Clever Beaver
Density Management
Environmental Assessment

NEPA #: DOI-BLM-OR-R040-2010-002-EA

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

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U.S. Department of the Interior, Bureau of Land Management
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Chapter 1. Purpose and Need for Action

A. Purpose & Need

The Bureau of Land Management (BLM), Swiftwater Field Office proposes thinning of approximately 301 acres of mid-seral forest stands, 49-60 years old, in the proposed Clever Beaver Density Management timber sale.

There is a need to treat mid-seral stands that are currently overstocked in order to improve wildlife habitat within the Late Successional Reserve. Wildlife habitat would be improved by creating conditions that: increase structural diversity in the canopy layers, increase vegetative species diversity, and maintain or increase high growth rates of trees to accelerate the development of late-successional characteristics (e.g. larger limb size, larger tree diameters). The purpose of the proposed project would be to reduce the stand densities through thinning prescriptions in order to improve wildlife habitat in a cost-efficient manner following 1995 ROD/RMP management direction.

The proposed Clever Beaver sale is located in the Upper Smith River and Upper Siuslaw watersheds. It is anticipated that the proposed timber sale would yield approximately 6-7 million board feet (6-7 MMBF) of timber in support of local and regional manufacturers and economies.

B. Conformance

This environmental assessment (EA) analyzes the environmental consequences of the Proposed Action Alternative and the No Action Alternative, to explain the environmental effects of each in the decision-making process. In addition to the 1995 *Roseburg District Record of Decision and Resource Management Plan* (1995 ROD/RMP) and periodic plan maintenance as published in the *Roseburg District Annual Program Summary and Monitoring Report Fiscal Year 2008* (2008 APS), 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*;

Implementation of the actions proposed in this analysis would conform to the requirements of the 1995 ROD/RMP, incorporating the standards and guidelines therein.

Survey & Manage

The proposed Clever Beaver Density Management 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.

On December 17, 2009, the U.S. District Court for the Western District of Washington issued an Order in *Conservation Northwest, et al. v. Rey, et al.*, No. 08-1067 (W.D. Wash.) (Judge Coughenour), granting Plaintiffs' motion for partial summary judgment and finding a variety of

NEPA violations in the BLM and USFS 2007 Record of Decision eliminating the Survey and Manage mitigation measure. Previously, in 2006, the District Court (Judge Pechman) had invalidated the agencies' 2004 RODs eliminating Survey and Manage due to NEPA violations. Following the District Court's 2006 ruling, parties to the litigation had entered into a stipulation exempting certain categories of activities from the Survey and Manage standard (hereinafter referred to as "Pechman Exemptions").

Judge Pechman'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 (emphasis added);
(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."

Following the Court's December 17, 2009 ruling, the Pechman exemptions are still in place. Judge Coughenour deferred issuing a remedy in his December 17, 2009 order until further proceedings and did not enjoin the BLM from proceeding with projects. Because the Clever Beaver project entails no regeneration harvest and entails thinning only in stands 49-60 years old, it project meets exemption "a" of the Pechman Exemptions (October 11, 2006 Order) even if the District Court sets aside or otherwise enjoins use of the 2007 *Survey and Manage Record of Decision* since the Pechman Exemptions would remain valid in such case.

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

C. Objectives

Specific objectives of the proposed action are outlined below.

- Comply with Section 1 of the O&C Act (43 USC § 1181a) which stipulates that O & C Lands be managed "… for permanent forest production, and the timber thereon shall be sold, cut, and removed in conformity with the principal of sustained yield for the purpose of providing a permanent source of timber supply, protecting watersheds, regulating stream flow, and contributing to the economic stability of local communities and industries, and providing recreational facilities…"

- 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.

- Seek a balance between reducing the risk of wildfire and a fuel profile that supports land allocation objectives (1995 ROD/RMP, pg. 78).

- Protect and enhance conditions of late-successional and old-growth forest ecosystems, which serve as the habitat for the northern spotted owl and other late-successional and old growth species (1995 ROD/RMP, pgs. 38, 153).

- Apply silvicultural treatments that would be beneficial to the creation of late-successional forest conditions and would put stands on a developmental pathway that would reduce the risk of stand loss to maintain long-term habitat viability (1995 ROD/RMP, pg. 153).

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 manner in which thinning would be conducted with respect to cost, the method(s) of yarding, and type of equipment; season(s) of operations; and the manner in which access would be provided, including road renovation, and the types and locations of road construction;

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, air 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.

- Provide revenue to the government from the sale of timber resources in a cost efficient manner.

Chapter 2. Discussion of the Alternatives

This chapter describes the basic features of the alternatives being analyzed.

A. The 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 mid-seral stands within the bounds 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 maintenance would be conducted as-needed to provide resource protection, accommodate reciprocal users, and protect the federal investment.

B. The Proposed Action Alternative

The action alternative proposes the offering of the Clever Beaver timbersale located on Revested Oregon and California Railroad Lands (O&C Lands). Clever Beaver would result in thinning approximately 301 acres of mid-seral stands in 10 units and provide approximately 6-7 million board feet of timber (Appendix F, Figure 1). Approximately four acres of the 301 acres would be cleared or brushed for spur right-of-ways or roads to access the treatment units. Activities included in the proposed action are summarized in Table 1 and the land use allocation and yarding method(s) for each of the proposed units is displayed in Table 2.

Table 1. Clever Beaver Proposed Action Summary.

Activity		Total
Thinning	Late Successional Reserve	301 acres
Yarding	Cable Yarding Ground Based Yarding Combination of Cable & Ground Based Yarding	57 acres 11 acres 233 acres
Hauling	Dry Season Haul Only Wet or Dry Season Haul	13,180 feet 21,698 feet
Road Activities	New, Temporary Construction New, Permanent Construction Renovation of Existing Roads Clearing associated with Construction/Renovation Decommissioning (i.e. waterbar, block, and mulch)	5,995 feet 0 feet 28,883 feet 4 acres 13,180 feet
Fuels Treatment	Machine Pile and Burn at Landings	

Table 2. Clever Beaver Land Use Allocations & Yarding Methods.

Unit	Township-Range-Section	Acres	Land Use Allocation	Yarding Method(s)
25A	T20S-R06W-Sec. 25	59	LSR	Cable; Ground-based
25B	T20S-R06W-Sec. 25	11	LSR	Cable; Ground-based
27A	T20S-R06W-Sec. 27	54	LSR	Cable; Ground-based
27B	T20S-R06W-Sec. 27	42	LSR	Cable
27C	T20S-R06W-Sec. 27	42	LSR	Cable; Ground-based
33A	T20S-R06W-Sec. 33	15	LSR	Cable
33B	T20S-R06W-Sec. 33	19	LSR	Cable; Ground-based
33C	T20S-R06W-Sec. 33	2	LSR	Ground-based
35A	T20S-R06W-Sec. 35	48	LSR	Cable; Ground-based
35B	T20S-R06W-Sec. 35	9	LSR	Ground-based
Total		301		

1. Timber Harvest

a) Treatment Prescription

Tree Marking

Stands in Clever Beaver would have an average of 80, 90, or 110 square feet of basal area retained. A variable spacing marking prescription would be used. Portions of units that are either within 100 feet of late-successional habitat, where marbled murrelet surveys have not been conducted or the adjacent stand is known to be occupied by murrelets (Appendix F, Figure 3), would have 120 square feet of basal area retained. Portions of Units 27A and 27C would be marked at 110 square feet of basal area for soil stability concerns (refer to *Soils: Proposed Action Alternative*, pg. 29).

In general, dominant and co-dominant trees from a variety of tree species including conifers and hardwoods would be retained. Minor conifer and hardwood species would be retained where possible to maintain stand diversity and canopy openings would be created or enlarged to maintain trees with large limbs, full crowns, promote tree regeneration, shrubs, and forbs. Some smaller shade tolerant trees such as western red cedar and western hemlock would be marked to maintain the existing species diversity if they are under-represented in the dominant and co-dominant classes.

Older remnant trees may be present, but are not the numerically predominant stand components or the focus of the treatments. Trees would primarily be removed from the suppressed and intermediate canopy classes, although some co-dominant and dominant trees would be removed where necessary to meet specific land use objectives. Since thinning would focus on removal of intermediate and suppressed canopy layers, it is possible that suppressed trees designated for cutting may be older than the prevailing stand age.

Snags & Coarse Woody Debris

Conifer and hardwood snags 10 inches or larger in diameter breast height (dbh) and at least 16 feet in height would be marked for retention. Existing snags would be felled only if they pose a safety concern. Snags felled for safety reasons would be retained on site as coarse woody debris and all coarse woody debris would be retained.

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

b) Stream Buffers

Perennial or Fish-bearing Streams

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

Intermittent Streams

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

c) Timber Cruising

Timber cruising would employ methods that could include the felling of sample trees to formulate local volume tables. Felled sample trees would become part of the offered 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

Proposed units would require a mixture of skyline cable yarding and ground-based yarding (Table 2). Up to 10 acres of additional, incidental ground-based logging may be necessary (i.e. removal of guyline anchor trees, isolated portions of units, etc.).

Prior to attaching logging equipment to a reserve tree, precautions to protect the tree from damage would be taken. Examples of protective measures include the use of straps, tree plates, and synthetic rope where possible and minimal notching where necessary (less than 1/2 the tree's diameter would be notched). If it would be necessary to fall a reserve tree for safety reasons, then it may be harvested or left as coarse woody debris at the discretion of the government's contract administrator.

Cable Yarding

Cable logging systems that limit ground disturbance would be used to obtain partial or full 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.

Cable yarding would not be permitted on very steep slopes (i.e. 70 percent and greater) when soil moisture levels are high enough to squeeze water from soil samples by hand. Soil moisture would be considered too high if cable yarding creates glazed imprints on soil that channels water down slope. This generally occurs when the soil moisture is greater than 30 percent.

Where practical, require full suspension over streams.

Ground-Based Yarding

Ground-based logging would be limited to the dry season (normally May 15th to October 15th (1995 ROD/RMP, pg. 131). If soil moisture levels would cause the amount of compaction to exceed 10 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 to determine when operations may need to be suspended.

Ground-based yarding equipment would be limited to slopes generally less than 35 percent (2001 Plan Maintenance; 2008 APS, pgs. 65-66). 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 and harvester/forwarder trails would be spaced at least 50 feet apart where topography allows. In addition, machines used for ground-based logging would be limited to a track width no greater than 10.5 feet.

Harvesters would cut trees so that stumps are no higher than 12 inches above the ground to allow subsoiling excavators to pass over the stumps. Harvesters would also place tree limbs in the trails in front of the equipment to minimize compaction. In harvester trail segments that are within five feet of reserved trees, slash would be placed to protect the large roots at or near the surface.

3. Timber Hauling

Approximately 21,698 feet of rocked roads would be used for haul in either the dry- or wet-season while 13,180 feet of natural surface roads would be limited to dry-season hauling (Table 3).

Prior to any wet season haul on natural 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 of slash would occur at machine-piled landing piles. The fine fuels generated during the thinning process would remain scattered throughout the treatment units. All prescribed burning (i.e. slash piles) would have an approved "Burn Plan," and be conducted under the requirements of the Oregon Smoke Management Plan and in a manner consistent with the requirements of the Clean Air Act (ODEQ & ODF, 1992).

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

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 (i.e. 14 foot running surface) to minimize soil disturbance (1995 ROD/RMP, pg. 132). Approximately four acres would be cleared or brushed for spur right-of-ways or roads to access the harvest units.

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

Construction

There would be a total of approximately 5,995 feet of new, temporary road construction in Clever Beaver and no new, permanent spur roads would be constructed (Table 3). New cut and fill slopes would be mulched with weed-free straw, or equivalent, and seeded with a native or sterile hybrid mix. Temporary spurs would be decommissioned after harvest.

Temporary spur roads would not be rocked at purchaser's expense because these roads would occur within the LSR and are not anticipated to be used for subsequent stand treatments.

Renovation

There would be a total of approximately 28,883 feet of renovation in Clever Beaver. Approximately 7,185 feet of existing, native surfaced roads in Clever Beaver would be renovated by brushing, grading, and replacing drainage structures (Table 3). Approximately 21,698 feet of existing, rock surfaced roads in Clever Beaver would be renovated by brushing, grading, replacing drainage structures, and adding rock where needed (Table 3). These rocked roads would then remain open following thinning. Road renovation would generally be performed by the purchaser.

Maintenance

Approximately 7,000 feet of existing roads would be maintained. Road maintenance would consist of brushing, grading, maintaining or replacing drainage structures (culverts and drainage ditches), and adding spot rock where needed (1995 ROD/RMP, pgs. 137-138). Road maintenance would generally be performed by the Roseburg BLM District maintenance crew.

Decommissioning

Approximately 5,995 feet of newly constructed, native-surface spur roads and 7,185 feet of renovated, native-surface roads would be decommissioned following their use (Table 3). These roads and spurs would be decommissioned by water-barring, sub-soiling, mulching with logging slash where available (or with straw if logging slash is not available), and blocking with trench barriers.

Over-wintering

Over-wintering natural surface spur roads would be done by building, using, and winterizing natural surface spur roads prior to the end of the dry season. Over-wintering would include: installation of waterbars, mulching the running surface with weed-free straw, seeding and

mulching bare cut and fill surfaces with native species (or a sterile hybrid mix if native seed is unavailable), and blocking.

