table 12 (below) displays the predicted conditions of the stand in Johnson Cleghorn in 100 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, 1990). Within a few decades it is expected that trees within the skips 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, 1990). 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 other proposed alternatives or treatments (Table 13). The amount of snags and downed woody debris would be within the observed range of natural mature and old-growth Coast Range stands (Spies et al. 1988).

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).

In the absence of a substantial disturbance, it is expected that the stand structure would continue to be single-storied over the next 100 years. Over time, site conditions would become more conducive to the establishment and growth of shade-tolerant tree species. However, this process would be slow and it is unlikely that understory tree development would be sufficient to cause a shift from single-storied to a two-storied or layered structure within 100 years (Oliver and Larson, 1990; Munger 1940).

Table 12. Stand Conditions in 100 Years under the No Action Alternative: Live Trees in Johnson Cleghorn.

Unit #	Trees Per Acre	Average Diameter[1] (inches)	Basal Area All Species (feet^2/acre)	Basal Area Minor Spp. (feet^2/acre)	Trees Per Acre ≥ 32" DBH	Trees Per Acre ≥ 36" DBH	Trees Per Acre ≥ 40" DBH	Curtis Relative Density	Scribner Volume[2] (MBF/ acre)	Layered Structure ?[3]	Canopy Cover[4] (%)
4A	55	32	302	7	24	17	12	54	149	No/No	80
5A	65	31	334	5	27	21	14	60	154	No/No	85
7A	81	27	325	64	21	13	7	62	167	No/No	90
7B	64	31	331	132	22	16	7	59	180	No/No	85
7C	62	31	317	20	23	17	5	57	156	No/No	85
7D	76	28	330	14	21	13	8	62	151	No/No	90
8A	78	27	312	26	18	10	5	60	142	No/No	90
8B	63	31	323	23	22	16	12	58	168	No/No	85
8C	64	30	307	9	17	17	2	56	147	No/No	85
9A	66	30	328	62	18	12	6	60	160	No/No	85
9B	68	28	297	24	21	8	1	56	133	No/No	85
Range	*55-81*	*27-32*	*297-334*	*5-132*	*17-27*	*8-21*	*1-14*	*54-62*	*133-180*	*0/0*	*80-90*
Weighted Average	*68*	*30*	*318*	*28*	*22*	*15*	*8*	*58*	*154*	*-*	*86*

[1] *Average Diameter* denotes the diameter of the tree of average basal area in the stand measured at 4.5' above the ground, i.e. the quadratic mean diameter.
[2] *Scribner Volume* denotes the gross Scribner board foot scale (16 foot log basis).
[3] *Layered Structure* is the prediction of whether a unit will meet definition of "layered" structure. A range is shown depicting a pessimistic/optimistic estimate of the number of stands that meet the criteria based on the uncertainty that stands thinned a single time to a moderate level would allow an understory to persist and grow sufficiently to contribute to a layered structure over the time frame shown.
[4] *Canopy Cover* is the proportion of the forest floor covered by the vertical projection of tree crowns adjusted for crown overlap.

Note: Attributes are aggregated at the individual stand level.

Table 13. Stand Conditions in 100 Years under the No Action Alternative: Dead Trees in Johnson Cleghorn.

Unit #	Snag Density (Trees Per Acre) Weighted Average			Coarse Woody Debris* (Down Wood) Weighted Average	
	Total Snags	4" to 19" DBH	≥20" DBH	Cubic Feet Per Acre	Percent Ground Cover
ALL	137	122	15	5,289	14

*Coarse woody debris includes all pieces greater than 4" diameter.

b) Consequences Common to Alternatives 1, 2, 3, and 4

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 1990), 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)

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 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). Variable-density thinning with skips and gaps will likely promote greater stand inhomogeneity than prescriptions that simply vary thinning intensity (Harrington et al., 2005).

(1) *Effects from the Light Thinning Prescription*

Stands that are lightly thinned to RD 30-40 would produce moderately-high volume growth rates at the expense of individual tree diameter growth rates (Curtis and Marshall, 1986). Growth simulations of Johnson Cleghorn stands for 100 years post-thinning predict that merchantable board foot volume production is not substantially different than that of an unthinned stand (i.e. skip) at the end of that time period. 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).

(2) *Effects from the Moderate Thinning Prescription*

Stands that are moderately thinned to RD 15-25 would produce high rates of diameter growth at the expense of volume production (Curtis and Marshall, 1986). Growth simulations of Johnson Cleghorn stands for 100 years post-thinning predict that moderate thinning would have merchantable board foot volume production of between 88 - 98 percent of that of an unthinned stand (skip), depending on the growth and vigor of the planted understory trees.

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).

(3) *Effects from the Heavy Thinning Prescription*

Heavily thinned stands would produce the highest rates of diameter growth of the proposed thinning intensities at the expense of volume production (Curtis and Marshall, 1986). Growth simulations of Johnson Cleghorn stands for 100 years post-thinning predict that heavy thinning would have merchantable board foot volume production of between 70 - 98 percent of that of an unthinned stand (skip), depending on the growth and vigor of the planted understory trees.

It is anticipated that the overstory canopy 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).

(4) *Effects from the Gap Prescription*

Canopy gaps with, or without retention trees will encourage understory vegetation development contributing to horizontal and vertical structural diversity. A range of gap sizes examined over seven years in northern California found species specific responses to gap size. In general, height gains tended to diminish between gap sizes of 0.75 - 1.5 acres (York et al. 2007). Larger gaps are needed on north facing slopes to produce light regimes found in smaller gaps on south facing slopes. Gap size and the present and future height growth of the adjacent stand will affect development of vegetation in gaps

(Malcolm et al., 2001). Increased basal area growth of 11 percent has been measured in trees in the adjacent thinned matrix of Douglas-fir dominated stands (Roberts and Harrington, 2008).

Gaps would contribute to the development of a mixed species layered stand structure. Growth simulations to stand (gap) age 100-years-old predict that, for Johnson Cleghorn, gaps would have merchantable board foot volume production of about 68 percent of that of an unthinned stand (skip).

It is expected that the canopy gaps would remain open enough without additional treatments to maintain light levels that provide an environment conducive to the long-term survival and growth of gap vegetation that would produce a layered structure.

(5) *Effects from the Skip Prescription*

Stands that have a skip prescription applied would develop in the same manner as described previously for stands under the No Action Alternative.

c) *Consequences Unique to Alternative 1*

Table 14 (below) shows the stand conditions in Johnson Cleghorn immediately following harvest. Individual treatment types will produce the effects described previously; the stand conditions predicted to develop after 100 years in Johnson Cleghorn are displayed in Table 15 (below). The composite of harvest types and their distribution in this alternative suggest that over the next 100 years, many attributes found in unmanaged mature and old-growth stands would develop with the exception of a layered structure. The stand structure is expected to remain single-storied and even-aged.

The number of large snags is predicted to be roughly 80 percent of that as predicted under the *No Action Alternative* after 100 years (comparison of values in Tables 13 and 16). The volume of down woody debris is predicted to be roughly 90 percent of that as predicted under the *No Action Alternative* after 100 years. The amount of snags and downed woody debris would be within the observed range of natural mature and old-growth Coast Range stands.

Table 14. Post-Harvest Stand Conditions under Alternative 1: Live Trees in Johnson Cleghorn.

Unit #	Trees Per Acre[1]	Basal Area[1] (feet/acre)	Average Diameter[2] (inches)	Curtis Relative Density	Canopy Cover[4] (%)
4A	101	167	16	43	83
5A	240	286	14	76	100
7A	126	151	12	46	87
7B	164	186	14	50	92
7C	127	150	15	43	83
7D	149	170	14	47	91
8A	371	236	11	67	97
8B	154	189	13	54	89
8C	195	195	12	48	95
9A	267	227	13	54	100
9B	127	136	14	36	85
Range	***101-371***	***136-286***	***11-16***	***36-67***	***83-100***

Table 15. Stand Conditions in 100 Years under Alternative 1: Live Trees in Johnson Cleghorn.

Unit #	Trees Per Acre	Average Diameter[1] (inches)	Basal Area All Species (feet²/acre)	Basal Area Minor Spp. (feet²/acre)	Trees Per Acre ≥ 32" DBH	Trees Per Acre ≥ 36" DBH	Trees Per Acre ≥ 40" DBH	Curtis Relative Density	Scribner Volume[2] (MBF/ acre)	Layered Structure?[3]	Canopy Cover[4] (%)
4A	48	32	288	3	24	17	12	50	143	No/No	75
5A	65	31	334	5	27	21	14	60	154	No/No	85
7A	81	27	317	82	20	13	7	61	162	No/No	90
7B	64	31	331	132	22	16	7	59	180	No/No	85
7C	56	32	306	21	22	17	8	54	150	No/No	80
7D	71	29	319	15	21	14	6	60	145	No/No	85
8A	76	27	310	26	19	11	5	59	140	No/No	85
8B	57	32	311	27	23	16	13	55	161	No/No	80
8C	64	30	307	9	17	17	2	56	147	No/No	85
9A	66	30	328	62	18	12	6	60	160	No/No	85
9B	65	29	294	24	21	9	1	55	132	No/No	85
Range	*48-81*	*27-32*	*288-334*	*3-132*	**17-27**	**9-21**	**1-14**	**50-61**	**132-180**	*0/0*	*75-90*
Weighted Average	*65*	*30*	*312*	*30*	**21**	**15**	**8**	**57**	**151**	-	*84*

[1] *Average Diameter* denotes the diameter of the tree of average basal area in the stand measured at 4.5' above the ground, i.e. the quadratic mean diameter.
[2] *Scribner Volume* denotes the gross Scribner board foot scale (16 foot log basis).
[3] *Layered Structure* is the prediction of whether a unit will meet definition of "layered" structure. A range is shown depicting a pessimistic/optimistic estimate of the number of stands that meet the criteria based on the uncertainty that stands thinned a single time to a moderate level would allow an understory to persist and grow sufficiently to contribute to a layered structure over the time frame shown.
[4] *Canopy Cover* is the proportion of the forest floor covered by the vertical projection of tree crowns adjusted for crown overlap.

Note: Attributes are aggregated at the individual stand level.

Table 16. Stand Conditions in 100 Years under Alternative 1: Dead Trees in Johnson Cleghorn.

Unit #	Snag Density (Trees Per Acre) Weighted Average			Coarse Woody Debris* (Down Wood) Weighted Average	
	Total Snags	4" to 19" DBH	≥20" DBH)	Cubic Feet Per Acre	Percent Ground Cover
ALL	96	82	14	4,398	12

*Coarse woody debris includes all pieces greater than 4 inches diameter.

d) Consequences Unique to Alternative 2

Table 17 (below) shows the stand conditions in Johnson Cleghorn immediately following harvest as proposed under *Alternative 2*. Individual treatment types will produce the effects described previously; the stand conditions predicted to develop after 100 years in Johnson Cleghorn are displayed in Table 18 (below). The composite of harvest types and their distribution in this alternative suggest that long-term (next 100 years), many attributes found in unmanaged mature and old-growth stands would develop, including a layered structure. Layered structure development is expected as early as twenty years after thining.

The number of large snags is predicted to be roughly 40 percent of that as predicted under the *No Action Alternative* after 100 years (comparison of values in Tables 13 and 19). The volume of down woody debris is predicted to be roughly 50 percent of that as predicted under the *No Action Alternative* after 100 years. The amount of snags and downed woody debris would be within the range observed by Spies et al. (1988) in natural mature and old-growth Coast Range stands.

Table 17. Post-Harvest Stand Conditions under Alternative 2: Live Trees in Johnson Cleghorn.

Unit #	Trees Per Acre[1]	Basal Area[1] (feet/acre)	Average Diameter[2] (inches)	Curtis Relative Density	Canopy Cover[4] (%)
4A	42	83	16	20	44
5A	57	94	17	23	52
7A	59	78	12	22	50
7B	123	151	15	39	84
7C	71	89	14	23	56
7D	120	138	14	39	74
8A	136	103	12	31	57
8B	68	98	14	26	55
8C	88	100	13	27	58
9A	117	114	14	30	60
9B	67	79	14	21	55
Range	*42-136*	*78-151*	*12-17*	*19-39*	*44-84*

Table 18. Stand Conditions in 100 Years under Alternative 2: Live Trees in Johnson Cleghorn.

Unit #	Trees Per Acre	Average Diameter[1] (inches)	Basal Area All Species (feet²/acre)	Basal Area Minor Spp. (feet²/acre)	Trees Per Acre ≥ 32" DBH	Trees Per Acre ≥ 36" DBH	Trees Per Acre ≥ 40" DBH	Curtis Relative Density	Scribner Volume[2] (MBF/ acre)	Layered Structure?[3]	Canopy Cover[4] (%)
4A	99	25	325	150	14	11	10	65	147	Yes/Yes	90
5A	98	26	324	124	17	14	11	65	139	Yes/Yes	90
7A	117	24	339	189	14	11	6	70	158	Yes/Yes	95
7B	61	32	329	139	22	17	11	58	175	No/No	85
7C	105	26	332	148	16	13	7	67	152	Yes/Yes	90
7D	89	26	323	78	17	12	8	63	142	Yes/Yes	90
8A	113	23	326	137	15	11	6	68	139	Yes/Yes	95
8B	101	26	339	140	17	13	12	67	162	Yes/Yes	90
8C	101	25	323	111	16	12	3	65	143	No/Yes	90
9A	90	27	333	141	16	12	8	65	151	Yes/Yes	90
9B	105	24	321	134	16	9	1	66	135	Yes/Yes	90
Range	***61-117***	***23-32***	***321-339***	***78-189***	**14-22**	**9-17**	**1-12**	**58-70**	**135-175**	***9/10***	***85-95***
Weighted Average	***102***	***25***	***328***	***138***	**16**	**12**	**7**	**66**	**148**	**-**	***91***

[1] *Average Diameter* denotes the diameter of the tree of average basal area in the stand measured at 4.5' above the ground, i.e. the quadratic mean diameter.
[2] *Scribner Volume* denotes the gross Scribner board foot scale (16 foot log basis).
[3] *Layered Structure* is the prediction of whether a unit will meet definition of "layered" structure. A range is shown depicting a pessimistic/optimistic estimate of the number of stands that meet the criteria based on the uncertainty that stands thinned a single time to a moderate level would allow an understory to persist and grow sufficiently to contribute to a layered structure over the time frame shown.
[4] *Canopy Cover* is the proportion of the forest floor covered by the vertical projection of tree crowns adjusted for crown overlap.

Note: Attributes are aggregated at the individual stand level.

Table 19. Stand Conditions in 100 Years under Alternative 2: Dead Trees in Johnson Cleghorn.

Unit #	Snag Density (Trees Per Acre) Weighted Average			Coarse Woody Debris (Down Wood) Weighted Average	
	Total Snags	**4" to 19" DBH**	**≥20" DBH)**	**Cubic Feet Per Acre**	**Percent Ground Cover**
ALL	33	25	8	2,111	5

*Coarse woody debris includes all pieces greater than 4 inches diameter.

e) Consequences Unique to Alternative 3

Table 20 (below) shows the stand conditions in Johnson Cleghorn immediately following harvest as proposed under *Alternative 3*. Individual treatment types will produce the effects described previously; the stand conditions predicted to develop after 100 years in Johnson Cleghorn are displayed in Table 21 (below). The composite of harvest types and their distribution in this alternative suggest that long-term (next 100 years), many attributes found in unmanaged mature and old-growth stands would develop, including a layered structure. Layered structure development is expected as early as twenty years after thinning.

Active recruitment of snags and coarse woody debris would provide these features sooner (i.e. immediately following treatment) than through passive recruitment under the other alternatives. Actively recruited snags and coarse woody debris would contribute to stand conditions for approximately 70 years post-harvest. The number of large snags is predicted to be roughly 50 percent of that as predicted under the *No Action Alternative* after 100 years (comparison of values in Tables 13 and 22). The volume of down woody debris is predicted to be roughly 40 percent of that as predicted under the *No Action Alternative* after 100 years. The amount of snags and downed woody debris would be within the range observed by Spies et al. (1988) in natural mature and old-growth Coast Range stands.

Table 20. Post-Harvest Stand Conditions under Alternative 3: Live Trees in Johnson Cleghorn.

Unit #	Trees Per Acre[1]	Basal Area[1] (feet/acre)	Average Diameter[2] (inches)	Curtis Relative Density	Canopy Cover[4] (%)
4A	41	83	16	20	44
5A	57	95	17	23	52
7A	58	78	12	22	50
7B	124	151	15	39	84
7C	57	76	15	19	50
7D	60	81	14	22	54
8A	103	86	12	25	53
8B	68	98	14	26	55
8C	80	93	13	26	56
9A	114	112	14	29	59
9B	63	76	14	20	53
Range	*41-124*	*76-151*	*12-17*	*19-39*	*44-84*

Table 21. Stand Conditions in 100 Years under Alternative 3: Live Trees in Johnson Cleghorn.

Unit #	Trees Per Acre	Average Diameter[1] (inches)	Basal Area All Species (feet²/acre)	Basal Area Minor Spp. (feet²/acre)	Trees Per Acre ≥ 32" DBH	Trees Per Acre ≥ 36" DBH	Trees Per Acre ≥ 40" DBH	Curtis Relative Density	Scribner Volume[2] (MBF/ acre)	Layered Structure?[3]	Canopy Cover[4] (%)
4A	99	25	325	150	14	11	10	65	147	Yes/Yes	90
5A	99	26	325	126	17	14	11	65	140	Yes/Yes	90
7A	117	23	338	188	14	10	6	70	157	Yes/Yes	95
7B	61	32	329	139	22	17	11	58	175	No/No	85
7C	111	25	335	168	15	12	7	68	151	Yes/Yes	90
7D	105	24	319	127	24	11	7	65	135	Yes/Yes	90
8A	117	23	330	146	15	11	7	69	139	Yes/Yes	95
8B	101	26	339	140	17	13	12	67	162	Yes/Yes	90
8C	104	25	325	115	16	12	3	65	143	No/Yes	90
9A	90	27	333	141	16	12	8	65	151	Yes/Yes	90
9B	107	24	323	138	16	9	1	66	138	Yes/Yes	90
Range	***61-117***	***23-32***	***319-339***	***115-188***	**14-24**	**9-17**	**1-12**	**58-70**	**135-175**	***9/10***	***85-95***
Weighted Average	***104***	***25***	***329***	***145***	**16**	**12**	**8**	**66**	**148**	**-**	***91***

[1] *Average Diameter* denotes the diameter of the tree of average basal area in the stand measured at 4.5' above the ground, i.e. the quadratic mean diameter.
[2] *Scribner Volume* denotes the gross Scribner board foot scale (16 foot log basis).
[3] *Layered Structure* is the prediction of whether a unit will meet definition of "layered" structure. A range is shown depicting a pessimistic/optimistic estimate of the number of stands that meet the criteria based on the uncertainty that stands thinned a single time to a moderate level would allow an understory to persist and grow sufficiently to contribute to a layered structure over the time frame shown.
[4] *Canopy Cover* is the proportion of the forest floor covered by the vertical projection of tree crowns adjusted for crown overlap.

Note: Attributes are aggregated at the individual stand level.

Table 22. Stand Conditions in 100 Years under Alternative 3: Dead Trees in Johnson Cleghorn.

Unit #	Snag Density (Trees Per Acre) Weighted Average			Coarse Woody Debris (Down Wood) Weighted Average	
	Total Snags	**4" to 19" DBH**	**≥20" DBH)**	**Cubic Feet Per Acre**	**Percent Ground Cover**
ALL	23	15	8	2,041	8

*Coarse woody debris includes all pieces greater than 4 inches diameter.

f) Consequences Unique to Alternative 4

Table 23 (below) shows the stand conditions in Johnson Cleghorn immediately following harvest as proposed under *Alternative 4*. Individual treatment types will produce the effects described previously; the stand conditions predicted to develop after 100 years in Johnson Cleghorn are displayed in Table 24 (below). The composite of harvest types and their distribution in this alternative suggest that long-term (next 100 years), many attributes found in natural mature and old-growth stands would develop, including a layered structure. Layered structure development is expected as early as twenty years after thinning, but the potential for its long-term maintenance is not certain.

The number of large snags is predicted to be roughly 70 percent of that as predicted under the *No Action Alternative* after 100 years (comparison of values in Tables 13 and 25). The volume of down woody debris is predicted to be roughly 50 percent of that as predicted under the *No Action Alternative* after 100 years. The amount of snags and downed woody debris would be within the range observed by Spies et al. (1988) in natural mature and old-growth Coast Range stands.

Table 23. Post-Harvest Stand Conditions under Alternative 4: Live Trees in Johnson Cleghorn.

Unit #	**Trees Per Acre**[1]	**Basal Area**[1] (feet/acre)	**Average Diameter**[2] (inches)	**Curtis Relative Density**	**Canopy Cover**[4] (%)
4A	71	131	16	33	70
5A	91	146	16	36	78
7A	90	117	12	34	76
7B	105	127	15	33	73
7C	97	124	15	32	75
7D	89	116	14	31	74
8A	141	117	12	34	73
8B	96	132	14	35	75
8C	100	116	13	32	69
9A	128	128	14	35	79
9B	96	111	15	29	74
Range	*71-141*	*111-146*	*12-16*	*29-36*	*69-79*

Table 24. Stand Conditions in 100 Years under Alternative 4: Live Trees in Johnson Cleghorn.

Unit #	Trees Per Acre	Average Diameter[1] (inches)	Basal Area All Species (feet²/acre)	Basal Area Minor Spp. (feet²/acre)	Trees Per Acre ≥ 32" DBH	Trees Per Acre ≥ 36" DBH	Trees Per Acre ≥ 40" DBH	Curtis Relative Density	Scribner Volume[2] (MBF/ acre)	Layered Structure ?[3]	Canopy Cover[4] (%)
4A	64	31	304	42	22	16	12	55	147	No/No	80
5A	70	31	320	41	23	19	13	59	145	No/No	85
7A	93	26	325	114	19	12	7	64	163	No/No	90
7B	106	27	378	222	18	15	9	74	189	No/Yes	90
7C	62	31	317	20	23	17	5	57	156	No/No	85
7D	81	28	316	45	28	13	8	60	140	No/No	85
8A	100	26	324	88	19	13	6	65	140	No/Yes	90
8B	83	29	333	81	21	15	14	63	166	No/Yes	85
8C	92	27	322	66	19	13	4	63	146	No/Yes	90
9A	111	25	351	158	17	10	5	71	161	No/Yes	95
9B	81	27	309	59	20	10	1	60	135	No/No	85
Range	*62-111*	*25-31*	*304-378*	*20-222*	**17-28**	**10-19**	**1-14**	**55-74**	**135-189**	*0/5*	*80-95*
Weighted Average	*83*	*28*	*322*	*74*	**21**	**14**	**8**	**62**	**151**	-	*87*

[1] *Average Diameter* denotes the diameter of the tree of average basal area in the stand measured at 4.5' above the ground, i.e. the quadratic mean diameter.
[2] *Scribner Volume* denotes the gross Scribner board foot scale (16 foot log basis).
[3] *Layered Structure* is the prediction of whether a unit will meet definition of "layered" structure. A range is shown depicting a pessimistic/optimistic estimate of the number of stands that meet the criteria based on the uncertainty that stands thinned a single time to a moderate level would allow an understory to persist and grow sufficiently to contribute to a layered structure over the time frame shown.
[4] *Canopy Cover* is the proportion of the forest floor covered by the vertical projection of tree crowns adjusted for crown overlap.

Note: Attributes are aggregated at the individual stand level.

Table 25. Stand Conditions in 100 Years under Alternative 4: Dead Trees in Johnson Cleghorn.

Unit #	Snag Density (Trees Per Acre) Weighted Average			Coarse Woody Debris (Down Wood) Weighted Average	
	Total Snags	4" to 19" DBH	≥20" DBH)	Cubic Feet Per Acre	Percent Ground Cover
ALL	23	13	10	2,500	6

*Coarse woody debris includes all pieces greater than 4 inches diameter.

B. Wildlife

1. Northern Spotted Owl *(Federally Threatened)*

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.

Although suitable habitat also functions as dispersal habitat, these terms are used separately.

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.

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); 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).

a) *Affected Environment*

One component of the stated *Need* for the proposed action is to promote and enhance the development of structural components associated with suitable habitat within stands where they are currently lacking. Effects of thinning dispersal 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 (1.5-mile radius). No suitable habitat (stand age $\geq$ 80 years) within the nest patch, core area, and home range of any known spotted owl activity center would be treated under any of the proposed action alternatives, Therefore, suitable habitat for spotted owls will not be discussed further (except referenced in tables). The proposed thinning units only contain dispersal habitat.

The extent of the analysis area for the northern spotted owl is defined by a 1.5 mile radius polygon around proposed timber sale units. The analysis area covers approximately 12,170 total acres, of which 9,604 acres (79 percent) are on Federal lands and 8,567 acres (70 percent) are within 2008 designated Critical Habitat. There are 3,380 acres (28 percent) of spotted owl suitable habitat and 3,365 acres (28 percent) of dispersal habitat on Federal land within the analysis area (Figure 9, Map of Spotted Owl Analysis Area).

The proposed thinning area is located within the Tyee Demography Study Area for the northern spotted owl. Annual surveys have been completed in the study area since the late 1980's. For the analysis of effects to owls and their habitat in the Johnson Cleghorn project area, the most recently occupied activity center and their corresponding nest patch, core area, and home range centers were considered to determine habitat impacts for each owl site (Table 26).

Based on 2010 survey data, there are five known spotted owl sites within 1.5 miles of the proposed action area, which includes fourteen activity centers (Figures 9, 10, 11, 12, or 13). Table 26 summarizes the status of each spotted owl site within the action area based on most recently used activity center for each site, including last documented occupancy, reproduction, and barred owl status. Of the five owl sites within the analysis area, the Halfway Creek site last produced young in 2005 and since has been determined to be either unoccupied or occupied by a single resident spotted owl through 2010. The other four sites have been unoccupied from 2005 to present, with the exception of the Hardenbrook site with a resident single spotted owl present in 2010. In addition, barred owls have been present at all five sites, either causing effects to detectability rates during surveys and/or causing social instability among spotted owl pairs, thus affecting occupancy, reproduction, and survival at these sites (Olson *et al.*, 2005; Pearson and Livezey, 2003).

Table 26. Site Status for Northern Spotted Owls within the Action Area.

Spotted Owl Site (IDNOs)	Site Status (2005-2010)	Year of Last Known Pair Status (IDNO)	Year of Last Known Nesting (IDNO)	Year of Last Known Reproduction (IDNO)	Barred Owl Status (IDNO)	
					First Year Detected	Last Year Detected
Halfway Creek (0264O-E)	Unoccupied (2006-2007) Resident Single (2008-2010)	2005 (0246E)	2005 (0246E)	2005 (0246E)	2004 (0246O) pair	2010 (0246E) pair
Halfway Ridge (0533O-B)	Unoccupied	1998	1994	1994	2004 (0533O) pair	2010 (2041O) single
Harden-brook Creek (2056O-E)	Unoccupied (2006-2009) Single (2010)	2005	1997 (0256B)	1997 (0256B)	2004 (2056O) single	2010 (2056C) pair
Smith Quarry (4663O)	Unoccupied	2004	None	None	2001 single	2009 pair
Upper Johnson Creek (2041O-A)	Unoccupied	1998	1990 (2041O)	1990 (2041O)	1999 (2041O) single	2010 (2041O) single

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 "insignificant."

Of the fourteen known spotted owl activity centers, the closest known spotted owl activity center (Smith Quarry, IDNO 4663O) is located approximately 450 yards (0.26 miles) north of Unit 5A (Figures 9, 10, 11, or 12). The other activity centers are located approximately 705 to 2,635 yards (0.4 to 1.5 miles) away from proposed unit boundaries. Because the known sites are located outside of the disruption and disturbance distance-thresholds, there would be no seasonal restriction requirements for harvest operations occurring during the spotted owl critical breeding season (March 1st-July 15th).

Dispersal Habitat – Conifer stands with birthdates of 40-79 were considered dispersal habitat for this analysis. All proposed thinning units are considered dispersal habitat because the stands contain relatively small tree sizes (quadratic mean diameter 12 to 15 inches) (*Forest Vegetation*, Table 10, pg. 26) , high stand densities, and lack suitable habitat components. Within 8A (45 acres), although the stand average tree diameter of 10 inches does not meet the 11 inch diameter threshold as defined for dispersal habitat by Thomas *et al.* (1990), after field review it was determined that this stand would also function as dispersal habitat because it is structurally similar to the other proposed units. Therefore, up to 428 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). Table 11 in the *Forest Vegetation* section (pg. 27), presents current snag and down wood conditions within the proposed units. Based on this data, there is currently a snag deficit within the units, particularly large snags (> 20 inches DBH). Large down wood is present within some of the units; down wood levels (cubic feet/acre) are within the range indicative of mature forests (80 – 195 years of age) (Table 29).

Simulations of the applied silvicultural prescriptions were completed for the *No Action Alternative* and the *Action Alternatives* (*Forest Vegetation* section; pgs. 28-39) projecting stand development 100 years into the future (summarized below in Table 29). These stand characteristics (including basal area of stand, basal area of shade tolerant conifers, number of conifers > 40 inches DBH, number of canopy layers, number of snags > 20 inches DBH, amount of down wood, and down wood percent cover) were then compared to mature and old-growth attributes outlined in the South Coast/North Klamath Late-Successional Reserve Assessment (Tables 8 and 10). In summary, these stands would develop suitable habitat components within 100 years that would meet or exceed those thresholds found in natural mature or old-growth stands.

Home Range – The home range for northern spotted owls in the Coast Range Province is a 1.5 mile radius circle surrounding an activity center and is used by spotted owls to meet their nesting, roosting, and foraging needs. The home ranges of several owl pairs may overlap and the habitat within them is commonly shared between adjacent owl pairs and by other non-territorial 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. All proposed units are located within a home range for one or more spotted owl activity centers (Figures 9, 10, 11, or 12). The Upper Johnson Creek (IDNO 2041O) home range encompasses all proposed units.

Table 27. Northern Spotted Owl Habitat within Known Home Ranges in the Johnson Cleghorn Action Area.

Northern Spotted Owl Site (IDNO)*		Federal Land (acres)	Habitat on Federal Lands Only (acres)						
			Suitable Habitat	Dispersal-Only Habitat					
					Habitat Modified** through Proposed Action Alternatives				
			Current Condition	Current Condition	No Action	Alt. 1	Alt. 2	Alt. 3	Alt. 4
HALFWAY CREEK **(0264E)**	Home Range (4,496 acres)	3,738	2,241	532	0	26	51	55	56
	Core Area (502 acres)	418	249	0	0	0	0	0	0
	Nest Patch (70 acres)	68	64	0	0	0	0	0	0
HALFWAY RIDGE **(0533O)**	Home Range (4,496 acres)	3,507	1,222	1,165	0	73	111	133	137
	Core Area (502 acres)	448	255	54	0	0	0	0	0
	Nest Patch (70 acres)	70	60	5	0	0	0	0	0
HARDENBROOK CREEK **(2056C)**	Home Range (4,496 acres)	3,206	920	1,167	0	0	49	49	49
	Core Area (502 acres)	365	194	50	0	0	0	0	0
	Nest Patch (70 acres)	69	45	6	0	0	0	0	0
SMITH QUARRY **(4663O)**	Home Range (4,496 acres)	3,165	1,039	1,164	0	55	211	216	219
	Core Area (502 acres)	400	169	318	0	0	43	43	43
	Nest Patch (70 acres)	69	59	0.7	0	0	0	0	0
UPPER JOHNSON CREEK **(2041O)**	Home Range (4,496 acres)	3,507	1,165	1,344	0	148	352	386	395
	Core Area (502 acres)	439	221	143	0	0	20	23	23
	Nest Patch (70 acres)	70	68	2	0	0	0	0	0

*Bold IDNO indicates which activity center (based on most recent spotted owl use) within an owl site was used for the habitat analysis.
** Under the Proposed Action dispersal-only habitat would have a reduction in quality but would maintain its function. Only acres treated are included in total acres modified, and therefore do not include skips included in the prescription.