Table 3. Cleaver Beaver Roads & Spurs[1]

Spur/Road #	New, Temporary Construction (feet)	Renovation (feet)	Surfacing		Decommissioning	
			Existing	Proposed	(feet)	How Decommissioned
Spur CB1	200	0	None	Native	200	Water-bar, subsoil, mulch, block
Spur CB2	700	0	None	Native	700	Water-bar, subsoil, mulch, block
Spur CB3	700	0	None	Native	700	Water-bar, subsoil, mulch, block
Spur CB4	1,120	0	None	Native	1,120	Water-bar, subsoil, mulch, block
Spur CB5	2,700	0	None	Native	2,700	Water-bar, subsoil, mulch, block
Spur CB6	200	0	None	Native	200	Water-bar, subsoil, mulch, block
Spur CB7	175	0	None	Native	175	Water-bar, subsoil, mulch, block
20-6-25.1	0	1,060	Native	Native	1,060	Water-bar, mulch, block
20-6-26.0	0	750	Native	Native	750	Water-bar, mulch, block
20-6-26.0	0	4,000	Rock	Rock	0	None
20-6-27.0	0	1,700	Rock	Rock	0	None
20-6-27.1	200	1,000	Native	Native	1,200	Water-bar, subsoil, mulch, block
20-6-27.2	0	500	Rock	Rock	0	None
20-6-33.1	0	175	Native	Native	175	Water-bar, mulch, block
20-6-33.3	0	6,600	Rock	Rock	0	None
20-6-33.8	0	450	Rock	Rock	0	None
20-6-34.0	0	8,448	Rock	Rock	0	None
20-6-36.0	0	4,200	Native	Native	4,200	Water-bar, subsoil[2], mulch, block
TOTAL	**5,995**	**28,883**			**13,180**	

[1]Approximately 7,000 feet of existing roads would be maintained for Cleaver Beaver in addition to the roads and spurs described in the table.
[2] Approximately 1,900 feet of the 20-6-36.0 road would be subsoiled.

C. Additional Project Design Features of the Action Alternative

1. Cultural Resources:

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

2. Noxious Weeds:

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

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

3. Special Status Plants and Animals:

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

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

Northern Spotted Owl

Suitable spotted owl habitat is present within 65 yards of all Clever Beaver Units (Appendix F, Figure 2). The proposed project area is located within the Tyee Demography Study Area for the northern spotted owl and stands of suitable habitat within the proposed project area have had annual surveys since the early 1990s through 2009. Based on 2008 and 2009 protocol survey data, there are currently no active known northern spotted owl activity centers or unsurveyed suitable habitat within 440 yards of the proposed action. Therefore, none of the proposed units in Clever Beaver would require seasonal restrictions until March 1, 2012 unless spotted owls are discovered in the future. Since this project is located within the Tyee Demography Study Area, annual surveys are expected to continue as funding allows.

If future surveys locate spotted owls within 65 yards of the proposed action, harvest activities in that area (e.g. falling, bucking, and yarding of timber) would be seasonally restricted from March 1st through July 15th unless current calendar year surveys indicate: 1) spotted owls present but not attempting to nest or 2) spotted owls present but nesting attempt has failed. Waiver of seasonal restriction is valid until March 1st of the following year.

If future surveys locate spotted owls within 440 yards of the proposed action, prescribed burning in that area (i.e. slash piles) would be seasonally restricted from March 1st through July 15th unless current calendar year surveys indicate: 1) spotted owls present but not attempting to nest or 2) spotted owls present but nesting attempt has failed. Waiver of seasonal restriction is valid until March 1st of the following year.

Marbled Murrelet

An occupied murrelet site is located adjacent to Unit 35A within a 32-acre stand southwest of the unit. Harvest activities (e.g. falling, bucking, and yarding of timber) within 100 yards of the occupied site would be seasonally restricted from April 1st thru August 5th, and Daily Operating Restrictions would be applied from August 6th thru September 15th (Appendix F, Figure 3). Under Daily Operating Restrictions, operations may occur between two hours after sunrise until two hours before sunset.

Those portions of proposed units within 100 yards of unsurveyed, suitable habitat would have Daily Operating Restrictions from April 1st through August 5th (Appendix F, Figure 3).

A second year of surveys is scheduled to be completed in 2010 near Units 25A and 25B following the Pacific Seabird Group protocol (Mack et al., 2003) (Appendix F, Figure 3). If

surveys detect murrelet occupancy, then harvest activities (e.g. falling, bucking, and yarding of timber) within 100 yards of the occupied stand would be seasonally restricted from April 1st through August 5th and would have Daily Operating Restrictions applied from August 6th through September 15th. If the second year of surveys does not detect murrelet occupancy, then seasonal restrictions or Daily Operating Restrictions would not be required for Units 25A or 25B. Once completed, the survey results would be valid until April 1, 2016.

For all the Clever Beaver units, prescribed burning (i.e. slash piles) within 440 yards of unsurveyed, suitable habitat or the occupied murrelet site would be seasonally restricted from April 1st through August 5th.

4. Petroleum Products or other Hazardous Material:

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

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

D. Resources that Would be Unaffected by Either Alternative

1. Resources Not in Project Area

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

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

There are currently no energy transmission, transport facilities, utility rights-of-way, and/or energy resources with commercial potential in proximity to any of the proposed units.

2. Cultural Resources

Inventories for cultural resources in the proposed Clever Beaver units were completed in November 2, 2009. No cultural resources were discovered; as such, the alternatives would not impact cultural resources. It was determined that there would be no effect to any cultural resources since none would be included within the Clever Beaver units.

3. Visual Resource Management

The Visual Resource Management (VRM) classification for this area is Class IV. The basic elements of form, line, color and texture as required by the 1995 ROD/RMP (pg. 52) would be maintained under the proposed action.

Chapter 3. Affected Environment & Consequences by Resource

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

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

A. Forest Vegetation

1. Affected Environment

The proposed units are predominantly Douglas-fir forested stands 49-60 years old. Other conifer species in the stands include incense-cedar, western hemlock, western red cedar, and grand fir. Hardwoods and ground vegetation are common where there is sufficient light available (e.g. Pacific madrone, golden chinquapin, big leaf maple, red alder, salal, Oregon grape, and sword fern). All of the proposed units were originally harvested in the 1950's or 1960's. Fifty percent of the stands had been precommercial thinned and thirty percent of the stands had fertilization treatments.

Current stand exam data was input into the ORGANON growth and yield model version 8.2. Model output was used to describe current stand conditions and to predict post-treatment conditions after the prescribed management is implemented. Harvest units may contain one or more stands, and may contain a mix of tree species, form, and distribution. The current stand conditions for the Clever Beaver sale are summarized below in Table 4.

Table 4. Current Stand Conditions[1].

Unit #	Stand Age (years)	Trees Per Acre	Basal Area (square feet)	Quadratic Mean Diameter (inches)	Relative Density Index	Crown Closure[2] (%)	Live Crown Ratio (%)
25A	55	218	265	15.0	0.79	179	36
25A	55	207	215	13.8	0.66	136	35
25B	52	206	180	12.7	0.57	144	45
27A	50	196	195	13.5	0.6	132	37
27B	48	294	180	10.7	0.62	164	39
27C	55	224	185	12.3	0.59	148	47
33A	66	168	255	16.7	0.72	131	37
33B	50	295	250	12.4	0.79	217	39
35A	53	173	195	14.3	0.58	126	38
35B	59	295	250	12.4	0.79	217	39

[1] Data shown are for trees 6 inches dbh and larger.

[2] Canopy Closure is the proportion of the forest floor covered by the vertical projection of tree crowns, which is adjusted for crown overlap in closed canopy stands.

2. No Action Alternative

Current stand relative densities exceed or are near suppression related mortality thresholds. In the absence of treatment, canopies would remain closed and the crowns of individual trees would continue to recede, resulting in increased suppression mortality and decreasing diameter growth as trees compete for water, nutrients, and sunlight.

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. Based on ORGANON modeling, it is predicted that within the first two decades (0-20 years from now), approximately 13,400 trees over six inches dbh would be dead within the proposed project area. The following three decades (21-50 years from now) are predicted to add another 11,700 dead trees over six inches dbh. Some of these dead trees or snags would stay standing longer than others but they all would eventually fall and become coarse woody debris. Continued suppression would also lead to a reduction in the hardwood and shrub components, which would further simplify the vegetative composition of the stands.

Live crown ratios of the overstory trees would continue to decrease from current levels as lower limbs are shaded out and die. Closely spaced trees with small crown ratios have reduced photosynthetic capacity, which results in decreased diameter growth and lower resistance to disease and insects. As trees increase in height, with little increase in diameter, they become unstable and more susceptible to wind damage (Oliver and Larson, 1996).

3. Proposed Action Alternative

Thinning would result in increased diameter growth, improved stem and root strength, cessation of crown recession, release of understory vegetation and increased potential for new tree and shrub understory regeneration (Bailey 1996; Bailey and Tappeiner 1998; Bailey, et al. 1998; Oliver and Larson 1996).

Thinning would reduce relative stand densities to approximately 0.25 – 0.43 (Table 5). Stands thinned to a relative density of 0.23-0.45 would produce high rates of diameter growth (Curtis and Marshall, 1986). Generally, trees selected for retention would have at least a 30 percent live crown ratio. Trees with at least a 30 percent live crown ratio would be more likely to develop deeper crowns (i.e. increase live crown ratio) and accelerate diameter growth in response to thinning (Daniel, et al. 1979). The post-thinning stand conditions are summarized in Table 5.

Table 5. Post-Treatment Stand Conditions[1]

Unit #	**Stand Age** (years)	**Trees Per Acre**	**Basal Area**	**Quadratic Mean Diameter** (inches)	**Relative Density Index**	**Crown Closure[2]** (%)	**Live Crown Ratio** (%)
25A	55	74	90	15	0.26	60	36
25A	55	84	90	14.7	0.30	59	36
25B	52	103	90	12.7	0.28	72	45
27A	50	80	80	13.5	0.25	54	37
27A	50	110	110	13.5	0.34	74	37

Unit #	Stand Age (years)	Trees Per Acre	Basal Area	Quadratic Mean Diameter (inches)	Relative Density Index	Crown Closure[2] (%)	Live Crown Ratio (%)
27B	48	129	80	10.7	0.27	72	39
27C	55	97	80	12.3	0.26	64	47
27C	55	134	110	12.3	0.35	88	47
33A	66	73	80	20.4	0.43	72	39
33B	50	95	80	12.4	0.25	70	39
35A	53	80	90	14.3	0.27	59	38
35B	59	92	90	13.4	0.28	63	43

[1] Data shown are for trees 6 inches dbh and larger.
[2] Canopy Closure is the proportion of the forest floor covered by the vertical projection of tree crowns, which is adjusted for crown overlap in closed canopy stands.

The proposed thinning would reduce tree densities, allowing selected trees more room to grow and harvesting the anticipated mortality. In the long-term, the treatment would maintain or increase growth rates of retained species and promote stem quality and tree vigor. This would reduce stand susceptibility to disturbances such as wildfire, disease or insect infestation (Fettig, 2006).

A reduction in stand density (such as with thinning) involves the tradeoff between maintaining or improving individual tree growth rates and reducing the accumulation of dead trees (such as snags and down wood) while promoting understory growth and a multi-layered stand structure. Even though the proposed action would capture most of the suppression mortality by harvesting, trees would continue to die due to competition and other factors. Based on ORGANON modeling, it is predicted that within the first two decades (0 – 20 years following thinning), approximately 4,800 trees over six inches dbh would be dead within the proposed project area. The following three decades (21 – 50 years following thinning) are predicted to add another 4,700 dead trees over six inches dbh. Some of these dead trees or snags would stay standing longer than others but they all would eventually fall and become coarse woody debris. Though fewer snags would develop over time when compared to the No Action Alternative, the snags developed post treatment are expected to be larger snags with more resiliency and limb structure (Reukema and Smith, 1987) than snags that develop under a more competitive stand condition (Nietro, 1985). As stated previously (*Treatment Prescription: Snags & Coarse Woody Debris*, pgs. 5-6), snags greater than 10 inches dbh and all coarse woody debris down logs would be retained and the residual stands following harvest would provide a pool of candidate trees for future snag and coarse woody debris recruitment.

While the proposed thinning would reduce tree densities in individual stands, it would not alter the seral stage of the stands, or the seral stage distribution of BLM-managed lands in the Upper Smith River and Upper Siuslaw watersheds.

B. Wildlife

1. Federally Threatened & Endangered Wildlife Species

a) Northern Spotted Owl

For the analysis of effects to owls and their habitat in the Clever Beaver project area, only the most recently occupied activity center and their corresponding home range circle were considered to determine habitat impacts for each owl site (Table 6).

(1) Affected Environment

Based on 2009 survey data, there is one known spotted owl activity center (Clevenger Creek; IDNO 1918O) within the proposed boundary of Unit 33A (Appendix F, Figure 2). This activity center was established in the mid-1980s based on an observation of a single male. Annual surveys have been completed since 1987 and a single male was observed in 1993 and 2007. A pair of spotted owls has not been observed at this established activity center. The last two years of surveys (Tyee Demography Study, 2008-2009) did not locate a pair of spotted owls within the area.

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 (i.e. nest site) and is used by spotted owls to obtain cover, food, mates, and to care for their young. The home ranges of several owl pairs may overlap and the habitat within them is commonly shared between adjacent owl pairs and by other dispersing owls. These areas are important for the survival and productivity of spotted owls because owls are non-migratory birds that remain in their home ranges year-round.

There are nineteen known spotted owl activity centers, from ten known spotted owl sites, within 1.5 miles of the proposed Clever Beaver units (Table 6). The closest spotted owl activity center (Clevenger Creek, IDNO 1918O) is currently located within Clever Beaver unit 33A (Appendix F, Figure 2). The other activity centers are currently located approximately 202 to 2,435 yards (0.1 to 1.38 miles) away from proposed unit boundaries.

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. Seven proposed units (i.e. 25B, 27A, 27B, 27C, 33A, 33B, and 33C) fall within the core areas of known spotted owl activity centers (Table 6; Appendix F, Figure 2).

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 and are used in determination of incidental take. Two units (i.e. 27B and 33A) would fall within the nest patches of known spotted owl activity centers (Table 7; Appendix F, Figure 2).

Known Owl Activity Centers (KOAC) – Known Owl Activity Centers have been designated to minimize impacts and protect nest sites found before 1994 (1995 ROD/RMP; pg. 48). There are two KOACs located north of the proposed project area. The proposed project would not treat habitat located within any KOAC.

Designated Critical Habitat – Critical Habitat is a specific geographical area designated by the USFWS as containing habitat essential for the conservation of a Threatened or Endangered species. Critical Habitat for the northern spotted owl was re-designated in 2008 (Fed. Register; Vol. 73 No. 157; Aug. 13, 2008; pgs. 47326-47374). Under the 2008 Critical Habitat rule, units 33A, 33B, and 33C are located in Critical Habitat (Unit OR-13) for the northern spotted owl. However, the 2008 Critical Habitat rule is currently the subject of legal review. Under the 1992 Final Rule for Determination of Critical Habitat for the Northern Spotted Owl (Fed. Register; Vol. 57, No. 10; Jan. 15, 1992; pgs. 1796-1838), all of the proposed Clever Beaver units would be located within designated Critical Habitat (Unit OR-53) for the northern spotted owl.

Dispersal Habitat – Forest types described as dispersal habitat are essential to the dispersal of juvenile and non-territorial (e.g. single birds) northern spotted owls. Dispersal habitat can occur in intervening areas between or within blocks of nesting, foraging, and roosting habitat. Dispersal habitat is essential to maintaining stable owl populations to be able to fill territorial vacancies when resident owls die or leave their territories, and to providing adequate gene flow across the range of the species (USDI USFWS, 2008b).

Table 6. Northern Spotted Owl Habitat within Known Home Ranges near Clever Beaver Density Management.

Northern Spotted Owl Site (IDNO)*		Federal Land (acres)	Habitat on Federal Lands Only (acres)			
			Suitable Habitat		Dispersal-Only Habitat	
			Current Condition	Habitat Modified through Proposed Action	Current Condition	Habitat Modified** through Proposed Action
CLEVENGER CREEK (**1918O**)	Home Range (2,895 acres)	1,987	1,265	0	262	127
	Core Area (502 acres)	230	122	0	39	39
	Nest Patch (70 acres)	64	13	0	15	15
ELK BEAVER CREEK (**0016O**)	Home Range (2,895 acres)	2,029	779	0	373	12
	Core Area (502 acres)	368	62	0	91	0
	Nest Patch (70 acres)	70	28	0	35	0
GUNTER REC (**4662A**)	Home Range (2,895 acres)	2,206	510	0	1,171	121
	Core Area (502 acres)	167	65	0	53	0
	Nest Patch (70 acres)	45	32	0	13	0
HEFTY CREEK (**2040O** & A)	Home Range (2,895 acres)	2,088	1,074	0	390	216
	Core Area (502 acres)	437	274	0	90	90
	Nest Patch (70 acres)	70	61	0	5	5
LOWER BUCK CREEK (**0015D** & E)	Home Range (2,895 acres)	2,131	890	0	551	87
	Core Area (502 acres)	358	128	0	175	0
	Nest Patch (70 acres)	70	41	0	13	0
PLANK CREEK (**3905O**, A-B)	Home Range (2,895 acres)	2,067	768	0	988	14
	Core Area (502 acres)	204	113	0	12	0
	Nest Patch (70 acres)	36	32	0	0	0
SF SMITH RIVER (**0260**O, A-B, **C** & D)	Home Range (2,895 acres)	2,342	2,005	0	454	39
	Core Area (502 acres)	304	302	0	0	0
	Nest Patch (70 acres)	64	64	0	0	0

Northern Spotted Owl Site (IDNO)*		Federal Land (acres)	Habitat on Federal Lands Only (acres)			
			Suitable Habitat		Dispersal-Only Habitat	
			Current Condition	Habitat Modified through Proposed Action	Current Condition	Habitat Modified** through Proposed Action
SMITH FOLLEY (**2052C**)	Home Range (2,895 acres)	2,788	2,077	0	340	23
	Core Area (502 acres)	65	164	0	63	0
	Nest Patch (70 acres)	53	53	0	0	0
SMITH CREEK WEST (**1937O** & A)	Home Range (2,895 acres)	239	1,237	0	589	267
	Core Area (502 acres)	277	100	0	33	33
	Nest Patch (70 acres)	55	46	0	9	0
Upper Buck Creek (0019O)	Home Range (2,895 acres)	2,075	877	0	523	71
	Core Area (502 acres)	407	137	0	47	0
	Nest Patch (70 acres)	70	29	0	8	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.

Table 7. Northern Spotted Owl Habitat within Clever Beaver Proposed Units.

Sale	Unit	Unit Acres	Unit Acres within…						Unit Total	
			Nest Patch		Core Area		Home Range			
			Suitable Habitat	Dispersal-only Habitat	Suitable Habitat	Dispersal-only Habitat	Suitable Habitat	Dispersal-only Habitat	Suitable Habitat	Dispersal-only Habitat
CLEVER BEAVER	25A	59	0	0	0	0	0	59	0	59
	25B	11	0	0	0	0	0	11	0	11
	27A	54	0	5	0	42	0	54	0	54
	27B	42	0	0	0	0	0	42	0	42
	27C	42	0	0	0	0	0	42	0	42
	33A	15	0	15	0	15	0	15	0	15
	33B	19	0	0	0	19	0	19	0	19
	33C	2	0	0	0	2	0	2	0	2
	35A	48	0	0	0	0	0	48	0	48
	35B	9	0	0	0	0	0	9	0	9
TOTAL		**301**	**0**	**20**	**0**	**78**	**0**	**301**	**0**	**301**

(2) No Action Alternative

The quality and availability of northern spotted owl habitat would be unaffected under the No Action alternative. The 301 acres of mid-seral stands included in proposed Clever Beaver units would continue to function as dispersal habitat. However, stand diversity would decrease over time as hardwoods and shrubs, important components of owl habitat, are lost due to suppression as mentioned in the *Forest Vegetation: No Action Alternative* previously. The development of suitable habitat characteristics, such as larger diameter trees with large crowns, would continue but at a slower rate than with the proposed thinning treatment. Spotted owl activity centers would continue to function at current levels because habitat would not be modified.

(3) Proposed Action Alternative

No suitable habitat within the home range, core area, or nest area of any known spotted owl activity center would be treated under the proposed action.

Home Range –Approximately 301 acres of dispersal-only habitat would be modified by thinning activities within the home ranges of ten known spotted owl sites (including nineteen activity centers) (Table 6).

Core Area – A total of 78 acres of dispersal-only habitat are proposed for thinning within the core areas associated with five spotted owl activity centers (Table 6).

Nest Patch – A total of 20 acres of dispersal-only habitat would be treated within the nest patches of two known spotted owl sites (Clevenger Creek, IDNO 1918O and Hefty Creek, IDNO 2040O & 2040A) under the proposed thinning prescription (Tables 6 & 7).

Approximately 15 acres in Clever Beaver Unit 33A is within the nest patch associated with the Clevenger Creek owl site (IDNO 1918O), which is 21 percent of that nest patch. However, the Clevenger Creek nest patch does not contain suitable habitat or the two key elements within a nest patch: (1) canopy cover of dominant, co-dominant, and intermediate trees (conifers and hardwoods) and (2) a sufficient amount of down wood (USDI USFWS et al., 2008c; pg. 13). Without these elements, the Clevenger Creek nest patch would be unlikely to sustain a nesting pair of spotted owls. This assertion is supported by the annual survey data that indicates no nesting spotted owl pairs have been documented here since surveys began in 1987. Disturbance or disruption to nesting spotted owls would not occur because none are known to be present based on the survey history and lack of nesting spotted owls at this location (i.e. IDNO 1918O). In addition, the project design features include seasonal restrictions for nesting spotted owls if they are discovered in the future (*Additional Project Design Features: Special Status Plants and Animals*, pg. 10). Thus, treatment of dispersal-only habitat within the Clevenger Creek nest patch is not expected to adversely affect spotted owls.

Approximately five acres are located within the nest patch of one activity center (IDNO 2040O) associated with the Hefty Creek owl site. Approximately two percent (1.6 acres for IDNO 2040A) to five percent (3.4 acres for IDNO 2040O) of the nest patches are located within Clever Beaver Unit 27B and would be treated with the proposed thinning prescription. Based on annual survey data from 1987 through 2009, neither of the nest patches for activity centers IDNO 2040O or 2040A has been occupied by a pair of spotted owls since 1996 and 1998, respectively. In addition, these nest patches are

primarily comprised of suitable habitat (e.g. greater than 80 years of age) outside of the proposed unit boundaries and are part of a 410 acre stand of contiguous suitable nesting, roosting, and foraging habitat. Thus, thinning of the five acres of dispersal-only habitat within these two nest patches is not expected to adversely affect spotted owls within the Hefty Creek owl site since there is additional, higher quality habitat to support potential nesting.

Designated Critical Habitat – Under the 2008 Critical Habitat rule, treatment of 36 acres of dispersal-only habitat (Units 33A, 33B, and 33C) would modify habitat on approximately 0.03 percent of Critical Habitat unit OR-13 (118,515 acres in total size). Under the 1992 Critical Habitat rule, treatment of 301 acres of dispersal-only habitat (all proposed units) would modify approximately 0.9 percent of Critical Habitat Unit OR-53 (34,300 acres in total size).

Thinning treatments are designed to facilitate the development of late seral stand characteristics. Canopy closure would be maintained above forty percent and additional structural elements needed to support spotted owl dispersal would be maintained. Although some primary constituent elements contributing to canopy cover and multiple canopy layers would be removed, the proposed thinning treatment would result in sufficient primary constituent elements to provide for spotted owl dispersal across the landscape, within Critical Habitat Units, and between Critical Habitat Units.

Dispersal Habitat – Though the quality of dispersal-only habitat within the proposed units would be temporarily reduced by the thinning treatment, 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. These stands are expected to continue functioning as dispersal habitat because post-treatment canopy closure would be maintained between 54-74 percent and the quadratic mean diameter would be between 10.7 - 20.4 inches (Table 5). Canopy closure exceeding 40 percent and an average tree diameter exceeding 11 inches are figures widely used as minimum criteria describing functioning dispersal habitat (Thomas *et al.*, 1990).

The proposed thinning would accelerate the development of late-successional characteristics used by spotted owls such as large diameter trees, multiple canopy layers, understory development, and hunting perches. Development of late-successional characteristics and suitable habitat from dispersal-only habitat would be expected in approximately 50 years; roughly 100 years sooner than through natural stand development (pers. comm., Craig Kintop, Roseburg District Silviculturist).

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. 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). However, there are an additional 47,000 acres of dispersal habitat (suitable habitat and dispersal-only habitat) available within a ten mile radius of the project area.

There are also 69,553 acres of Late-Successional Reserves within the Upper Smith River and Upper Siuslaw River watersheds that would, over the long-term, provide both dispersal habitat and suitable habitat for spotted owls. Currently, there are approximately

32,125 acres of suitable habitat and 18,780 acres of dispersal-only habitat in Late-Successional Reserves within the two watersheds.

Although the proposed action would 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 between Critical Habitat Units or within the physiographic province.

b) Marbled Murrelet

(1) Affected Environment

The proposed Clever Beaver project is located between 37 to 40 miles from the coast within Marbled Murrelet Inland Management Zone 2 (within 36-50 miles of the coast). To avoid disruption to nesting marbled murrelets, suitable habitat adjacent to proposed Units 25A, 35A, and 35B as well as scattered, suitable habitat trees within the proposed units were surveyed in 2009 following the Pacific Seabird Group two-year protocol (Mack et al., 2003).

During surveys in 2009, an occupied marbled murrelet site was discovered along Summit Creek within a 32 acre stand southwest of proposed Clever Beaver Unit 35A (Appendix F, Figure 3). Surveys in 2009 also detected marbled murrelet presence, but not occupancy, east of Unit 25A (Appendix F, Figure 3). Another year of surveys is planned for 2010 and additional suitable habitat would be surveyed to the north of the murrelet detection in an attempt to determine occupancy. If murrelets are detected within or adjacent to the proposed units, the proposed thinning treatment would be re-evaluated within the occupied stand and seasonal restrictions and Daily Operating Restrictions would be implemented within 100 yards of the occupied stand.

Surveys for potential marbled murrelet nesting trees were completed within all the Clever Beaver units following the Residual Habitat Guidelines (USDI USFWS & BLM, 2004). All potential murrelet nest trees, and trees adjacent to them, within unit boundaries were marked and tagged for retention. Potential nest trees were located within the proposed boundaries of units 25A, 27A, 27B, 27C, 33A, and 35B.

Designated Critical Habitat –Critical Habitat for the marbled murrelet was designated in 1996 (Fed. Register; Vol. 61 No. 102; May. 13, 1996; pgs. 26256-26230). All units, except for Unit 25A and 25B, are located within designated Critical Habitat Unit OR-04-*i* for the marbled murrelet. The proposed action includes density management on 231 acres of recruitment habitat within murrelet Critical Habitat.

(2) No Action Alternative

The quality and availability of marbled murrelet habitat would be unaffected under the No Action alternative. Suitable habitat characteristics, particularly large trees with limbs greater than four inches, would develop more slowly when compared to the proposed action (see *Forest Vegetation: No Action Alternative* and *Proposed Action Alternative*).

(3) Proposed Action Alternative

Marbled murrelets within the occupied site would not be disturbed during their nesting season since seasonal restrictions from April 1st through August 5th and has daily operating restrictions from August 6th through September 15th (refer to *Additional Project Design Features*, pg. 10) would be applied to harvest operations. Impacts to marbled murrelet habitat would include the modification of approximately 301 acres of mid-seral habitat. Where two years of surveys were completed and no murrelets were detected, micro-site conditions around potential nest trees within the unit boundaries and adjacent stands would be modified during thinning. The removal of trees adjacent to potential nest trees would reduce the cover immediately adjacent to those potential nest trees. However, removing trees adjacent to potential nest trees may provide murrelets with additional access to those potential nest trees that were located within the canopy and not accessible during pre-harvest conditions. In addition, reducing tree density adjacent to residual trees would reduce competition with surrounding vegetation and, in the long term, would create larger trees with larger limbs suitable for nesting marbled murrelets.

There are 12 potential nest trees located in Unit 25A. If murrelet occupancy is not detected during the scheduled 2010 survey effort in the vicinity of these potential nest trees, then they would not require a buffer from treatment activities and seasonal restrictions would not be applied. Regardless, these potential nest trees would not be removed and potential nesting structures (i.e. large limbs) would not be damaged.

There are 17 potential nest trees arranged in clusters in Units 25B, 27B, and 27C that would be protected from density management activities under the Residual Habitat Guidelines (USDI USFWS & BLM, 2004). These potential nest trees would be buffered by 90 feet (one-half site tree distance) and approximately nine acres would be excluded from the proposed project (i.e. 1 acre in Unit 25B, 4.5 acres in Unit 27B, and 3.8 acres in Unit 27C).

There are five scattered, potential nest trees in Units 27A, 33A, and 33B that would still be included in the proposed units but would be protected from damage under the Residual Habitat Guidelines (USDI USFWS & BLM, 2004). These potential nest trees and trees immediately adjacent to them (i.e. those trees with interlocking canopies) would be retained to maintain micro-site conditions around the suitable nest trees.