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. Four proposed units (i.e. Units 5A, 7A, 8A, and 8C) fall within the core areas of two known spotted owl activity centers (Smith Quarry, IDNO 4663O and Upper Johnson Creek, IDNO 2041O), affecting up to approximately 71 total acres of dispersal habitat (Table 28; Figures 9, 10, 11, or 12).

Table 28. Northern Spotted Owl Habitat within Johnson Cleghorn Proposed Units.

Unit[1]	Unit Acres	Unit Acres within...						Unit Total	
		Nest Patch		Core Area		Home Range			
		Suitable Habitat	Dispersal Habitat	Suitable Habitat	Dispersal Habitat	Suitable Habitat	Dispersal Habitat	Suitable Habitat	Dispersal Habitat
4A	56	0	0	0	0	0	56	0	56
5A	54	0	0	0	51.2	0	54	0	54
7A	62	0	0	0	0.3	0	62	0	62
7B	17	0	0	0	0	0	17	0	17
7C	32	0	0	0	0	0	32	0	32
7D	34	0	0	0	0	0	34	0	34
8A	45	0	0	0	13.6	0	45	0	45
8B	37	0	0	0	0	0	37	0	37
8C	54	0	0	0	5.7	0	54	0	54
9A	12	0	0	0	0	0	12	0	12
9B	25	0	0	0	0	0	25	0	25
TOTAL	**428**	**0**	**0**	**0**	**70.8**	**0**	**428**	**0**	**428**

Nest Patch – Within the core area, the nest patch is defined as the 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. None of the proposed units fall within a nest patch of a known spotted owl activity center (Tables 27 and 28; Figures 9, 10, 11, or 12).

Known Owl Activity Centers (KOAC) – Known Owl Activity Centers were designated in the 1995 ROD/RMP to minimize impacts and protect nest sites found before 1994 (pg. 48). There is one 108-acre KOAC (Upper Johnson; MSNO 2041) located among the proposed units. The proposed project would not treat habitat within the KOAC.

Designated Critical Habitat – Critical Habitat for the spotted owl was designated in the Federal Register 73 and describes the Primary Constituent Elements that support nesting, roosting, foraging, and dispersal (73 FR 47326-47374). Dispersal habitat is a Primary Constituent Element in spotted owl Critical Habitat. Designated Critical Habitat also includes forest land that is currently unsuitable, but has the capability of becoming suitable habitat in the future (73 FR 47347). Under the 2008 Critical Habitat rule, all the proposed units (428 acres) are located in the Willamette/North Umpqua Critical Habitat Unit (OR-13) (118,515 acres) for the northern spotted owl.

b) Environmental Consequences

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

The quality and availability of northern spotted owl habitat would not be directly affected under the *No Action Alternative*. Spotted owl activity centers, core areas, and home ranges would continue to function at current levels because dispersal habitat would not be modified. Where long-term development of suitable habitat is a concern, as in the designated Critical Habitat, 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. This would also delay habitat development in proximity to or within northern spotted owl home ranges or core areas.

The 428 acres included in the proposed Johnson Cleghorn units would continue to function as dispersal habitat. The stands would continue to develop as relatively homogeneous and even-aged stands that are primarily single-storied in nature and dominated by Douglas-fir. Currently, within the proposed units, pre-treatment canopy cover estimates range between 90-100 percent stand averages. Without silvicultural treatment or natural disturbance, canopies would remain closed and individual tree growth would slow even as stand growth continues. This would likely result in stands with little structural complexity, decreased species diversity as hardwoods and shade intolerant conifers die from suppression, and maintenance of closed and single-layered canopy conditions. 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 in the understory. In addition, formation of canopy gaps and stratification of the canopy into multiple layers would generally not occur.

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 alternatives or treatments (Tables 13 and 29). The amount of snags (>40 inches DBH) and downed woody debris would be within, or exceed, the observed range of natural mature and old-growth Coast Range stands in 100 years (Table 29). 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).

Therefore, based on the stand simulations, under the *No Action Alternative* these stands would be expected to develop some of the structural components associated with suitable habitat for the spotted owl, including large conifers, snags, and down wood. However, the development of a multi-layered canopy and shade tolerant conifers would be delayed by 100 years or more (Table 29).

Table 29. Modeled Stand Attributes – Stand Conditions in 100 years Post-Treatment for all Alternatives.

Stand Attribute	Old Growth[1] > 200 years	Mature[1] 80-195 years	No Action	Alt 1	Alt 2	Alt 3	Alt 4
			100 years Post-treatment				
Basal Area (ft^2/acre) Entire Stand	305 (222-418)	257 (230-283)	318	312	328	329	322
Basal Area (ft^2/acre) Shade Tolerant Conifers	135 (44-274)	n/a	28	30	138	145	74
Number of Conifers > 40" DBH per acre	10 (4-21)	1 (0.4-1.9)	8	8	7	8	8
Canopy Layers[2]	Multiple	n/a	Single	Single	Multiple	Multiple	Multiple
Number of Snags > 20" DBH per acres	4 (2-6)	3 (0-7)	15	14	8	8	10
Down Wood (cubic feet/acre)	3,262 (1,385-5,141)	1,731 (300-3,162)	5,289	4,398	2,111	2,041	2,500
Down Wood Percent Cover	n/a	n/a	14	12	5	8	6

[1]Old-growth and Mature attributes are from S. Coast/N. Klamath LSRA Tables 8 and 10. Average values and (95 percent confidence intervals) shown except as indicated.
[2]Estimated number of canopy layers or the percent of stands for an alternative predicted to be in a "layered" condition at the stated comparison age. A range is shown depicting an estimate based on the uncertainty that stands thinned a single time to a moderate level would allow an understory to persist and grow sufficiently to contribute to a layered structure over the time frames shown.

Designated Critical Habitat – Primary Constituent Elements (e.g. dispersal habitat) would not be removed or modified and the current quality and availability of spotted habitat would be unaffected under the *No Action Alternative*. The Critical Habitat Unit would continue to function in its current condition. As discussed above for dispersal habitat, stands within the Critical Habitat unit would be slower to develop, through natural processes, 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.

(2) Consequences Common to Alternatives 1, 2, 3, and 4

A general description of effects to the spotted owl and dispersal habitat are provided initially, followed by specific affects for each action alternative. Direct impacts to dispersal habitat addressed are those acres modified by treatments and do not include the no treatment areas previously referred to as "skips." However, skips were included in discussion of overall impacts and used to determine average canopy cover at the stand level.

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 requires use of trees tailholds and guyline anchors, within suitable habitat located outside of the unit boundaries. Guyline tree are generally cut and could result in loss of suitable nest trees, but the potential number of trees is not known. 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. 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, 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, at about one to two percent per year (q.v. *Forest Vegetation*, pg. 29). With the exception of Unit 4A, all units under *Alternatives 1, 2, 3* and *4*, are predicted to be at or above 60 percent canopy closure within 5 to 10 years post-harvest. Canopy cover in Unit 4A is expected to recover to 50 percent within 6 to10 years post-harvest and reach 60 percent within 20 years.

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.

Dispersal Habitat - Though the quality 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 *Alternatives 1, 2, 3,* and *4*, post-treatment canopy closure would be maintained between 44-100 percent and the quadratic mean diameter would be between 11 and 17 inches (q.v. *Forest Vegetation*; Tables 14,17, 20, and 23). Large remnant trees and dominant and co dominant hardwoods would be reserved, and 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, regardless of proposed treatment intensity within a unit under *Alternatives 1, 2, 3,* and *4*, treated stands are expected to maintain dispersal function because 40 percent canopy closure and other structural elements important for spotted owl dispersal will be retained.

Development of late-successional characteristics and suitable habitat from modified dispersal habitat would be expected roughly 100 years sooner than through natural stand development. The development of suitable habitat components within the stands is dependent on the intensity of the treatments. More structural components would be expected to develop within those areas treated with greater intensity and variability. 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. As structural components used by spotted owls continue to develop, such as multiple canopy layers, large diameter trees and eventually large snags and coarse woody debris, the amount of nesting habitat would increase for the spotted owl over time.

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 alternatives incorporate some of those considerations, including:

- retention of existing large decadent trees and snags;
- retention of no-treatment areas (e.g., "skips" and 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). In addition, the skips and lightly thinned areas would provide a continuous recruitment of snags and down wood. 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.

In the long term, based on the stand simulations (Table 29), some late-seral structural components would develop within 100 years under all alternatives, including within stand basal area of large conifers (>40 inches diameter at breast height), large snags (>20 inches diameter at breast height), and down wood (cubic feet/acre). Although the amount of each of these stand attributes differs by alternative, the predicted amounts would be within the observed range of natural mature and/or old-growth Coast Range stands (Table 29) under *Alternatives 1, 2, 3,* and *4.* However within 100 years, the development of shade tolerant conifers and percent cover of down wood differs by alternative and for some alternatives (Table 29). The amount of shade tolerant conifers is not predicted to be within the observed range of natural variation associated with mature and/or old-growth habitat (Table 29).

Home Range – Dispersal habitat would be modified by thinning activities within the home ranges of five known spotted owl sites (Table 28). Current research has shown that 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).

Core Area – No thinning would occur within a core area under *Alternative 1.* Dispersal habitat is proposed for thinning within the core areas of two spotted owl activity centers (Table 28) under *Alternatives 2, 3,* and *4.* 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). Although core areas associated with the Smith Quarry and Upper Johnson Creek sites contain less than 50 percent suitable habitat (Table 26), both sites have been unoccupied since 2004 and 1998, respectively (Table 26). The Smith Quarry site has never produced young and the Upper Johnson Creek site last fledged young in 1990. Therefore, thinning is not expected to cause a decline in productivity or of use by spotted owls within these two core areas in the near term.

Designated Critical Habitat –Thinning treatment would modify a Primary Constituent Element, dispersal habitat, by reducing canopy cover within Critical Habitat. As described above in the discussion of effects to dispersal habitat, the function of the dispersal habitat within Critical Habitat would be maintained. Although stand structure would be modified as a result of thinning, the average canopy closure is expected to remain in excess of 44 percent, and would therefore continue to provide foraging and dispersal opportunities. The proposed treatment would not change the amount or pattern of dispersal habitat available for dispersing spotted owls across the landscape, within the Critical Habitat Unit, and between Critical Habitat Units.

The Johnson Cleghorn project is designed, in part, 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. 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 Critical Habitat Unit would increase for the spotted owl over time.

(3) *Consequences Unique to Alternative 1*

Under *Action Alternative 1,* no treatment would occur within those units or portions of units that are located within a spotted owl core area. Thus, Unit 5A and portions of Units 7A, 8A, and 8C would be untreated as "skips" under this alternative. Approximately148 acres of dispersal habitat would be thinned outside of core areas. *Alternative 1* would treat the fewest acres of dispersal habitat and as a result those stands would take longer than treated stands, under the other alternatives, to develop the structural diversity and complexity associated with older forests (≥ 80 years of age). In addition, there would also be no loss of dispersal habitat due to road construction since there is no road construction under this alternative.

Dispersal Habitat –Under *Alternative 1*, approximately 148 acres of dispersal habitat would be treated. The treatment would be of low intensity consisting of light thinning, resulting in a post-harvest stand average canopy cover ranging between 83-97 percent and a high residual density (q.v. *Forest Vegetation,* Table 14). Thus, with a minimal loss of canopy cover, potential predation risks to spotted owls are not expected to increase. However, the higher residual density would yield single-storied stands without size differentiation between trees and stratification of canopy layers. These forest conditions would continue to delay the development of structural diversity and complexity important for spotted owls and flying squirrels. These stand conditions would also hinder establishment and growth of a robust understory with shrubs, grasses, and forbs that would provide shelter and forage for small mammals. However, the high residual density would leave more trees available for natural snag recruitment through suppression mortality (Table 29). Though higher snag recruitment is expected under this alternative, the snags would be of a smaller diameter and would become down woody debris sooner than larger snags.

In the long term, it is predicted that down wood cover would be at approximately 14 percent within 100 years (Table 29), exceeding the 10 percent cover considered necessary to ensure high prey populations (e.g. small mammals) for owls (Cary *et al.*,1999a). However, because of the high residual density post-harvest, these stands would likely remain a relatively homogenous stand of Douglas fir, impeding the growth of shade tolerant conifers and the development of a multi-layered canopy indicative of mature or old-growth forests (Table 29) and suitable habitat.

Home Range – Although the light intensity of the treatment would not provide for stand differentiation (as described above), the treatment would create some habitat diversity within the home ranges of four spotted owl sites (Table 30).

Table 30. Treatment of Dispersal Habitat within Spotted Owl Home Ranges for Alternative 1.

Alternative 1	**Spotted Owl Sites**				
	Halfway Creek	Halfway Ridge	Hardenbrook Creek	Smith Quarry	Upper Johnson Creek
Home Range					
Dispersal Habitat *acres treated (% of available dispersal habitat)*	26 (5%)	73 (6%)	0	55 (5%)	148 (11%)
New Road Construction *acres (miles)*	0	0	0	0	0
Roads to be Decommissioned *acres (miles)*	0.4 *(0.08)*	0.5 *(0.1)*	0	0	0.9 *(0.2)*
No treatment of dispersal habitat, new road construction, or road decommissioning would occur within any ***Core Areas****.*					

Core Area – No treatment would occur within those units or portions of units that are located within a spotted owl core area. The dispersal habitat within the core areas would remain in its current condition and continue to develop under high tree densities as described under the *No Action Alternative* section above.

Designated Critical Habitat – Treatment of approximately 148 acres would modify dispersal habitat, a Primary Constituent Element, on approximately 0.1 percent of Critical Habitat unit OR-13 (118,515 acres). Important components of the Primary Constituent Elements contributing to canopy cover would remain because treatments would be of low intensity consisting of light thinning only. No road construction would occur within Critical Habitat under this alternative. However, approximately 0.2 miles of road would be decommissioned, providing the opportunity for some habitat components to develop (e.g. re-establishment of shrubs, forbs, and grasses) on 0.9 acres (Table 30) of Critical Habitat.

(4) <u>*Consequences Unique to Alternative 2*</u>

Approximately 352 acres of forest habitat would be modified under *Alternative 2* to accelerate the development of structural characteristics associated with suitable forest habitats. Modification of dispersal habitat would be of variable intensity using a combination of light, moderate, and heavy thinning treatments and the creation of gap openings within the stands (q.v. *Design Features Unique to Alternative 2*; Table 5). Variable treatment would create and promote diversity within the stands, including the development of a multi-species and multi-layered canopy, large trees with complex canopies and large limbs, and eventually larger snags and down wood.

Snags and down woody debris would be acquired through passive recruitment through suppression mortality. Passive recruitment of snags and down wood would be expected to occur at lower levels in those areas treated at higher intensities (q.v. *Forest Vegetation*; Table 19, pg. 34). However, skips and areas of lower treatment intensities would continue to provide a source of snags and down wood within the stand. The variable intensities of thinning treatment under *Alternative 2* would result in a high amount of stand differentiation, developing more structural components and diversity within the stand that is characteristic of suitable habitat.

Dispersal Habitat – The treatment of 352 acres would be of variable intensity resulting in a post-harvest stand average canopy cover ranging between 44-84 percent. With the exception of Units 7B and 7D, the units would have a post-harvest canopy cover ranging between 44-57 percent and are expected to return to a 60 percent canopy in 5-10 years. Because the thinning intensity would be higher within the units (except 7B and 7D), they would yield a multi-layered canopy with establishment of understory shrubs, grasses, and forbs. In addition, larger trees with more complex crown and limb structure would develop as a result of reduced competition within the stand.

In contrast, Units 7B and 7D would have a post-harvest canopy cover (84 and 74 percent, respectively) and residual density (q.v. *Forest Vegetation,* Table 17, pg. 34). These post-harvest stand conditions would result in the development of single-storied stands without size differentiation between trees and stratification of canopy layers, which may largely preclude establishment and growth of a robust understory with shrubs, grasses, and forbs that would provide shelter and forage for small mammals. However, since there would be more residual trees susceptible to suppression mortality, these stands would be expected to yield more snags and down wood in the short term. At least 23 percent (averaging 43 percent) or more of each unit is comprised of "no treatment" and lightly thinned areas. These areas would provide a source of dead wood, as well as provide habitat that would serve as refugia and travel corridors for flying squirrels.

The composite of harvest types and their distribution in this alternative suggest that in the next 100 years, many attributes found in natural mature and old-growth stands would develop, including a layered structure and the development of shade tolerant conifer species. Development of a multi-layered structure is expected as early as twenty years after thinning. In the long term, it is predicted that down wood cover would be at approximately 5 percent within 100 years (Table 29), below the 10 percent cover considered necessary to ensure high prey populations (e.g. small mammals) for owls (Cary *et al.*,1999a). However, the amount of down wood (cubic feet per acre) is predicted to be within the threshold recorded for mature and old-growth forests (Table 29).

Home Range – Dispersal habitat conditions would be temporarily modified within all five home ranges (Table 31). Variable density treatment would improve habitat conditions by promoting the development of habitat diversity and structure, improving foraging and roosting opportunities within the home ranges.

Table 31. Treatment of Dispersal Habitat within Spotted Owl Home Ranges for Alternative 2.

Alternative 2	Spotted Owl Sites				
	Halfway Creek	Halfway Ridge	Hardenbrook Creek	Smith Quarry	Upper Johnson Creek
Home Range					
Dispersal Habitat *acres treated*	51 (10%)	111 (10%)	49 (4%)	182 (16%)	352 (26%)
New Road Construction *acres (miles)*	0	0	0	0	0
Roads to be Decommissioned *acres (miles)*	0.4 *(0.08)*	0.5 *(0.1)*	0	0	0.9 *(0.2)*
Core Area					
Dispersal Habitat *acres treated*	0	0	0	43 (10%)	20 (14%)
New Road Construction *acres (miles)*	0	0	0	0	0
Roads to be Decommissioned *acres (miles)*	0	0	0	0.6 *(0.1)*	0.8 *(0.2)*

Core Area – A total of 71 acres of dispersal habitat are proposed for treatment, within the core areas of two spotted owl activity centers (Table 28 and 31). Variable density treatment would improve habitat conditions by promoting the development of habitat diversity and structure within the core areas, improving foraging and roosting opportunities in the long term.

Designated Critical Habitat – Treatment of 352 acres would modify dispersal habitat on approximately 0.3 percent of Critical Habitat unit OR-13 (118,515 acres in total size). Thinning would be of variable intensity resulting in a post-harvest stand average canopy cover ranging between 44-84 percent, thus treatments would remove structures contributing to canopy cover. Canopy cover is expected to return to at least 60 percent stand average within 5-10 years. A canopy cover of 60-80 percent would improve roosting habitat conditions to provide for thermoregulation, shelter and cover to reduce predation risks while resting or foraging. In addition, treatment would improve roosting and foraging habitat characteristics contributing to Primary Constituent Elements; these stands would develop a multi-layered and multi-species canopy with large overstory trees, large snags and eventually large down wood and sufficient open space below the canopy for spotted owls to fly. No road construction would occur and approximately 0.2 miles of road would be decommissioned within Critical Habitat under *Alternative 2.*

(5) *Consequences Unique to Alternative 3*

Approximately 386 acres of forest habitat would be modified under *Alternative 3* to accelerate the development of structural characteristics associated with late seral forest habitats. As with *Alternative 2,* modification of forested stands would be of variable intensity using a combination of light, moderate, and heavy thinning treatments and the creation of gap openings within the stands. Therefore, effects of *Alternative 3* would be similar as those discussed for *Alternative 2*. *Alternative 3* differs from *Alternative 2* by: 1) approximately 1.4 miles (6.8 acres) more road construction; 2) 29 more acres of dispersal habitat would be modified; and 3) active recruitment of snags and down wood.

This alternative would include the construction of roads, impacting a total of 6.8 acres of forest habitat. Twelve spurs would be constructed with road-lengths varying from approximately 0.06 to 0.41 miles, totaling approximately 1.4 miles (q.v. *Design Features Unique to Alternative 3*, Table 8, pg. 22). Because the clearing limits for the road construction would be approximately 40 feet wide and of relatively short lengths (average spur length is 0.1 miles) and would occur within stands less than 50 years of age, canopy closure would not be altered significantly along the road corridors. Therefore, these roads would not be expected to cause significant edge effects or habitat fragmentation, and are not expected to create a barrier to dispersing small mammals and wildlife.

Approximately 0.3 miles of road, including six of the spurs (ranging in length from 0.02 to 0.2 miles) would remain post-harvest and would remove 1.5 acres from forest production within the action area. Disturbance to wildlife may increase within the vicinity of these roads due to humans and vehicle traffic, causing animals to avoid these areas when humans are present.

Approximately 1.1 miles (5.3 acres) of road would be decommissioned after harvest is complete, including six of the constructed roads and two existing "native" roads (ranging in length from 0.06 to 0.4 miles). Decommissioning roads with waterbars and mulching with slash would reduce disturbances to wildlife caused by humans by eliminating vehicle access to these roads. Understory vegetation, including grasses, forbs, shrubs, and seedling trees, would begin to re-establish on these roadbeds.

Home Range – Dispersal habitat conditions would be temporarily modified within all five home ranges. Acres of treatment within the home ranges of three of the sites (Halfway Creek, Hardenbrook Creek, and Smith Quarry) would not differ (< 3 percent) when compared to *Alternative 2*, which is similar in treatment intensity as *Alternative 3*. Road construction and decommissioning would occur within all five home ranges (Table 32).

Table 32. Treatment of Dispersal Habitat within Spotted Owl Home Ranges for Alternative 3.

Alternative 3	Spotted Owl Sites				
	Halfway Creek	Halfway Ridge	Hardenbrook Creek	Smith Quarry	Upper Johnson Creek
Home Range					
Dispersal Habitat *acres treated*	55 (10%)	133 (11%)	49 (4%)	216 (18 %)	386 (29 %)
New Road Construction *acres (miles)*	0.3 *(0.06)*	1.9 *(0.4)*	0.6 *(0.12)*	3.9 *(0.8)*	6.8 *(1.4)*
Roads to be Decommissioned *acres (miles)*	0.7 *(0.14)*	0.9 *(0.2)*	0.6 *(0.12)*	3.1 *(0.6)*	5.3 *(1.1)*
Core Area					
Dispersal Habitat *acres treated*	0	0	0	43 (10%)	23 (16%)
New Road Construction *acres (miles)*	0	0	0	0.6 *(0.1)*	0.8 *(0. 2)*
Roads to be Decommissioned *acres (miles)*	0	0	0	0.6 *(0.1)*	0.8 *(0.2)*

Core Area – A total of 68 acres of dispersal habitat are proposed for treatment, encompassing the core areas of two spotted owl activity centers (Table 31 and Table 32). Two core areas, Smith Quarry and Upper Johnson Creek, would each have construction of a short spur road on 0.6 and 0.8 acres, respectively (Table 32). Both roads would be decommissioned after harvest activities are complete and are not expected to impact future use of the core areas by spotted owls. Vegetation beneficial for prey species, including grasses, forbs, shrubs, and seedling trees would be expected to re-establish on these roadbeds.

Dispersal Habitat – The treatment of 386 acres would be of variable intensity resulting in a post-harvest stand average canopy cover ranging between 44-84 percent. With the exception of Unit 7B, the units would have a post-harvest canopy cover ranging between 44-57 percent and are expected to return to a 60 percent canopy in 5-10 years. Because the thinning intensity would be higher within these units, the stands would yield a multi-layered canopy with establishment of understory shrubs, grasses, and forbs. In addition, larger trees with more complex crown and limb structure would develop as a result of reduced competition within the stand. In contrast, Unit 7B would have a post-harvest canopy cover of 84 percent. The high residual density would yield a single-storied stand without size differentiation between trees and stratification of canopy layers, which may largely preclude establishment and growth of a robust understory with shrubs, grasses, and forbs that would provide shelter and forage for small mammals within this stand.

Snags and down wood would be actively recruited under this alternative. Within one year of harvest, one tree per acre would be felled to create down wood and 1.2 trees per acre would be killed to create snags. Additional creation of dead wood would provide shelter and habitat micro sites for spotted owl prey in the short term. Active recruitment of snags and coarse woody debris would provide these features sooner (i.e. immediately following treatment) than through passive recruitment under the other alternatives. Actively recruited snags and coarse woody debris would contribute to stand conditions for approximately 70 years post-harvest. Hagar (2009) has demonstrated that artificially-created small snags (<18 inches diameter at breast height) in thinned units will begin to provide foraging habitat after five years. Passive recruitment of snags and down wood would be expected to occur at lower levels in those areas treated at higher intensities. However, at least 23 percent (averaging 39 percent) or more of each unit is comprised of "no treatment" and lightly thinned areas. These areas would provide a source of dead wood, as well as provide habitat that would serve as refugia and travel corridors for flying squirrels.

With the exception of percent down wood cover, development of suitable stand attributes within 100 years would be at similar levels as predicted under *Alternative 2* (Table 29). *Alternative 3* would yield a higher percent of down wood cover, predicted at approximately 8 percent (Table 29), but below the 10 percent cover considered necessary to ensure high prey populations (Cary *et al.*,1999a). However, the amount of down wood (cubic feet per acre) is predicted to be within the threshold recorded for mature and old-growth forests (Table 29).

Designated Critical Habitat – Treatment of 386 acres would modify dispersal habitat on approximately 0.3 percent of Critical Habitat unit OR-13 (118,515 acres in total size). Additional snags and down wood would be created under *Alternative 3* which would foster additional micro site habitat conditions for spotted owl prey in the short term, contributing to Primary Constituent Elements (e.g. dispersal habitat) relating to dispersal and foraging habitat.

Approximately 1.4 miles (6.8 acres) of road would be constructed of which 1.1 miles would be decommissioned post-harvest. Thus, approximately 0.3 miles of road, including six spurs (ranging from 0.02 to 0.23 miles) would remain post-harvest and would preclude 1.5 acres from developing into spotted owl habitat within Critical Habitat Unit OR-13. As described previously, the new roads are not expected to cause significant edge effects or habitat fragmentation for the spotted owl, nor are they expected to create a barrier to dispersing small mammals. The decommissioned roads are expected to return to habitat production, with the re-establishment of understory vegetation and seedlings.

(6) <u>*Consequences Unique to Alternative 4*</u>

Approximately 395 acres of dispersal habitat would be modified under *Alternative 4*. Modification of forest habitat would be a combination of light and moderate thinning treatments within the stands. Impacts due to road construction and road decommissioning would be the same as described for *Alternative 3*.

Home Range –Approximately 395 acres of dispersal habitat would be modified by thinning activities within the home ranges of five known spotted owl sites (Table 31 and Table 33). This alternative would treat the highest number of acres within each home range, but with reduced intensity of treatment (no heavy thinning or gap creation) as described for *Alternatives 2* and *3*. Impacts due to road construction are the same as those identified under *Alternative 3*.

Table 33. Treatment of Dispersal Habitat within Spotted Owl Home Ranges for Alternative 4.

Alternative 4	Spotted Owl Sites				
	Halfway Creek	Halfway Ridge	Hardenbrook Creek	Smith Quarry	Upper Johnson Creek
Home Range					
Dispersal Habitat *acres treated*	56 (11%)	137 (12%)	49 (4%)	219 (19%)	395 (29%)
New Road Construction *acres (miles)*	0.3 *(0.06)*	1.9 *(0.4)*	0.6 *(0.12)*	3.9 *(0.8)*	6.8 *(1.4)*
Roads to be Decommissioned *acres (miles)*	0.7 *(0.14)*	0.9 *(0.2)*	0.6 *(0.12)*	3.1 *(0.6)*	5.3 *(1.1)*
Core Area					
Dispersal Habitat *acres treated*	0	0	0	43 (14%)	23 (16 %)
New Road Construction *acres (miles)*	0	0	0	0.6 *(0.12)*	0.8 *(0.16)*
Roads to be Decommissioned *acres (miles)*	0	0	0	0.6 *(0.12)*	0.8 *(0.16)*

Core Area – A total of 65 acres of dispersal habitat are proposed for treatment, within core areas of two spotted owl activity centers (Table 28 and 33). As described for *Alternative 3,* two core areas would each have construction of a spur road. Both roads will be decommissioned after harvest activities are complete and vegetation beneficial for prey species would be expected to re-establish on these roadbeds.

Dispersal Habitat – The treatment of 395 acres would be of variable intensity resulting in a post-harvest stand average canopy cover ranging between 69-79 percent. Maintenance of canopy cover between 60-80 percent would retain favourable roosting conditions for spotted owls. High canopy cover would also maintain habitat conditions beneficial for flying squirrels. Post-harvest tree density would yield some stand differentiation between trees and stratification of canopy layers, allowing for establishment and growth of an understory with shrubs, grasses, and forbs that would provide shelter and forage for small mammals. However, without the creation of gaps and use of heavy thinning, stand conditions would be less diverse than those described for *Alternatives 2* and *3.*

The composite of harvest types and their distribution in this alternative suggest that in the next 100 years, many attributes found in natural mature and old-growth stands would develop, including a layered structure and the development of shade tolerant conifer species. Development of a multi-layered structure is expected as early as twenty years after thinning. Within 100 years, it is predicted that down wood cover would be at approximately 6 percent (Table 29), below the 10 percent cover considered necessary to ensure high prey populations for owls (Cary *et al.*, 1999a).

Designated Critical Habitat – Treatment of 395 acres would modify dispersal habitat on approximately 0.3 percent of Critical Habitat Unit OR-13 (118,515 acres in total size). Thinning treatments would be of light to moderate intensity resulting in a post-harvest stand average canopy cover ranging between 69-79 percent. Maintenance of canopy cover above 60 percent would retain favourable roosting conditions. Impacts due to road construction and road decommissioning would be the same as described for *Alternative 3*.

(7) Cumulative Effects to Northern Spotted Owls

Of the 56,532 acres (federal and private) within the Upper Smith River Fifth-field Watershed, there are approximately 28,240 acres (50 percent) of dispersal-only habitat on Federal lands. Within the past five years, approximately 515 acres of thinning has occurred and approximately 510 acres of thinning is planned within the next five years, collectively affecting 4 percent of the dispersal habitat within the watershed. The proposed action alternatives would modify from 0.5 to 1.3 percent (*Alternative 1* to *Alternative 4*) of dispersal habitat within the watershed (Table 34). Including this proposed action, approximately 1,173-1,378 acres (4-5 percent) of dispersal habitat would be modified within the watershed spanning 10 years.

Table 34. Cumulative Effects to Spotted Owl Dispersal Habitat within the Upper Smith River Fifth-field Watershed.

Upper Smith River Fifth-Field Watershed 56,532 acres		Dispersal-Only Habitat (Federal Lands Only) 28,240 acres			
		Alt 1	Alt 2	Alt 3	Alt 4
Past Thinnings (2005-2010)	515	148	317	346	353
Reasonably Foreseeable Thinnings (2010-2015)	510				
Cumulative Effects	Total Acres	1173	1342	1371	1378
	Percent of Dispersal Habitat Effected	4.2	4.8	4.9	4.9

Cumulative effects within the analysis area would include past and "reasonably foreseeable" thinning projects that would result in additional acres of modified dispersal habitat within the home range and core area for the Smith Quarry and Upper Johnson Creek owl sites (Table 35). Treatments associated with past thinnings resulted in similar post harvest conditions as discussed for *Alternative 4*. Dispersal capabilities of these stands remained because canopy cover was maintained above 40 percent. Because both of these spotted owl sites have essentially been unoccupied over the past five years or more (Table 35), thinning treatment of dispersal habitat is not expected to affect productivity or use at these sites in the short term. The proposed action is designed, in part, to create and enhance the development of structural characteristics associated with late seral habitat, thus creating additional suitable nesting, roosting, and foraging habitat in the future within the core area and home ranges. The variation of thinning treatments is expected to provide for greater diversity of dispersal habitat characteristics within these home ranges.

Cumulative adverse effects to spotted owls will 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 across the District 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.

Table 35. Cumulative Effects to the Smith Quarry and Upper Johnson Creek Spotted Owl Sites.