Designated Critical Habitat – The proposed project would implement thinning on 301acres, thereby modifying recruitment habitat on approximately 0.5 percent of marbled murrelet Critical Habitat unit OR-04-*i* (60,837 acres). The proposed thinning prescription on approximately 301 acres 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). 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 will maintain its function by continuing to provide nesting opportunities for marbled murrelets.

2. Special Status Species

Bureau Sensitive species suspected to occur within the project area and that may be affected by the proposed action, are discussed briefly in *Appendix A: Bureau Sensitive & Bureau Strategic 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.

a) No Action Alternative

Under the No Action Alternative, no suitable habitat or habitat features for BLM Special Status Species would be affected. Species within, or adjacent to the project area, would be expected to persist at their current levels. It is expected that the mid-seral wildlife habitat that is currently present would continue to function in its current capacity. The development of suitable and/or late-successional habitat characteristics such as large trees, large snags, coarse woody debris, and a well-developed understory would occur more slowly than compared to the proposed action (refer to *Forest Vegetation*, pg. 14). The assemblage of wildlife species and the wildlife populations currently utilizing the stands in the project area would be expected to continue using those stands.

As the stands mature, structural features (i.e., snow breaks, forked tops, decay) would develop and result in snags, cavities, and a multi-layered canopy. In addition, structural diversity on the forest floor would continue to develop with the growth of the shrub layer and accumulation of down wood. This diversity would benefit many of the Bureau Sensitive and Strategic Species. The effects of the No Action Alternative on individual Bureau Sensitive and Strategic Species are summarized in *Appendix A: Bureau Sensitive & Bureau Strategic Species*.

b) Proposed Action Alternative

Under the Proposed Action Alternative, post-treatment canopy closure would be reduced to 54-74 percent within the proposed units (Table 5). The proposed action may temporarily reduce the utility of the project area for some wildlife species by removing canopy cover and horizontal structure.

While the proposed action would reduce tree densities, it would not affect overall stand ages, but would facilitate the ability of the stand to develop late-successional characteristics earlier than through natural development. Canopy closure would be reduced to 54-74 percent (Table 5) within the upland portions of the harvest units and would be maintained at current levels (92-100 percent; Table 4) within the 35 and 60 foot no-harvest stream buffers. Snags and coarse woody debris would be retained within the project area. As discussed earlier regarding spotted owls, the development of late-successional characteristics such as larger trees, large snags, and coarse woody debris would be accelerated by reducing tree densities.

C. Fire and Fuels Management

1. Affected Environment

Clever Beaver 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-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 Clever Beaver is 11 tons per acre, although there are some areas that

have a lighter fuel load. This low fuel loading indicates that the current risk of wildfire in the Clever Beaver project is low to moderate because there is a low to moderate chance of the area supporting wildfire spread if a fire is ignited.

2. No Action Alternative

Downed fuels would continue to gradually accumulate adding to the existing fuel conditions of 11 tons per acre. The risk of wildfire would also gradually increase as fine fuels continue to accumulate.

3. Proposed Action Alternative

After thinning, the down woody debris would increase from 11 tons per acre to approximately 15 tons per acre as depicted in the photo 2-DF-3-PC from *Photo Series for Quantifying Forest Residues in the Coastal Douglas-Fir – Hemlock Type* (Maxwell and Ward, 1976). The down woody debris created at landings by the proposed action would be machine piled and burned to reduce concentrated fuel loads. The remaining fuels created by the proposed action would be predominately small (i.e. less than three inches in diameter) and scattered over the harvest area.

The additional amount of down woody debris (i.e. four tons per acre) would not dramatically increase the fire risk to the area. The primary carrier of fires is the fine fuels of less than three inches in diameter. These fine fuels generated in the harvest process would mostly degrade within two years after harvest. Therefore, there would be an increase in fire risk in the area for approximately two years before these additional fine fuels degrade.

D. Soils

1. Soil Disturbance & Productivity

a) Affected Environment

Based on 1959 and 1964 aerial photo interpretation, previous ground-based yarding occurred on about 50 percent of the project area, primarily on the gentle to moderate slopes. Substantial soil displacement and compaction resulted. The skid trail density is generally high on gentle slopes where soil displacement and compaction often exceeded 25 percent of the ground-based harvest area. Heavy compaction is still present in some skid trails, decking areas, and landings 40 to 45 years later. Soil productivity is recovering very slowly where the topsoil had been displaced and highly compacted, clayey subsoil is exposed or where there is less than ten inches of soil depth. Some organic matter incorporation and recovery of soil compaction is occurring on skid trails where native understory vegetation is growing well.

Currently, little in-unit erosion is occurring because: (1) vegetation and woody debris dissipate rainfall energy, (2) natural soil structure and porosity outside of roads and old ground-based yarding features (i.e. trails; log decking areas) allow high water infiltration rates into the soil, and (3) the near absence of new disturbance, such as off-highway vehicle traffic in the trails helps keep erosion low. However, the natural-surfaced 20-6-36.0 road through Unit 25A receives occasional vehicle traffic and has segments that are eroding.

b) No Action Alternative

Without timber harvesting or road construction, no additional soil compaction or displacement would occur beyond the current level. In-unit erosion would remain low. Compacted soils in the skid trails would continue to recover very slowly over time, as plant

roots penetrate through the soil, organic matter becomes incorporated into the soil, and small animals burrow through the soil layers. The duff layer would increase with the accumulation of needles, twigs, and small branches, along with decomposing larger woody material, absent a fire of sufficient intensity to consume the material. Erosion on the 20-6-36.0 road would continue as long as vehicle traffic remains unimpeded by shrub and young tree growth or accumulating woody debris in the road bed.

c) Proposed Action Alternative

The proposed road construction would create approximately 1.6 acres of new soil displacement and compaction where soil impacts due to past management are currently light or non-existent. Renovating natural surfaced roads and widening existing trails into spurs would re-disturb approximately 3.5 acres where there is currently moderate to heavy residual soil impact and varying degrees of re-vegetation.

Detrimental compaction is defined, for this analysis, as an increase in soil bulk density of 15 percent or more and an alteration of soil structure to platy or massive to a depth of four inches or more that limits tree growth. Restricting ground-based operations to the dry season, as included in the project design (refer to *Timber Yarding: Ground-Based Yarding*, pg. 7), would reduce soil productivity loss. Generally, slopes greater than 35 percent would not be ground-based yarded.

Where there is no existing compaction, ground-based yarding with a tractor or rubber-tired skidder would detrimentally compact approximately six to seven percent of the ground-based area (D. Cressy, 2006; pers. obs.). If a feller-buncher is used to cut trees instead of hand-falling in a skidding operation, up to nine percent of the ground-based area would be detrimentally compacted (D. Cressy, 2009; pers. obs. monitoring Adams Apple). A harvester-forwarder operation, where slash is plentiful, would detrimentally compact approximately three percent of the ground-based area (D. Cressy, 2006; pers. obs.). The amount of new detrimental compaction would be reduced by using existing compacted trails to the extent practical. Landings and log deck ground would account for approximately an additional two percent of the ground-based harvest area.

In total (including trails, landings, and log deck ground), up to nine percent of the ground-based harvest area would be detrimentally compacted if tractors or rubber-tired skidders are used and approximately five percent of the ground-based harvest area would be detrimentally compacted if harvesters and forwarders are used. Where a feller-buncher is used in conjunction with skidding on trails spaced 150 feet apart, the total detrimental compaction would be up to approximately 11 percent of the ground-based harvest area.

Cable-yarding corridors would cover about three percent of the cable-yarding area's surface (Adams, 2003). Soil disturbance from cable-yarding would vary by topography (e.g. convex vs. concave slope, slope steepness, and the presence or absence of pronounced slope breaks) and by the amount of logs yarded. Compaction would typically be absent or light with little soil displacement in the cable-yarding corridors, partly because intermediate supports would be required where necessary for one-end suspension. Light compaction would be confined to the topsoil and would recover without mitigation. There would be areas with heavier compaction, especially along terrain breaks. Excessive furrowing created by cable yarding would be hand waterbarred and filled with limbs or other organic debris to prevent erosion, sedimentation, and the channeling of water (refer to *Timber Yarding: Cable Yarding*, pg.5).

Surface soil erosion in disturbed areas would be controlled by applying erosion control measures (e.g. new cut and fill slopes would be mulched with weed-free straw, or equivalent, and seeded; *Road Activities: Construction*, pg. 6-7). With the project design features described in Chapter 2, resulting soil erosion would be limited to localized areas, and any reduction of soil productivity due to erosion would be minor. The effects to soils would be consistent with those identified and considered in the 1994 PRMP/EIS (Chapter 4, pgs. 12-16) due to the project design.

Under the proposed action, natural surface spur roads and ground-based harvest trails may or may not be subsoiled to ameliorate soil compaction (see below); although, most new soil displacement created would be shallow and would not expose subsoil. In either case, spur roads would be decommissioned by water-barring to help prevent erosion, mulching with logging slash where available to discourage use following thinning (or with straw if logging slash is not available), and blocking with trench barriers (*Road Activities: Decommissioning*, pg. 8).

Effects to soil *without* subsoiling amelioration:

Approximately 1.6 acres of new soil displacement and compaction would be effectively removed from timber or forest production and 3.5 acres of pre-existing soil displacement and compaction would remain in a non-productive condition. Where subsoil is not exposed and detrimental compaction is confined to the topsoil, substantial recovery of the soil would occur over a 40 to 50 year period. In contrast, old skids trails and roads where the subsoil is exposed and where they would be re-disturbed during the proposed Clever Beaver Density Management would not have soil recovery until well beyond the first 50 years following harvest. However, ground-based trails (both old and new) would recover quicker than the spur roads because trails generally receive less traffic during harvest operations and have less soil displacement, less heavy compaction, and compaction is not as deep.

Effects to soil *with* subsoiling amelioration:

Approximately 3.3 acres (1.7 miles) of natural surfaced spur roads and trails would be subsoiled (see Appendix F, Figure 4). Where subsoiling would occur, 60 to 80 percent of the compacted soil would be shattered forming a mix of non-compacted earth and compacted clods. This would improve soil recovery by, in part, improving water infiltration and gas exchange needed for root growth and healthier soil ecology. Subsoiling in trails would be done by an excavator using a bucket with attached subsoiling shanks. Using an excavator to subsoil provides flexibility to keep subsoiling away from the bases of adjacent residual tree boles in order to prevent damage to the roots. New detrimental compaction that is confined to the topsoil would heal satisfactorily over a 40 to 50 year period without subsoiling. Subsoiled areas would recover and return to timber or forest productivity in 40 to 50 years, similar to those areas where compaction was confined to the topsoil.

Burning slash in the late-fall to mid-spring (refer to *Fuels Treatment*, pg. 7) would confine burn impacts to the soil underneath the piles and lessen the depth of the impacts (i.e., loss of organic matter, and the change of soil physical properties, ecology and soil nutrients).

2. Landslides & Slope Stability

a) Affected Environment

The geology in the project area is Tyee sandstone and siltstone where the potential for debris flow initiation in very steep headwalls is often high under disturbed conditions. Slopes greater than 70 percent that include headwalls are located in Units 25B, 27A, 27B, and 27C cover about 35 acres. These slopes are considered to be fragile due to slope gradient but suitable for forest management with mitigation for surface erosion and shallow-seated landslides (classified as FGR under the Timber Production Capability Classification [TPCC] system; Appendix B, Table B-1).

On these Clever Beaver FGR slopes, 20 small- to medium-sized post-harvest landslides (0.02 to 0.28 acres) were identified from field investigations and interpretation of aerial photographs dating back to 1959 (Appendix B; Table B-2). The combined extent of these 20 landslides is approximately 1.8 acres. Thirteen of these landslides likely resulted from timber harvest and the other seven from roads. All of the identified landslides occurred over 40 years ago under clear-cut or early-seral conditions. Four of the medium-sized landslides were debris flows that initiated in the headwalls.

Approximately four acres of moderate slopes in Units 27A and 35A are suitable for forest management with mitigation for slump-earth flow movements (fragile soils classified as FPR under the TPCC system; Appendix B, Table B-1). One small slump in the cut slope of the 20-6-27.1 road (Unit 27A) occurred before tree establishment. No additional tension cracks or fresh scarps (those that have occurred after tree establishment) were discovered from field investigation, indicating no recent slope movements other than localized soil creep had occurred in the FGR and FPR areas.

b) No Action Alternative

Landslides on the 39 acres of potentially unstable slopes within the Clever Beaver units (FGR and FPR areas) would have a low probability of occurring (less than ten percent chance in a given year). If landslides do occur they would likely be small (less than 0.10 acre in size and few in number). This assessment is based on:

- No in-unit landslides occurring under mid- or late-seral forest conditions were identified by aerial photo interpretation landslide inventory or field observations; (pers. obs.; Cressy, 2009).
- No actively failing slopes were discovered in the in-unit FGR and FPR areas (pers. obs.; Cressy, 2009).
- Approximately 70 percent of historic, post-timber harvest landslides within the project area were 0.02 to 0.10 acres in size. There were six medium-sized landslides (0.11 to 0.28 acres) but they occurred shortly after clear-cut timber harvest, a period of higher vulnerability for landslides (aerial photo landslide inventory; field observations; Cressy, 2009; Appendix B, Table B-2).
- The Oregon Department of Forestry found that landslide numbers were lowest in mid-and old-seral stands (31 to 100 years old) following the intense 1996 storms (ODF Forest Practices Technical Report No. 4, 1999, pg. 64).
- Many of the sites that were most vulnerable to failure probably failed after the units were clear cut in the early 1960s and then subjected to an intense rain-on-snow event. This left the FGR and FPR slopes in an overall more stable state.

c) Proposed Action Alternative

The cut-slope of the 20-6-27.1 road (where the small slump occurred) would not be disturbed and cross drains would be installed to improve water drainage from the cut-slope. The remaining renovation and spur construction would be located on stable positions that are: (1) ridge tops and gently to moderately sloping locations (near level to 55 percent) and (2) have no apparent signs of potential instability, such as highly curved or pistol-butted conifer boles or instability such as, tension cracks, scarps, or jack-strawed trees that indicate active slope movement. Based on the monitoring of spurs constructed on similar stable terrain, the proposed road construction and renovation in Clever Beaver would not create instability (D. Cressy, 2007, 2008, and 2009; pers. obs.).

Where soils are classified as FGR or FPR (39acres; Appendix B, Table B-1), the risk of in-unit landslide occurrence would fall between the low risk of the No Action Alternative and the moderate risk under historical, clear-cut conditions (moderate risk determined from interpretation of 1959, 1964, 1970 and 1978 aerial photos and on-site field investigations). The period of maximum vulnerability would be the ten year period immediately following harvest as root systems and canopies expand. If in-unit landslides do occur during this period of vulnerability, then they would likely be few in number and would be less than 0.10 acre in size, for similar reasons as stated previously under the No Action Alternative but also because:

- Only the upper quarter of the headwalls in Unit 25A would be thinned; this is above the zone of maximum moisture convergence where debris flows are most likely to initiate.
- Portions of Units 27A and 27C would have additional retention trees (i.e. 110 square feet of basal area) due to the very steep V-shaped inner gorges with the potential for debris flows and areas where there appeared to be soil creep with a risk of small to medium landslides. Higher tree retention reduces the risk of in-unit debris flows and landslides.
- All trees in the incipient channels of headwalls would be retained.
- Yarding on the slopes greater than 70 percent would-not occur in the wet season during and shortly after large storms when soils saturated. This would help prevent skyline cable-yarding from creating channels that direct extra drainage onto potentially unstable slopes.

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

E. Hydrology

1. Water Quality

a) Affected Environment

Most of the Clever Beaver project area (289 acres) lies within the Beaver Creek, Hefty Creek, and Summit Creek seventh field Drainages of the Headwaters Smith River sixth-field

Subwatershed and the Upper Smith River fifth-field Watershed. Approximately 12 acres of the proposed project lie within the Upper Siuslaw Watershed. Proposed activities in the Upper Siuslaw Watershed consist of thinning less than 1/100th of a percent of the watershed. These actions are expected to have negligible effects on hydrology within the Upper Siuslaw Watershed because of the ridge top location and due to the small area affected within the watershed. Therefore, hydrologic effects of Clever Beaver on the Upper Siuslaw Watershed will not be analyzed further within this document.

Within the three drainages containing the project area there are approximately 46 miles of streams. Of these 46 miles of stream, approximately 35 miles are 1st and 2nd order headwater streams that flow into Summit, Hefty, Clevenger, and Beaver Creeks, which eventually drain into Smith River. Approximately 25 percent of the streams in the surrounding drainages are classified as perennial (i.e. flow year-round) and 74 percent are classified as intermittent (i.e. stops flowing in the dry season) with the remainder of the streams being ephemeral (i.e. flow in response to storm events).

Summit Creek and Beaver Creeks were placed on the Oregon 303(d) list for excessive Temperature. Smith River, less than one mile downstream from the proposed project area, was included on Oregon's 303(d) list for temperature and fecal coliform. These streams are now covered under ODEQ's 2006 Umpqua Basin Total Maximum Daily Load (TMDL) and Water Quality Management Plan (WQMP) in an effort to achieve compliance with water quality standards in the Umpqua Basin (ODEQ, 2006). Because forest managed lands do not contribute to bacterial water quality violations (ODEQ, 2006), fecal coliform bacteria levels in the Upper Smith River Watershed will not be analyzed further within this document.

The beneficial uses of water within the project area potentially affected are: resident fish, aquatic life, and salmonid fish spawning and rearing. Beneficial uses of water downstream of the project area consist primarily of: domestic water supply, irrigation, and fish and aquatic life. Two points of diversion for domestic use, two points of diversion for irrigation/landscaping and one diversion for water storage exist less than one mile downstream from the proposed thinning units.

The Upper Smith River Watershed is a Tier 1 Key Watershed. Management direction in the 1995 ROD/RMP (pg. 20) calls for reducing existing road mileage or, if reductions cannot be implemented, do not provide a net increase in road mileage within key watersheds. Roads occupy approximately 2.2 percent of the total acreage within the Headwaters Smith River 6th Field Subwatershed, in which the Clever Beaver project area resides. However, some segments are in poorer condition and deteriorating due to lack of maintenance and are experiencing increased surface erosion (e.g. 20-6-36.0 road as discussed previously under *Soils*, pg. 26).

b) No Action Alternative

There would be no impact to water quality, beneficial uses of water, or hydrologic processes under the No Action Alternative. Trees within the riparian reserves would continue to compete for space and stands would persist in an overly dense condition and not attain potential growth rates (refer to *Forest Vegetation: No Action Alternative*, pgs. 13-14). This slow development would result in a smaller size of potential wood for long-term recruitment to streams and slower canopy development to provide shade.

Road renovation, beyond routine maintenance, would not repair existing sediment sources (e.g. some road segments that are in poorer condition and are experiencing surface erosion).

Some road stream crossings and drainage features are in poor condition and have an increasing likelihood of failure over time, which could introduce sediment into streams. The amount of sediment would vary depending on the condition of the road and the size of the storm event.

As discussed previously (*Landslides & Slope Stability: No Action Alternative*, pgs. 28-29), there is a low probability of landslides occurring but there is the potential for in-unit landslides to directly impact segments of first, second, and third order streams. The likelihood of a landslide reaching a stream segment in a given year would produce a short-term increase in sedimentation until the material is dispersed downstream. Effects of sediment in the stream bed from small landslides would have a low probability of being detected more than a few hundred feet downstream from the landslide (during normal flow conditions) since small streams have low capacity for carrying sediment because of their small size and low flows.

Landslides are a natural disturbance mechanism which can provide important ecological functions when they occur at natural rates. As discussed previously (*Landslides & Slope Stability: Proposed Action Alternative*, pg. 27), landslide rates have been declining over the last 25 years to where they now occur at near natural rates on BLM managed lands.

c) Proposed Action Alternative

Flow on intermittent streams ceases for some portion of the year, which makes them less susceptible to propagating temperature impacts downstream during the warm dry season. Many of these intermittent streams are also interrupted (the defined stream channel disappears in some locations as it extends downstream due to water going subsurface) which further minimizes the mechanism for delivering impacts further downstream. Water going subsurface tends to be cooled by the subsurface environment such that it has a lower temperature when it re-appears downstream (Story *et al*., 2003). In contrast, perennial streams flow year-round, which makes them more susceptible to temperature impacts.

Vegetation that provides primary shading for perennial streams would be protected by a 60 foot "no-harvest" buffer and by maintaining a canopy closure of approximately 54 to 88 percent outside of the "no-harvest" buffers (Table 5). Consequently, effective shade for these streams would not be affected by thinning due to retention of sufficient shade and any measurable increase in water temperature from solar heating during the summer months would be avoided (2008 Final EIS, pgs. 759-760).

Thinning near streams can cause localized soil disturbance and the short-term potential for erosion, primarily associated with yarding operations. However, "no-harvest" buffers (a minimum of 60 feet on perennial streams and 35 feet on intermittent streams) would be established for all streams adjacent to and within the proposed units and full suspension would be required when yarding across streams (*Timber Yarding: Cable Yarding*, pgs. 6-7). These "no-harvest" buffers would prevent disturbance to stream channels and stream banks as well as intercept any surface run-off from reaching the streams.

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. Under the Proposed Action Alternative, there would be no new stream crossings. The proposed action includes approximately 7,000 feet of road that would be maintained, 28,883 feet of road would be renovated, and 5,995 feet

of road would be constructed (Table 3). After harvest operations, newly constructed spur roads would be decommissioned. There would be no net increase in road mileage which would meet 1995 ROD/RMP (pg. 20) guidance for Tier 1 Key Watersheds.

All roads built would be built on stable slopes and/or ridge tops and in accordance with the Best Management Practices (BMPs) described in the 1995 ROD/RMP (pgs. 131-138), in order to comply with state and federal water quality standards for turbidity. Road renovation and improvement would occur on existing roads during the dry season (refer to *Road Activities*, pgs. 7-8). Timber hauling could occur in both the dry and wet seasons, although during the wet season hauling would be limited to surfaced roads. Hauling and other road related activities during dry season would not deliver road-derived sediment to live stream channels because without precipitation there would be no mechanism for the transport of fine sediment into streams. However, during the first seasonal rains there could be a flush of sediment from the roads near stream crossings. The amount of sediment contributed from these crossings during the first seasonal rains would be negligible when compared to the amount of sediment from all other intermittent channel beds and stream banks that have accumulated within the stream network during the dry season. Following the first seasonal rains, erosion rates would stabilize and sediment delivery would be indistinguishable from background levels resulting in no measureable change to water quality.

The risk of landslides impacting streams would be slightly higher than under the No Action Alternative for a given year. If these landslides occur, they would still be occurring at near natural rates and impacts would be similar to the No Action Alternative. Some stream reaches would still have low risks and others would have low to moderate risks. "No-harvest" buffers paired with areas of higher basal area retention on steep slopes (refer to *Landslides & Slope Stability: Proposed Action Alternative*, pgs. 26-27) would exclude or reduce timber harvest on the steepest, inner gorge slopes where there are higher risks for failure, and where the greatest potential for initiating stream impacting landslides exist. The period of increased vulnerability would be about ten years as the roots and canopies of the residual trees expand.

In summary, "no-harvest" buffers and the project design features referenced above would prevent disturbance to stream channels and stream banks. These mitigation measures would also intercept surface run-off and prevent sedimentation of streams, such that there would be no cumulative degradation to water quality in the Upper Smith River Watershed or to the beneficial uses of water and municipal drinking water sources.

2. Stream Flow

a) Affected Environment

Average annual precipitation in the Clever Beaver project area ranges from 52 to 67 inches, occurring primarily between October and April. Precipitation occurs mostly as rainfall in the Clever Beaver project area since all of the area is less than 2,000 feet in elevation (i.e. below the rain-on-snow zone). Elevations in the Clever Beaver project area range from 1,560 to 800 feet in elevation putting it within the rain dominated hydroregion where shallow snow accumulations are uncommon and the dominate precipitation pattern is in the form of rain.

Stream flows are dependent upon the capture, storage, and runoff of precipitation. Timber harvest can alter the amount and timing of peak flows by changing site-level hydrologic processes. These hydrologic processes include changes in evapotranspiration of forest trees,

forest canopy interception of water, snow and snowmelt rates, roads intercepting surface and subsurface flow, and changes in soil infiltration rates and soil structure (2008 Final EIS, pg. 352). Based on a compilation of watershed studies in the Northwest, completed in small catchments, a peak flow response is only detected where at least 29 percent of the drainage area is harvested (Grant *et al.*, 2008). There are no peak-flow experimental study results in the rain dominated hydroregion showing a peak-flow increase where less than 29 percent of a drainage area is harvested (2008 Final EIS, pg. 353).

b) No Action Alternative

Existing roads and landings may modify storm peaks by reducing infiltration, which would allow more rapid surface runoff (Ziemer, 1981, pg. 915). Existing roads may also intercept subsurface flow and surface runoff and channel it more directly into streams (Ziemer, 1981, pg. 915). 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).

Currently within the Headwaters Smith River 6th Field Subwatershed, which the Clever Beaver project area resides, roads occupy approximately 2.2 percent of the total acreage. Therefore, no statistically significant increase in peak flows would be expected to occur due to road effects. Also, with no change in the vegetative cover there would be no change in runoff, infiltration and transpiration from the Cleaver Beaver project area drainages.

c) Proposed Action Alternative

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

The 2008 Final EIS (pgs. 753-759) analyzed 6th field subwatersheds, in the rain on snow area (elevation > 2000 ft.) and rain dominated area (elevation < 2000 ft.), that are susceptible to peak flow effects due to regeneration harvests on public and private lands at the 6th field subwatershed level. The proposed project takes place entirely in the Headwaters Smith River 6th field sub-watershed and was found to be "not susceptible" to peak flow effects (FEIS, 2008 pg 352-354). In addition, effects to peak flows are not expected because the majority of the stream types within the Cleaver Beaver project area are cascade or step-pool streams, which are the stream types most resistant to peak flow effects and channel modification (2008, FEIS pg. 758).

There would be no effective increase in road density within the Headwaters Smith River sub-watershed since less than one mile of road would be constructed and then decommissioned after use. Therefore, the percent of road surface within the sub-watershed would remain at approximately 2.2 percent, which is below the 12 percent threshold where measurable increase in peak flows would be expected (Harr, et al. 1975).

In summary, the silvicultural treatment within the project area is not expected to have any effects on stream flow due to the following reasons:

- The project consists entirely of thinning which has the least hydrologic effect of active forest management and would subsequently not pose any risk to peak flow enhancement.

- The stream types encountered within the project area consist entirely of cascade and step-pool streams, which have little potential to affect peak stream flows.
- The subwatershed within the project area is not susceptible to peak flow enhancement.
- New road construction would not increase road density or total roaded area within the project area beyond susceptibility thresholds.

F. Aquatic Habitat & Fisheries

1. Affected Environment

There are three fish bearing streams within the Clever Beaver project area, Beaver Creek, Clevenger Creek, and Summit Creek. The project area for the fisheries analysis includes the proposed thinning units and haul routes to the nearest paved road. There are approximately 7,840 feet (1.4 miles) of haul route located within 200-500 feet of the fish bearing streams in the project area. Portions of the proposed haul route are dry-season haul (summer), although 21,698 feet of the haul route (i.e. the rocked roads) can be either dry-season or wet-season (winter) haul (Table 1). Ditch banks along the haul route are well vegetated and there are no direct connections to fish-bearing streams.

ODFW habitat surveys in Summit and Beaver Creeks indicate an average of 208 pieces of large wood per mile of stream habitat (ODFW, 1999). Streams with greater than 70 pieces of large wood per mile are considered in excellent condition. Field observations have also noted an abundance of small wood along with the large wood in Summit, Beaver, and Clevenger Creeks (McEnroe, personal observation; Sept. 2009).

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 coho salmon. There are no coho salmon within the project area. The closest coho presence is adjacent to Units 35A (Summit Creek), 33B (Clevenger Creek), and 27B (Beaver Creek). Streams with coho salmon are located within 200-500 feet of approximately 7,840 feet (1.4 miles) of haul route.