Dispersal-Only Habitat (Federal Lands Only) *acres*		**Northern Spotted Owl Site (IDNO)**					
		SMITH QUARRY **(4663O)**			UPPER JOHNSON CREEK **(2041O)**		
		Home Range	Core Area	Nest Patch	Home Range	Core Area	Nest Patch
CURRENT CONDITIONS		*1,164*	*318*	*0.7*	*1,344*	*143*	*2*
Past Thinnings (2005-2010)		196	90	0	196	90	0
Reasonably Foreseeable Thinnings (2010-2015)		0	0	0	187	0	0
Proposed Action	Alt 1	55	0	0	148	0	0
	Alt 2	182	43	0	317	6	0
	Alt 3	187	43	0	346	9	0
	Alt 4	190	43	0	353	10	0
Cumulative Effects *(percent of current conditions)*	Alt 1	***251 (22%)***	***90 (28%)***	***0***	***531 (40%)***	***90 (63%)***	***0***
	Alt 2	***378 (32%)***	***133 (42%)***	***0***	***700 (52%)***	***96 (67%)***	***0***
	Alt 3	***383 (33%)***	***133 (42%)***	***0***	***729 (54%)***	***99 (69%)***	***0***
	Alt 4	***386 (33%)***	***133 (42%)***	***0***	***736 (55%)***	***100 (70%)***	***0***

2. Marbled Murrelet (Federally Threatened)

Nesting habitat for the marbled murrelet includes mature (with or without an old-growth component) and old-growth coniferous forests; younger coniferous forests that have platforms; and any forested area with a residual component, small patches of residual trees, or one or more platforms (Mack *et al.*, 2003). Grenier and Nelson (1995) determined that stand structure is more important than stand age, and that murrelets were selecting stands with old-growth characteristics, including large trees with nesting platforms, vertical canopy cover (hiding cover), and variable canopy cover.

A nest structure or platform is a relatively flat surface at least 10 centimeters (4 inches) in diameter and 10 meters (33 feet) high in the live crown of a coniferous tree. Platforms can be created by a wide bare branch, moss or lichen covering a branch, mistletoe, witches brooms, other deformities or structures such as squirrel nests (Mack *et al.*, 2003).

Availability of trees with platforms is critical for nesting (McShane *et al.* 2004) and the presence of platforms appears to be the most important stand characteristic for predicting murrelet presence in an area (Hamer *et al.* 1994). Nelson and Wilson (2002) found that potential nest platforms per acre were a strong correlate for nest stand selection by murrelets in Oregon. Forest stands with trees greater than 80-years-old may provide platforms, but the quality and abundance of trees with platforms and the number of platforms per tree is more apparent in stands over 150-years-old.

At the stand level, vertical complexity is correlated with nest sites (Meekins and Hamer 1998, Manley 1999, Waterhouse *et al.* 2002, Nelson and Wilson 2002), and flight accessibility is probably a necessary component of suitable habitat (Burger 2002). Stands with low canopy closures and low tree densities would be expected to have longer sight distances through the canopy. In these cases, murrelet nests would be easier to locate by visual predators (e.g. corvids).

Potential suitable habitat includes forested stands within 50 miles of the coast containing a residual component of potential nesting structure, as described in the *Management of Potential Marbled Murrelet Nesting Structure in Thinning Stands* guidance (herein referred to as *The Residual Habitat Guidelines*) of March 26, 2004 (BLM and USFWS, 2004). This habitat type occurs in 40-79 year old stands when residual or remnant trees were left standing during previous harvest. *The Residual Habitat Guidelines* describe a process for identifying areas of potential suitable murrelet habitat in these stands.

Habitat development (e.g. tree growth, regeneration, and certain silvicultural prescriptions favoring development of large trees with an abundance of platforms) enhances murrelet nesting habitat and has a positive effect on murrelet populations. These processes also can result in development of potential nesting habitat that may be "recruited" as murrelet nesting habitat at some time in the future (Madsen *et al.*, 1999). Size of suitable stands would increase as managed stands develop suitable habitat components and integrate with adjacent suitable stands. Larger stands will: (1) provide more nesting and hiding opportunities, (2) provide for multiple alternative nesting sites for individual pairs of birds over time, (3) facilitate nesting for multiple pairs of birds (and thus promote increased social contact), and (4) provide greater interior forest habitat conditions (to reduce potential nest and adult predation, increase protection of nests from windstorms and environmental changes, and reduce loss of habitat from wind throw and fire) (USFWS, 1997).

a) Affected Environment

Disruption/Disturbance – The concepts of "disturbance" and "disruption" were defined previously in regards to northern spotted owls (q.v., pg. 45) and those concepts apply to marbled murrelets as well. The proposed Johnson Cleghorn project is located between 30 and 32 miles from the coast within Marbled Murrelet Inland Management Zone 1 (within 0-35 miles of the coast/marine environment). Suitable habitat (in general, stand age ≥ 80 years) is adjacent to all proposed units.

Habitat – Some proposed thinning units have large residual trees that pre-date the existing stands, but overall lack suitable nesting habitat. Surveys for "potential" suitable marbled murrelet nest trees were completed within all the Johnson Cleghorn units following the Residual Habitat Guidelines (USDI USFWS & BLM, 2004). Six potential nest trees were located within Units 7A and 4A. Two trees in Unit 7A and all three trees in Unit 4A are considered suitable habitat and are associated with adjacent suitable habitat.

Designated Critical Habitat –Critical Habitat for the marbled murrelet was designated in 1996 (61 FR 26256-26320), and includes the Primary Constituent Elements that support nesting, roosting, and other normal behaviors that are essential to the conservation of the marbled murrelet. The Primary Constituent Elements include: 1) individual trees with suitable nesting platforms, and 2) forested areas within 0.8 kilometers (0.5 miles) of nest trees with a canopy height of at least one-half the site-potential tree height (61 FR 53843). Designated Critical Habitat also includes habitat that is currently unsuitable, but has the capability of becoming suitable ("recruitment") habitat in the future (61 FR 26256-26320).

There are 3.3 acres, in the southern portion of Unit 7C, within Critical Habitat Unit OR-04-g. Treatment of 3.3 acres would affect less than 0.6 percent of the Critical Habitat Unit (544 acres).

b) Environmental Consequences

(1) No Action Alternative

The quality and availability of marbled murrelet habitat would be unaffected under the *No Action Alternative*. Development of trees capable of providing nesting habitat for marbled murrelets would be delayed or would not occur at all in the homogenous stands with high tree densities. Under conditions of high relative density, tree canopies would remain confined and develop more cylindrically than conically. Thus, tree crowns would continue to recede and large limbs that provide nesting platforms would not be expected to develop within the next 100 years.

(2) Consequences Common to Alternatives 1, 2, 3, and 4

A general description of effects to the marbled murrelet and its habitat are provided initially, followed by specific affects for each action alternative.

Disturbance/Disruption – Because there is unsurveyed suitable habitat adjacent to all proposed units, disruption effects to marbled murrelets would be avoided during the nesting season through the application of seasonal and daily operating restrictions. Seasonal restrictions from April 1st through August 5th and daily operating restrictions from August 6th through September 15th (q.v. *Design Features Common to Proposed Action Alternatives 1, 2, 3, and 4*, pg. 13) would be applied to all harvest operations that occur within 100 yards of suitable habitat.

Cable yarding may require the use of trees tailholds and guyline anchors, outside the unit boundaries within suitable habitat. Guyline trees that are cut could result in loss of suitable nest trees, but the potential number of trees is not known. To the extent possible, trees with suitable nesting structure (large trees with platforms or limbs > 4 inches) would be avoided. To ensure that tree removal does not directly affect marbled murrelets, seasonal restrictions and daily operating restrictions would be implemented.

Habitat- No suitable habitat would be removed or modified under *Alternatives 1, 2, 3,* and *4*. For all action alternatives, in order to maintain microclimate conditions and avoid significant edge effects, light thinning would be prescribed for those portions of units within 100 feet of stands of adjacent suitable habitat. Unit boundaries would be adjusted so five of the six suitable nest trees located within Units 7A and 4A, would be located outside of unit boundaries. In addition, there is one potential nest tree in Unit 7A that is located within the proposed unit boundary and would be protected from damage under the *Residual Habitat Guidelines* (USDI USFWS & BLM, 2004). This potential nest tree and those trees immediately adjacent with interlocking canopies would be retained to maintain micro-site conditions around the potential nest tree.

The thinning treatment of 148 to 395 acres of forest habitat would have no direct impacts to suitable marbled murrelet habitat, because suitable habitat would not be removed or modified. Trees containing existing platform structures and adjacent trees with interlocking canopies with suitable habitat trees would be maintained within the stand. In general, the thinning treatments are expected to accelerate the development of desired habitat conditions for the marbled murrelet, including multi-story canopies with large overstory conifer trees containing complex limb structure or deformities.

However, the future development of large trees and large limbs is dependent on the intensity of the treatment. Larger trees with larger limbs will develop within stands with greater thinning intensities resulting in lower tree densities within the stand. As the density of large limbs and other suitable platform structures increases within a stand, the probability of marbled murrelets occupying a stand also increases (Hamer 1995, Nelson and Wilson 2002). In addition, as the stands develop late-seral characteristics and canopies begin to interact with adjacent suitable habitat, the amount of interior habitat will increase as suitable stands increase in size. The increase of interior habitat with suitable nest structures would increase nesting opportunities for the murrelet while decreasing predation risks at nest sites.

Based on the Organon model simulating stand characteristics for these stands under all alternatives, suitable habitat components important for marbled murrelets including a multi layered canopy with large overstory conifers would be expected to develop within 100 years (Table 29). However, the number and size of suitable nest platforms (e.g. limbs > 4 inches) that would develop within the stand in 100 years is unknown.

Designated Critical Habitat – The proposed project would implement treatment on up to 3.3 acres, thereby modifying habitat on approximately 0.6 percent of marbled murrelet Critical Habitat unit OR-04-*g* (544 acres). Primary Constituent Elements of Critical Habitat would be modified, since trees that are within 0.5 miles of suitable nest trees and are at least one-half site potential tree height would be removed. However, because existing nest structure would not be removed, the Critical Habitat Unit would maintain its function by continuing to provide forested habitat that could support future nesting opportunities for marbled murrelets. The proposed thinning prescriptions would accelerate the development of suitable habitat characteristics and is consistent with the

Marbled Murrelet Recovery Plan (USDI USFWS 1997, Recovery Action 3.2.1.3). Road construction would not occur within Critical Habitat for the marbled murrelet.

(3) Consequences Unique to Alternative 1

Approximately 142 acres of forest habitat that would be treated with low intensity, resulting in a post-harvest stand average canopy cover ranging between 83-100 percent (q.v. *Forest Vegetation*; Table 14, pg. 32). As discussed for the spotted owl, thinning would release trees and foster accelerated growth in the short term. However, in the long term as stand canopies reclose and crown expansion ceases, canopy stratification would not occur and the development of large trees with suitable nest platforms would be largely precluded. Some platform development may occur if trees adjacent to remnant trees are removed to reduce competition for resources. There would be no road construction under this alternative.

Designated Critical Habitat – The proposed project would modify 2.0 acres (0.4 percent), of forest habitat on approximately 0.4 percent of marbled murrelet Critical Habitat unit OR-04-*g* (544 acres). The proposed thinning prescription would result in a high residual density post-harvest which would yield single-storied stands without size differentiation between trees and stratification of canopy layers. Therefore, development of large trees with suitable nest platforms would be largely precluded. Some platform development may occur if trees adjacent to remnant trees are removed to reduce competition for resources.

(4) Consequences Unique to Alternative 2

Approximately 352 acres would be treated with variable intensities using a combination of light, moderate, and heavy thinning treatments and the creation of gap openings within the stands. Variable density treatments would create and promote diversity within the stands, including the development of a multiple species and canopy layers, as well as large trees with complex canopy and large limbs, especially in areas that are heavily thinned and in gaps with retention trees. Thus, variable density thinning would establish a growth trajectory that could eventually produce larger trees with abundant platforms that would provide additional nesting opportunities. There would be no road construction under this alternative.

Designated Critical Habitat – The proposed project would modify forest habitat on approximately 3.2 acres (0.6 percent) of marbled murrelet Critical Habitat unit OR-04-*g* (544 acres). Variable treatment would create and promote diversity within the stands, including the development of a multi-species and multi-layer canopy, as well as large overstory trees with complex canopy and large limbs. Thus, variable density thinning would establish a growth trajectory that would produce larger trees with abundant platforms that would provide additional nesting opportunities.

(5) Consequences Unique to Alternative 3

Approximately 386 acres would be treated with variable density prescriptions using a combination of light, moderate, and heavy thinning treatments and the creation of gap openings which would yield similar results of stand development as described for *Alternative 2*. Road construction would occur on a total of 6.8 acres and its effects to the forest habitat is described in the spotted owl section (q.v., pg. 58). Road construction would not be expected to cause edge effects that would modify micro climate conditions around suitable platform trees or habitat fragmentation which could increase predation risks at murrelet nest sites by providing additional access to stands by corvid species (e.g. jays, crows, ravens).

Designated Critical Habitat – The proposed project would modify forest habitat on approximately 3.2 acres (0.6 percent) of marbled murrelet Critical Habitat unit OR-04-*g* (544 acres). The proposed thinning prescription on approximately 3.3 acres would yield similar results on habitat development as described under *Alternative 2*.

(6) <u>Consequences Unique to Alternative 4</u>

Approximately 395 acres would be treated with light to moderate intensity, resulting in a post-harvest stand average canopy cover ranging between 69-79 percent (q.v. *Forest Vegetation*; Table 23, pg. 38). This alternative would have a low to moderate likelihood of developing a multi-layered canopy and large trees with large limbs. Once canopies reclose crown expansion would cease, canopy stratification would not occur, and development of large trees with suitable nest platforms would be largely precluded. Some platform development may occur if trees adjacent to remnant trees are removed to reduce competition for resources. Impacts due to road construction and road decommissioning would be the same as described for *Alternative 3*.

Designated Critical Habitat – The proposed project would modify forest habitat on approximately 3.2 acres (0.6 percent) of marbled murrelet Critical Habitat unit OR-04-*g* (544 acres). The proposed thinning prescription on approximately 3.3 acres would result in a high to moderate residual density post-harvest which would more or less yield single-storied stands without size differentiation between trees and stratification of canopy layers. Therefore, development of large trees with suitable nest platforms would be largely precluded. Some platform development may occur if trees adjacent to remnant trees are removed to reduce competition for resources.

(7) <u>Cumulative Effects to Marbled Murrelets</u>

This proposed alternatives are not expected to cause significant cumulative effects to marbled murrelets. The intended outcome of the alternatives is to create additional nesting opportunities in the future, by enhancing and increasing the development of suitable nest structures. Although there would be ground-disturbing activities and potential for disturbance, potential adverse impacts to the murrelets are eliminated or substantially avoided through the implementation of project design features such as retention of potential nest trees, large residual trees, and seasonal restrictions during the breeding season.

Cumulative adverse effects to murrelets will likely continue within the action area. To date, the Oregon Forest Practice Rules have not adopted regulations that provide protection to murrelets and therefore harvest of suitable murrelet habitat on private land could remove active and potential murrelet nest sites and increase risk to the persistence of the species in the action area.

C. Soils

1. Affected Environment

The landscape within the Johnson Cleghorn project area consists of terrain ranging from gentle, broad ridges, to steep and very steep side slopes, and headwalls (Johnson et al., 2004). The majority of the project area is currently stable, with exceptions noted below. Analysis of past aerial photos from 1959 through 1983 indicated that slope failures were small and relatively few after clear cutting in the 1960s.

About one-third of the unit acres are located on stable broad ridges, and gentle to moderately sloping convex to concave sideslopes, with slopes of 30 percent or less. These soils are deeply weathered with moderate to high amounts of clays in the subsoil, with clay loams and clay textures. These soils are moderately to highly susceptible to compaction and displacement by ground equipment, because of the clay content and the low to moderate amount of gravels (Johnson et al., 2004, Williamson and Neilsen, 2000).

About one-third of the unit acres are located on moderate slopes of 30 to 60 percent, with convex and concave topography. These soils are moderately deep, 20-40 inches, to deep, greater than 60 inches. The soil textures are loams, clay loams, and some clays with moderate to high amounts of gravels and cobbles. These slopes are stable to moderately stable, but would be moderately susceptible to displacement, based on slope steepness. The potential for erosion would also be greater than the gentler terrain, due to the steeper slope gradient.

The remaining one-third of the unit acres are located on steep to very steep sideslopes of 60 to 90 percent or more, with moderately deep to shallow soils, less than 20 inches deep. These areas include steep bedrock shelves and rock outcrops surrounded by very shallow soils, less than 10 inches deep, on very steep slopes of greater than 90 percent. The soils are not well developed, with moderate to very high amounts of gravels and cobbles. Soil textures generally range from sandy loams and loams to clay loams. Units 4A and 9A contain several headwall areas or unstable areas just above the stream inception points or adjacent to the stream course.

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).

The cable yarding in the 1960s included both uphill and downhill yarding, with at least partial log suspension in most units. However, about one-third of Unit 7D was ground-lead, downhill, with little log suspension. Today there are shallow furrows 3-8 inches deep of displaced soils from the downhill yarding over the 20-35 percent slopes. Trenches that are up to 3 feet deep are located at the lower end of the unit. The remaining two-thirds of Unit 7D was ground based yarded, with a network of skid trails covering about 10-15 percent of the area.

In the proposed unit areas that were previously ground based yarded, the old skid trails are compacted to varying degrees. The major skid trails have heavy compaction with dense and massive to platy soil structure of exposed subsoil in the top five to six inches or more over the running surface, where the topsoil has been scraped off or displaced. Secondary skid trails generally have compacted soils to 3 to 4 inch depth along the tread areas, which are three to four feet wide per tread area. The main skid trails are predominantly vegetated with forbs, moss, or shrubs with little erosion taking place in most places. The secondary trails are vegetated with conifers as well as forbs, moss and shrubs.

In steeper areas that were cable yarded in the 1960-70s, several small (less than 1/20 acre) shallow, slope failures occurred in and adjacent to Unit 9B. Also, a road fill failure occurred from side cast road construction in Unit 7B. These areas and the affected downstream areas are currently fully vegetated. In the western portion of Unit 9A, a shallow road fill failure that occurred in the 1970s is partially revegetated.

In Unit 5A a rock quarry was constructed prior to 1970, but is no longer in use. Portions of the quarry site are vegetated with conifers and hardwoods, such as alder. However, some of the very steep slopes of the rock quarry are still exposed, with some soil erosion occurring. Rock cliffs and ledges remain from the excavation activities along the main ridge.

2. Environmental Consequences

a) 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).

There would be no change in the stability of the soils, since there would be no soil disturbance. There could be occasional shallow, rapid slope failures during storm events.

b) Consequences Common to Alternatives 1, 2, 3, and 4

(1) Soil Displacement and Compaction

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).

(i) Ground-Based Yarding

Past monitoring of timber sales of ground-based harvest systems on the Roseburg District from fiscal years 2000 through 2010 has shown that with the proposed project design features in Johnson Cleghorn, the amount of ground affected by harvest machinery ranged from 3 to 9 percent of the harvest unit (USDI/BLM, 2004, 2006, 2007, and 2008; pers. obs., W.Fong, 2008-2009). 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.

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). The area affected in Johnson Cleghorn would average less than six percent of ground-based harvest areas in skid trails, landings (including log deck areas and equipment areas), and large piles.

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.

A forwarder would collect the processed logs, and make repeated passes on a trail. The forwarder would use every second or third harvester trail to collect and transport the processed logs. The repeated passes on a forwarder trail would generally result in some soil displacement and compaction along the tread areas. However, water bars and subsoiling would not be constructed on forwarder trails, since there is slash remaining on the trails, compared to tractor or and rubber tired skidder systems where slash is typically absent.

Monitoring has shown that forwarder trails plus landings covered from 3-9 percent of the unit area; but not all of that area had detrimental soil impacts. These trails resulted in the top 3-6 inches of soil having light to heavy compaction, mainly concentrated in the tread areas (USDI/BLM, 2000; USDI/BLM, 2004; USDI/BLM, 2006; USDI/BLM, 2008; pers. obs., W.Fong, 2008 and 2009). Within the forwarder tread areas, the top one to three inches of soil were displaced. When conducted over slash and dry soil conditions, harvester operations have either not compacted soil or only lightly compacted soil in the tread areas. Although the surface area covered by harvester/forwarder trails can be similar to that covered by tractors, the amount of detrimental compaction and soil displacement is generally less with harvester/forwarders than with tractors (USDI/BLM, 2000, pgs. 94-96).

The light thinning prescription would result in approximately five percent of the ground-based harvest area having detrimental soil compaction and displacement. Heavy thinning and gap prescriptions would result in approximately 10 percent of the ground-based harvest area having detrimental soil compaction and displacement. Light thinning prescription would result in less detrimental soil conditions because there would generally be less timber volume extracted which would require less passes and fewer trails to be made with ground-based equipment.

Alternative 1 has the least amount of ground-based yarding (52 acres; Figure 2), while *Alternatives 2, 3,* and *4* have similar amounts of ground-based yarding (78-81 acres; Table 36, Figures 4, 6, and 8 respectively). Ground-based yarding on designated trails and on slopes generally less than 35 percent would reduce soil displacement and the extent of area affected.

Table 36. Yarding on Gentle to Very Steep Slopes in Johnson Cleghorn.

Alternative	Gentle to Moderate Slopes (< 60 percent)			Moderate to Very Steep Slopes (> 60 percent)		Cable Yarding Total	
	Uphill Cable Yarding (acres)	**Downhill Cable Yarding** (acres)	**Ground-Based Yarding*** (acres)	**Uphill Cable Yarding** (acres)	**Downhill Cable Yarding** (acres)	**Uphill** (acres)	**Downhill** (acres)
No Action	0	0	0	0	0	0	0
1	45	9	52	39	3	84	12
2	130	61	78	76	7	206	68
3	188	23	80	90	5	278	28
4	193	23	81	90	8	283	31

* Ground-Based Yarding would generally be limited to slopes less than 35 percent.

(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 in Johnson Cleghorn (USDI/BLM, 2007, pg. 97; USDI/BLM, 2008, pgs. 86-87; USDI/BLM, 2009, pgs. 72-73; pers. obs., 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.

Downhill cable-yarding in areas without favorable deflection or 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. The soil effects of downhill yarding on moderate to very steep slopes (i.e. greater than 40 percent) are uncertain because most of the recent monitoring for cable yarding impacts has been based on uphill yarding or on downhill where slopes were less than 40 percent. One project was monitored where downhill yarding was conducted on slopes 24 to 65 percent. The total percent area with detrimental soil impacts was less than 2 percent. However, the landings were situated such that the effective corridor yarding slopes were about 35 percent or less and the corridors were also relatively short (pers. obs., W.Fong, 2010).

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). In addition, 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 100 feet and average corridor spacing of 200 feet would reduce the number of yarding corridors and landings, thus reducing the spatial extent of soil disturbance and compaction.

In some instances, downhill yarding would enable less road construction. *Alternative 2* would have 37-40 acres more downhill cable yarding than *Alternatives 3* or *4* (Table 36), but would also have 1.27 miles less proposed road work than those alternatives as well (q.v. *Description of the Alternatives*, Table 2).

(2) *Slope Stability*

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

The stands on Johnson Cleghorn are 42-51 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).

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. In Johnson Cleghorn, the most likely slope failure would be occasional shallow (3 feet or less in depth), rapid slope failures as noted in the affected environment. The occasional shallow, rapid slope failures or other small slope failures would not exceed the level and scope of soil effects considered and addressed in the PRMP/EIS (USDI/BLM, 1994; Chapter 4; pgs. 12-16)

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 Johnson Cleghorn 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.

The proposed thinning and gap openings in *Alternatives 2* and *3* would decrease the current tree canopy and the live root mass helping to hold the soil in place for a short period, until the remaining roots of the residual trees expanded into the thinned and cleared areas. In cleared areas or openings, root strength drops to a low point in seven to ten years and then improves rapidly. After 10 years, the landslide susceptibility drops substantially (USDI, 2008; pg. 348; Robison et al., 1999). In the gap areas, the residual trees along the border would grow into the open areas, as well as understory vegetation, such as shrubs, forbs and grasses, that would also take up any increased soil moisture and help in stabilizing the soil.

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 all alternatives, these areas have been buffered with no-treatment areas (q.v. *Hydrology, Aquatic Habitat, & Fish*).

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 majority of the proposed routes for road construction would utilize old, existing skid roads, tractor fire lines, or jeep roads. *Alternatives 3* and *4* would have 1.4 miles of road construction, whereas *Alternatives 1* and *2* would have none. The creation and use of landings and roads would displace and compact soil, thereby decreasing soil productivity. Native surface spur roads, main skid trails, and associated landings in areas proposed for moderate to heavy thinning or gaps would be subsoiled; especially in areas with high amounts of clay soils. These areas would be subsoiled because a relatively large amount of timber volume would be extracted in these areas that would require multiple equipment passes. Subsoiling would contribute to growth and productivity of planted seedlings and allow natural seedlings to become established.

Subsoiling would also help prevent runoff and erosion by reducing the amount of soil compaction and increasing water infiltration into the soil. Subsoiling would provide approximately 80 percent soil fracturing (from subsoiling monitoring of the Diet Coq Commercial Thinning area, South River Resource Area, Roseburg BLM; pers. obs., W. Fong, 2006). Although subsoiling does not produce total recovery from soil compaction or restore detrimental soil displacement, it would be an important step in the recovery process (Luce, 1997). Out of the 1.4 miles of road construction proposed in *Alternatives 3* and *4*, approximately 0.51 miles (2.5 acres) would be subsoiled and mulched with logging slash, to help initiate soil recovery from compaction and displacement and to help replace duff and surface soil organic matter.

Table 37. Estimated Acres[a] in Roads, Main Skid Trails/Forwarder Trails, Landings, & Ground Based Yarding.

Alternative	Road Construction		Main Skid Trails, Forwarder Trails, & Landings		TOTAL	
	Amount to be Built (acres)	**Amount to be Subsoiled** (acres)	**Amount to be Used** (acres)	**Amount to be Subsoiled** (acres)	**Amount to be Built/Used** (acres)	**Amount to be Subsoiled** (acres)
1	0	0	3.1	0	**3.1**	**0**
2	0	0.8[b]	4.7	1.8	**4.7**	**1.8[b]**
3	6.8	2.5	4.8	1.7	**11.6**	**4.2**
4	6.8	2.5	4.9	0	**11.7**	**2.5**

[a]Based on an average of 6 percent of ground based areas in main skid trails/forwarder trails and landings, with 70 percent of these areas being subsoiled.
[b]*Alternative 2* also has 0.17 miles of maintenance/renovation on Spur 5A proposed for subsoiling.

D. Hydrology, Aquatic Habitat, & Fisheries

1. General Affected Environment

The Johnson Cleghorn project area lies within the Halfway Creek, Johnson Creek-Smith River, and the Middle Smith River Seventh-field drainages of the Upper Smith River Fifth-field Watershed. The Halfway Creek-Smith River and Headwaters Smith River Sixth-field subwatersheds of the Upper Smith River Fifth-field Watershed have been identified by the BLM as a Tier 1 Key Watershed in the 1994 FEIS (ch. 2-5). Hydrologic units with this classification serve as refugia for maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species (1994 FEIS, ch. 2-5).

Smith River is listed on the Clean Water Act 303(d) list for exceeding year around temperature as essential to salmon and trout rearing and migration. Smith River is now covered under the Oregon Department of Environmental Quality's 2006 Umpqua Basin Total Maximum Daily Load and Water Quality Management Plan which was approved by the U.S. Environmental Protection Agency on April 12, 2007.

Perennial stream channels pass some volume of water throughout the year. Conversely, at some time during the year, flow ceases in intermittent stream channels and water is no longer transported downstream. In the analysis area there are approximately 14 miles of perennial stream and another 32 miles of intermittent stream. Approximately two miles of stream in the analysis area are also spatially interrupted. Most commonly, spatial interruption can be attributed to subsurface flow. When streamflow subsides into the substrate it begins a cooling process which can moderate downstream temperature impacts (Story et al., 2003).

Stream channel substrates in the project area are comprised primarily of cobble and small boulders in smaller stream channels, and bedrock in the larger stream channels. High levels of natural or management-related fine sediment contributed to stream channels often results in gravels and cobbles that are embedded in this fine material. Embedded substrates are an indication of aquatic habitat that is of lesser quality – a result of the fine sediments reducing habitat for aquatic insects, filling pools, and potentially smothering fish eggs in the gravel. Field surveys conducted throughout the project area found no evidence of high levels of substrate embeddedness (Lightcap, 2010). This is an indication that stream channels appear to be processing sediment contributions by routing smaller particles to downstream areas instead of storing them.

Average annual precipitation in the analysis area is 50 inches occurring primarily between October and April. Elevation in the analysis area ranges from 490 feet at the confluence of Smith River and Slideout Creek up to 1,560 feet at the headwaters of Johnson Creek. The analysis area is entirely within a rain-dominated hydroregion (i.e. below 2,000 feet elevation).

A variety of anadromous (sea run) fish are found within the project area, including Fall Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. 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*), redside shiner (*Richardsonius balteatus*), and threespine stickleback (*Gasterosteus aculeatus*).

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 fish bearing portions of Smith River, Johnson Creek, and Little Johnson Creek within the project area are considered to be critical habitat for OC coho salmon.

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 Johnson Cleghorn analysis area, there are approximately 10.6 miles of essential fish habitat. The majority of this habitat is located in the main stem of Smith River, with small segments also being found in Johnson Creek, Lower Johnson Creek, and an unnamed tributary between Units 4A and 9B (Figure 18).

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.

Extensive timber and stream management actions from the 1950's through the 1980's in the Pacific Northwest have resulted in a large proportion of aquatic habitats that are considered degraded (Meehan et al, 1991; Williams et al, 1997). This is especially true along the larger, fish bearing stream channels. Aquatic habitat conditions in fish bearing streams within the project area are representative of this trend. The past combination of splash damming, riparian timber harvest, physical removal of large wood from streams (stream cleanout), construction of roads along stream channels, and harvest of unstable areas have all led to highly simplified aquatic habitat conditions throughout the project area.

Within the project analysis area, GIS analysis indicates that approximately 70 percent of the Riparian Reserves have been previously harvested. In general, previously harvested riparian areas are dominated by dense, single age stands of Douglas fir – with little vegetative or structural diversity (q.v. *Forest Vegetation*).

Recent habitat surveys summarizing the quantity and quality of fish habitat within the project area are not available. Therefore, habitat assessments discussed below are general in nature, and based on recent field reviews of streams and riparian areas in the project area.

Larger streams in the project area (Smith River, Johnson Creek, Lower Johnson Creek) are currently lacking in large, stable woody material, and therefore do not retain the smaller woody material or gravel and cobble substrates being routed downstream annually. Stream channel substrates in these areas are dominated by bedrock, instead of the gravels and cobbles that would be expected in more complex channels. Overall channel widths are also wider than would be expected based on their respective drainage areas. Specific aquatic habitat components, such as woody material, are discussed in detail related to the relevant resource issues identified later in this chapter.

Aside from salmonid spawning and rearing and utilization by resident fish and other aquatic life, there are no additional beneficial uses of water immediately downstream of the analysis area. The nearest filed water right on the Smith River is approximately 28 miles downstream from the analysis area which is beyond the influence of any potential impacts. The analysis area does not lie within any municipal drinking water sources.

a) Analytical Methodology

For hydrologic and aquatic analysis purposes, unless otherwise noted, the scale of analysis includes the Johnson Creek-Smith River and Middle Smith River Seventh-field drainages as well as a 163 acre analytical hydrologic unit (AHU) in the Halfway Creek drainage (Figure 18). The AHU extent was defined by the project hydrologist so as to encompass all potential impacts without including a substantially larger Seventh-field drainage. At the scale of the AHU, impacts will be more apparent and won't be diluted by looking at them at a larger scale.

The Roseburg District BLM examined the harvest prescriptions to consider the impacts of transpiration and hydrologic gaps on the availability of water to streams. Based on a compilation of small catchment studies in the Northwest, a peak flow response in a rain-dominated hydroregion is only detectable where at least 29 percent of the drainage area is harvested (Grant et al., 2008). Areas with less than 30 percent canopy closure are considered a "gap" from a hydrologic perspective (2008 FEIS (Appendices, 226)); this is used as a surrogate for Equivalent Clearcut Acres (ECA) when calculating the risk for peak flow enhancement.

The Roseburg District BLM looked at the amount of roads under each alternative, to consider whether new road construction could increase the risk of peak flow enhancement. Existing roads and landings may modify storm peaks by reducing infiltration, which would allow more rapid surface runoff (Ziemer, 1981). Existing roads may also intercept subsurface flow and surface runoff and channel it more directly into streams (Ziemer, 1981). However, peak flows have been shown to have a statistically significant increase due to effects from roads only when roads occupy at least 12 percent of the watershed (Harr, *et al.* 1975).

This analysis focused on four key components of aquatic habitat: woody material, fine sediment, water temperature, and Riparian Reserve vegetative conditions. This is based on the assumption that these four components are the primary factors influencing the present and future condition of aquatic habitat and fish populations.

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, snowmelt, forest canopy interception of water and snow, road interception of surface and subsurface flow and changes in soil infiltration rates and soil structure (2008 Final EIS; pg. 352). The Halfway Creek-Smith River Sixth-field subwatershed, in which the analysis area lies, is not considered susceptible to increases in peak flow stemming from unrecovered canopy openings (2008 Final EIS; pg. 755).

The project area is within a rain-dominated hydroregion, and the Halfway Creek-Smith River subwatershed is not considered susceptible to peak flow enhancement (2008 Final EIS, pg.

755). While evidence suggested that peak flow enhancement was not likely to be an effect from the proposed action or alternatives, there were many questions regarding the impacts of roads during the scoping period. As such, the BLM decided to include peak flow risk as an issue for detailed analysis.

Based on 2006 aerial photo interpretation, across all land ownerships, there are currently 2,267 acres (8.3 percent) of canopy openings within the Halfway Creek-Smith River Sixth-field subwatershed (Table 38).

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. Within the past five years, most of the culverts along the 21-7-8.0 road were redesigned and replaced and now accommodate water and sediment flux.

Existing roads in the analysis area total approximately 27 miles, of which 21 miles (including the main haul roads) are surfaced with rock or asphalt. The remaining six miles are natural surface, many in poor condition and subject to poor drainage and erosion. These mileages are estimates based on those roads that are currently within the BLM transportation records and may not include un-inventoried roads and/or recently constructed roads on private lands. Many roads within the analysis area have re-vegetated and are overgrown due to lack of maintenance and use. These roads are relatively stable, but are still compacted and are subject to poor drainage and erosion. No areas of road surface erosion or gullying were observed except for the on the 21-7-8.1 road. The last 800 feet of the 21-7-8.1 road, while being overgrown and relatively stable, was never waterbarred and at least one culvert was never removed. The culvert is used to drain an intermittent stream where it crosses the road. However, the culvert is rusted, allowing water to leak out the bottom. Between leaking and the fact that the culvert is perched, road fill is gradually eroding and washing downstream to a large deposition area. This failing culvert represents a chronic source of fine sediment to lower Johnson Creek and the Smith River during the winter months.

During field review of Unit 5A, a non-numbered, abandoned road was discovered along the bottom boundary of that unit. This road still has stream crossing culverts in place, but is currently overgrown with vegetation. In its current state, this road represents a substantial risk of future failure, and is a potential source of future fine sediment to the aquatic system.

The average road density, which is an index of the relative amount of roads in the analysis area, is 4.88 miles per square mile. Roads under BLM ownership comprise 90 percent of the total road mileage in the analysis area. Remaining roads are owned by private entities. Based on road widths (assuming a 40-foot average width), roads cover 128 acres and represent 3.66 percent of the analysis area. Increases in peak flow can be found when the roads and other impermeable areas contained within occupy more than 12 percent of a catchment scale watershed (Harr, et al. 1975). Within the analysis area, roads do not currently pose a risk to peak flow enhancement.

Whether or not a road is surfaced and with what material can affect drainage, surface erosion, runoff and subsequent water clarity (turbidity levels). No data regarding suspended sediment (turbidity) was found for the Upper Smith River Watershed. However, there are currently no stream miles listed by the Oregon Department of Environmental Quality as turbidity impaired that occur on BLM-managed lands. Fine sediments are generally considered to be sand, silt, and clay less than 2 millimeters in size. These materials occur in two primary forms – particles that are suspended in the water column (turbidity) and those that are deposited on the channel bottom (sedimentation or embeddedness).

Roads which cross streams represent potential sources for sediment delivery depending upon road surface condition and the volume of water passing the road at a given time. Road segments linked to the channel network also increase flow routing efficiency and offer a mechanism for peak flow increases (Wemple et al., 1996). Within the analysis area there are approximately 75 stream crossings.

Several recently cleaned ditchlines with disturbed and exposed soils were observed along proposed haul routes in the project area. These areas were recently seeded and mulched, but were likely contributing fine sediment to the aquatic system during the wetter months. This contribution will lessen over time as grasses and other vegetation reestablish the sites, and begin to filter and trap sediments mobilized in the ditchlines.

b) Environmental Consequences

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

The Roseburg District BLM considered several factors to determine the risk of peak flow enhancement. First, stream morphology would not be changed as a consequence of any action alternatives except for where stream bank angles would be reduced to an angle of repose to restore proper functioning condition following removal of the failing culvert on the 21-7-8.1 road. The high gradient cascade and step-pool stream types of the analysis area would remain unchanged and subsequently resistant to peak flow enhancement as described in the *No Action Alternative*.

Under the *No Action Alternative*, overly dense stands of timber in Riparian Reserves will lead to greater transpiration rates, effectively reducing water availability to the streams themselves and altering overall soil-moisture conditions (Ziemer, 1981).

It is presumed that hydrologic impacts (such as peak flow increases) change with the intensity of treatment, with clear cut harvest having the greatest impact and thinning treatments having the least. In an overview of several studies, peak flow enhancement can be mitigated when individual trees or small groups of trees are harvested; reduced evapotranspiration from overstory vegetation following clearing may be strongly countered by evapotranspiration from the understory due to increased availability of energy and soil water (Keppeler and Ziemer, 1990).

Alternatives 1 and *4,* light and moderate thinning, respectively, would not contribute new canopy openings from a hydrologic perspective. *Alternatives 2* and *3,* however, prescribe gaps, which would leave openings in the forest canopy, but none larger than 1.6 acres in Riparian Reserves. Additionally, heavy thinning applied in Unit 4A would result in a post-treatment canopy cover of 20 percent which would be considered a gap from a hydrologic perspective in terms of rain interception by the canopy cover. Table 38 (below) shows the acres of canopy openings by alternative and the percentage of the sixth-field subwatershed in equivalent clearcut acres. *Alternative 3* has the most equivalent clearcut acres but is still well under the 29 percent threshold at which a peak flow response may be detectable.

Table 38. Canopy Openings in Hydrologic Analysis Area.

Alternative	**Current Canopy Openings** (acres)	**Additional Canopy Openings from Treatment** (acres)	**Resulting Sixth-field Subwatershed ECA* (percent)**
No Action	2,267	0	8.3
Alternative 1	2,267	0	8.3
Alternative 2	2,267	54	8.5
Alternative 3	2,267	57	8.5
Alternative 4	2,267	0	8.3

*Equivalent Clearcut Area.

(2) Road Impacts on Peak Flow Susceptibility

Under both the *No Action Alternative* and *Alternative 1*, there would be no new road construction. Under *Alternative 2*, there would be a 0.17 mile net reduction of roads within the analysis area, and roads would occupy 127.2 acres or 3.63 percent of the analysis area. As such, none of these alternatives would increase the risk of peak flow enhancements by increasing the total road mileage, roaded area, or road density.

Under *Alternatives 3* and *4*, after proposed road construction and road decommissioning in the analysis area there would be a net gain of approximately 1.07 miles of roads which would increase road density by 0.19 miles per square mile. The road construction would add approximately 5 acres to the total roaded area which would increase the roaded area within the analysis area from 3.66 percent to 3.80 percent. This is below the 12 percent threshold at which peak flows may increase due to road effects. In addition, the new roads proposed for construction would not cross any stream channels, and would be hydrologically disconnected. Therefore, these roads would not contribute to peak flow increases caused by increased flow routing efficiency – as described previously by Wemple et al (1996).

At the scale of the Tier 1 Key Watershed, past road decommissioning efforts allow for no net gain of roads under these alternatives which is consistent with management direction (Table 39). There have been 11.1 miles of road fully decommissioned in the Upper Smith River Fifth-field Key Watershed since its original identification (USDI BLM, 2009; pg. 75). Changes to the road network are detailed in Table 39 and the specifics of the roadwork by are detailed in Table 8. Given previous road decommissioning activities coupled with the road construction proposed under this alternative, there would not be a net increase in road mileage.

Table 39. Changes to Road Network by Alternative within Tier 1 Watershed.

Alternative	**Change in road mileage** (miles)	**Change in road area** (acres)
No Action	0	0
Alternative 1	0	0
Alternative 2	-0.17	-0.82
Alternative 3	-0.51	-2.47
Alternative 4	-0.51	-2.47

(3) <u>*Sedimentation from Roads*</u>

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.) This lack of road maintenance would be most prominent on roads that are not well used or on roads which 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 chronic source of fine sediment originating from the failing road crossing on the 21-7-8.1 road would continue to deliver sediment to Lower Johnson Creek and Smith River. If the culvert were to fail entirely, approximately 123 cubic yards of road sediment (based on field measurements and calculations by the project soil scientist) would enter the stream network to the detriment of hydrologic and biologic resources.

The main haul roads proposed for use in all action alternatives in the analysis area (i.e. the 22-7-2.0 road and the 20-7-27.0 road) have been surfaced with asphalt, thereby eliminating their potential to contribute haul-related sediment to the aquatic system.

The proposed haul routes would only cross streams on existing roads that already possess adequate drainage structures and ditches, except as noted on the 21-7-8.1 road. Timber hauling could occur in both the dry and wet seasons. All haul routes reach pavement within two miles. Non-paved roads on the haul route would cross eight intermittent streams. With the exception of the 21-7-8.1 road which would remain native surface, these crossings are on roads which are or would be surfaced with aggregate rock material. Utilization of the 21-7-8.1 road is expected to be light since most timber would be yarded uphill to the 21-7-17.0 road.

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 have well vegetated ditchlines that serve to filter and trap sediments. Past monitoring of timber haul and sediment delivery on similar road systems in the Oregon coast range (Lightcap, 2009) 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 haul 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 *Alternatives 2, 3* and *4* (Table 40). None of the road construction in Riparian Reserves (under *Alternatives 3* and *4)* 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; none of the proposed roads would include new stream crossings. The nearest segment of road construction to OC coho salmon habitat is located roughly 0.2 miles 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.

Table 40. Road Activities within Riparian Reserves by Alternative.

Alternative	Road Construction (miles)	Road Improvement (miles)	Road Maintenance/Renovation (miles)
No Action	0	0	0
Alternative 1	0	0	1.19
Alternative 2	0	0.23	1.06
Alternative 3	0.20	0.20	0.99
Alternative 4	0.20	0.20	0.99

Under all action alternatives, use of the 21-7-8.1 road as part of the proposed haul route would enable BLM to fund removal of the failing culvert and decommission the road. Upon completion of use, the failing culvert on the 21-7-8.1 road would be removed to reduce existing sedimentation issues as was described in the Affected Environment section.

(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* and *Alternative 1*, 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.

In addition to Riparian Reserves associated with stream channels, in *Alternatives 1, 2, 3,* and *4*, all areas deemed unstable by the project Soil Scientist were 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. 70-72).

There would be potential for localized soil disturbance and erosion associated with harvest and yarding operations under *Alternatives 2, 3,* and *4* within Riparian Reserves. However, full suspension of timber would be required, where practical, when yarding across streams (q.v., pg. 9) under *Alternatives 2, 3* and *4*. This would reduce the risk of sedimentation arising from streambank and channel disturbance.

There would be no need to cross intermittent streams under *Alternatives 1* or *2* with ground-based logging equipment but under *Alternatives 3* or *4*, there would two potential stream crossings. In the vicinity of the potential stream crossings, both streams are completely interrupted due to flat terrain (i.e. flow underground). Spatial interruption of the stream network can also be attributed to the fact that this area was previously a rock quarry – an area of extensive ground disturbance. Stream flow has likely subsided into this rock and is well armored. A stream crossing in these locations would result in no sediment inputs to the stream network, although the PDFs described in *Alternative 2* would still be implemented to the extent practical. If a stream crossing in these locations is necessary, the Project Design Features described for *Alternatives 3* and *4* (q.v. pgs. 21 and 24, respectively)should be implemented to minimize or eliminate sediment additions to the stream.

Under *Alternatives 2, 3,* and *4,* the BLM would apply a "no-harvest" buffer of 35 feet (slope distance) either side of the edge 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 in the near-stream region 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) Stream Temperature Impacts

Under all alternatives, shade that regulates water temperature in streams would be maintained in Johnson Cleghorn. Under the *No Action Alternative* and *Alternative 1,* effective stream shade would be maintained since there would be no silvicultural prescription within the Riparian Reserve. Under *Alternatives 2, 3,* and *4,* effective stream shade would be maintained. 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. Beyond 60-feet from streams, evidence for increasing air temperature and relative humidity is not distinguishable from the upslope (Rykken et al., 2007). Maintaining a 50 percent canopy closure outside of this buffer within the Riparian Reserve is also essential in preventing increases of stream and air temperatures (2008 FEIS, p. 761). Canopy closure within Riparian Reserves will be maintained at a minimum of 50 percent despite the implementation of gaps under *Alternatives 2* and *3.*

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 judgement, 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. Where there are pockets of large wood, the amount of small functional wood is relatively high when compared to surrounding areas without in-stream large wood.

In smaller streams adjacent to previously harvested stands, field surveys (Lightcap, 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 in the Oregon Coast Range, 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 213 trees per acre (TPA). Based on studies in the Oregon Coast range by Tappenier et al (1997), conifer stands in the Oregon coast range 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 3 to 4 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 conducted in all stream sizes within the analysis area (Lightcap, 2010), large wood levels are low 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 pockets of 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 range from 10-15 inches dbh (Table 10), and average 117 feet in height (Kintop, 2010), and would be considered as small functional wood if they entered adjacent stream channels.

b) Consequences of the No Action Alternative and Alternative 1

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). The *No Action Alternative* and *Alternative 1* do not propose any thinning within Riparian Reserves. As a result, tree growth rates in these areas would continue on their current trajectory – leading to increased suppression mortality and decreasing diameter.

(1) Small Functional Wood

The *No Action Alternative* and *Alternative 1* would maintain existing stand densities throughout the untreated areas. These densities average 213 trees per acre (TPA). Therefore, these alternatives would result in no reduction of small functional wood available to enter stream channels in the future.

(2) Large Wood

Based on the trend of increasing suppression mortality and decreasing diameter growth in these stands, the *No Aaction Alternative* and *Alternative 1* would result in an increase in the time needed for average stand diameters to attain values of 20 inches or greater, when compared to alternatives that decrease stand density, which as a result would increase tree growth rates.

c) Consequences of Alternatives 2, 3, and 4

(1) Small Functional Wood

Alternatives 2, 3, and *4* propose to 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. 200 or 400 feet).

In *Alternatives 2, 3,* and *4*, no-harvest buffers ranging from 35 or 60 feet in width would maintain existing stand densities (averaging 213 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. The potential impacts to aquatic habitat from this reduction would be small, however, due to the decreasing probability of these trees falling towards and entering stream channels from distances further away from the stream. 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).

Stand densities in thinned areas would average from 55-57 TPA. 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 80-96 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*

Alternatives 2, 3, and *4* all propose thinning in the outer portions of the Riparian Reserve. Based on a retrospective study of similar stand treatments (Bailey and Tappeiner, 1998), 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 Johnson Cleghorn 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* and *Alternative 1*, with their 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 in these 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 be expected to attain late seral characteristics over a longer time frame when compared to *Alternatives 2, 3,* and *4*. In addition, due to the relatively high stand densities present over a longer period of time, there is a higher risk of mass tree mortality from large natural disturbance events such as windstorms or fire.

As riparian thinning treatments are carried out in *Alternatives 2, 3,* and *4*, 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.

The cumulative increase in vegetative diversity in Riparian Reserves, coupled with the increase in availability of large wood to enter streams, would contribute positively to the trend of gradually improving habitat in the Upper Smith River Watershed. When compared to alternatives that do not include riparian thinning, these alternatives would hasten the attainment of healthy aquatic habitat capable of supporting the natural fish species mix and population variability typical of healthy coastal ecosystems. These changes would rarely be measurable at the site scale.

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, recreational and/or commercial harvest, etc.

In addition, while there would be a small reduction in the amount of standing small functional wood in the outer Riparian Reserve (as discussed previously), 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.

It is also important to point out that there are 5.7 miles of stream channels within or adjacent to the proposed units or actions; 1.2 miles of these stream channels are considered to be perennial (i.e. flowing surface waters during the summer months). Approximately 0.28 miles of the perennial stream channels support fish populations (Figure 18). Therefore, there is an inherently low probability of any of the action alternatives resulting in a measureable impact on fish habitat and/or fish populations.

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. Logging Economics

1. Affected Environment

The expense associated with road work, timber yarding, timber hauling, other miscellaneous activities, and the pond value (delivered log value) of the timber influence the economic viability of a timber sale like Johnson Cleghorn. Other factors that affect the viability are the harvest volume per acre, seasonal restrictions and winter logging opportunities. If there is a decision to implement this project, BLM would conduct a field cruise and an analytical appraisal to establish a minimum bid price. Forest products must not be offered for sale less than 10 percent of their pond value or wholesale selling value, if other than log form. (BLM Manual 9351.14) The overall value of the timber removed on Johnson Cleghorn would be determined based on the final bid price at auction.

The three most expensive cost categories associated with a timber sale like Johnson Cleghorn are road work, timber yarding, and timber hauling. The higher the cost per thousand board feet ($/MBF) for these expenses, the lower the overall value of the timber sale. Log prices and the market value of timber are highly volatile. Therefore, they were not used in this analysis.

a) Road Work

For the purposes of this economics analysis, "road work" includes road maintenance/renovation, road improvement, and road construction. The BLM estimated the average costs for the road work proposed amongst *Alternatives 1, 2, 3,* and *4* in Johnson Cleghorn. The estimated road work cost for *Alternative 1* is $86,625.00, *Alternative 2* is $99,225.00, and *Alternatives 3* and *4* is $183,725.00 each. These estimated costs are intended to provide a means to compare the relative cost of road work amongst *Alternatives 1, 2, 3,* and *4* and not the actual expense of road work associated with a given alternative.

b) Timber Yarding

For the purposes of this economics analysis, timber yarding includes; felling, bucking, yarding and loading timber. Timber yarding costs will vary depending on the type of yarding system that will be used. Johnson Cleghorn *Alternatives 1, 2, 3,* and *4* all have a combination of ground based, uphill cable, and downhill cable (q.v. *Soils*; Table 36). Generally, ground based yarding is the least expensive of these three systems; and downhill cable is the most expensive. Downhill cable yarding averaged 2.5 times more expensive than uphill cable yarding (World Forest Institute 1997).

The cost of yarding timber is based on production and the type of system. Production is directly related to the amount of volume per acre being removed. Higher timber volume per acre generally yields higher production rates. The estimated volume per acre was based on the amount of harvest volume divided by harvest acres to be used in Johnson Cleghorn under *Alternatives 1, 2, 3,* and *4* (Table 41).

Table 41. Timber Volume Harvested in Johnson Cleghorn Thinning.

	Timber Volume Harvested				
	No Action	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Harvest Acres	0	148 acres	352 acres	385 acres	395 acres
Harvest Volume	0	2,107 MBF	10,288 MBF	10,949 MBF	7,538 MBF
Average volume per acre	0	14 MBF/acre	29 MBF/acre	28 MBF/acre	19 MBF/acre

The cost of timber yarding was estimated based on the acreage of ground-based, uphill cable, and downhill cable yarding systems that would be used in Johnson Cleghorn under *Alternatives 1, 2, 3,* and *4* (q.v. *Soils*; Table 36). For this economic analysis, BLM assumed that the acres of yarding accomplished per day would be 1.5 acres for ground-based systems, 1.0 acre for uphill yarding systems, and 0.5 acres for downhill yarding systems. The average truckload was assumed to be 4.5 MBF based averages used on current thinning timber sales. Based on these assumptions an estimated number of loads per day by logging system were used amongst *Alternatives 1, 2, 3,* and *4* in Johnson Cleghorn.

Logging costs per MBF were calculated using Pacific Northwest Logging Costs program (World Forest Institute 1997). The average cost per MBF of timber yarding for a given alternative was based on the weighted average of ground-based, uphill, and downhill yarding (Table 42). The estimated cost of timber yarding for *Alternative 1* is $402,226.30 ($190.90/MBF), for *Alternative 2* is $1,182,194.08 ($114.91/MBF), for *Alternative 3* is $1,120,082.70 ($102.30/MBF), and for *Alternative 4* is $1,160,550.48 ($153.96/MBF). These estimated costs are intended to provide a means to compare relative cost of the timber yarding amongst *Alternatives 1, 2, 3,* and *4* in Johnson Cleghorn and would not be the actual expense incurred.

Table 42. Weighted Timber Yarding Costs in Johnson Cleghorn.

Alternative	Harvested Volume (MBF)	Percent of Ground Base Yarding	Percent of Uphill Cable Yarding	Percent of Downhill Cable Yarding	Weighted Cost ($/MBF)
1	2,107	35	58	8	$190.90
2	10,288	22	59	19	$114.91
3	10,949	21	72	7	$102.30
4	7,538	21	72	8	$153.96

c) Timber Hauling

For the purposes of this economic analysis, the cost of timber hauling was estimated based on the number of hours it would take to haul timber loads amongst *Alternatives 1, 2, 3,* and *4* in Johnson Cleghorn. The number of loads for each alternative is based on the estimated amount of volume to be harvested under *Alternatives 1, 2, 3,* or *4* (Table 41) divided by an average of 4.5MBF per load. Based on previous timber sales in the vicinity of *Alternatives 1,* *2, 3,* and *4* in Johnson Cleghorn it is estimated that each load of logs would take four hours round trip to be delivered. The estimated number of loads for each alternative is multiplied by the four hours for estimated total number of hours for timber hauling. The hourly rate for timber hauling used in five other thinning timber sales that were auctioned during the fourth quarter of fiscal year 2010 was $65 per hour.

Based on these assumptions, the estimated timber haul cost for *Alternative 1* is $121,940.00 ($57.87/MBF), for *Alternative 2* is $594,620.00 ($57.80/MBF), for *Alternative 3* is $632,840.00 ($57.80/MBF), and for *Alternative 4* is $435,760.00 ($57.81/MBF). These estimated costs are intended to provide a means to compare relative cost of hauling timber amongst *Alternatives 1, 2, 3,* and *4* in Johnson Cleghorn and would not be the actual expense incurred.

d) Miscellaneous Expenses

The BLM acknowledges that there are additional, miscellaneous activities associated with a thinning project that incur a monetary cost to perform. Examples of such miscellaneous activities include: road use fees, maintenance and rock wear fees, active snag and down wood recruitment, slash disposal, sub-soiling, road decommissioning, intermediate support and lift trees, and equipment cleaning. However, these other miscellaneous expenses were not quantified and used in the calculations to compare the economic viability of implementing *Alternatives 1, 2, 3,* and *4* of Johnson Cleghorn thinning.

2. Environmental Consequences

Based on simulations of the proposed silvicultural prescriptions using the Organon growth and yield model (Hann, 2009), between 2,107-10,949 MBF would be harvested under *Alternative 1, 2, 3,* or *4* (Table 41). Using the assumptions regarding logging expenses described above, *Alternative 3* would be the most economically viable scenario at a cost of $176.88 per MBF for road work, yarding and hauling. *Alternative 1* would be the least economically viable at a cost of $298.88 per MBF (Table 43). These figures are based only on assumptions of road work, timber yarding, and timber hauling as they relate to the estimated harvest volume.

Table 43. Estimated Logging Costs for Johnson Cleghorn Thinning.

Alternative	Volume (MBF)	Estimated Expenses ($/MBF)				Estimated Logging Cost[e] ($/MBF)
		Road Work[a]	Timber Yarding[b]	Timber Hauling[c]	Miscellaneous[d]	
1	2,107	$41.11	$190.90	$57.87	*not estimated*	$298.88
2	10,288	$9.64	$114.91	$57.80	*not estimated*	$182.35
3	10,949	$16.78	$102.30	$57.80	*not estimated*	$176.88
4	7,538	$24.37	$153.96	$57.81	*not estimated*	$236.14

[a] Cost of road work = estimated road work costs were divided by the estimated harvest volume for a cost per thousand board feet ($/MBF).
[b] Cost of timber yarding = a weighted average of cost/MBF by percent of logging system were used (World Forest Institute 1997).
[c] Cost of timber hauling = estimated cost for timber haul is based on the anticipated number of hours needed to transport to estimated volume for each alternative.
[d] Other Miscellaneous costs were not estimated for this analysis.
[e]Estimated logging cost = only includes road work, timber yarding and timber hauling.

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 Johnson Cleghorn, 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 that would result under the alternatives. 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 Johnson Cleghorn 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 proposed *Alternatives 1, 2, 3,* and *4*. The methodology used in the calculations to estimate the net carbon balance is described in *Appendix D: 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 of (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 BLM Districts of western Oregon and on the Klamath Falls Resource Area of the Lakeview BLM 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 77,536 tonnes of carbon held within the stands that comprise the Johnson Cleghorn project. This carbon is held in either the pool of "standing, live trees" (47,448 tonnes) or in the pool of "other than live trees" (30,088 tonnes) (refer to *Current Condition* in Table 44). The amount of carbon currently held in Johnson Cleghorn (77,536 tonnes) represents approximately 0.01 percent of the total carbon stored on BLM administered lands in western Oregon (417 million tonnes) 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. Environmental Consequences

a) 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* (q.v., pgs. 27-28). 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 Johnson Cleghorn would, on average over 100 years, sequester 1,380 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 roughly triple from 77,536 tonnes to 215,565 tonnes (Table 44).

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,* Johnson Cleghorn would sequester an average of 1,380 tonnes of carbon annually as the pools of "standing live trees" and "other than live trees" continue to develop and mature. In 100 years Johnson Cleghorn would represent 0.04 percent of the carbon stored on BLM administered lands in western Oregon (Table 49).

Table 44. Carbon Storage in Johnson Cleghorn Thinning 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)
	Residual	*Ingrowth*						
Current Condition	47,448	0	30,088	0	0	0	0	77,536
+10 years	67,918	0	30,088	0	0	0	0	98,006
+20 years	87,653	0	30,088	0	0	0	0	117,741
+50 years	133,946	0	37,750	0	0	0	0	171,696
+100 years	174,991	0	40,574	0	0	0	0	215,565

b) *Alternatives 1, 2, 3, and 4*

Alternatives 1, 2, 3, and *4* would have a common, consistent trend on carbon storage in Johnson Cleghorn that is discussed further below (e.g. release of carbon associated with harvest and sequestration of carbon associated with tree growth). However, these alternatives vary in the overall amount of carbon that would be released.

Under *Alternatives 1, 2, 3,* and *4,* thinning would be prescribed with varying proportions of intensity (q.v., *Treatment Prescription,* pgs. 15, 17, 20, and 23 respectively) and carbon would consequently be released from harvest-related sources. Based on ORGANON modeling, between 2.107-10.949 million board feet of timber would be harvested in Johnson Cleghorn under the different action alternatives (Table 41). Consequently, between 6,316-27,396 tonnes of carbon would be moved from the standing, live tree pool into:

- the "logging slash" pool (i.e. between 2,716-11,836 tonnes; Tables 45, 46, 47, 48),
- the "wood products" pool as pulpwood and saw logs (i.e. between 3,081-13,428 tonnes; Tables 45, 46, 47, 48),
- the "slash burning" pool which would release carbon into the atmosphere (i.e. between 56-150 tonnes, Tables 45, 46, 47, 48),
- or would be immediately released into the atmosphere following harvest (i.e. between 520-2,131 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 Johnson Cleghorn this would be between 520-2,131 tonnes of carbon). In addition, it is estimated that the consumption of between 19,887-73,160 gallons of fossil fuels (Appendix Tables D5, D6, D7) would release between 54-201 tonnes of carbon as a direct consequence of harvest operations (Tables 45, 46, 47, 48).

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 D, Tables D-3 and D-4). Over the course of 100 years following harvest, between 2,941-12,794 tonnes of carbon would be emitted from logging slash and wood products or an average of 29-128 tonnes of carbon per year, depending on alternative (Table 49).

While logging slash and wood products are emitting carbon, the standing live trees would simultaneously continue to grow, both as residual trees, and new young trees growing into the stand (referred to as "ingrowth"). Under the *No Action Alternative* and *Alternative 1*, it was assumed that while there would be some natural ingrowth under the closed canopy (i.e. 83-100 percent canopy cover; Tables 10 and 14), it would not be substantial enough to influence carbon storage. In contrast, under *Alternatives 2, 3,* and *4*, gaps, and moderate, and heavily thinned areas would be planted with a mix of conifer species to promote layered stand structure (q.v., pgs. 17, 20, and 23 respectively).

The growing trees would remove carbon from the atmosphere and sequester it within additional standing volume on-site. The amount of carbon stored in "other than live trees" would also increase over time (Tables 45, 46, 47, 48). The "standing live trees" and "other than live trees" pools in Johnson Cleghorn combined would, on average, sequester between 1,293-1,345 tonnes of carbon per year from the atmosphere over the 100 years following harvest (Table 49). The net carbon balance would nearly triple from 77,536 tonnes currently to between 214,937-221,227 tonnes in 100 years after harvest (Tables 45, 46, 47, 48).

It is noteworthy that this analysis of carbon storage yielded results different from similar, previous analyses conducted in the Swiftwater Field Office (i.e. Mud Den, Third Elk, and Clever Beaver commercial thinning projects). The Johnson Cleghorn analysis indicates that alternatives that have active forest management (particularly *Alternatives 2, 3,* and *4*) have a net carbon balance greater than that of the *No Action Alternative* after 100 years; whereas previous analyses indicated that active forest management resulted in a net carbon balance that was 60-82 percent of the carbon balance of the *No Action Alternative*. The reason that active forest management in Johnson Cleghorn would have a greater carbon balance when compared to the *No Action Alternative* is because this project has a greater proportion of no-harvest areas (e.g. skips) and *Alternatives 2, 3,* and *4* include underplanting of trees after thinning operations. The underplanting of trees would result in additional sequestration of carbon through "ingrowth" that previous analyses did not have.

Table 45. Carbon Storage in Johnson Cleghorn Thinning under Alternative 1.

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)
	Residual	*Ingrowth*						
Current Condition	47,448	0	30,088	0	0	0	0	77,536
Harvest Time (0 years)	41,132	0	30,088	2,716	3,081	(54)	(56)	76,906
+10 years	60,694	0	30,088	2,266	2,826	0	0	95,874
+20 years	79,885	0	30,088	1,931	2,700	0	0	114,604
+50 years	127,303	0	37,750	1,194	2,494	0	0	168,741
+100 years	171,506	0	40,574	537	2,319	0	0	214,937

Table 46. Carbon Storage in Johnson Cleghorn Thinning under Alternative 2.

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)
	Residual	*Ingrowth*						
Current Condition	47,448	0	30,088	0	0	0	0	77,536
Harvest Time (0 years)	22,210	0	30,088	10,904	12,371	(180)	(134)	75,261
+10 years	35,208	0	30,088	9,177	11,347	0	0	85,820
+20 years	48,460	394	30,088	7,819	10,844	0	0	97,605
+50 years	87,867	10,057	37,750	4,836	10,015	0	0	150,525
+100 years	133,277	33,666	40,574	2,176	9,313	0	0	219,005

Table 47. Carbon Storage in Johnson Cleghorn Thinning under Alternative 3.