The Oregon Coast steelhead (*Oncorhynchus* mykiss) is a Bureau Sensitive fish species. Beaver Creek, Clevenger Creek, and Summit Creek all contain Oregon coast steelhead and cutthroat trout (*Oncorhynchus clarki*).

2. No Action Alternative

Without a mechanism to affect either water quality (refer to *Water Quality: No Action Alternative*, pg. 31) or stream flow (refer to *Stream Flow: No Action Alternative*, pg. 33) aquatic habitat in fish-bearing streams within and downstream of the project area would remain unaffected under the No Action Alternative. Without a mechanism to affect aquatic habitat, fish species and populations would remain unaffected under the No Action Alternative.

3. Proposed Action Alternative

Key factors defining the quality of aquatic habitat are water temperature, substrate/sediment quality, large wood, pool quality, and habitat access. Measurable increases in water temperature would be avoided by this project (refer to *Water Quality: Proposed Action Alternative*, pg. 31-33). Substrate and sediment quality is affected by altering the amount or timing of peak flows or from road derived sediment input. No effects to peak flows are expected as a result of this project

(refer to *Stream Flow: Proposed Action Alternative*, pgs. 33-34). No-harvest" stream buffers, a large volume of in-stream wood, and well-vegetated ditch banks would protect aquatic habitat from road sediment within the project area. Well vegetated ditchbanks have been shown to decrease road sediment erosion on forested roads (Luce and Black, 1999; Rashin *et al*. 2006).

The amount of instream large wood (i.e. trees >20 inches in diameter and 50 feet in length) and pool habitat are highly correlated with the number and size of trees in the riparian area that have the potential to enter the stream by natural processes. By thinning the area near streams, stand diversity and tree diameter growth rates would increase (refer to *Forest Vegetation: Proposed Action Alternative*, pgs. 14-15) thereby providing larger wood for recruitment into the stream in the future. Thinning outside the no-harvest buffer would temporarily decrease the amount of large wood available to fall into the stream. This short-term decrease in large wood availability would not impact fish habitat because there is already a large volume of wood in the streams within the project area (ODFW, 1999). Additionally, the high density of trees in the sixty foot no-harvest buffer (168-295 trees per acre, Table 4) would provide an ample source of woody material to the stream while the rest of the stand grows and matures.

Small functional wood also has the potential to affect fish habitat. Smaller trees and logs that enter stream channels provide temporary pool habitat and slow-water refugia; although, pools formed by small functional wood generally are not as deep or complex as those formed by large wood. Small wood also 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). Thinning outside of the no-harvest buffers would temporarily decrease the amount of wood available to fall into the stream. While there would be some decrease, it would be minimal because the sixty foot no-harvest buffers on fish bearing streams contain the majority of small functional wood available to the stream (McEnroe, personal observation; Sept. 2009). This short-term decrease in small functional wood availability would not impact fish habitat because streams in the project area already have a large volume of small functional wood (McEnroe, personal observation; Sept. 2009). The high density of trees within the no-harvest buffers would provide an ample amount of small functional woody material to the stream while the rest of the stand grows and matures.

Thinning activities outside the no-harvest buffers would retain approximately 73-134 dominant and co-dominant trees per acre (Table 5). Within the no-harvest buffer, stand density would remain high at 168-295 trees per acre (Table 4). This treated stand density, combined with the high density no-harvest buffer, would provide a source of continued woody material delivery for the short, mid, and long-term that is within the range of natural variability. Without any change to large or small wood inputs, pool quality would remain unaffected by the proposed action.

Although habitat access can be affected by road crossings there are no new road crossings over fish-bearing streams in the project area. Therefore, there would be no mechanism for road crossings to affect habitat access in the Proposed Action.

Overall, aquatic habitat in Summit Creek, Beaver Creek, Clevenger Creek and their tributaries would be unaffected, except for short-term reductions in the amount of large and small functional wood available to the stream. Due to the high volume of wood already in the stream and the high density of trees in the no-harvest buffers fish species and populations in the streams in the project area would be unaffected. Coho salmon and their critical habitat would be unaffected by this project. Over the long term, the quality of large wood in the stream channel would increase and would have a positive effect on aquatic habitat quality and fish populations. Wood recruitment modeling has determined that the potential large wood contribution to fish bearing and non-fish-

bearing stream channels would increase over time after thinning harvests (2008 Final EIS, pg. 781).

4. 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). Streams and habitat that are currently or were historically accessible to Chinook and coho salmon are considered essential fish habitat. There is a 1.4 miles of essential fish habitat within the project area in Beaver Creek, Summit Creek, and Clevenger Creek.

Essential Fish Habitat would be unaffected by the Proposed Action (refer to *Aquatic Habitat and Fisheries: Proposed Action Alternative*, pgs. 35-36). Without any mechanism for an adverse effect to essential fish habitat, no mitigation measures are proposed.

5. Aquatic Conservation Strategy

The Swiftwater Field Office assessed the effect of the proposed project on the Aquatic Conservation Strategy (ACS) objectives at both the site and watershed scale (assessment included in Appendix C). The proposed action would meet ACS objectives and would not retard or prevent attainment of ACS objectives at the site or watershed scales. Instead, the proposed action would speed attainment of these objectives. Therefore, this action would be consistent with the ACS, and its objectives at the site and watershed scales.

G. Botany

1. Special Status Species

a) Affected Environment

Field surveys for special status botanical species were conducted in the spring and summer of 2009 to comply with Departmental Manual 6840 directives and the Special Status Plant program.

(1) Federally Listed Species

The project is within the known range of Kincaid's Lupine (*Lupinus sulphureus* ssp. *kincaidii*), a Federally Threatened plant. Habitat for Kincaid's Lupine occurs in the project area. The project area is also within the known range of the Federally Endangered popcorn flower (*Plagiobothrys hirtus*); however, habitat for the popcorn flower is not present.

No Federally listed plant species were detected within the project area during surveys (Appendix D: Botany Summary).

(2) Bureau Sensitive & Strategic Species

No Bureau Sensitive or Strategic plant species were detected within the project area during surveys (Appendix D: Botany Summary).

b) No Action Alternative

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.

c) Proposed Action Alternative

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 Proposed Action Alternative. In addition, density management would not remove habitat for special status botanical species.

2. Noxious Weeds

a) Affected Environment

The Clever Beaver project has approximately 2.5 acres of Scotch broom (*Cytisus scoparius*) and Himalayan blackberry (*Rubus armeniacus*) infestations collectively (Table 8). These areas were treated in 2008 as part of the ongoing Roseburg District Noxious Weed Program. Other species of noxious weeds present in the project area include: Meadow knapweed (*Centaurea pratensis*), Canada thistle (*Cirsium arvense*), and tansy ragwort (*Senecio jacobea*). These other species are not likely to establish invasive populations in forested habitats because they are typically out-competed by the forest canopy. Biocontrols, primarily insects that target specific noxious weed species, are also present throughout the range of Scotch broom, meadow knapweed, Canada thistle, and tansy ragwort.

Table 8. Noxious Weed Infestations in Clever Beaver.

Weed Species	**Infested Area** (acres)
Scotch Broom	1
Himalayan Blackberry	0.7
Canada Thistle	0.1
Tansy ragwort	0.5
Meadow knapweed	0.2
Total	**2.5**

b) No Action Alternative

Noxious weeds within the project area would be managed under the Roseburg District's Noxious Weed Program. Weed populations in this area would be monitored and evaluated for treatment at regular intervals (USDI, BLM 1995). Control of weed populations within the project area is planned for treatment in 2011, contingent on funding and workload priorities, by applying approved herbicides and/or manual removal.

Repeated treatments of existing noxious weed populations, limited opportunities (e.g. disturbed soil) for establishment of new infestations, and ongoing competition from native vegetation would reduce the noxious weed numbers in the project area over time.

c) Proposed Action Alternative

Existing infestations of Scotch broom and Himalayan blackberry would be treated, prior to thinning operations, in order to limit the development and spread of seeds. Treatment of noxious weed infestation would be done by the BLM but is contingent on funding and workload priorities. In addition, implementing the *Additional Project Design Features* (pg .9) would limit the spread of weed seed by washing logging and construction equipment prior

to entry on BLM lands. As under the No Action Alternative, noxious weed populations would be monitored, evaluated, and treated under the Roseburg District's Noxious Weed Program.

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

H. 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 Clever Beaver, 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 Clever Beaver was analyzed by calculating: the amount of carbon held in live trees and other components of the forest stands, the amount of carbon held in wood products and logging slash that gradually releases that carbon over time, and the amount of carbon released by the burning of fossil fuels and slash burning by the proposed action alternative. The methodology used in the calculations to estimate the net carbon balance is described in *Appendix E: Carbon Storage Analytical Methodology*.

1. Affected Environment

Current global emissions of carbon dioxide total 6.8 billion tonnes of carbon (based on Denman et al. 2007) and current U.S. emissions of carbon dioxide total 1.7 billion tonnes (based on EPA, 2010; Table 2-3). In 2008, forest management in the United States resulted in the net carbon sequestration of 196 million tonnes 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 districts of western Oregon and on the Klamath Falls Resource Area of the Lakeview District there are 222 million tonnes of carbon currently stored in live trees (2008 Final EIS, pg. 221). For this same area, the amount of carbon stored in other than live trees (includes shrubs, brush, snags, woody debris, and organic carbon in the soil) is calculated at 195 million tonnes (2008 Final EIS, pg. 222).

Currently, there are 50,878 tonnes of carbon held within the stands that comprise the Clever Beaver project. This carbon is held in either the pool of "standing, live trees" (30,048 tonnes) or in the pool of "other than live trees" (20,830 tonnes) (refer to *Current Condition* in Tables 9 or 10). The amount of carbon currently held in Clever Beaver (50,878 tonnes) represents approximately 0.01 percent of the total carbon stored on BLM administered lands in western Oregon (417 million tonnes) as described previously.

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

2. No Action Alternative

Under the No Action Alternative, the stands in the proposed units would continue to develop and grow as described under *Forest Vegetation* (pgs. 12-13). 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 Clever Beaver would, on average over 100 years, sequester 1,090 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 50,878 tonnes to 159,807 tonnes (Table 9).

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, Clever Beaver would sequester an average of 1,090 tonnes of carbon annually. Therefore, Clever Beaver would represent an offset of 0.00002 percent of current global emissions (1,090 tonnes out of 6.8 billion tonnes) and 0.00006 percent of current U.S. emissions (1,090 tonnes out of 1.7 billion tonnes). Clever Beaver would constitute 0.006 percent of the net sequestration represented by forest management in the United States (1,090 tonnes out of 196 million tonnes). In roughly 100 years (ca. 2106), Clever Beaver would represent 0.03 percent of the carbon stored on BLM administered lands in western Oregon (159,807 out of 596 million tonnes).

Table 9. Carbon Storage in Clever Beaver Density Management under the No Action Alternative.

Time Step	Carbon Storage						
	Standing, Live Trees (tonnes)	Other Than Live Trees (tonnes)	Logging Slash (tonnes)	Wood Products (tonnes)	Fossil Fuels (tonnes)	Slash Burning (tonnes)	Net Carbon Balance (tonnes)
Current Condition	30,048	20,830	0	0	0	0	50,878
+10 years	42,004	20,830	0	0	0	0	62,833
+20 years	54,437	20,830	0	0	0	0	75,267
+50 years	89,591	26,134	0	0	0	0	115,724
+100 years	131,718	28,089	0	0	0	0	159,807

3. Proposed Action Alternative

Under the proposed action alternative, thinning would be prescribed with variable retention of 80, 90, 110, or 120 square feet of basal area (*Treatment Prescription*, pg. 5) and carbon would consequently be released from harvest-related sources. Based on ORGANON modeling, 6,607,965 board feet (6.6 MMBF) would be harvested from Clever Beaver. Consequently, 16,207 tonnes of carbon would be moved from the standing, live tree pool into:

- the "logging slash" pool (6,893 tonnes; Table 10),
- the "wood products" pool as pulpwood and saw logs (7,951 tonnes; Table 10),
- the "slash burning" pool which would release carbon into the atmosphere (115 tonnes; Table 10),
- or would be immediately released into the atmosphere following harvest (1,248 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 Clever Beaver this would be 1,248 tonnes of carbon). In addition, it is estimated that the

consumption of 43,796 gallons of fossil fuels would release another 120 tonnes of carbon as a direct consequence of harvest operations (Table 10).

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 C, Tables C-3 and C-4). Over the course of 100 years following harvest, a total of 7,556 tonnes of carbon would be emitted from logging slash and wood products or an average of 76 tonnes of carbon per year.

While logging slash and wood products are emitting carbon, the standing live trees would simultaneously continue to grow; removing carbon from the atmosphere and sequestering it within additional standing volume on-site. The amount of carbon stored in "other than live trees" would also increase over time (Table 10). The "standing live trees" and "other than live trees" pools in Clever Beaver combined would, on average, sequester 843 tonnes of carbon per year from the atmosphere under the Proposed Action Alternative over the 100 years following harvest. The net carbon balance would more than double from 50,878 tonnes currently to 126,326 tonnes in 100 years after harvest (Table 10).

Direct carbon emissions resulting from the proposed action would total 1,483 tonnes of carbon. Therefore, the emissions from the proposed action would constitute 0.00002 percent of current global emissions (1,483 tonnes out of 6.8 billion tonnes) and 0.00009 percent of current U.S. emissions (1,483 tonnes out of 1.7 billion tonnes). The emissions from the proposed action would represent an offset of 0.0008 percent of the net sequestration by forest management in the United States (1,483 tonnes out of 196 million tonnes). In roughly 100 years (ca. 2106), Clever Beaver would represent 0.02 percent of the carbon stored on BLM administered lands in western Oregon (126,326 out of 596 million tonnes).

Overall, the Proposed Action Alternative would result in the direct release 1,483 tonnes of carbon through the burning of fossil fuels (120 tonnes), slash burning (115 tonnes), and immediate release of carbon at time of harvest (1,248 tonnes). It would take approximately two to three years for the residual stands (i.e. "standing live trees" and "other than live trees" pools) in Clever Beaver to recover or sequester carbon (at an average rate of 843 tonnes per year) equivalent to that released directly by the proposed action. After two to three years, Clever Beaver 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. 76 tonnes per year) would be less than the average rate at which the residual stands sequester carbon (i.e. 843 tonnes per year).