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)
	Residual	*Ingrowth*						
Current Condition	47,448	0	30,088	0	0	0	0	77,536
Harvest Time (0 years)	20,052			11,836	13,428	(201)	(147)	75,057
+10 years	32,490	0	30,088	9,960	12,317	0	0	84,855
+20 years	45,281	408	30,088	8,487	11,770	0	0	96,035
+50 years	84,397	10,635	37,750	5,249	10,871	0	0	148,902
+100 years	130,511	35,736	40,574	2,361	10,109	0	0	219,291

Table 48. Carbon Storage in Johnson Cleghorn Thinning under Alternative 4.

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)
	Residual	*Ingrowth*						
Current Condition	47,448	0	30,088	0	0	0	0	77,536
Harvest Time (0 years)	26,971	0	30,088	8,826	10,013	(171)	(150)	75,578
+10 years	43,571	0	30,088	7,392	9,185	0	0	90,236
+20 years	60,495	0	30,088	6,299	8,777	0	0	105,659
+50 years	107,891	3,228	37,750	3,896	8,106	0	0	160,931
+100 years	158,209	13,153	40,574	1,753	7,538	0	0	221,227

Direct carbon emissions resulting from the action alternatives would range between 630 (*Alternative 1*), and 2,479 (*Alternative 3*) tonnes of carbon (Table 49). Direct emissions from *Alternatives 1, 2, 3,* and *4* would each constitute less than 0.00004 percent of annual global carbon emissions and less than 0.0001 percent of annual U.S. carbon emissions (Table 49). The amount of carbon that would be emitted from wood products and logging slash slowly over 100 years would average between 29-128 tonnes per year; again with *Alternative 1* being the lowest and *Alternative 3* being the highest amount of emissions (Table 49). The average amount of carbon emitted annually from wood products and logging slash would constitute less than 0.000001 percent of global and less than 0.000008 percent of U.S. carbon emissions (Table 49).

In contrast, *Alternatives 1, 2, 3,* and *4* would sequester an average of 1,293-1,345 tonnes of carbon per year as the pools of "standing live trees" and "other than live trees" continue to develop over the next 100 years (Table 49). Under all alternatives, in 100 years Johnson Cleghorn would represent 0.04 percent of the carbon stored on BLM administered lands in western Oregon (Table 49).

Under *Alternatives 2, 3,* and *4* it would take approximately two years for the residual stands (i.e. "standing live trees" and "other than live trees" pools) in Johnson Cleghorn to recover or sequester carbon equivalent to that released directly by the proposed action; while under *Alternative 1* it would take approximately one year. Afterwards, Johnson Cleghorn would begin to have a net increase in carbon sequestration since the average rate at which logging slash and wood products would emit carbon (i.e. 29-128 tonnes per year) would be less than the average rate at which the residual stands sequester carbon (i.e. 1,293-1,345 tonnes per year; Table 49).

Table 49. Cumulative Effects of Carbon Emissions & Storage.

Project Contribution to Carbon Emissions...	**No Action**	**Alt. 1**	**Alt. 2**	**Alt. 3**	**Alt. 4**
Direct Carbon Emission from Johnson Cleghorn (tonnes)	0	630	2,276	2,479	1,959
Average Annual Off-gassing of Wood Products and Slash from Johnson Cleghorn over 100 years (tonnes)	0	29	118	128	95
Annual Global Carbon Emissions (tonnes)	6,800,000,000				
Current Annual U.S. Carbon Emissions (tonnes)	1,700,000,000				
Project Contribution to Carbon Sequestration...	**No Action**	**Alt. 1**	**Alt. 2**	**Alt. 3**	**Alt. 4**
Average Annual Carbon Sequestration in Johnson Cleghorn (tonnes)	1,380	1,345	1,300	1,293	1,344
Annual Net Carbon Sequestration by Forest Management in the U.S. (tonnes)	196,000,000				
Project Contribution to Carbon Storage in 100 years...	**No Action**	**Alt. 1**	**Alt. 2**	**Alt. 3**	**Alt. 4**
Carbon Stored by Johnson Cleghorn in 100 years (tonnes)	215,565	214,937	219,005	219,291	221,227
Carbon Stored on BLM Administered lands in western Oregon in 100 years (tonnes)	596,000,000				

G. Resources Considered but not Analyzed in Detail

1. Special Status Wildlife Species

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 eight *Bureau Sensitive* terrestrial species associated with conifer forest habitats, of which five 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:

- **Peregrine falcon** *(Falco peregrinus anatum)*- There is no suitable nesting habitat (cliffs/rock outcrops) within the project area. However, the peregrine is expected to 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. This species has not been documented within the project area, but is expected to occur in Smith River and Halfway Creek located within the project area. 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. However, they are not a concern for the following reasons:

- **Bald eagle** *(Haliaeetus leucocephalus)*-There are no known nests within two miles of the action area. 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 since 1980 (14.9 miles to northwest of proposed project area) and the closest documented sighting in1975 was within approximately five miles (northeast) of 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.

- **Spotted tail-dropper** *(Prophysaon vannattae pardalis)* - Primarily associated with deciduous vegetation in mature forest. The proposed action would not occur within older forested stands and therefore, is not expected to have measurable effects.

a) No Action Alternative

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 *Alternatives 1, 2, 3, and 4.*

Due to closed canopy conditions and without treatment or natural disturbances, a multi-layered and multi-species canopy would not be well-developed within 100 years (q.v. *Wildlife*; Table 29). 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 attitributes would limit the amount of diversity and micro habitats used for foraging, denning, or roosting.

b) Alternatives 1, 2, 3, and 4

Special Status Species that are associated with structurally complex forests would benefit from treatments under *Alternatives1, 2, 3,* and *4.* However, the development of suitable habitat components within the stands is dependent on the intensity of the treatments. More structural components would be expected to develop within those areas treated with greater intensity and variability. The highest amount of heterogeneity would be expected to develop from a combination of no treatment areas, light to heavy thinning treatments, and gap creation within the stands. Thus, these species would benefit most from treatments of heavy thinning and gap creation under *Alternatives 2* and *3* which would best create conditions fostering the development of suitable nesting, denning, foraging, or roosting habitat. 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.

In contrast to *Alternatives 2* and *3*, higher post-harvest canopy cover conditions under *Alternatives 1* and *4*, would limit the ability of the stand to develop a diverse multi-layered canopy within 100 years (q.v. *Wildlife*; Table 29). These forest conditions would continue to delay the development of structural diversity and complexity, including large trees with large limbs.

This proposed project is not expected to cause significant 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 discussed above.

2. Landbirds

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 E addresses specific impacts to 20 species of land birds expected within the project area.

Of the 20 species of land birds addressed in Appendix E, 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.*

a) No Action Alternative

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 nine 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.

b) Alternatives 1, 2, 3, and 4

Disturbance– Nests, eggs, and/or nestlings could be destroyed if nest sites are present and units are thinned during the breeding season (April – July). Seasonal restrictions for murrelets would also overlap with the breeding season for land birds. Therefore, disturbance to birds nesting within 100 yards of older stands (≥80 years of age) would be avoided with the implementation of the seasonal restrictions for marbled murrelets from April 1st thru August 5th, both days inclusive.

There may noise disturbance impacts associated with timber harvest activities within 0.25 mile of suitable habitat (stands ≥ 80 years of age) for the golden eagle or northern goshawk during the nesting season (February 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 under all alternatives would modify habitat for species that use young

(40-50 year old) forest habitats with closed canopy conditions. Retention of remnant trees, snags, and down wood would also 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 most from *Alternatives 2* and *3*, while those species dependent on more closed stand conditions would benefit from treatments proposed under *Alternatives 1* and *4*, but would see a temporary reduction in habitat suitability until the canopy cover increases and closes in 10 to 20 years.

The nine species that require older, more structurally complex stands would benefit most from treatments of heavy thinning and gap creation under *Alternatives 2* and *3* which would best create conditions fostering the development of structural characteristics associated with late successional habitat, including large overstory trees, increase in vegetation species diversity, and multi-layered canopy. Under conditions of high tree densities under *Alternatives 1* and *4*, post-harvest conditions would limit the ability to create diverse, multi-storied stands. 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.

3. **Special Status Botanical Species**

Johnson Cleghorn is within the known range of Kincaid's Lupine (*Lupinus sulphureus ssp. kincaidii*), a federally threatened plant. Surveys for Kincaid's lupine and other special status botanical species (including Bureau Sensitive and Bureau Strategic Species) were conducted in July 2010 to comply with Departmental Manual 6840 directives and the Special Status Plant program. Based on surveys, the primary habitat for Kincaid's lupine is absent from the proposed project (i.e. in Douglas County habitat is generally open woodland and meadow edges, often near roadsides, associated with Pacific madrone, incense cedar, and Douglas-fir trees with a relatively open canopy cover). Johnson Cleghorn is outside of the known range of the federally endangered rough popcornflower (*Plagiobothrys hirtus*).

Since there were no sites or populations of special status botanical species found during project surveys, there would be no effect to these species under the *No Action Alternative* or *Alternative 1, 2, 3,* or *4*. In addition, *Alternative 1, 2, 3,* or *4* would not remove habitat for Special Status botanical species.

4. **Noxious Weeds**

The project area was surveyed for noxious weed species during July 2010. Noxious weed species found within the project area include Scotch broom (*Cytisus scoparius*), Himalayan blackberry (*Rubus armeniacus*), herb Robert (*Geranium robertianum*), Canada thistle (*Cirsium arvense*), bull thistle (*Cirsium vulgare*), meadow knapweed (*Centaurea debeauxii*), and tansy ragwort (*Senecio jacobaea*). Scotch broom, Himalayan blackberry, and herb Robert are primarily found along existing roads and are relatively small infestations ranging from one plant to patches of less than 200 plants. However there is a large infestation of Scotch broom along the entire 0.5 mile length of BLM road 21-7-5.5 adjacent to Unit 5A. Scotch broom and Himalayan blackberry infestations along major access roads in the project area were treated with herbicides in 2007 and 2008. The thistles, meadow knapweed, and tansy ragwort are found along and adjacent to roads in small patches of less than 20 plants each. French broom (*Genista monspessulana*) was documented along roads within and adjacent to Unit 7C in 2003 and gorse (*Ulex europaeus*) was documented adjacent to this unit in 1998. While these infestations have been treated, viable seed of French broom or gorse may still be present in the soil.

Under the *No Action Alternative* and *Alternatives 1, 2, 3,* and *4*, weed populations in this area would be monitored and evaluated for treatment at regular intervals (USDI, BLM 1995) under the Roseburg District's Noxious Weed Program. Control of weed populations within the project area is planned for treatment in 2011 by applying approved herbicides and/or manual removal, contingent on funding and workload priorities.

If a decision is issued selecting *Alternative 1, 2, 3,* or *4*, then existing infestations would also be treated, prior to on-the-ground implementation of road activities or thinning operations. In addition, project design features would limit the spread of weed seed by washing logging and construction equipment prior to entry on BLM lands. Thinning has the potential to increase exotic or invasive plant species. However, percent cover of those exotic or invasive species tends to be low and rapid growth of the overstory and understory is expected to decrease or eliminate the early seral invasive species (Bailey et al. 1998; Chan et al. 2006). Therefore, the Alternatives 1, 2, 3, or 4 are not anticipated to increase the abundance or rate of spread of noxious weeds.

5. Fire Fuels Management

Johnson Cleghorn is not within the Wildland Urban Interface (WUI) boundary as identified in the Roseburg District Fire Management Plan. Current fuel conditions are best described by photo 1-MC-2 or 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 Johnson Cleghorn is 7-11 tons per acre.

Under the *No Action Alternative*, downed fuels would continue to gradually accumulate adding to the existing fuel conditions of 7-11 tons per acre. As stands mature, suppression mortality would occur in the smaller size classes of trees and would be the main source for passive snag and woody debris recruitment (q.v. *Forest Vegetation*, pg. 27), which would also contribute to fuel loading. The estimated increase in fuel loading over the next two to three decades may be described by photo 2-MC-3 which has larger trees and approximately 20 tons per acre downed woody material (Maxwell and Ward, 1980). The risk of wildfire would gradually increase as fine fuels continue to accumulate.

After thinning, the down woody debris would increase from 7-11 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). The amount of material that contributes to fuel loading would vary depending on the prescription (i.e. heavier thinning would generate more fuel loading). The Photo Series is limited in its ability to quantitatively predict post-harvest fuel amounts that vary subtly by harvest type. The down woody debris created at landings would be machine piled and burned to reduce concentrated fuel loads. The remaining fuels created would be predominately small (i.e. less than one inch in diameter) and scattered over the harvest area.

The additional amount of down woody debris (i.e. four to nine 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 one inch 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.

6. Cultural Resources

Inventories within the proposed units and in the locations of proposed road construction for Johnson Cleghorn were completed and no cultural or historical resources were discovered. Therefore, there would be no effect to any cultural or historical resources since none would be included within the proposed Johnson Cleghorn units or road construction.

Chapter 4. Contacts, Consultations, and Preparers

A. Agencies & Organizations 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 for the Johnson Cleghorn density management project has not yet been completed, but is expected during FY2011. The Project Design Features described in the EA are consistent with those found in the recent 2009-2010 Biological Opinion for the Roseburg District (USFWS Tails#: 13420-2009-F-0125; August 4, 2009). Project Design Features developed for this project through the consultation process are not anticipated to change from those in the 2009-2010 Biological Opinion. When consultation for Johnson Cleghorn has been completed, the results will be disclosed in the decision document and Finding of No Significant Impacts (FONSI).

b) NOAA Fisheries Service

The Roseburg District 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. There are no anticipated direct effects to aquatic habitat from any of the alternatives. Therefore, no direct effects on fish populations are anticipated. Aquatic habitat in Smith River, Johnson Creek, Lower Johnson Creek and their tributaries within the project area would be unaffected, except for short-term reductions in the amount of large and small functional wood available to the stream. 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 (q.v., pgs. 87-88). As a result, no impacts to fish populations would be anticipated. It is also important to point out that there are 5.7 miles of stream channels within or adjacent to the proposed units or actions; 1.2 miles of these stream channels are considered to be perennial (i.e. flowing surface waters during the summer months). Approximately 0.28 miles of the perennial stream channels support fish populations (Figure 18). Therefore, there is an inherently low probability of any of the action alternatives resulting in a measureable impact on fish habitat and/or fish populations. 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.

2. Cultural Resources Section 106 Compliance

Compliance with Section 106 of the National Historic Preservation Act under the guidance of the 1997 National Programmatic Agreement and the 1998 Oregon Protocol has been documented with a Project Tracking Form dated May 24, 2010. It was determined that there would be no effect to any cultural or historical resources since none would be included within the proposed Johnson Cleghorn units or in the locations of proposed road construction.

B. Public Collaboration & Notification

1. Collaborative Process

Approximately 85 different members of the public participated in the process, either in part or whole. Some represented environmental organizations or the timber industry, and some were simply interested citizens. The collaborative process was facilitated by an independent, third-party contractor. Nineteen public meetings and field trips were held between February and October 2010. The collaborative sessions focused on the three objectives for the process (accelerating habitat, reducing fire risk, and providing reliable timber), and integrating these objectives into on-the-ground projects. Furthermore, the collaborative group addressed the restoration forestry concepts put forth by Drs. Norm Johnson and Jerry Franklin, authors of the Northwest Forest Plan and professors at the Oregon State University and the University of Washington, respectively.

During the process, many individuals and organizations provided written comments on the collaborative process and its objectives. Additionally, meeting notes captured participant input from the numerous public meetings, and a videographer recorded all of the meetings and field trips. Public comments were varied, wide-ranging, and sometimes contradictory.

2. Notification of Landowners

A letter was sent (February 12, 2010) to adjacent landowners, landowners along the proposed haul route, registered water-rights users, tribal governments (Confederated Tribes of Grand Ronde, Confederated Tribes of Siletz, Cow Creek Band of Umpqua Tribe of Indians), and the Komemma Cultural Protection Association).

3. Roseburg District Planning Updates

The Johnson Cleghorn project was announced in the past five Roseburg District Quarterly Planning Updates since Summer 2010 (published May 24, 2010) which was published 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.

4. State, County, and Local Government Agencies

This EA, and its associated documents, will 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 one of the proposed action alternatives, 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 was published in *The News-Review* on September 13, 2011. The public comment period began with publication of the notice published in *The News-Review* on September 13, 2011 and ends close of business October 13, 2011. 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

Interdiscplinary Team

Project Lead, Forest Vegetation	Craig Kintop
Management Rep.	Max Yager
Botany/Noxious Weeds	Susan Carter
Cultural Resources	Isaac Barner
Engineering	Terrie King
Fisheries	Scott Lightcap
Fuels Management	Krisann Kosel
Hydrology	Jonas Parker
Forester, Carbon Storage	Abe Wheeler
Logging Economics	Kristen Thompson
NEPA & Writer/Editor	Meagan Conry
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Wildlife	Elizabeth Gayner

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Appendix A. Bureau Sensitive & Bureau Strategic Wildlife Species

Project: Johnson Cleghorn Thinning
Prepared By: Elizabeth I. Gayner
Date: October 5, 2010
SSSP List Date: July 26, 2007 (IM-OR-2007-072)

The following tables include those species which are documented or suspected to occur within the Roseburg District BLM. Those Bureau Sensitive or Bureau Strategic 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).

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	Alternatives 1, 2, 3, & 4
BUREAU SENSITIVE				
American Peregrine Falcon *Falco peregrinus anatum*	Cliffs, rock outcrops; open habitats for hunting birds. Closest known nest site is located approx. 13 miles south.	No Nesting Habitat	No Effects	No measurable effect to foraging habitat.
Bald Eagle *Haleaeetus leucocephalus*	Late successional forests with multi-canopies, generally within two miles of a major water source; Five miles west to nearest known nest site. Eagles observed within two miles of the action area (GeoBOB, 2009).	No Known Nest/ Roost Sites	No Effects	No direct effects to nesting/roosting habitat. Long term effects: increasing late seral forests within 2 miles of Smith River, thus increasing future nesting opportunities.
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	
Crater Lake Tightcoil *Pristiloma arcticum crateris*	Perennially wet areas in late seral forests above 2,000ft elevation and east of Interstate-5; seeps, springs, riparian areas.	Out of Range	No Effects	
Fisher *Martes pennanti*	Natal and foraging habitat consists of structurally complex forests; mature open forests with large live trees, snags, and down wood; nearest sighting in 1975 within 5.0 mile northeast of proposed units (ORNHIC, 2010).	Documented	No Effect	No effects to suitable natal and foraging habitat. Long term effects: increase of late seral characteristics, providing future natal and foraging habitat.
Foothill Yellow-legged Frog *Rana boylii*	Low gradient streams/ponds; gravel/cobble, bedrock pools. Suspected to occur within Smith	Suspected	No Effect	PDFs (e.g. "no-harvest" stream buffers) would protect micro

Species	General Habitat Requirements	Present in Project Area?	Impacts to Species	
			No Action	Alternatives 1, 2, 3, & 4
	River and Halfway Creek.			climate conditions within streams.
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. Documented 9 miles southeast of project area (GeoBOB, 2010; ORNHIC 2010). Suitable habitat is located adjacent to units. Expected to forage in or above units.	Suspected	No Effect	Alt. 1, 2, and 4 would include passive snag recruitment and Alt. 3 would actively create snags. PDFs would retain existing snags in Alts. 1, 2, 3, and 4. Long term affects: increase amount of roosting habitat through the development of late seral forest characteristics, including large snags.
Green Sideband *Monadenia fidelis beryllica*	Coast Range, riparian forests at low elevations; deciduous trees & shrubs in wet, undisturbed forest. Closest documented observation is approximately 14 miles south of project area (GeoBOB, 2010).	Suspected	No Effect	PDFs (e.g. "no-harvest" stream buffers) would protect micro climate conditions (e.g. deciduous habitat).
Harlequin Duck *Histrionicus histrionicus*	Mountain Streams in forested areas on west slope of the Cascade Mountains.	Out of Breeding Range	No Effects	
Lewis' Woodpecker *Melanerpes lewis*	Open woodland habitat near water; open woodland canopy and large diameter dead/dying trees, snag cavities.	No Habitat	No Effects	
Northwestern Pond Turtle *Clemmys marmorata marmorata*	Ponds, low gradient rivers; upland over-wintering habitat, coarse woody debris.	No Habitat	No Effects	
Oregon Shoulderband *Helminthoglypta hertleini*	Talus and rocky substrates, grasslands or other open areas with low-lying vegetation.	No Habitat	No Effects	
Oregon Vesper Sparrow *Pooecetes gramineus affinis*	Open habitats such as grasslands, meadows, farmlands.	No Habitat	No Effects	
Pallid Bat *Antrozous pallidus*	Usually rocky outcroppings near open, dry open areas; occasionally near evergreen forests.	No Habitat	No Effects	
Purple Martin *Progne subis*	Snags cavities in open habitats (e.g. grasslands, brushlands, open woodlands); foraging habitat in units.	Suspected	No Effect	No measurable effect to foraging habitat.
Rotund Lanx *Lanx subrotundata*	Major rivers and large tributaries with cold, well-aerated water and rocky substrate.	Out of Range	No Effects	
Scott's Apatanian Caddisfly *Allomyia scotti*	High-elevation (>4,000ft), cold streams in the mountainous regions of Oregon.	Out of Range	No Effects	
Spotted Tail-dropper *Prophysaon vannattae pardalis*	Mature conifer forests in the Coast Range; associated with significant deciduous tree/shrub component. Closest documented observation is approximately 19 miles of project area (GeogBOB, 2010).	Suspected	No Effect	No effect to mature conifer forests; hardwoods are retained to the extent possible within units. PDFs limiting ground disturbance would minimize effects to duff layers.
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. Documented roosting at bridge at 1.5 miles northwest of project area (GeoBOB, 2010; ORNHIC, 2010). Suitable habitat is located adjacent to units. Expected to forage in or above units.	Documented	No Effect	No measurable effect to foraging habitat. Long term affects: increase amount of roosting habitat through the development of late seral forest characteristics, including large snags.
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	

Species	General Habitat Requirements	Present in Project Area?	Impacts to Species	
			No Action	Alternatives 1, 2, 3, & 4
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 Effects	
Pristine Springsnail *Pristinicola hemphilli*	Shallow, cold, clear springs/seeps; strongly spring-influenced streams, slow-moderate flow; Umpqua River drainage.	Out of Range	No Effects	
Oregon Giant Earthworm *Driloleirus macelfreshi*	Deep, moist, undisturbed soils of riparian forests.	Out of Range	No Effects	

Appendix B. Aquatic Conservation Strategy Assessment

Project: Johnson Cleghorn Commercial Thinning
Prepared By: Scott Lightcap and Jonas Parker
Date: September 15, 2010

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. Riparian Reserve widths were developed using the Regional Ecosystem Office approved methodology in determining site potential tree heights. This methodology uses average site index computed from inventory plots throughout the fifth-field watershed. The site potential tree height for the Upper Smith River Fifthfield Watershed is 200 feet. One of the stated needs for this project is to accelerate the development of late seral characteristics needed for the northern spotted owl and marbled murrelet (pg. 2).

(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 Halfway Creek-Smith River and Headwaters Smith River Sixth-field subwatersheds of the Upper Smith River Fifth-field Watershed have been identified by the BLM as a Tier 1 Key Watershed in the 1994 FEIS (ch. 2-5).

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

In developing the project, the Middle and Upper Smith River Watershed Analysis was used to evaluate existing conditions, establish desired future conditions, and assist in the formulation of appropriate alternatives. The Middle and Upper Smith 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* (pg. 74-78) and *Aquatic Habitat & Fisheries* (pg. 82-84) sections of the EA and also in the Middle and Upper Smith River Watershed Analysis. The short and long term effects to aquatic resources are also described in these sections of the EA.

(4) *Watershed Restoration (ACS Component #4)*

While not one of the stated objectives of this project, alternatives that include riparian thinning prescriptions would result in accelerated tree growth and the reestablishment of shrub species that are currently absent or under-represented. Since these treatments would speed the attainment of late successional characteristics, they would therefore be considered restorative in nature.

Additionally, since 1994, numerous stream enhancement projects have been implemented in the Upper Smith River Watershed. This includes placing instream structures (e.g. logs, boulders, root wads, etc…) to improve aquatic habitat on over 27 miles of stream, replacing 55 culverts identified as barriers to fish passage to open up access to additional habitat, or improving or decommissioning 12 miles of road to reduce road sediment impacts to aquatic systems. This work has been done in a collaborative effort with private timber companies, the Smith River Watershed Council, and the Oregon Department of Fish and Wildlife. Future opportunities for restoration are discussed in the Middle and Upper Smith 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, windstorms, and landslides. Average fire return intervals at the drainage scale for similar watersheds were calculated between 50 and 75 years (prior to the advent of fire suppression). The more destructive stand replacement fires probably occurred irregularly at intervals from 150 to 350 years as this is the recurrence intervals found in the adjacent Elk Creek Watershed (Elk Creek Watershed Analysis, pg. 9). The Upper Smith River Watershed analysis does not discuss fire recurrence intervals so an analysis from the adjacent Elk Creek Watershed was used to address fire recurrence.

Most of the Upper Smith River Watershed is dominated by Tyee and Flournoy Formations of sandstones and siltstones which have a relatively high frequency of debris avalanches on slopes steeper than 65 percent and debris flows on slopes steeper than 35 percent.

Timber harvesting and road construction over the past 50 years have substantially increased the frequency and distribution of landslides above natural levels in the Upper Smith 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-managed land, future landslides, occurring mostly during large storm events, are expected to deliver large wood and rock fragments to lower-gradient streams. This is intentional, and is a direct result of Riparian Reserve protection and the recognition of their role as critical source areas for large wood and sediment to downstream habitats. As a result, 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. Although no survey data was found for the Johnson Cleghorn project area, surveys have been conducted throughout the Upper Smith River Watershed, mostly in the third through sixth-order streams. Approximately 20 stream reference reaches in the Coast Range 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 Upper Smith 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 Upper Smith River Watershed appear to be similar to the reference reaches (Middle and Upper Smith 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 (Middle and Upper Smith River Watershed Analysis, pgs. 42-44). 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 Smith River. Many tributaries within the Upper Smith River Watershed have also been cleaned (had large wood removed) or salvage logged. BLM forest management in the Upper Smith River Watershed would be designed to reduce or prevent watershed impacts.

Table B-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 two seventh-field drainages and one smaller analytical hydrologic unit (detailed below*) distributed throughout the watershed totaling roughly 3,501 acres in size. The BLM manages approximately 2,886 acres in these drainages (82 percent). Units proposed for treatment represent a maximum of 12 percent of the drainages (depending on the alternative), and 15 percent of the BLM-managed lands in the drainages.	Scale Description: This project is located in the Upper Smith River Fifth-field Watershed. This watershed is roughly 95,535 acres in size. The BLM manages approximately 56,514 acres in this watershed (59 percent). Units proposed for treatment represent less than 1 percent of the total watershed area, and less than 1 percent 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 a maximum of 138 acres of Riparian Reserves would be thinned (depending on the alternative). Trees within these treated stands would attain larger diameters in a shorter amount of time than if left untreated. No-treatment buffers established along streams would maintain primary shade zones and subsequent stream temperature regimes. Gaps in Riparian Reserves – outside of the no-treatment areas – are proposed in *Alternatives 2* and *3* in an effort to mimic natural succession while promoting necessary components of structural diversity in riparian ecosystems. Within Riparian Reserves, no gaps will exceed 1.6 acres in size. No-treatment 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 (EA, pgs. 82) 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 drainage, the proposed project would have no influence on aquatic connectivity. Therefore this treatment would maintain the existing connectivity condition at the site scale.	Within the watershed, the proposed project would have no influence on aquatic connectivity. Therefore this treatment would maintain the existing connectivity 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 (EA, pgs. 79). In addition, no-treatment buffers established on all streams in or adjacent to proposed units would prevent disturbance to stream channels and stream banks (EA, pg. 82). Therefore, these	This treatment would also maintain the physical integrity of the aquatic system at the watershed scale.

ACS Objective	Site/Project Scale Assessment	Fifth-Field Watershed Scale Assessment
	treatments would maintain the physical integrity of the aquatic system at the site 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.	No-treatment buffers established along streams would retain stream shade and subsequent temperature regimes. Water quality would not be adversely impacted by the proposed action. Outside the no-treatment areas, a minimum 50 percent canopy closure would be maintained under all alternatives. Gaps smaller than two acres as implemented in Riparian Reserves would enhance biological, physical and chemical structural components by promoting late successional characteristics. No-treatment 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 (EA, pgs. 82). 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-treatment 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 (EA, pgs. 82). 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 (EA, pgs. 79). The project would involve partial removal of vegetation on areas constituting approximately 1.6 percent of the sixth-field sub-watershed. 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. Therefore, this treatment would maintain stream flows within the range of natural variability at the site scale.	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.
7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and	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 watershed scale, this project would also maintain stream interactions with the floodplain and respective water tables within the range of natural variability.

ACS Objective	Site/Project Scale Assessment	Fifth-Field Watershed Scale Assessment
woodlands.	at the site scale.	
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.	Within Riparian Reserves, 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 thinning projects in previously harvested stands 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 thinning projects in previously harvested stands will help restore adequate habitat to support riparian-dependent species at the site and watershed scales.

*Detailed scale description of the drainages: Johnson Creek-Smith River, Middle Smith River, and Halfway Creek.

1) The **Johnson Creek – Smith River** seventh field drainage is roughly 865 acres in size. The BLM manages approximately 719 acres in this drainage (83 percent). Units proposed for treatment represent 12percent of the total drainage area, and 14 percent of the BLM-managed lands in the drainage.
2) The **Middle Smith River** seventh field drainage is roughly 2,473 acres in size. The BLM manages approximately 2,004 acres in this drainage (81 percent). Units proposed for treatment represent 12 percent of the total drainage area, and 15 percent of the BLM-managed lands in the drainage.
3) The **Halfway Creek** analytical hydrologic unit is roughly 163 acres in size; the BLM manages all of it. Units proposed for treatment represent 20 percent of the total drainage area.

ACS Summary:

Based upon the information presented above, the proposed action 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.

Appendix C. Botany Summary

Project: Johnson Cleghorn Thinning
Prepared By: Susan Carter
Date: September 13, 2010
SSSP List Date: December 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 C-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.	July 2010	N/A
Plagiobothrys hirtus Rough popcorn flower (E)	No	No	No	No habitat present.	N/A	N/A
Sensitive Species						
Diplophyllum plicatum Liverwort	Yes	No	No	No habitat present	N/A	N/A
Entosthodon fascicularis Moss	Yes	No	No	No habitat present	N/A	N/A
Gymnomitrion concinnatum Liverwort	Yes	No	No	No habitat present.	N/A	N/A
Helodium blandowii Moss	Yes	No	No	No habitat present	N/A	N/A
Meesia uliginosa Moss	Yes	No	No	No habitat present	N/A	N/A
Schistostega pennata Moss	Yes	No	No	No habitat present	N/A	N/A
Tayloria serrata Moss	Yes	Yes	No	Surveys performed, not detected.	July 2010	N/A
Tetraphis geniculata Moss	Yes	No	No	No habitat present	N/A	N/A
Tetraplodon mnioides Moss	Yes	Yes	No	Surveys performed, not detected.	July 2010	N/A
Tomentypnum nitens Moss	Yes	No	No	No habitat present	N/A	N/A

Species	Within species range?	Habitat Present?	Species Present?	Reason for concern or no concern	Surveys Completed	Mitigation Measures
Tortula mucronifolia Moss	Yes	No	No	No habitat present	N/A	N/A
Trematodon boasii Moss	Yes	No	No	No habitat present.	N/A	N/A
Bridgeoporus nobilissimus Giant polypore fungus	Yes	No	No	No habitat present.	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 spadicea 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
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]	N/A	N/A
Sowerbyella rhenana 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
Bryoria subcana Lichen	Yes	No	No	No habitat present.	N/A	N/A
Calicium adspersum Lichen	Yes	No	No	No habitat present	N/A	N/A
Chaenotheca subroscida Lichen	Yes	Yes	No	Surveys performed, not detected.	July 2010	N/A
Dermatocarpon meiophyllizum Lichen	Yes	No	No	No habitat present.	N/A	N/A
Hypogymnia duplicata Lichen	Yes	No	No	No habitat present.	N/A	N/A
Lobaria linita Lichen	Yes	No	No	No habitat present.	N/A	N/A
Pannaria rubiginosa Lichen	Yes	No	No	No habitat present.	N/A	N/A
Pilophorus nigricaulis Lichen	Yes	No	No	No habitat present.	N/A	N/A
Stereocaulon spathuliferum Lichen	Yes	No	No	No habitat present.	N/A	N/A
Adiantum jordanii California maiden-hair	Yes	No	No	No habitat present.	N/A	N/A
Arabis koehleri var. *koehleri* Koehler's rockcress	Yes	No	No	No habitat present.	N/A	N/A
Arctostaphylos hispidula *Hairy manzanita*	Yes	No	No	No habitat present.	N/A	N/A
Asplenium septentrionale Grass-fern	Yes	No	No	No habitat present.	N/A	N/A
Bensoniella oregana Bensonia	Yes	No	No	No habitat present.	N/A	N/A
Botrychium minganense Gray moonwort	Yes	No	No	No habitat present.	N/A	N/A
Calochortus coxii Crinite mariposa-lily	Yes	No	No	No habitat present.	N/A	N/A
Calochortus umpquaensis Umpqua mariposa-lily	Yes	No	No	No habitat present.	N/A	N/A
Camassia howellii Howell's camas	Yes	No	No	No habitat present.	N/A	N/A
Carex comosa Bristly sedge	Yes	No	No	No habitat present.	N/A	N/A
Carex gynodynama Hairy sedge	Yes	Yes	No	Surveys performed, not detected.	July 2010	N/A
Carex serratodens Saw-tooth sedge	Yes	No	No	No habitat present.	N/A	N/A
Cicendia quadrangularis Timwort	Yes	No	No	No habitat present	N/A	N/A
Cimicifuga elata var. elata Tall bugbane1	Yes	Yes	No	Surveys performed, not detected.	July 2010	N/A
Cypripedium fasciculatum Clustered lady slipper	Yes	No	No	No habitat present.	N/A	N/A
Delphinium nudicaule Red larkspur	Yes	No	No	No habitat present.	N/A	N/A
Epilobium oreganum Oregon willow-herb	Yes	No	No	No habitat present	N/A	N/A
Eschscholzia caespitosa Gold poppy	Yes	No	No	No habitat present.	N/A	N/A

Species	Within species range?	Habitat Present?	Species Present?	Reason for concern or no concern	Surveys Completed	Mitigation Measures
Eucephalus vialis Wayside aster	Yes	No	No	No habitat present	N/A	N/A
Horkelia congesta ssp. *congesta* Shaggy horkelia	Yes	No	No	No habitat present	N/A	N/A
Horkelia tridentata ssp. *tridentate* Three-toothed horkelia	Yes	No	No	No habitat present	N/A	N/A
Iliamna latibracteata California globe-mallow	Yes	No	No	No habitat present.	N/A	N/A
Kalmiopsis fragrans Fragrant kalmiopsis	Yes	No	No	No habitat present.	N/A	N/A
Lathyrus holochlorus Thin-leaved peavine	Yes	No	No	No habitat present.	N/A	N/A
Lewisia leeana Lee's lewisia	Yes	No	No	No habitat present.	N/A	N/A
Limnanthes gracilis var. *gracilis* Slender meadow-foam	Yes	No	No	No habitat present.	N/A	N/A
Lotus stipularis Stipuled trefoil	Yes	No	No	No habitat present.	N/A	N/A
Meconella oregana *White fairypoppy*	Yes	No	No	No habitat present.	N/A	N/A
Pellaea andromedifolia Coffee fern	Yes	Yes	No	Surveys performed, not detected.	July 2010	N/A
Perideridia erythrorhiza Red-rooted yampah	Yes	No	No	No habitat present.	N/A	N/A
Polystichum californicum California sword-fern	Yes	No	No	No habitat present.	N/A	N/A
Romanzoffia thompsonii *Thompson's mistmaiden*	Yes	No	No	No habitat present	N/A	N/A
Schoenoplectus subterminalis Water clubrush	Yes	No	No	No habitat present.	N/A	N/A
Scirpus pendulus *Drooping rush*	Yes	No	No	No habitat present.	N/A	N/A
Sisyrinchium hitchcockii Hitchcock's blue-eyed grass	Yes	No	No	No habitat present.	N/A	N/A
Utricularia gibba Humped bladderwort	Yes	No	No	No habitat present	N/A	N/A
Utricularia minor Lesser bladderwort	Yes	No	No	No habitat present.	N/A	N/A
Wolffia borealis Dotted water-meal	Yes	No	No	No habitat present.	N/A	N/A
Wolffia columbiana Columbia water-meal	Yes	No	No	No habitat present.	N/A	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 C-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	Documented	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 botrytis var. aurantiiramosa	Suspected	Surveys Not Practical. [1]
Ramaria concolor f. tsugina	Suspected	Surveys Not Practical. [1]
Ramaria conjunctipes var. sparsiramosa	Documented	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		
Lecanora pringlei	Suspected	None Observed
Schaereria dolodes (Lecidea dolodes)	Documented	None Observed
Leptogium rivale	Documented	None Observed
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).

Appendix D. Carbon Storage/Release Analytical Methodology

Project: Johnson Cleghorn Thinning
Prepared By: Rex McGraw, Ryan Johnson, Abe Wheeler
Date: October 10, 2010

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 Johnson Cleghorn 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. The growth of young trees from both natural regeneration and planting (where either would occur) is a sub-set of this pool and is categorized as "ingrowth" in Tables 44-48. The species composition and amount of "ingrowth" was manually entered into ORGANON based on the silvicultural planting assumptions (see Treatment Prescription, pgs. 15, 17, 20, and 23); the subsequent growth of these young trees was then modeled in ORGANON over time.

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 44-48 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 D-1 (which was adapted from Table C-2 in the 2008 Final EIS, Appendices-29). The stands in Johnson Cleghorn 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 Johnson Cleghorn were 42-51 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 44-48 as "Other Than Live Trees".

Table D-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 D-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 D-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 Tables 45-48.

Table D-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 Tables 45-48 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 D-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 Tables 45-48.

Table D-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 throught 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 D-4. For the fossil fuels portion of the analysis, the analytical assumption that was used was that the entire project would be cable-yarded and a loader would handle logs at the landings.

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

Equipment	Production Rate[a] (acres/day)	Fuel Efficiency[b]		Fuel Consumed (gallons)			
		(gallons/hour)	(gallons/day)	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Chainsaw (gasoline)	0.4	-	1	370	880	965	988
Motorized Carriage (gasoline)	1	-	3	444	1,056	1,158	1,185
Cable/Skyline Yarder (diesel)	1	2.3	19.55	2,893	6,882	7,546	7,722
Loader (diesel)	1	4.5	38.25	5661	13,464	14,765	15,109

[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. The timber volume used for each alternative was based on ORGANON modeling and was presented in Table 41. It was also assumed that the length of haul (round-trip) was 96 miles. It was estimated that the amount of diesel consumed during log hauling for this project would range from 10,242-44,640 gallons.

   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 renovated, maintained, or improved (Loeffler et al., 2009). For rock hauling, the amount of rock to be hauled was calculated assuming 14 foot wide rock roads with a rock depth of 10 inches. Round trip rock haul was assumed to be 60 miles, and truck capacity is assumed to be 10 yards. It was estimated that the amount of diesel consumed during road work activities for this project would range from 277- 4,084 gallons.

3. 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 renovation (derived in Step 3) were summed to provide the total fuel consumption for the project (Tables D-5 to D-7). 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 D-5. The total amount of carbon that would be released by the proposed action is shown in as "Fossil Fuels" in Tables 45-48.

Table D-5. Total Fossil Fuel Consumption and Associated Carbon Release under Alternative 1.

Fuel Use	**Fuel Consumption** (gallons)	**Pounds CO_2 per Gallon**[a]	**CO_2 Released**[b] (tonnes)	**Carbon Released**[c] (tonnes)
Harvest Operations (gasoline)	814	19.4	7.2	2
Harvest Operations (diesel)	8,554	22.2	86.3	23
Log Hauling (diesel)	10,242	22.2	103.3	28
Road Construction, Maintenance/Renovation, and Rock haul (diesel)	277	22.2	2.8	1
Total	-	-	**200**	**54**

Table D-6. Total Fossil Fuel Consumption and Associated Carbon Release under Alternative 2.

Fuel Use	**Fuel Consumption** (gallons)	**Pounds CO_2 per Gallon**[a]	**CO_2 Released**[b] (tonnes)	**Carbon Released**[c] (tonnes)
Harvest Operations (gasoline)	1,936	19.4	17.1	5
Harvest Operations (diesel)	20,346	22.2	205.3	56
Log Hauling (diesel)	41,125	22.2	415	113
Road Construction, Maintenance/Renovation, and Rock haul (diesel)	2090	22.2	21	6
Total	-	-	**658**	**180**

Table D-7. Total Fossil Fuel Consumption and Associated Carbon Release under Alternative 3.

Fuel Use	Fuel Consumption (gallons)	Pounds CO_2 per Gallon[a]	CO_2 Released[b] (tonnes)	Carbon Released[c] (tonnes)
Harvest Operations (gasoline)	2,123	19.4	18.7	5
Harvest Operations (diesel)	22,311	22.2	225.1	62
Log Hauling (diesel)	44,640	22.2	450.5	123
Road Construction, Maintenance/Renovation, and Rock haul (diesel)	4,087	22.2	41.2	11
Total	-	-	**736**	**201**

[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).

Table D-7. Total Fossil Fuel Consumption and Associated Carbon Release under Alternative 4.

Fuel Use	Fuel Consumption (gallons)	Pounds CO_2 per Gallon[a]	CO_2 Released[b] (tonnes)	Carbon Released[c] (tonnes)
Harvest Operations (gasoline)	2,173	19.4	19.1	5
Harvest Operations (diesel)	22,831	22.2	230	63
Log Hauling (diesel)	33,287	22.2	335.9	92
Road Construction, Maintenance/Renovation, and Rock haul (diesel)	4,087	22.2	41.2	11
Total	-	-	**626**	**171**

[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 E. Landbirds

Project: Johnson Cleghorn Thinning
Prepared By: Elizabeth I. Gayner
Date: December 1, 2010

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 Johnson Cleghorn 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 E-1. Effects of the Johnson Cleghorn Thinning Project on Landbirds.

Species	General Habitat Requirements	Impacts to Species	
		No Action	Alternatives 1, 2, 3, & 4
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 under *Alternatives 2* and *3* 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 and heavily thinned areas under *Alternatives 2* and *3* 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 Smith River.	No Effect	Project design criteria for streams and riparian areas would protect habitat under all alternatives.
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 Coast Range, closely associated with edges of older stands with tall trees and snags	Suitable habitat condition would continue to be absent until suppression mortality created gaps and edge habitat.	Variable density thinning under *Alternatives 2* and *3* would create more diverse stand conditions and accelerates growth of larger trees that may become snags. Forest gaps would increase understory growth,

Species	General Habitat Requirements	Impacts to Species	
		No Action	Alternatives 1, 2, 3, & 4
	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.		contributing to increased insect production over the next 20 years. Increased forest edge habitat would also enhance foraging opportunities. Gaps created by thinnings 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 by treatments proposed in *Alternatives 2, 3* and *4*, which would create additional nesting habitat as canopy layers and hardwoods develop in the moderate to heavily thinned areas and in gaps that contain remnant trees.
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			
Black-throated Gray Warbler (*Dendroica nigrescens*)	Strongly associated with pole forest conditions among younger and older forested stands in all elevations of managed forests of the central Oregon Coast Range, with areas of relatively high deciduous cover.	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. The development of deciduous trees would create more desirable nesting and foraging habitat. Heavily thinned areas under *Alternatives 2* and *3* would preclude this species from these areas.
Brown Creeper (*Certhia americana*)	Optimal habitat appears to be mature and old-growth unmanaged forests where large trees and 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.	Benefit more from treatments of heavy thinning and gap creation under *Alternatives 2* and *3* which would best create conditions fostering the development of suitable habitat, including large conifers with deep furrowed bark. Also would benefit from retention of remnant trees and snags under all alternatives.
Hammond's Flycatcher (*Empidonax hammondii*)	Mature coniferous and mixed deciduous/coniferous forest in the central Oregon Coast Range. Late-successional stands 120-140 years old in all elevations of managed forests.	Stands would remain unsuitable until some suppression mortality occurred which would provide more open space below the canopy for foraging.	Benefit from light to moderate single-layered thinning from below to reduce the density of trees and open the area below canopy foliage, but not layered understory development characteristics of variably spaced and variably layered thinning.
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. Heavily thinned areas under *Alternatives 2* and *3* would preclude this species from these areas, but would be expected to return as the tree crowns develop and canopy closure increases. Skips would help maintain habitat for this species until canopy closure in light thinning treatment areas of the stands returns to pre-thinning levels.
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 all alternatives, which would allow understory development of deciduous shrubs and trees. The combination of skips and lightly thinned areas would minimize negative effects of reduced overstory canopy closure by

Species	General Habitat Requirements	Impacts to Species	
		No Action	Alternatives 1, 2, 3, & 4
			maintaining some areas with high canopy closure.
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 light-moderate thinning treatments, which would create stand conditions that would create open space for foraging and promote understory development. However, heavy thinning may negatively impact species due to reduction of canopy cover and tree density.
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.	Benefit more from treatments of heavy thinning and gap creation under *Alternatives 2* and *3* 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 under all alternatives.
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).	Benefit more from treatments of heavy thinning and gap creation under *Alternatives 2* and *3* 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 under all alternatives 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 under all alternatives may enhance development of tree layers, but moderate to heavy 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.	Benefit more from treatments of heavy thinning and gap creation under *Alternatives 2* and *3* 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. Skips would maintain some useable habitat in the interim. 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 under all alternatives.
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	Species would benefit from thinning under all action alternatives 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.

Species	General Habitat Requirements	Impacts to Species	
		No Action	Alternatives 1, 2, 3, & 4
		stand.	
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.	Benefit more from treatments of heavy thinning and gap creation under *Alternatives 2* and *3* which would best create conditions fostering the development of suitable nesting and roosting habitat, including large overstory trees and multi-layered canopy. Under conditions of high relative density under *Alternatives 1* and *4*, post-harvest conditions 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 F. Map Packet

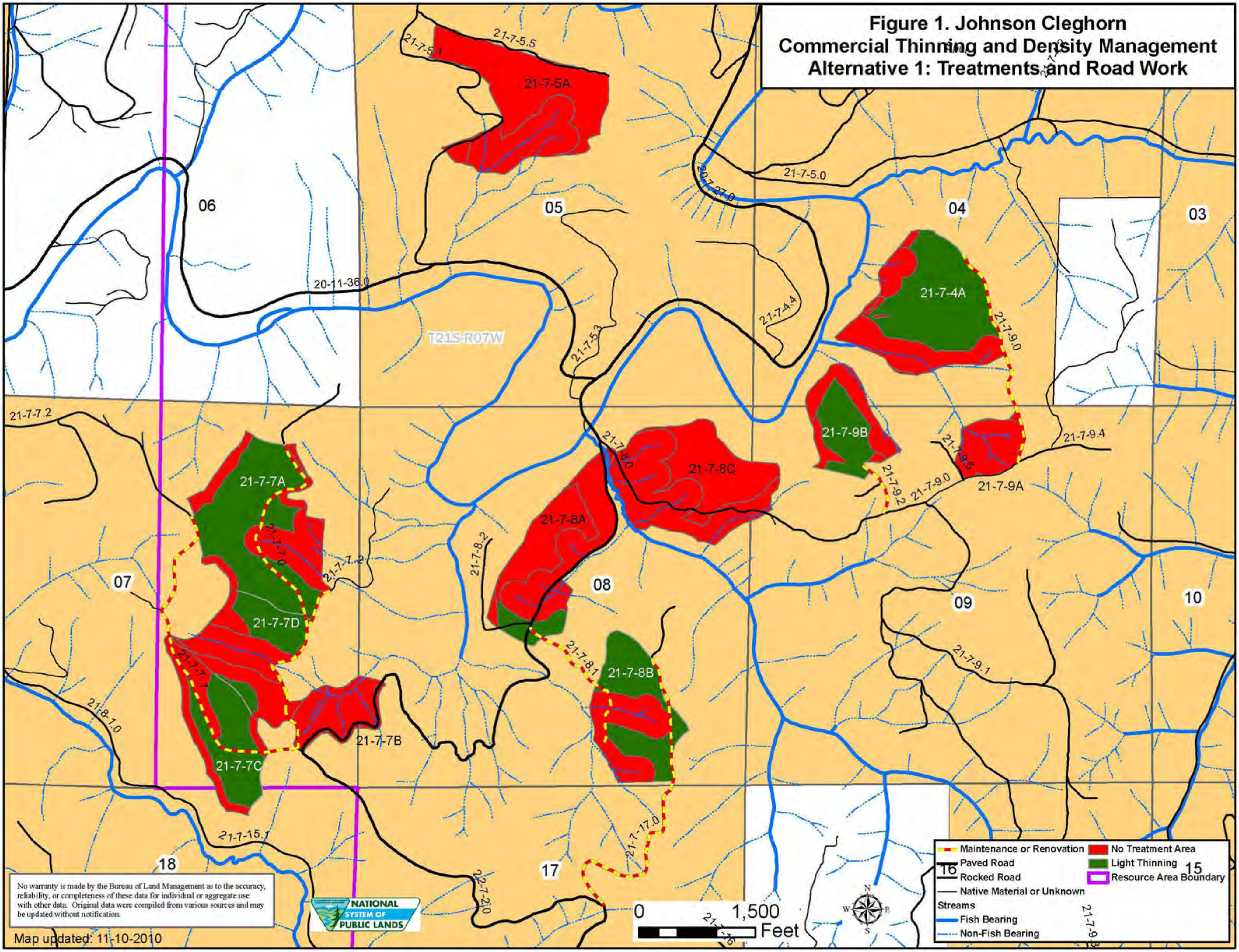


Figure 1. Johnson Cleghorn Commercial Thinning and Density Management Alternative 1: Treatments and Road Work

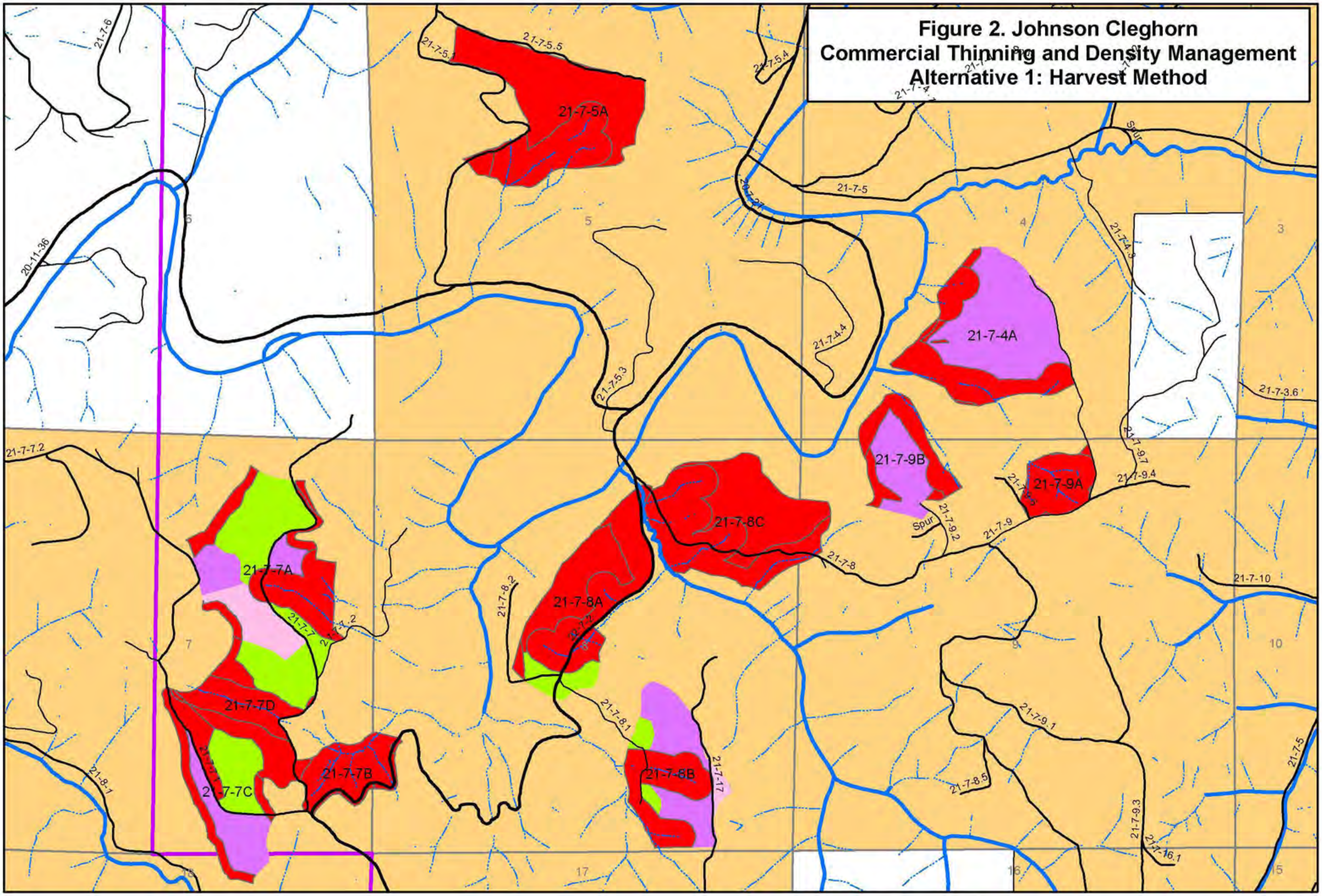


Figure 2. Johnson Cleghorn Commercial Thinning and Density Management Alternative 1: Harvest Method

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources and may be updated without notification.

NATIONAL SYSTEM OF PUBLIC LANDS

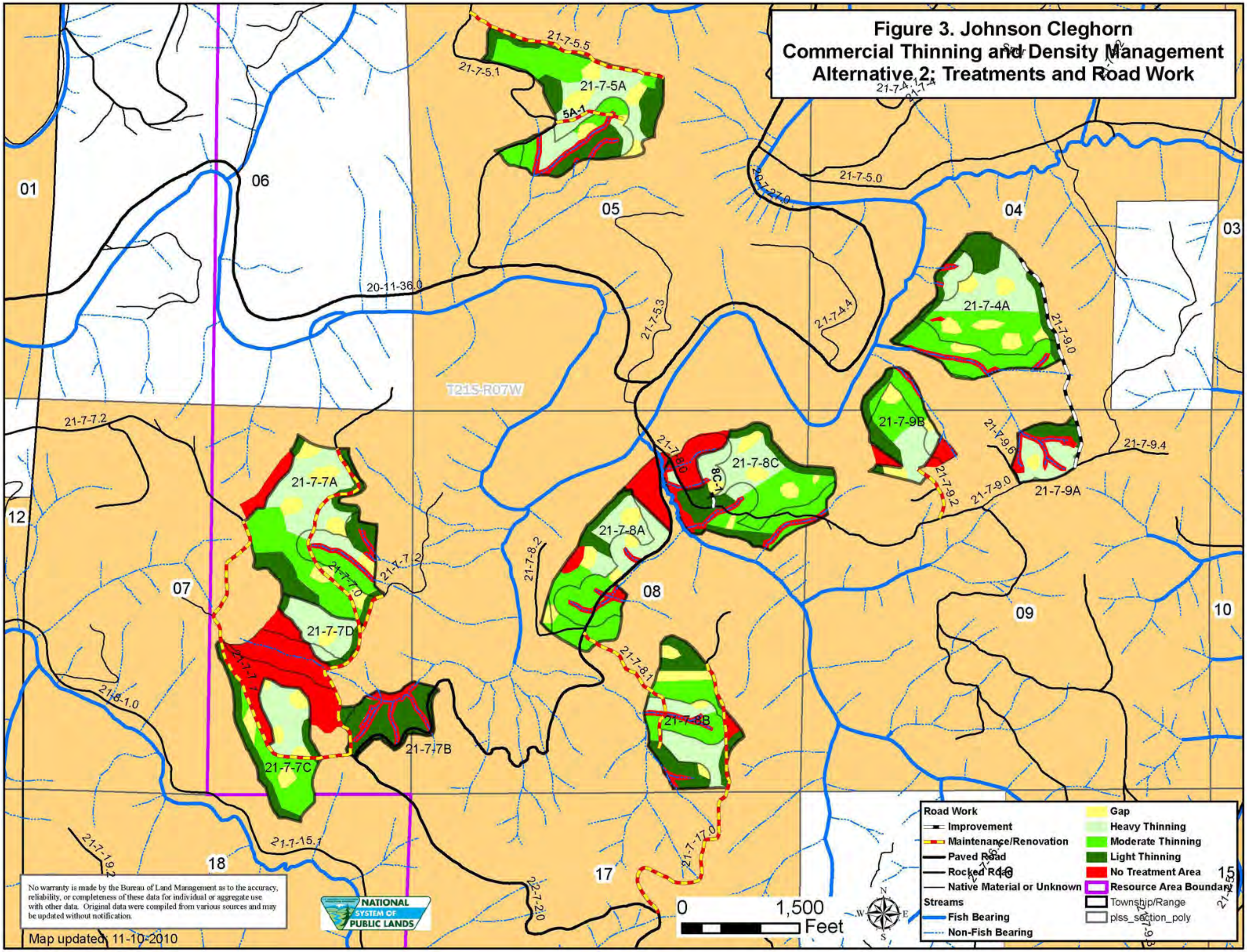
Feet
0 1,500

N
W E
S

Paved Road
Rocked Road
Native Material or Unknown
Streams
Fish Bearing
Non-Fish Bearing
No Treatment Area
Downhill Cable Yarding
Uphill Cable Yarding
Ground Based
Resource Area Boundary
Non-BLM Administered Land
BLM Administered Land

Map Updated: 11-10-2010

Figure 3. Johnson Cleghorn Commercial Thinning and Density Management Alternative 2: Treatments and Road Work



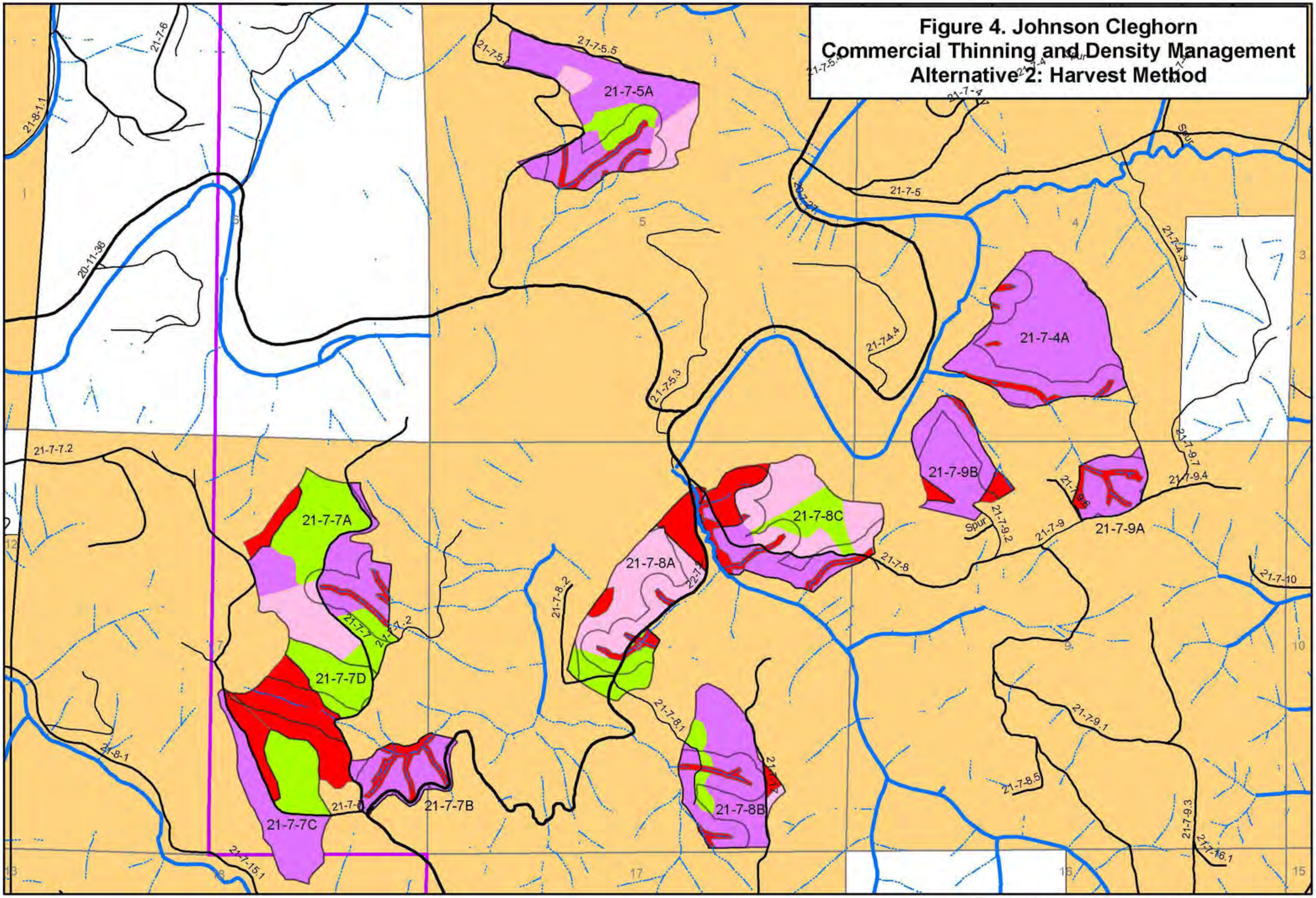


Figure 4. Johnson Cleghorn Commercial Thinning and Density Management Alternative 2: Harvest Method

Legend	
Paved Road	No Treatment Area
Rocked Road	Downhill Cable Yarding
Native Material or Unknown	Uphill Cable Yarding
Streams	Ground Based
Fish Bearing	Resource Area Boundary
Non-Fish Bearing	Non-BLM Administered Land
	BLM Administered Land