Table 10. Carbon Storage in Clever Beaver Density Management under the Proposed Action Alternative.

Time Step	Carbon Storage						
	Standing, Live Trees (tonnes)	**Other Than Live Trees** (tonnes)	**Logging Slash** (tonnes)	**Wood Products** (tonnes)	**Fossil Fuels** (tonnes)	**Slash Burning** (tonnes)	**Net Carbon Balance** (tonnes)
Current Condition	30,048	20,830	0	0	0	0	50,878
Harvest Time (0 years)	13,841	20,830	6,893	7,951	-120	-115	49,280
+10 years	21,732	20,830	5,873	7,293	0	0	55,728
+20 years	30,311	20,830	5,001	6,969	0	0	63,115
+50 years	57,166	26,134	3,095	6,437	0	0	92,832
+100 years	90,859	28,089	1,392	5,986	0	0	126,326

Chapter 4. Contacts, Consultations, and Preparers

A. Agencies, Organizations, and Persons Consulted

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

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

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

a) U.S. Fish & Wildlife Service

Consultation with the U.S. Fish & Wildlife Service for the Clever Beaver density management project has not yet been completed, but is expected during FY2010. The Project Design Features described in the EA (pgs. 5-11) are consistent with those found in the current 2009-2010 Letter of Concurrence for thinning activities (USFWS Tails#: 13420-2009-1-0109; June 9, 2009). Project Design Features developed for this project through the consultation process are not anticipated to change from those in the 2009-2010 Letter of Concurrence. When consultation for Clever Beaver has been completed, the results will be disclosed in the decision document and Finding of No Significant Information (FONSI).

b) NOAA Fisheries Service

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

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 Project Tracking Forms dated November 2, 2009. It was determined that there would be no effect to any cultural or historical resources since none would be included within the proposed Clever Beaver units.

B. Public Notification

1. Notification of Landowners

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

2. Roseburg District Planning Updates

The **general public** was notified via the *Roseburg District Planning Updates* (i.e. Winter 2008, Spring 2009, Fall 2009, Winter 2009, and Spring 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.

3. State, County, and Local Government Agencies

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

4. 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 April 20, 2010. The public comment period began with publication of the notice published in *The News-Review* on April 20, 2010 and ends close of business May 20, 2010. 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	Paul Meinke
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Botany/Noxious Weeds	Julie Knurowski
Cultural Resources	Isaac Barner
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Silviculture	Trixy Moser
Soils	Dan Cressy
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Timber Cruising	Joe Keady
Wildlife	Elizabeth Gayner

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Appendix A. Bureau Sensitive & Bureau Strategic Wildlife Species

Project: Clever Beaver Density Management
Prepared By: Elizabeth I. Gayner
Date: September 30, 2009
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	Proposed Action
BUREAU SENSITIVE				
American Peregrine Falcon *Falco peregrinus anatum*	Cliffs, rock outcrops; open habitats for hunting birds.	No Nesting Habitat	No Effects	
Bald Eagle *Haleaeetus leucocephalus*	Late successional forests with multi-canopies, generally within two miles of a major water source; 2.6 miles to nearest known site.	No Known Nest/ Roost Sites	No Effects	
Chace Sideband *Monadenia chaceana*	Rocky, talus habitats in the Klamath Province and southwards.	Out of Range	No Effects	
Columbian White Tailed Deer *Odocoileus virginianus leucurus*	Bottomlands, oak/hardwood forests; cover for fawning.	Out of Range	No Effects	
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 1.0 mile south of proposed units (ORNHIC, 2009).	Documented	No Effect	No effects to suitable natal and foraging habitat.
Foothill Yellow-legged Frog *Rana boylii*	Low gradient streams/ponds; gravel/cobble, bedrock pools.	Suspected	No Effect	PDFs (e.g. "no-harvest" stream buffers) would protect micro climate conditions within streams.
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.	Suspected	No Effect	PDFs would retain existing snags $\geq$ 10 inches dbh and $\geq$ 16 feet tall.

Species	General Habitat Requirements	Present in Project Area?	Impacts to Species	
			No Action	Proposed Action
Green Sideband *Monadenia fidelis beryllica*	Coast Range, riparian forests at low elevations; deciduous trees & shrubs in wet, undisturbed forest.	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 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, CWD.	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.	Suspected	No Effect	No effect to mature conifer forests; hardwoods are retained to the extent possible within mid-seral 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	No Effect	No measurable effect to foraging habitat.
Western Ridgemussel *Gonidea angulata*	Creeks, rivers, coarse substrates; Umpqua R. and possibly major tributaries.	Out of Range	No Effects	
White-Tailed Kite *Elanus leucurus*	Open grasslands, meadows, emergent wetlands, farmlands, lightly, wooded areas; wooded riparian habitats close to open hunting; tall trees and shrubs.	No Habitat	No Effects	
BUREAU STRATEGIC				
Broadwhorl Tightcoil *Pristiloma johnsoni*	Moist forest sites, typically with deciduous component; Coast/Cascades in WA, Coast Range in OR, as far south as Lane County.	Out of Range	No Effects	
Klamath Tail-Dropper *Prophysaon sp. nov.*	Moist, open areas along streams or springs in Ponderosa Pine forests; as far North as Crater Lake.	Out of Range	No Effects	
Merlin *Falco columbarius*	Coniferous forests adjacent to open habitats, along forest edges; units within winter range.	Suspected	No Effect	No measurable effect to foraging habitat.
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. Soils

Project: Clever Beaver Density Management
Prepared By: Dan Cressy
Date: October 8, 2009

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

Unit	FGR[1] (acres)	FPR[2] (acres)	FSR[3] (acres)	FGNW[4] (acres)	FPNW[5] (acres)	Category 1[6] (acres)
25A	1	0	NA	0	0	NA
25B	3	0	NA	0	0	NA
27A	18	2	NA	0	0	NA
27B	4	0	NA	0	0	NA
27C	9	0	NA	0	0	NA
35A	0	2	NA	0	0	NA
35B	0	0	NA	0	0	NA
33A	0	0	NA	0	0	NA
33B	0	0	NA	0	0	NA
33C	0	0	NA	0	0	NA
Total	**35**	**4**	**NA**	**0**	**0**	**NA**

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

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

Sale Name	# Debris Torrents	# Landslides[1]			
	Large (>0.5 acre)	Small (< 0.1 acre)	Medium (0.1-0.5 acre)	Large (> 0.5 acre)	All
Clever Beaver	0	15	6	0	21 (1.80 acres)
Probability of occurrence expected within units:					
No Action Alternative	none	low	low	low	low
Proposed Action Alternative	low	low to moderate	low	low	low
Cumulative Effects	Unchanged[2]	Unchanged[2]	Unchanged[2]	Unchanged[2]	Unchanged[2]

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

Appendix C. Aquatic Conservation Strategy Assessment

Project: Clever Beaver Density Management
Prepared By: Keith Karoglanian and Jeff McEnroe
Date: September 30, 2009

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

ACS Components:

(1) Riparian Reserves (ACS Component #1)

Riparian Reserves were established. The ROD/RMP (pg. 24) specifies Riparian Reserve widths equal to the height of two site potential trees on each side of fish-bearing streams and one site-potential tree on each side of perennial or intermittent non-fish bearing streams, wetlands greater than an acre, and constructed ponds and reservoirs. The height of a site-potential tree for the Upper Smith River Watershed has been determined to be the equivalent of 177.5 feet (Middle and Upper Smith River Watershed Analysis, pg. 46). One of the objectives of this project is to accelerate the development of late seral characteristics in the Late Successional Reserve (pg. 3).

(2) Key Watersheds (ACS Component #2)

Key Watersheds were established "as refugia . . . for maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species [ROD/RMP, pg. 20]." The Upper Smith River watershed is considered a key watershed.

(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. 28-29, 31-32) and *Aquatic Habitat & Fisheries* (pg. 33) 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)

One of the purposes of this project is to accelerate tree growth and the attainment of late successional characteristics (pg. 1). Therefore, the proposed action is considered to be a watershed restoration project.

Additionally, since 1994, numerous stream enhancement projects have been implemented in the Upper Smith River Watershed. This includes placing instream structures (e.g. logs, boulders, root wads, etc…) to improve aquatic habitat on over seven miles of stream, replacing over 10 culverts identified as barriers to fish passage to open up access to additional habitat, or improving or

decommissioning over five 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, 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 land, future landslides, mostly during large storm events, are expected to deliver large wood and rock fragments to lower-gradient streams because of BLM Riparian Reserves. These events would more closely resemble landslides within relatively unmanaged forests. These disturbance events are the major natural sources of sediment and wood to a stream system and are very episodic in nature.

Due to the dynamic nature of these disturbance events, stream channel conditions vary based on the time since the last disturbance event. This results in a wide range of aquatic habitat conditions at the site level. Site level habitat conditions can be summarized by Oregon Department of Fish and Wildlife (ODFW) habitat surveys. Surveys have been conducted throughout the 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 C-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 three separate seventh-field drainages (detailed below*) distributed throughout the watershed totaling roughly 3,830 acres in size. The BLM manages approximately 1,724 acres in these drainages (45%). Units proposed for treatment represent 8% of the total drainage area, and 17% of the BLM-managed lands in the drainage.	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%). Units proposed for treatment represent less than 1% of the total watershed area, and less than 1% 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 drainage, the proposed action would result in approximately 170 acres of thinned riparian stands. Trees within these treated stands would attain larger heights and diameters in a shorter amount of time than if left untreated. PDF's such as variable width "no-harvest" buffers established along streams would retain shading and therefore maintain water temperature. "No-harvest" buffers established on streams in or adjacent to proposed units would prevent disturbance to stream channels and stream banks and intercept surface run-off allowing sediment transported by overland flow to be filtered out before reaching active waterways (EA, pgs. 30-31) 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. 32-33). In addition, "no-harvest" buffers established on all streams in or adjacent to proposed units would prevent disturbance to stream channels and stream banks (EA, pg. 6). Therefore, these treatments would maintain the physical integrity of the aquatic system at the site scale.	This treatment would also maintain the physical integrity of the aquatic system at the watershed scale.
4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and	Project design features (PDF) would ensure that water quality would not be adversely impacted by the proposed action. PDF's such as variable width "no-harvest" buffers established along streams would retain shading and hence maintain water temperature.	Based on the information discussed at the site scale, this project would also maintain water quality at the watershed scale.

ACS Objective	Site/Project Scale Assessment	Fifth-Field Watershed Scale Assessment
chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.	"No-harvest" buffers established on streams in or adjacent to proposed units would prevent disturbance to stream channels and stream banks and intercept surface run-off allowing sediment transported by overland flow to be filtered out before reaching active waterways (EA, pgs. 30-31). Therefore, this treatment would maintain the existing water quality at the site scale.	
5. Maintain and restore the sediment regime under which aquatic ecosystems evolved.	As mentioned above, "no-harvest" buffers established on streams in or adjacent to proposed units would prevent disturbance to stream channels and stream banks and intercept surface run-off allowing any management related sediment transported by overland flow to settle out before reaching active waterways (EA, pgs. 30-31). 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. 32-33). The project would involve partial removal of vegetation on areas constituting three percent or less of each affected 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 woodlands.	As discussed in #6 above, this project would maintain stream flows within the range of natural variability at the site scale. Therefore, it would also maintain stream interactions with the floodplain and respective water tables at the site scale.	At the watershed scale, this project would also maintain stream interactions with the floodplain and respective water tables within the range of natural variability.
8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to	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.

ACS Objective	Site/Project Scale Assessment	Fifth-Field Watershed Scale Assessment
sustain physical complexity and stability.		
9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.	As mentioned previously, one of the objectives of this project is to restore riparian stand conditions in the proposed treatment areas. Implementation of riparian restoration projects will help restore adequate habitat to support riparian-dependent species at the site and watershed scales.	As mentioned previously, the intent of this project is to restore riparian stand conditions in the proposed treatment areas. Implementation of riparian restoration projects will help restore adequate habitat to support riparian-dependent species at the site and watershed scales.

*Detailed scale description of the three seventh-field drainages: Beaver Creek, Hefty Creek, and Summit Creek.

1) The **Beaver Creek** drainage is roughly 1,615 acres in size. The BLM manages approximately 802 acres in this drainage (49%). Units proposed for treatment represent 5% of the total drainage area, and 12% of the BLM-managed lands in the drainage.
2) The **Hefty Creek** drainage is roughly 1,080 acres in size. The BLM manages approximately 232 acres in this drainage (21%). Units proposed for treatment represent 5% of the total drainage area, and 24% of the BLM-managed lands in the drainage.
3) The **Summit Creek** drainage is roughly 1,135 acres in size. The BLM manages approximately 690 acres in this drainage (60%). Units proposed for treatment represent 11% of the total drainage area, and 19% of the BLM-managed lands in the drainage.