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Map Updated: 11-10-2010

NATIONAL SYSTEM OF PUBLIC LANDS

0 1,500 Feet

N S E W

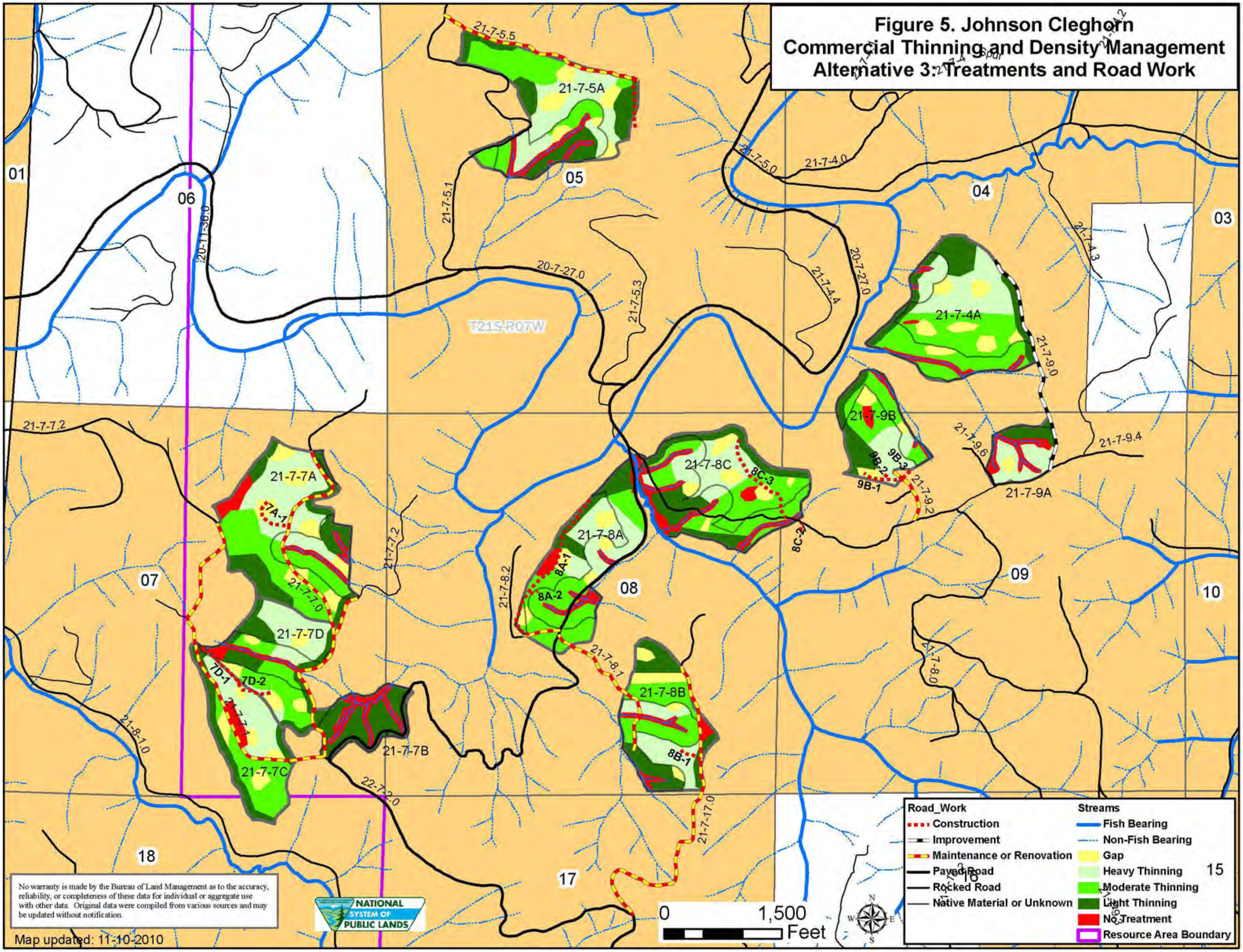
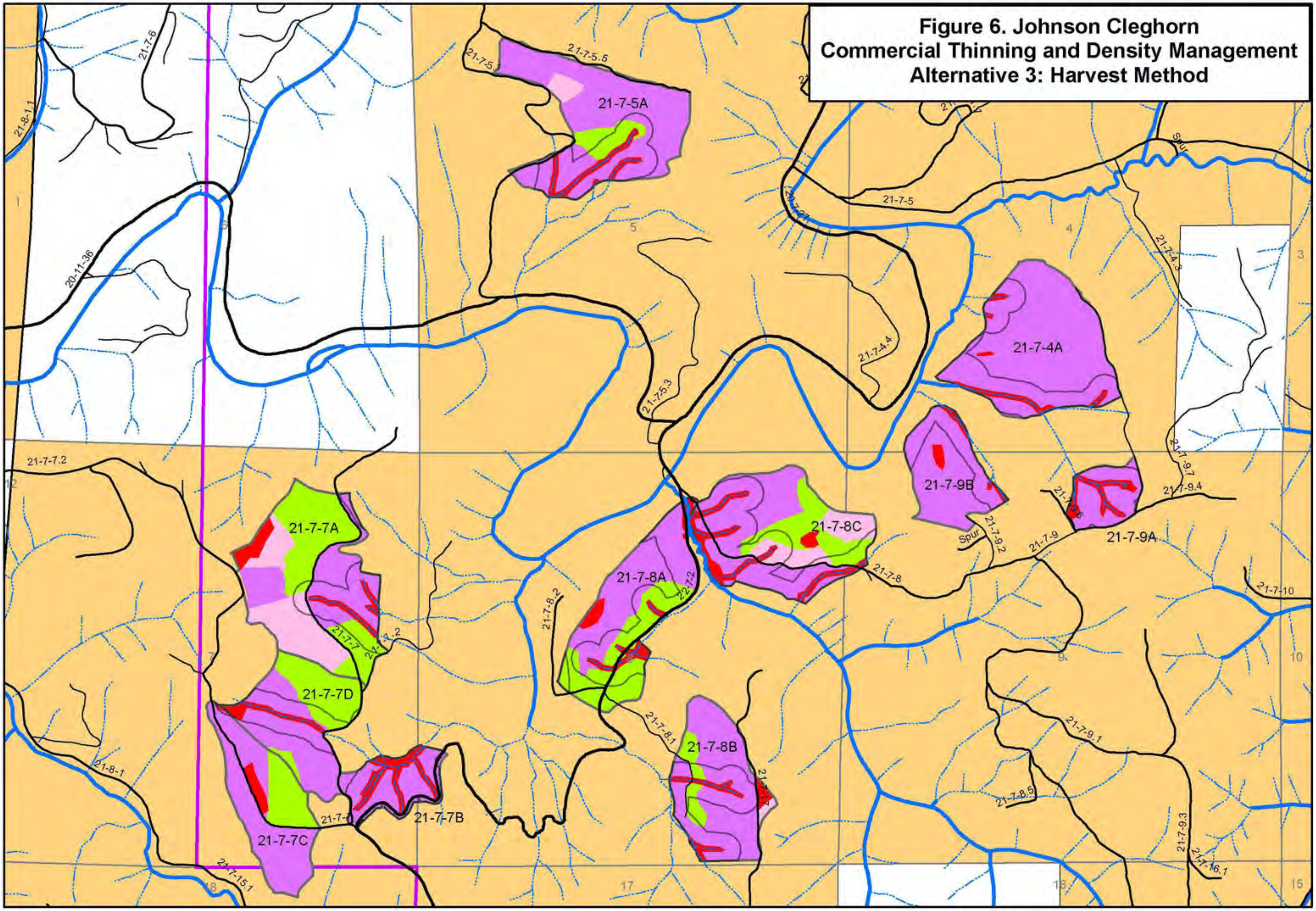


Figure 5. Johnson Cleghorn Commercial Thinning and Density Management Alternative 3: Treatments and Road Work

Figure 6. Johnson Cleghorn Commercial Thinning and Density Management Alternative 3: Harvest Method



- Paved Road
- Rocked Road
- Native Material or Unknown

Streams
- Fish Bearing
- Non-Fish Bearing

- No Treatment Area
- Downhill Cable Yarding
- Uphill Cable Yarding
- Ground Based
- Resource Area Boundary
- Non-BLM Administered Land
- BLM Administered Land

0 1,500 Feet

N S W E

NATIONAL SYSTEM OF PUBLIC LANDS

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Map Updated: 11-10-2010

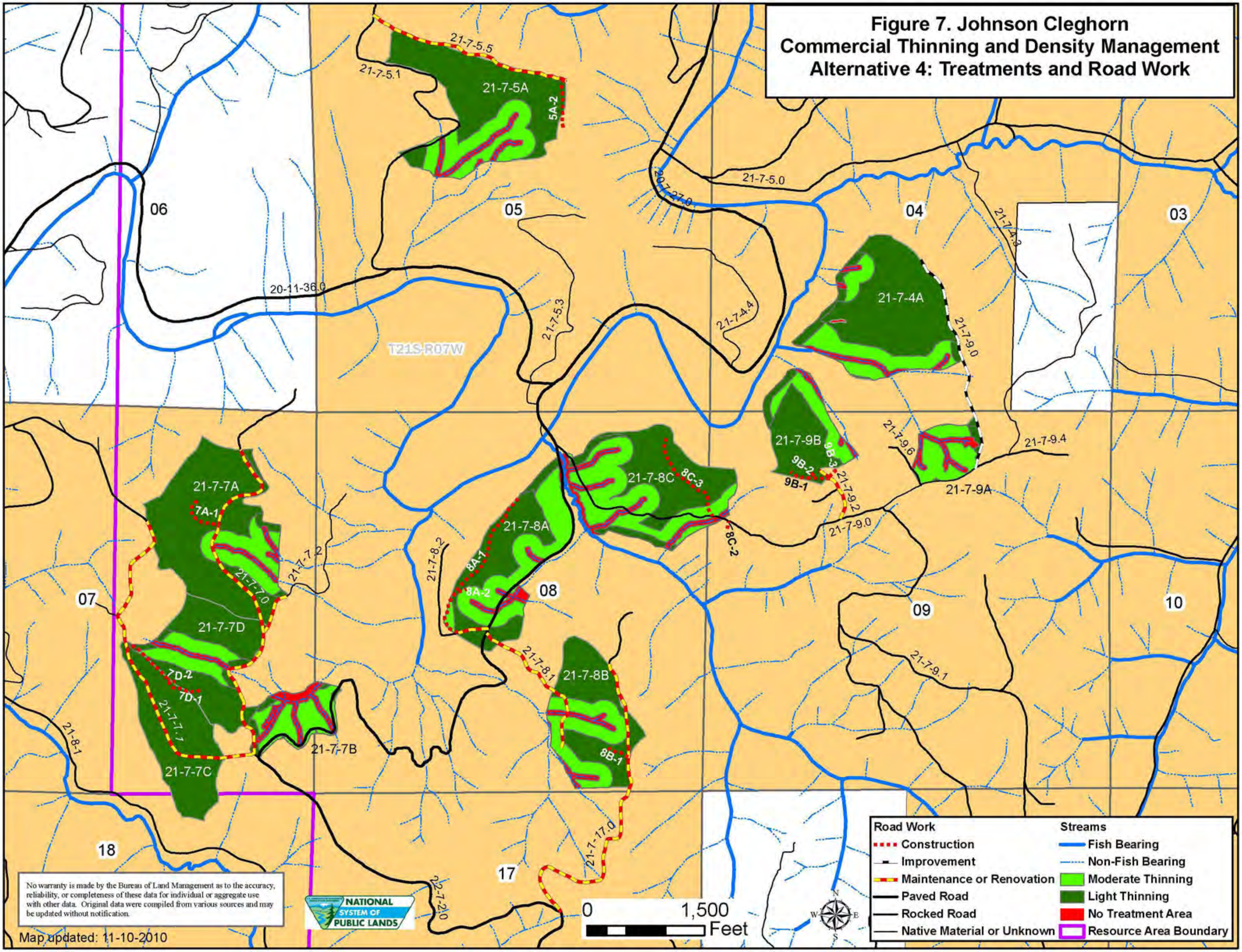

Figure 7. Johnson Cleghorn
Commercial Thinning and Density Management
Alternative 4: Treatments and Road Work
21-7-5.5
21-7-5.1
21-7-5A
5A-2
21-7-5.0
20-7-27.0
06
05
04
03
21-7-4.3
20-11-36.0
21-7-5.3
21-7-4.4
21-7-4A
21-7-9.0
T21S-R07W
21-7-9B
9B-3
9B-2
9B-1
21-7-9.6
21-7-9.4
21-7-9A
21-7-9.2
21-7-9.0
21-7-8C
8C-3
8C-2
21-7-7A
7A-1
21-7-8A
21-7-7.2
21-7-8.2
8A-1
8A-2
21-7-7.0
07
08
09
10
21-7-7D
21-7-8.1
21-7-8B
21-7-9.1
7D-2
7D-1
21-7-7.1
21-8-1
21-7-7B
8B-1
21-7-7C
21-7-17.0
18
17
22-7-2.0
Road Work
Construction
Improvement
Maintenance or Renovation
Paved Road
Rocked Road
Native Material or Unknown
Streams
Fish Bearing
Non-Fish Bearing
Moderate Thinning
Light Thinning
No Treatment Area
Resource Area Boundary
0
1,500
Feet
NATIONAL SYSTEM OF PUBLIC LANDS
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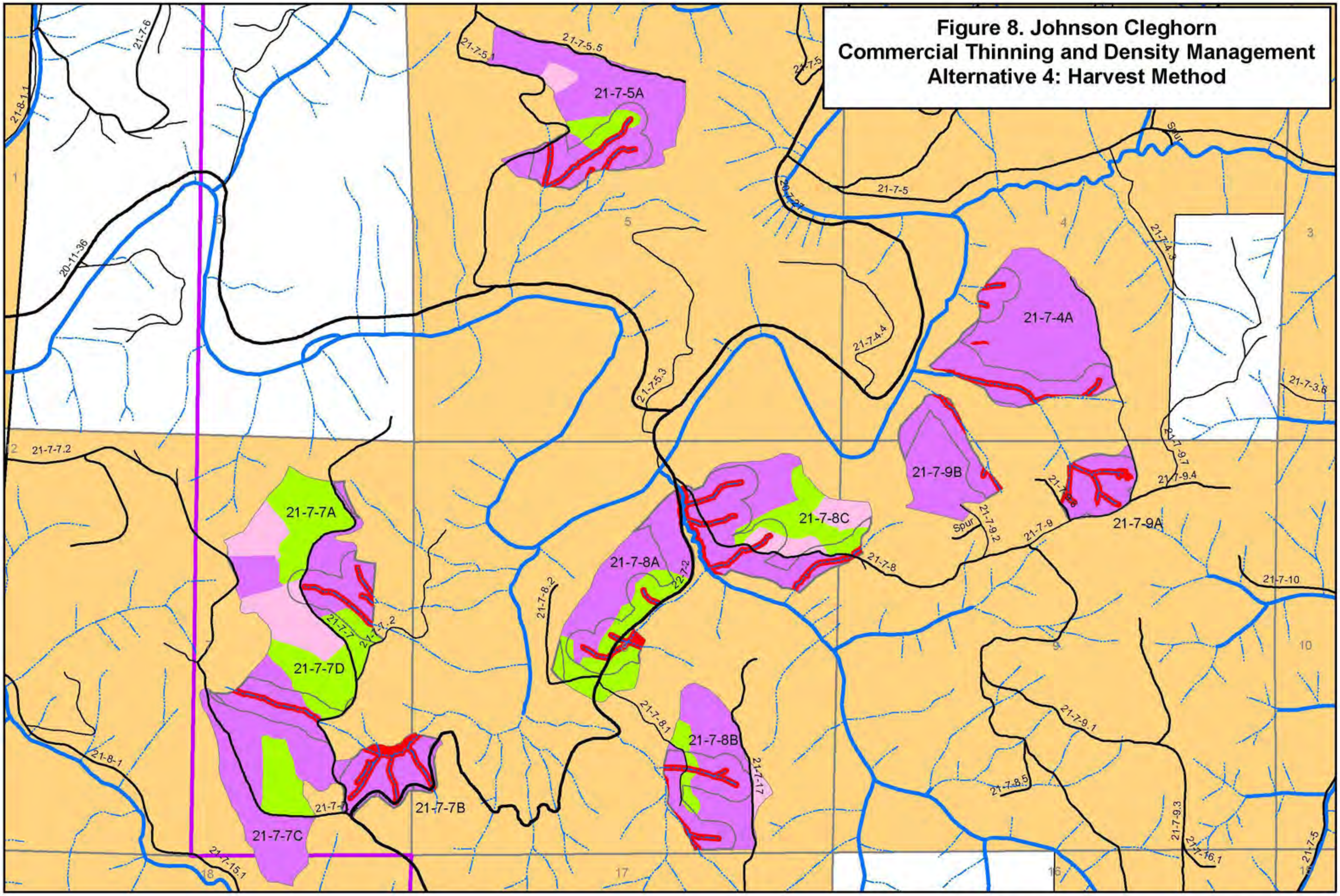
Map updated: 11-10-2010

Figure 8. Johnson Cleghorn Commercial Thinning and Density Management Alternative 4: Harvest Method



Paved Road
Rocked Road
Native Material or Unknown
Streams
Fish Bearing
Non-Fish Bearing
No Treatment Area
Downhill Cable Yarding
Uphill Cable Yarding
Ground Based
Resource Area Boundary
Non-BLM Administered Lands
BLM Administered Lands

Feet
0 1,500

Map Updated: 11-10-2010

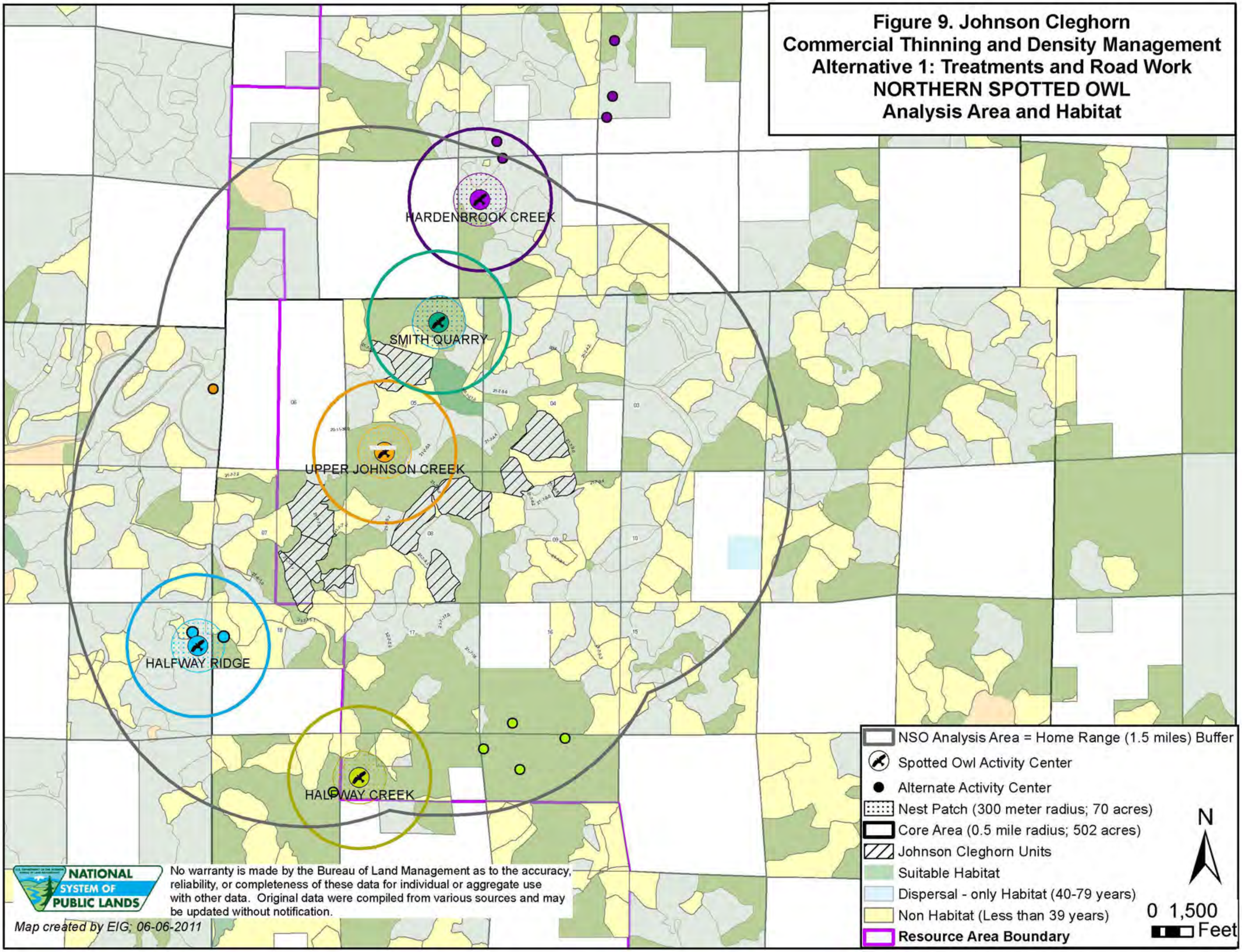


Figure 9. Johnson Cleghorn Commercial Thinning and Density Management Alternative 1: Treatments and Road Work NORTHERN SPOTTED OWL Analysis Area and Habitat

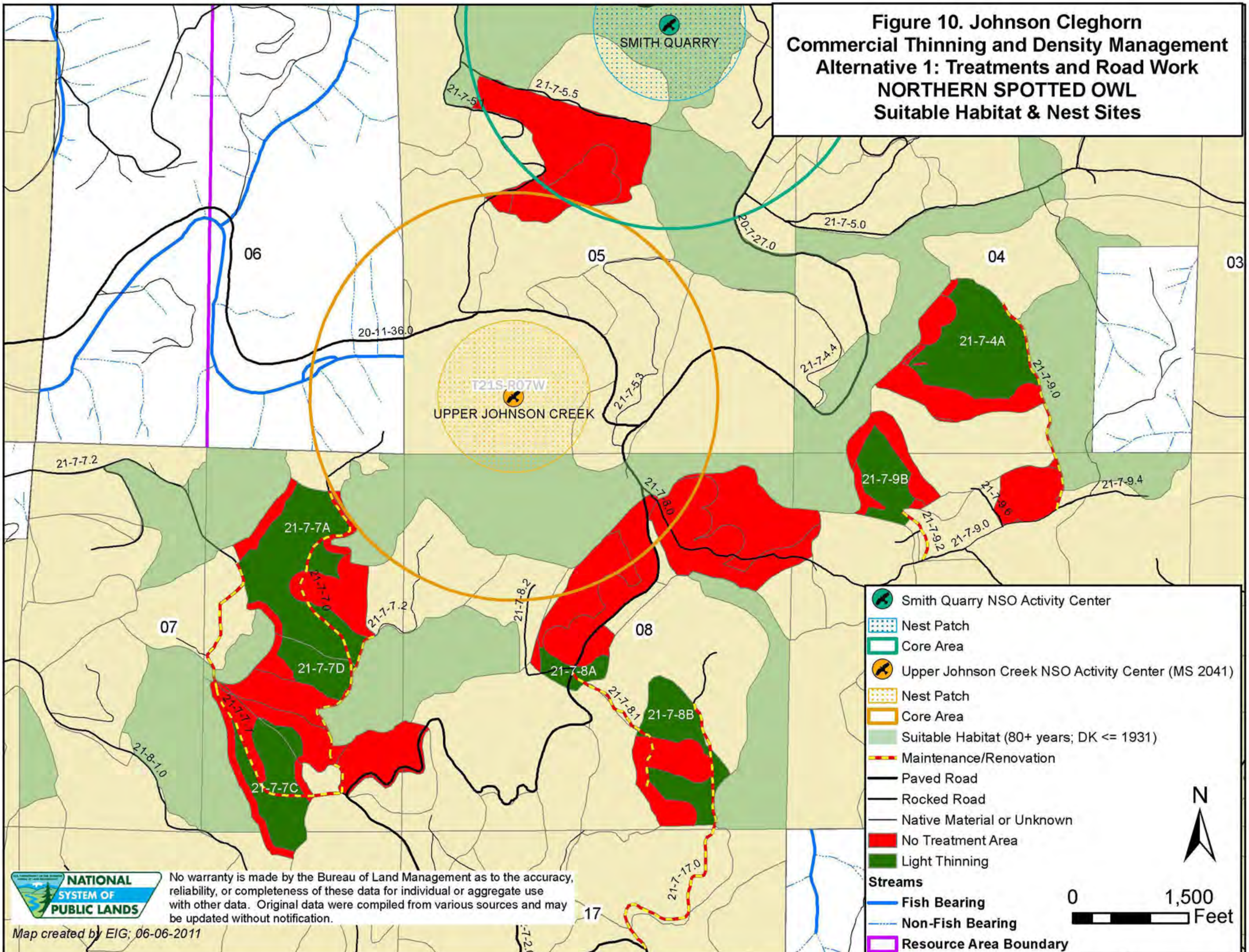


Figure 10. Johnson Cleghorn
Commercial Thinning and Density Management
Alternative 1: Treatments and Road Work
NORTHERN SPOTTED OWL
Suitable Habitat & Nest Sites
SMITH QUARRY
UPPER JOHNSON CREEK
T21S-R07W
06
05
04
03
07
08
17
21-7-5.5
20-7-27.0
21-7-5.0
20-11-36.0
21-7-4.4
21-7-5.3
21-7-4A
21-7-9.0
21-7-9B
21-7-9.4
21-7-9.6
21-7-9.2
21-7-7.2
21-7-7A
21-7-7.0
21-7-8.0
21-7-8.2
21-7-7D
21-7-8A
21-7-8.1
21-7-8B
21-7-7.1
21-7-7C
21-8-1.0
21-7-17.0
Smith Quarry NSO Activity Center
Nest Patch
Core Area
Upper Johnson Creek NSO Activity Center (MS 2041)
Nest Patch
Core Area
Suitable Habitat (80+ years; DK <= 1931)
Maintenance/Renovation
Paved Road
Rocked Road
Native Material or Unknown
No Treatment Area
Light Thinning
Streams
Fish Bearing
Non-Fish Bearing
Resource Area Boundary
N
0
1,500
Feet
NATIONAL SYSTEM OF PUBLIC LANDS
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Map created by EIG; 06-06-2011

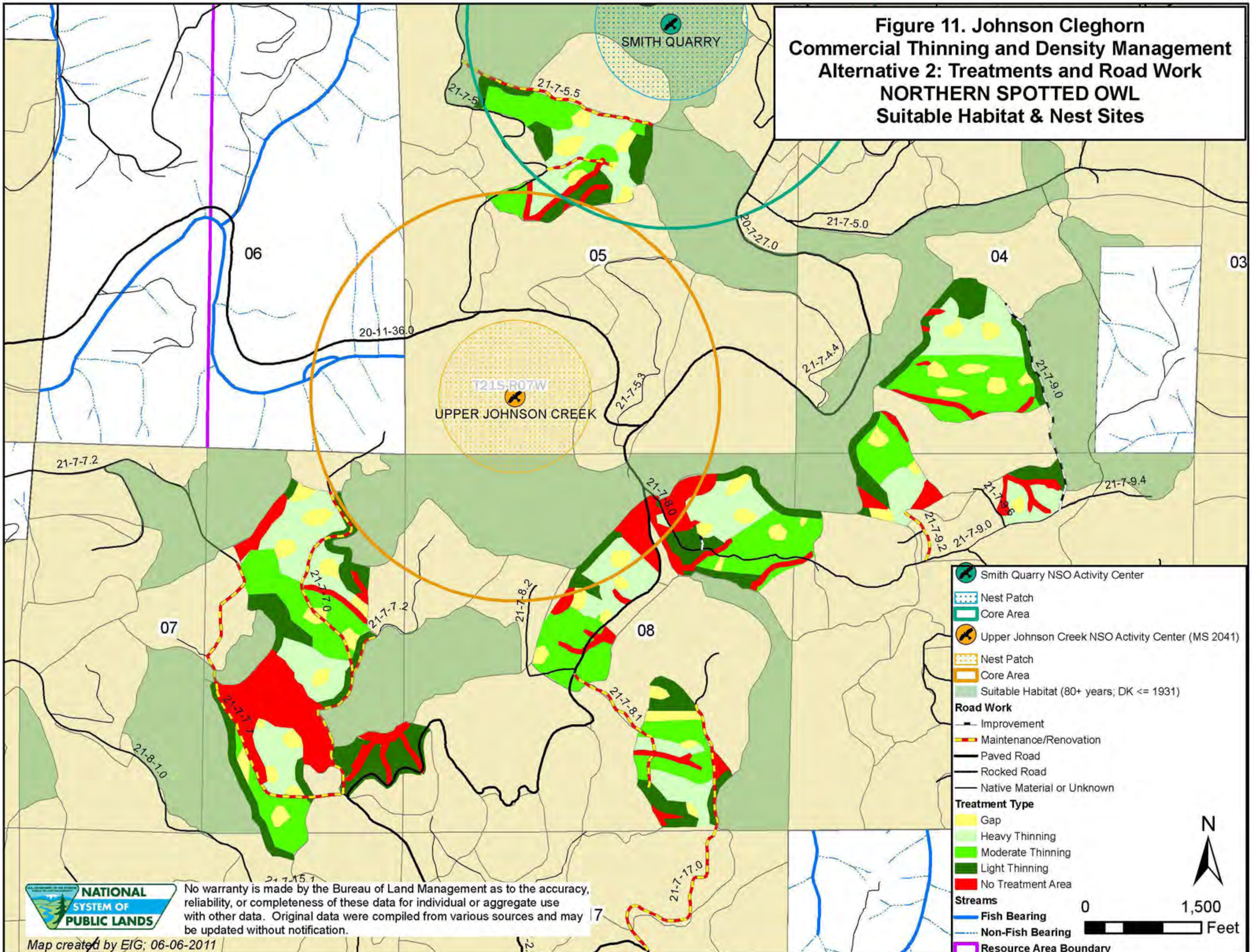
Figure 11. Johnson Cleghorn
Commercial Thinning and Density Management
Alternative 2: Treatments and Road Work
NORTHERN SPOTTED OWL
Suitable Habitat & Nest Sites
SMITH QUARRY
UPPER JOHNSON CREEK
T21S-R07W
06
05
04
03
07
08
21-7-5.5
21-7-5.0
20-7-27.0
20-11-36.0
21-7-5.3
21-7-4.4
21-7-9.0
21-7-9.4
21-7-9.2
21-7-8.0
21-7-7.2
21-7-7.0
21-7-7.1
21-7-8.2
21-7-8.1
21-8-1.0
21-7-17.0
Smith Quarry NSO Activity Center
Nest Patch
Core Area
Upper Johnson Creek NSO Activity Center (MS 2041)
Nest Patch
Core Area
Suitable Habitat (80+ years; DK <= 1931)
Road Work
Improvement
Maintenance/Renovation
Paved Road
Rocked Road
Native Material or Unknown
Treatment Type
Gap
Heavy Thinning
Moderate Thinning
Light Thinning
No Treatment Area
Streams
Fish Bearing
Non-Fish Bearing
Resource Area Boundary
N
0
1,500
Feet
NATIONAL SYSTEM OF PUBLIC LANDS
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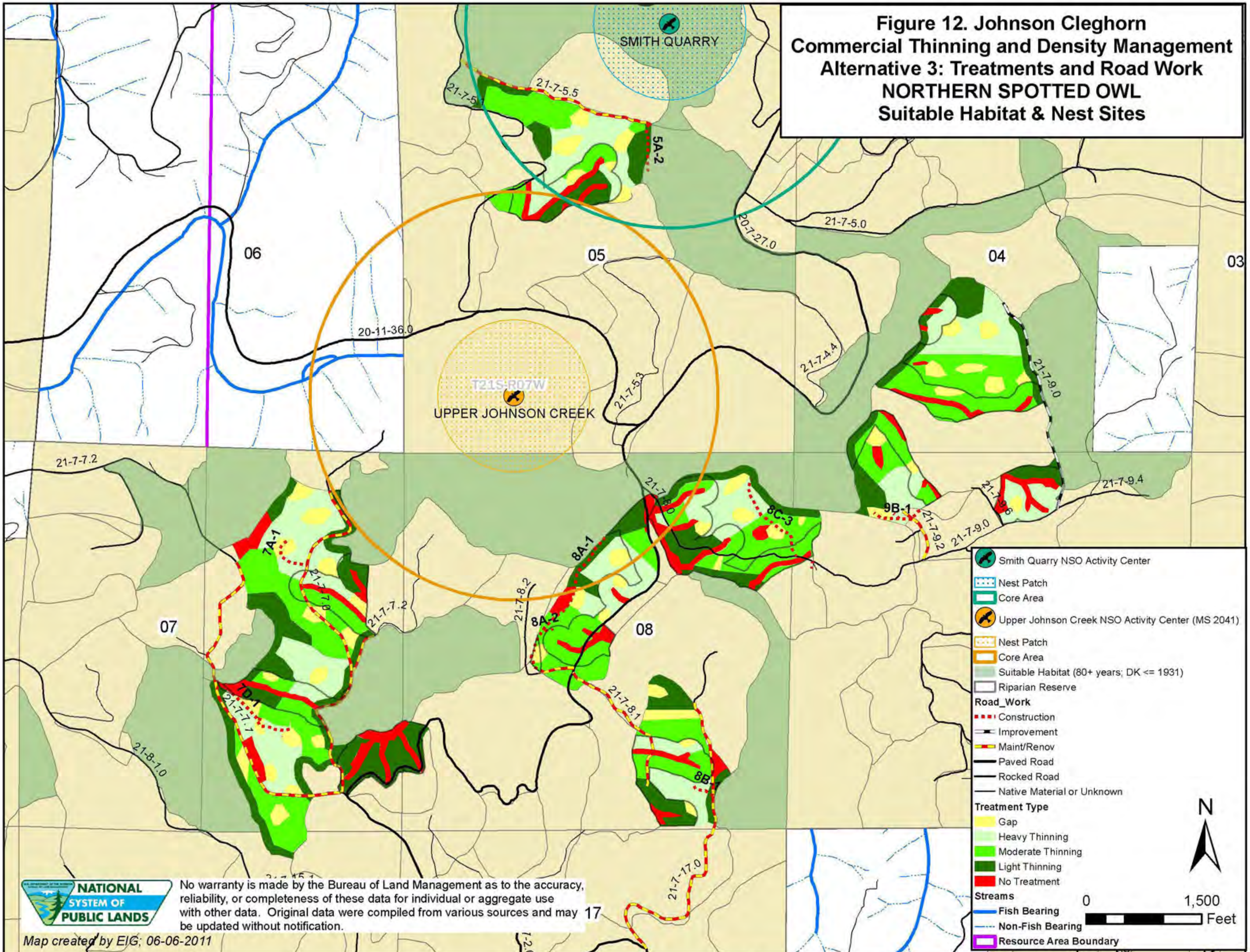
Figure 12. Johnson Cleghorn
Commercial Thinning and Density Management
Alternative 3: Treatments and Road Work
NORTHERN SPOTTED OWL
Suitable Habitat & Nest Sites
SMITH QUARRY
UPPER JOHNSON CREEK
T21S-R07W
06
05
04
03
07
08
17
5A-2
7A-1
7D-1
8A-1
8A-2
8B-1
8C-3
9B-1
21-7-5.5
21-7-5.1
21-7-5.0
20-7-27.0
20-11-36.0
21-7-5.3
21-7-4.4
21-7-9.0
21-7-9.4
21-7-9.6
21-7-9.2
21-7-8.0
21-7-8.2
21-7-8.1
21-7-7.2
21-7-7.0
21-7-7.7
21-8-1.0
21-7-17.0
Smith Quarry NSO Activity Center
Nest Patch
Core Area
Upper Johnson Creek NSO Activity Center (MS 2041)
Nest Patch
Core Area
Suitable Habitat (80+ years; DK <= 1931)
Riparian Reserve
Road_Work
Construction
Improvement
Maint/Renov
Paved Road
Rocked Road
Native Material or Unknown
Treatment Type
Gap
Heavy Thinning
Moderate Thinning
Light Thinning
No Treatment
Streams
Fish Bearing
Non-Fish Bearing
Resource Area Boundary
N
0
1,500
Feet
NATIONAL SYSTEM OF PUBLIC LANDS
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Map created by EIG; 06-06-2011

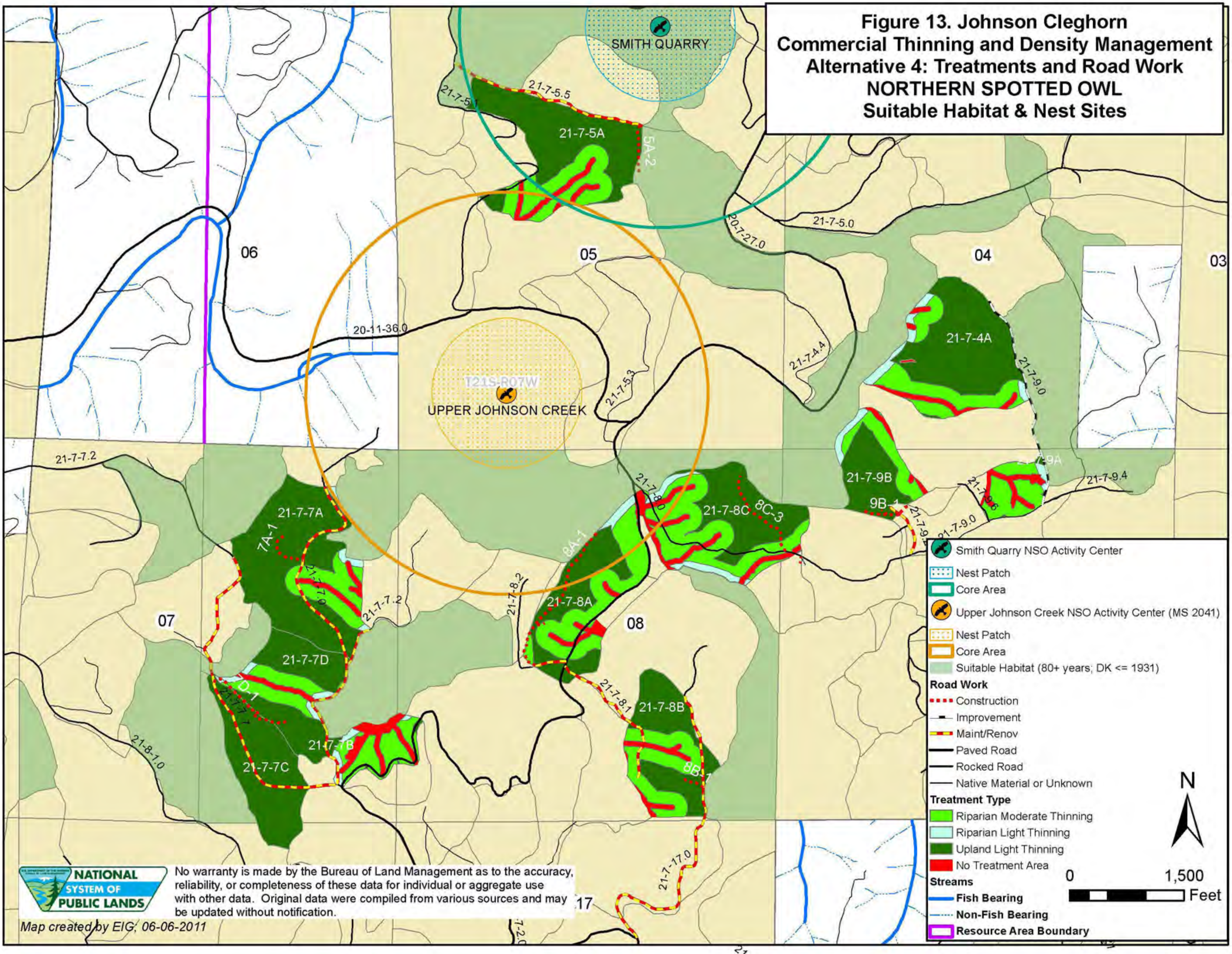

Figure 13. Johnson Cleghorn
Commercial Thinning and Density Management
Alternative 4: Treatments and Road Work
NORTHERN SPOTTED OWL
Suitable Habitat & Nest Sites
SMITH QUARRY
UPPER JOHNSON CREEK
T21S-R07W
06
05
04
03
07
08
17
21-7-5A
21-7-4A
21-7-9B
21-7-9A
21-7-8C
21-7-8A
21-7-8B
21-7-7A
21-7-7D
21-7-7C
21-7-7B
20-11-36.0
21-7-7.2
21-7-5.0
20-7-27.0
21-7-9.0
21-7-9.4
21-8-1.0
21-7-17.0
21-7-8.2
21-7-8.1
Smith Quarry NSO Activity Center
Nest Patch
Core Area
Upper Johnson Creek NSO Activity Center (MS 2041)
Nest Patch
Core Area
Suitable Habitat (80+ years; DK <= 1931)
Road Work
Construction
Improvement
Maint/Renov
Paved Road
Rocked Road
Native Material or Unknown
Treatment Type
Riparian Moderate Thinning
Riparian Light Thinning
Upland Light Thinning
No Treatment Area
Streams
Fish Bearing
Non-Fish Bearing
Resource Area Boundary
N
0 1,500 Feet
NATIONAL SYSTEM OF PUBLIC LANDS
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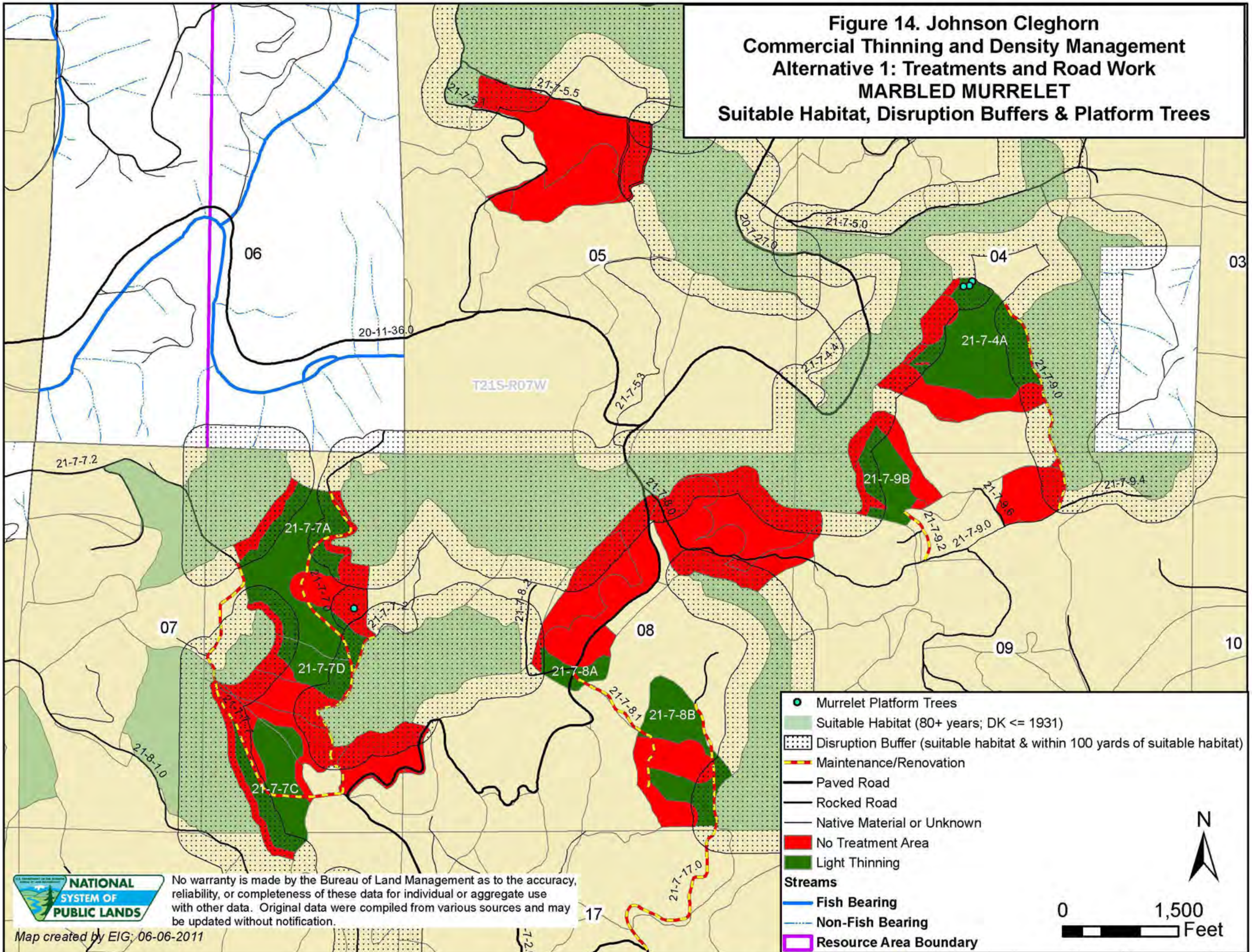
Figure 14. Johnson Cleghorn
Commercial Thinning and Density Management
Alternative 1: Treatments and Road Work
MARBLED MURRELET
Suitable Habitat, Disruption Buffers & Platform Trees
21-7-5.5
21-7-5.3
21-7-5.0
20-7-21.0
06
05
04
03
20-11-36.0
21-7-4.4
21-7-4A
21-7-5.3
21-7-9.0
T21S-R07W
21-7-7.2
21-7-9B
21-7-9.4
21-7-8.0
21-7-9.6
21-7-7A
21-7-9.2
21-7-9.0
21-7-8.2
21-7-2
07
08
09
10
21-7-7D
21-7-8A
21-7-8.1
21-7-8B
21-8-1.0
21-7-7C
21-7-17.0
17
Murrelet Platform Trees
Suitable Habitat (80+ years; DK <= 1931)
Disruption Buffer (suitable habitat & within 100 yards of suitable habitat)
Maintenance/Renovation
Paved Road
Rocked Road
Native Material or Unknown
No Treatment Area
Light Thinning
Streams
Fish Bearing
Non-Fish Bearing
Resource Area Boundary
N
0
1,500
Feet
NATIONAL SYSTEM OF PUBLIC LANDS
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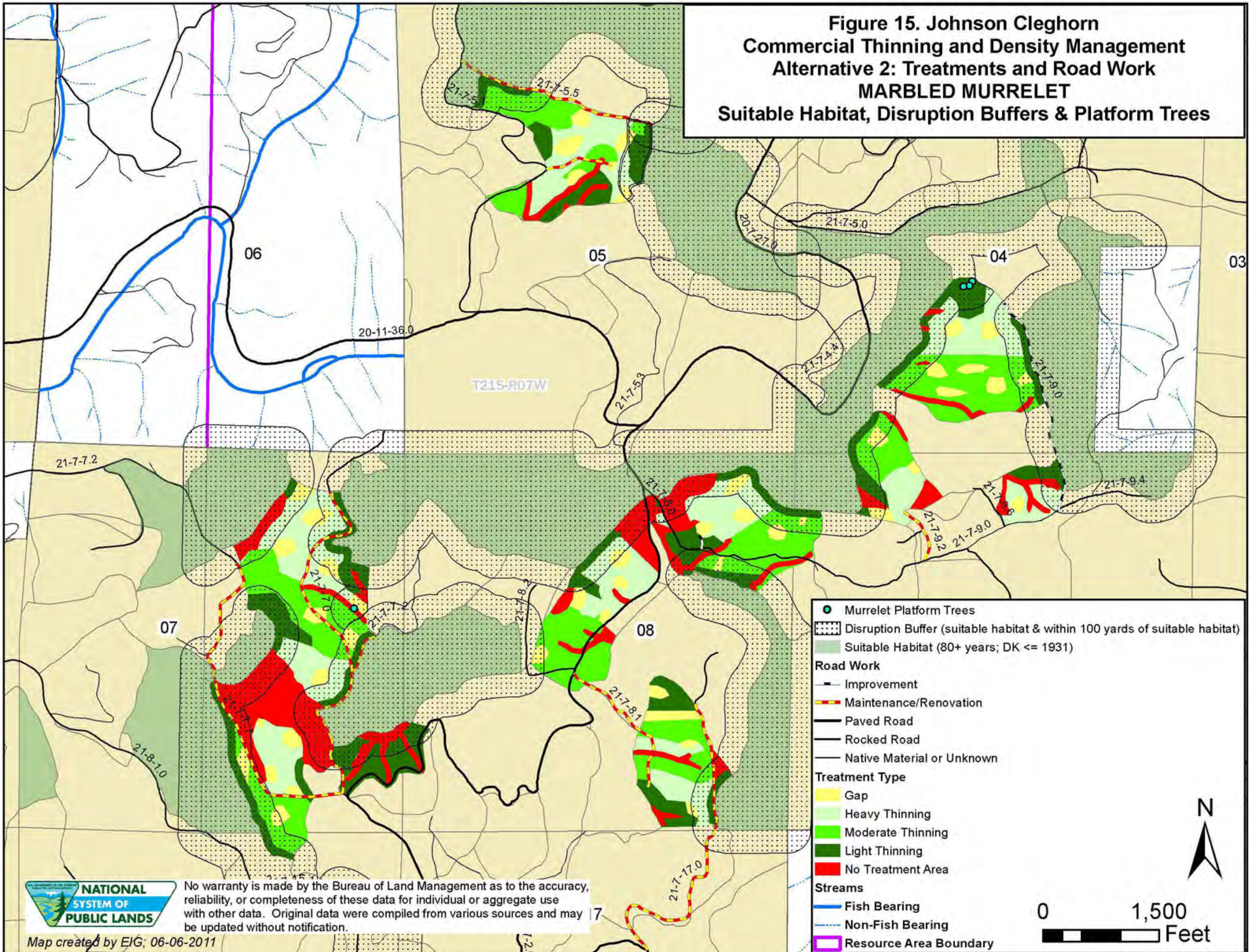

Figure 15. Johnson Cleghorn
Commercial Thinning and Density Management
Alternative 2: Treatments and Road Work
MARBLED MURRELET
Suitable Habitat, Disruption Buffers & Platform Trees
06
05
04
03
07
08
T21S-R07W
20-11-36.0
21-7-5.5
21-7-5.0
20-7-21.0
21-7-4.4
21-7-5.3
21-7-9.0
21-7-7.2
21-7-8.0
21-7-8.2
21-7-9.4
21-7-9.2
21-8-1.0
21-7-8.1
21-7-17.0
Murrelet Platform Trees
Disruption Buffer (suitable habitat & within 100 yards of suitable habitat)
Suitable Habitat (80+ years; DK <= 1931)
Road Work
Improvement
Maintenance/Renovation
Paved Road
Rocked Road
Native Material or Unknown
Treatment Type
Gap
Heavy Thinning
Moderate Thinning
Light Thinning
No Treatment Area
Streams
Fish Bearing
Non-Fish Bearing
Resource Area Boundary
N
0
1,500
Feet
NATIONAL SYSTEM OF PUBLIC LANDS
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources and may be updated without notification.
Map created by EIG; 06-06-2011

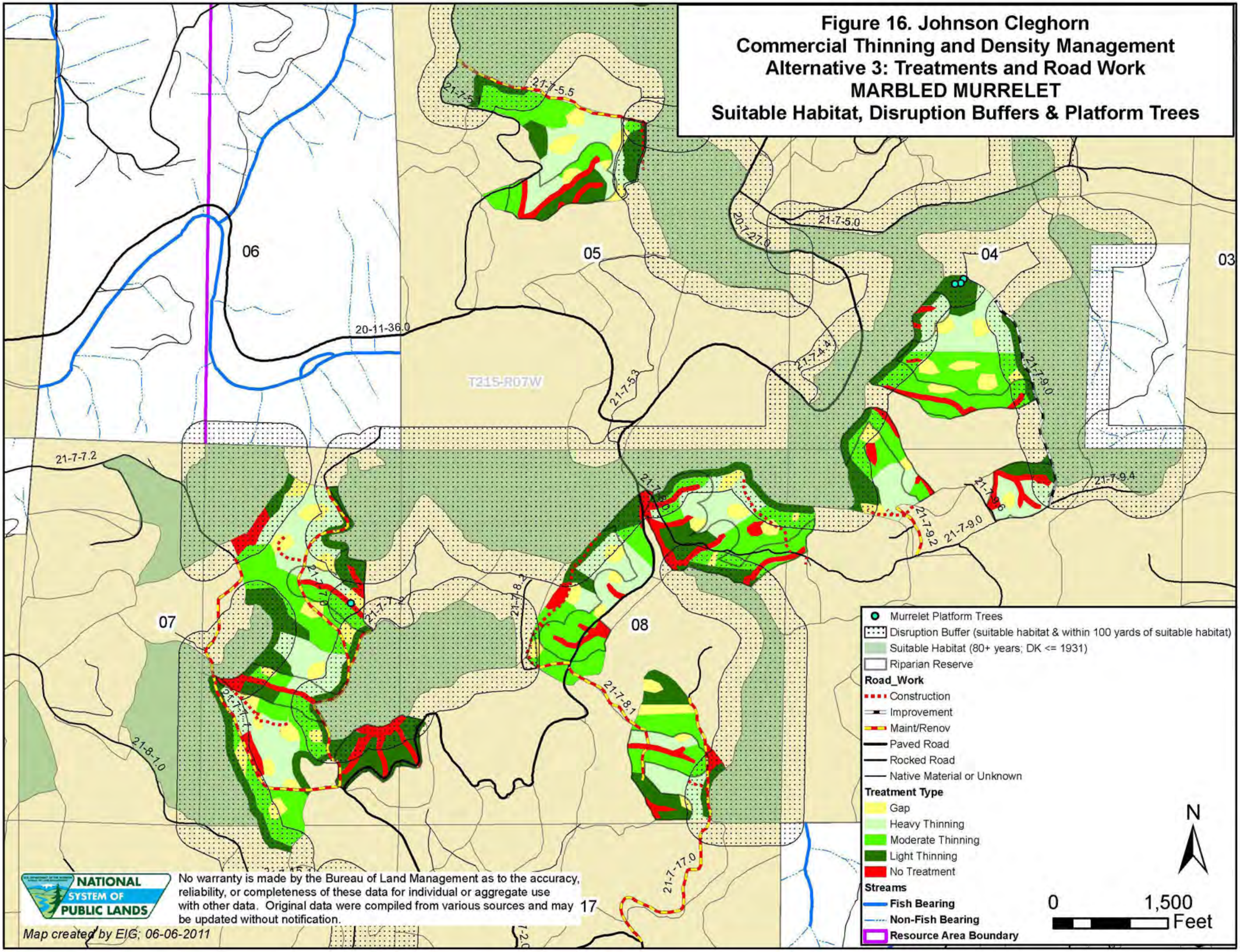

Figure 16. Johnson Cleghorn
Commercial Thinning and Density Management
Alternative 3: Treatments and Road Work
MARBLED MURRELET
Suitable Habitat, Disruption Buffers & Platform Trees
06
05
04
03
07
08
17
T21S-R07W
20-11-36.0
21-7-5.5
21-7-5.0
20-7-21.0
21-7-4.4
21-7-5.3
21-7-9.0
21-7-9.4
21-7-9.6
21-7-9.2
21-7-7.2
21-7-8.2
21-7-8.1
21-7-17.0
21-8-1.0
Murrelet Platform Trees
Disruption Buffer (suitable habitat & within 100 yards of suitable habitat)
Suitable Habitat (80+ years; DK <= 1931)
Riparian Reserve
Road_Work
Construction
Improvement
Maint/Renov
Paved Road
Rocked Road
Native Material or Unknown
Treatment Type
Gap
Heavy Thinning
Moderate Thinning
Light Thinning
No Treatment
Streams
Fish Bearing
Non-Fish Bearing
Resource Area Boundary
N
0
1,500
Feet
NATIONAL SYSTEM OF PUBLIC LANDS
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Map created by EIG; 06-06-2011

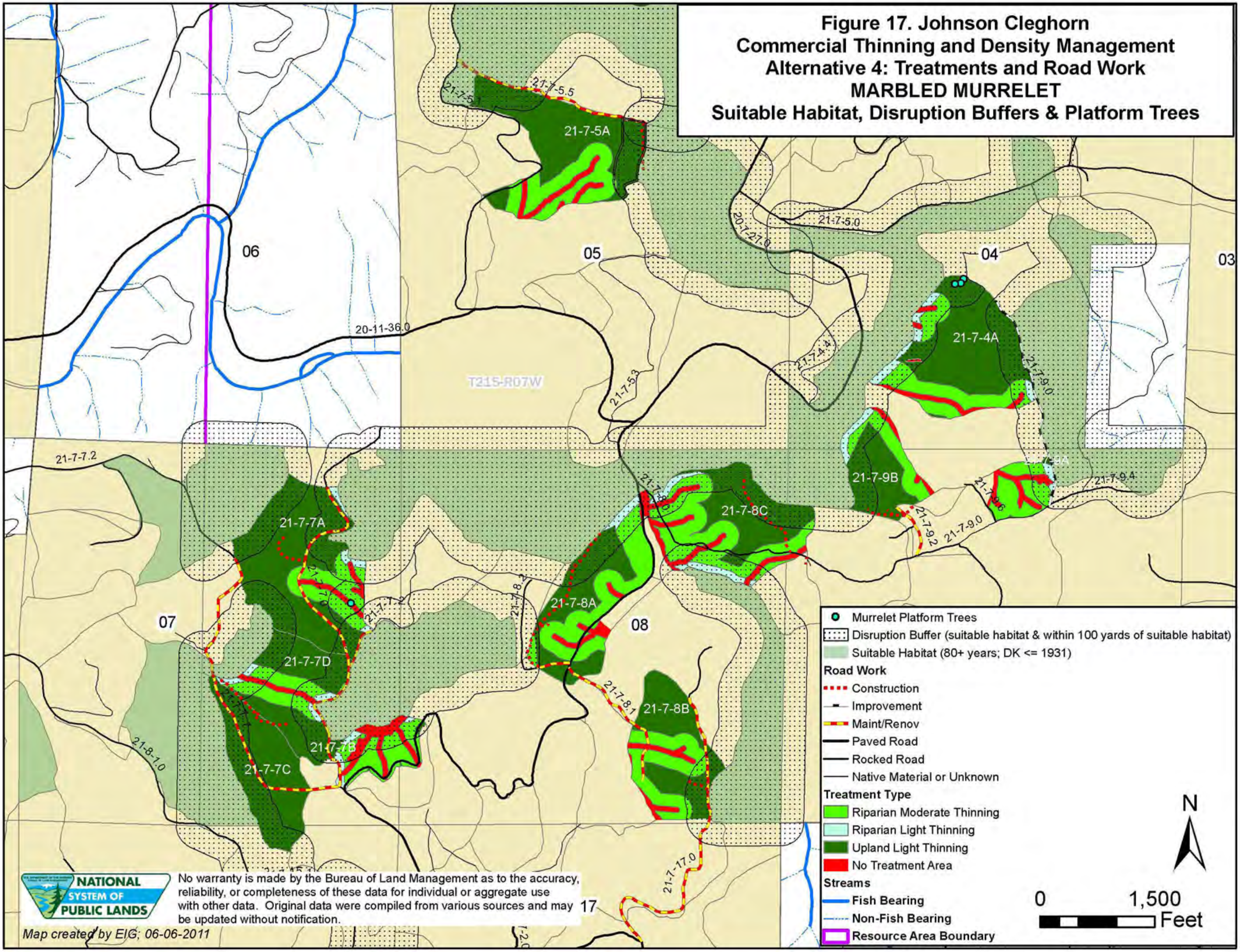
Figure 17. Johnson Cleghorn
Commercial Thinning and Density Management
Alternative 4: Treatments and Road Work
MARBLED MURRELET
Suitable Habitat, Disruption Buffers & Platform Trees
21-7-5.5
21-7-5.1
21-7-5A
21-7-5.0
20-7-21.0
06
05
04
03
20-11-36.0
21-7-4.4
21-7-4A
21-7-9.0
21-7-5.3
T21S-R07W
21-7-7.2
21-7-7A
21-7-8C
21-7-9B
21-7-9.4
21-7-9.2
21-7-9.0
21-7-7.2
21-7-8.2
21-7-8A
07
08
21-7-7D
21-7-8.1
21-7-8B
21-8-1.0
21-7-7B
21-7-7C
21-7-17.0
17
Murrelet Platform Trees
Disruption Buffer (suitable habitat & within 100 yards of suitable habitat)
Suitable Habitat (80+ years; DK <= 1931)
Road Work
Construction
Improvement
Maint/Renov
Paved Road
Rocked Road
Native Material or Unknown
Treatment Type
Riparian Moderate Thinning
Riparian Light Thinning
Upland Light Thinning
No Treatment Area
Streams
Fish Bearing
Non-Fish Bearing
Resource Area Boundary
N
0
1,500
Feet
NATIONAL SYSTEM OF PUBLIC LANDS
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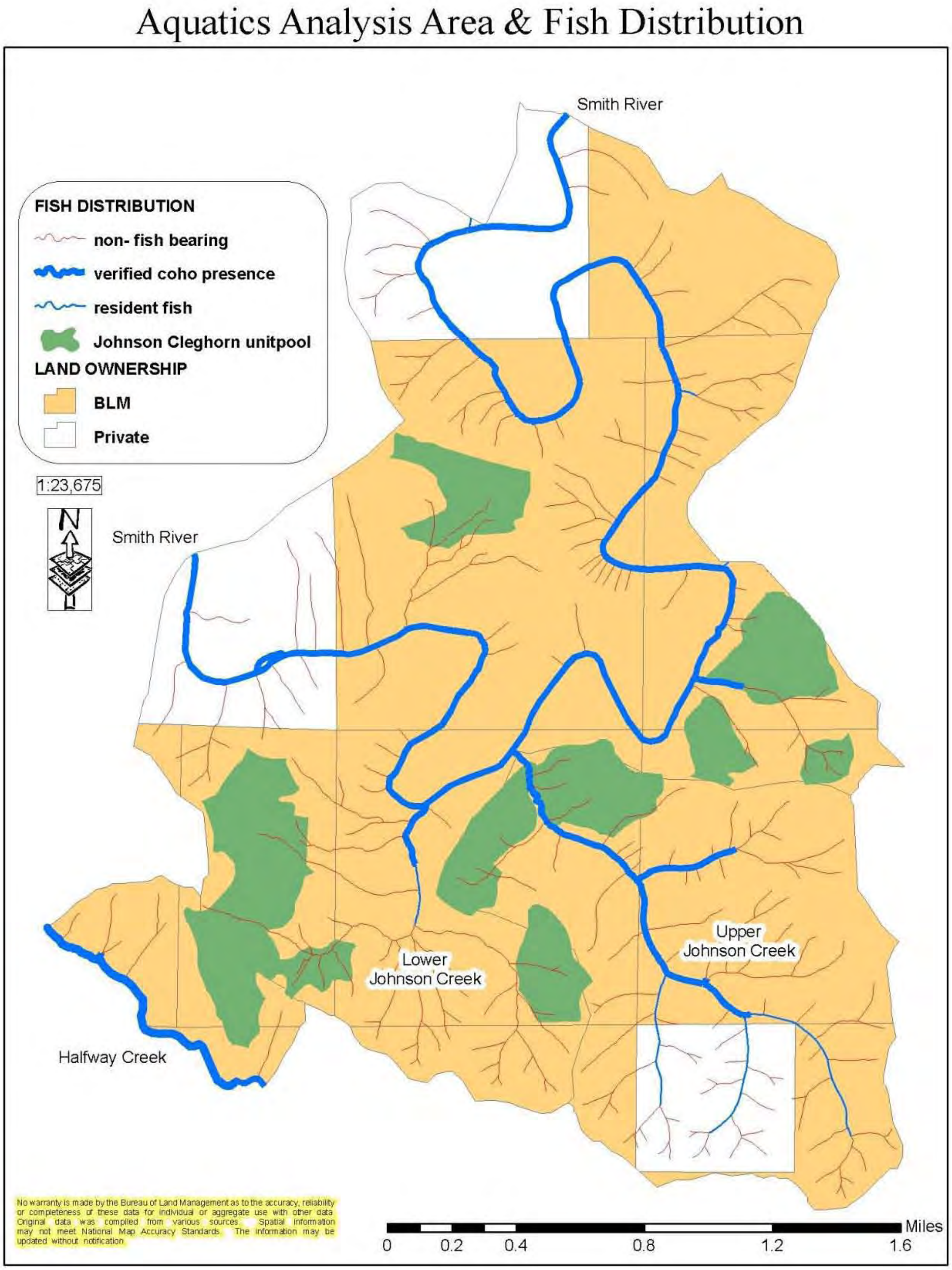
Map created by EIG; 06-06-2011

Figure 18.



Aquatics Analysis Area & Fish Distribution
FISH DISTRIBUTION
non- fish bearing
verified coho presence
resident fish
Johnson Cleghorn unitpool
LAND OWNERSHIP
BLM
Private
1:23,675
N
Smith River
Smith River
Halfway Creek
Lower Johnson Creek
Upper Johnson Creek
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0
0.2
0.4
0.8
1.2
1.6
Miles