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 D. Botany Summary

Project: Clever Beaver Density Management
Prepared By: Julie Knurowski
Date: January 14, 2010
SSSP List Date: February 8, 2008 (IM-OR-2008-038)

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

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

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

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

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

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

Species	Within species range?	Habitat Present?	Species Present?	Reason for concern or no concern	Surveys Completed	Mitigation Measures
Threatened & Endangered Species						
Lupinus sulphureus ssp. *kincaidii* Kincaid's lupine (T)	**Yes**	**Yes**	No	Surveys performed, not detected.	May/June 2009	N/A
Plagiobothrys hirtus Rough popcorn flower (E)	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Sensitive Species						
Chiloscyphus gemmiparus Liverwort	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Diplophyllum plicatum Liverwort	**Yes**	No	No	No habitat present	May/June 2009	N/A
Entosthodon fascicularis Moss	**Yes**	No	No	No habitat present	May/June 2009	N/A
Gymnomitrion concinnatum Liverwort	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Helodium blandowii Moss	**Yes**	No	No	No habitat present	May/June 2009	N/A
Meesia uliginosa Moss	**Yes**	No	No	No habitat present	May/June 2009	N/A
Schistostega pennata Moss	**Yes**	No	No	No habitat present	May/June 2009	N/A
Tayloria serrata Moss	**Yes**	**Yes**	No	Surveys performed, not detected.	May/June 2009	N/A
Tetraphis geniculata Moss	**Yes**	No	No	No habitat present	May/June 2009	N/A
Tetraplodon mnioides Moss	**Yes**	**Yes**	No	Surveys performed, not detected.	May/June 2009	N/A

Species	Within species range?	Habitat Present?	Species Present?	Reason for concern or no concern	Surveys Completed	Mitigation Measures
Tomentypnum nitens Moss	**Yes**	No	No	No habitat present	May/June 2009	N/A
Tortula mucronifolia Moss	**Yes**	No	No	No habitat present	May/June 2009	N/A
Trematodon boasii Moss	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Bridgeoporus nobilissimus Giant polypore fungus	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Cudonia monticola *Fungi*	**Yes**	No	N/A	Surveys Not Practical. [1]	N/A	N/A
Dermocybe humboldtensis Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Gomphus kauffmanii Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Helvella crassitunicata Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Leucogaster citrinus Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Otidea smithii Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Phaeocollybia californica Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Phaeocollybia dissiliens Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Phaeocollybia gregaria Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Phaeocollybia olivacea Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Phaeocollybia oregonensis Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Phaeocollybia pseudofestiva Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Phaeocollybia scatesiae Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Phaeocollybia sipei Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Phaeocollybia spacidea Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Pseudorhizina californica Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Ramaria amyloidea Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Ramaria gelatiniaurantia Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Ramaria largentii Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Ramaria rubella var. blanda Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Ramaria spinulosa var. *diminutiva* Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Rhizopogon chamalelotinus Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Rhizopogon exiguus Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	May/June 2009	N/A

Species	Within species range?	Habitat Present?	Species Present?	Reason for concern or no concern	Surveys Completed	Mitigation Measures
Sowerbyella rhenana Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	May/June 2009	N/A
Bryoria subcana Lichen	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Calicium adspersum Lichen	**Yes**	No	No	No habitat present	May/June 2009	N/A
Chaenotheca subroscida Lichen	**Yes**	**Yes**	No	Surveys performed, not detected.	May/June 2009	N/A
Dermatocarpon meiophyllizum Lichen	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Hypogymnia duplicata Lichen	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Lobaria linita Lichen	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Pannaria rubiginosa Lichen	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Pilophorus nigricaulis Lichen	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Stereocaulon spathuliferum Lichen	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Adiantum jordanii California maiden-hair	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Arabis koehleri var. *koehleri* Koehler's rockcress	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Arctostaphylos hispidula *Hairy manzanita*	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Asplenium septentrionale Grass-fern	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Bensoniella oregana Bensonia	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Botrychium minganense Gray moonwort	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Calochortus coxii Crinite mariposa-lily	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Calochortus umpquaensis Umpqua mariposa-lily	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Camassia howellii Howell’s camas	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Carex comosa Bristly sedge	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Carex gynodynama Hairy sedge	**Yes**	**Yes**	No	Surveys performed, not detected.	May/June 2009	N/A
Carex serratodens Saw-tooth sedge	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Cicendia quadrangularis Timwort	**Yes**	No	No	No habitat present	May/June 2009	N/A
Cimicifuga elata var. elata Tall bugbane1	**Yes**	**Yes**	No	Surveys performed, not detected.	May/June 2009	N/A
Cypripedium fasciculatum Clustered lady slipper	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Delphinium nudicaule Red larkspur	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Epilobium oreganum Oregon willow-herb	**Yes**	No	No	No habitat present	May/June 2009	N/A

Species	Within species range?	Habitat Present?	Species Present?	Reason for concern or no concern	Surveys Completed	Mitigation Measures
Eschscholzia caespitosa Gold poppy	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Eucephalus vialis Wayside aster	**Yes**	No	No	No habitat present	May/June 2009	N/A
Horkelia congesta ssp. *congesta* Shaggy horkelia	**Yes**	No	No	No habitat present	May/June 2009	N/A
Horkelia tridentata ssp. *tridentate* Three-toothed horkelia	**Yes**	No	No	No habitat present	May/June 2009	N/A
Iliamna latibracteata California globe-mallow	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Kalmiopsis fragrans Fragrant kalmiopsis	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Lathyrus holochlorus Thin-leaved peavine	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Lewisia leana Lee's lewisia	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Limnanthes gracilis var. *gracilis* Slender meadow-foam	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Lotus stipularis Stipuled trefoil	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Meconella oregana *White fairypoppy*	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Pellaea andromedifolia Coffee fern	**Yes**	**Yes**	No	Surveys performed, not detected.	May/June 2009	N/A
Perideridia erythrorhiza Red-rooted yampah	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Polystichum californicum California sword-fern	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Romanzoffia thompsonii *Thompson's mistmaiden*	**Yes**	No	No	No habitat present	May/June 2009	N/A
Schoenoplectus subterminalis Water clubrush	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Scirpus pendulus *Drooping rush*	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Sisyrinchium hitchcockii Hitchcock's blue-eyed grass	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Utricularia gibba Humped bladderwort	**Yes**	No	No	No habitat present	May/June 2009	N/A
Utricularia minor Lesser bladderwort	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Wolffia borealis Dotted water-meal	**Yes**	No	No	No habitat present.	May/June 2009	N/A
Wolffia columbiana Columbia water-meal	**Yes**	No	No	No habitat present.	May/June 2009	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 D-2. Bureau Strategic Botanical Species.

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

Project: Clever Beaver Density Management
Prepared By: Rex McGraw, Ryan Johnson, Abe Wheeler
Date: April 9, 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 Clever Beaver Density Management and not necessarily the absolute amount of carbon that would be stored or released under the alternatives.

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

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

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

Carbon Storage in Standing, Live Trees

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

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

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

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

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

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

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

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

8. The tonnes of carbon in whole trees within the project were derived by summing the tonnes of carbon in whole trees within each unit. It is this summation that is shown in Tables 9 and 10 (pgs. 40, 42) as "Standing, Live Trees".

Carbon Storage in Forests Other than Live Trees

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

1. Carbon in other than live trees for each unit was derived by multiplying the unit acreage by the tonnes of carbon per acre shown in Table E-1 (which was adapted from Table C-2 in the 2008 Final EIS, Appendices-29). The stands in Clever Beaver were aged based on the time steps used in the analysis (i.e. 10, 20, 50, and 100 years after the current condition) and the corresponding tonnes of carbon per acre was used in the calculations of other than live tree carbon. Under the "current condition", stands in Clever Beaver were 49-60 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 9 and 10 (pgs. 40, 42) as "Other Than Live Trees".

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

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

* adapted from 2008 Final EIS, Appendices-29.

Carbon Storage in Wood Products

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

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

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

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

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

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

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

7. The sum total of the tonnes of carbon immediately released from saw logs (derived in Step 4 above) and from pulpwood (derived in Step 6 above) represent the total amount of carbon released by "Wood Products" at harvest time. The sum total of the tonnes of carbon held in saw logs (derived in Step 4 above) and held in pulpwood (derived in Step 6 above) at each time step represent the amount of carbon stored in "Wood Products" as shown in Table 10 (pg. 42).

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

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

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

Carbon Release in Slash Burning

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

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

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

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

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

5. The tonnes of carbon that would be released under the proposed action were derived by multiplying the acreage of the project by 0.382 tonnes per acre (derived in Step 4 above) and are shown in Table 10 (pg. 42) as "Slash Burning" at harvest time.

Carbon Storage in Logging Slash

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

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

2. The tonnes of logging slash on-site were then multiplied by the fraction of Douglas-fir slash remaining at each time step as shown in Table E-3 (based on Janisch et al. 2005). This represents the amount of carbon stored in "Logging Slash" as it decayed and released carbon over time as shown in Table 10 (pg. 42).

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

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

* based on Janisch et al. 2005.

Carbon Release in Fossil Fuels

The carbon pool of "Fossil Fuels" represents the amount of carbon that would be released 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 E-4. For the fossil fuels portion of the analysis, it was assumed that the 301 acre project would be cable-yarded and a loader would handle logs at the landings.

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

Equipment	Production Rate[a]	Fuel Efficiency[b]		Fuel Consumed
	(acres/day)	(gallons/hour)	(gallons/day)	(gallons)
Chainsaw (gasoline)	0.4	-	1	753
Motorized Carriage (gasoline)	1	-	3	903
Cable/Skyline Yarder (diesel)	1	2.3	19.55	5,885
Loader (diesel)	1	4.5	38.25	11,513

[a] based on experience of BLM Contract Administrators and Crusier/Appraisers.

[b] based on World Forestry Institute (1997).

2. For the hauling of logs, this analysis assumed an average log-truck load of 4,000 BF (based on experience of BLM Contract Administrators and Crusier/Appraisers) and a fuel efficiency of 6.0 miles per gallon. It was also assumed that the total timber volume in Clever Beaver was 6,607,965 BF (based on ORGANON modeling) and the length of haul (round-trip) was 86 miles. It was estimated that 23,679 gallons of diesel would be consumed during log hauling for this project.

3. For road construction it was assumed that 588 gallons of diesel would be consumed per mile (5,280 feet) of road constructed and 73 gallons per mile of road renovated (Loeffler et al., 2009). In Clever Beaver, there would be 5,995 feet of road construction (Table 3) corresponding to 399 gallons of diesel consumed and 28,883 feet of road renovation (Table 3) corresponding to 664 gallons of diesel consumed.

4. The gallons of fuel that would be consumed by harvest operations (derived in Step 1), log hauling (derived in Step 2), and road construction and renovation (derived in Step 3) were summed to provide the total fuel consumption for the project (Table E-5). The total gallons of fuel that would be consumed were converted to tonnes of carbon that would be released using the conversion factors shown in Table E-5. The total amount of carbon that would be released by the proposed action is shown in as "Fossil Fuels" in Table 10 (pg. 42).

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

Fuel Use	Fuel Consumption (gallons)	Pounds CO_2 per Gallon[a]	CO_2 Released[b] (tonnes)	Carbon Released[c] (tonnes)
Harvest Operations (gasoline)	1,656	19.4	15	4
Harvest Operations (diesel)	17,398	22.2	176	48
Log Hauling (diesel)	23,679	22.2	239	65
Road Construction & Renovation (diesel)	1,063	22.2	11	3
Total	**-**	**-**	**441**	**120**

[a] based on experience of BLM Contract Administrators and Crusier/Appraisers.

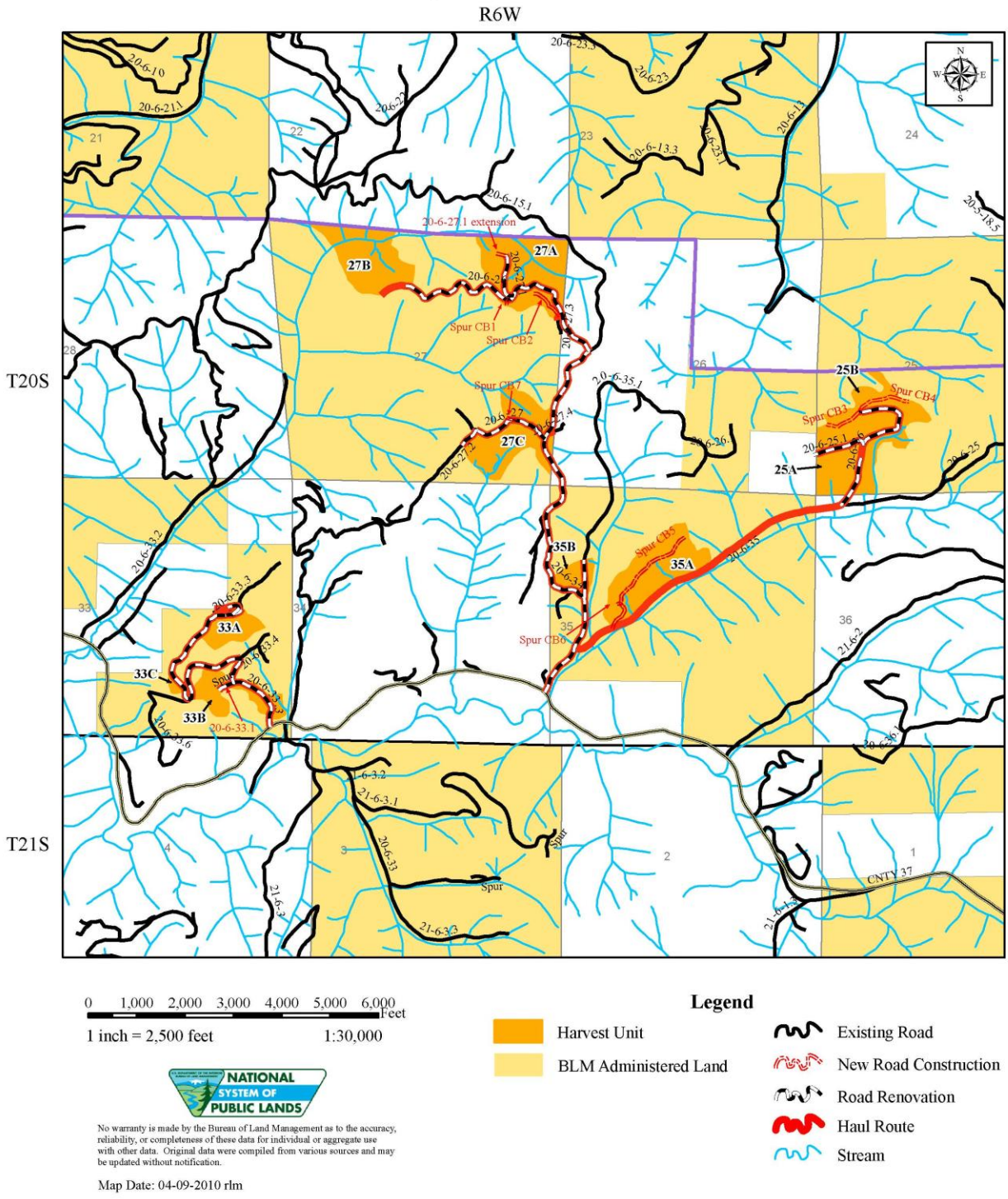
[b] conversion rate of 2,200 pounds per tonne (2008 Final EIS, Appendices-28).

[c] One tonne of carbon is equivalent to 3.67 tons of carbon dioxide (U.S. EPA, 2005).

Appendix F. Map Packet Table of Contents

Figure 1. Clever Beaver Density Management

Proposed Units & Roads



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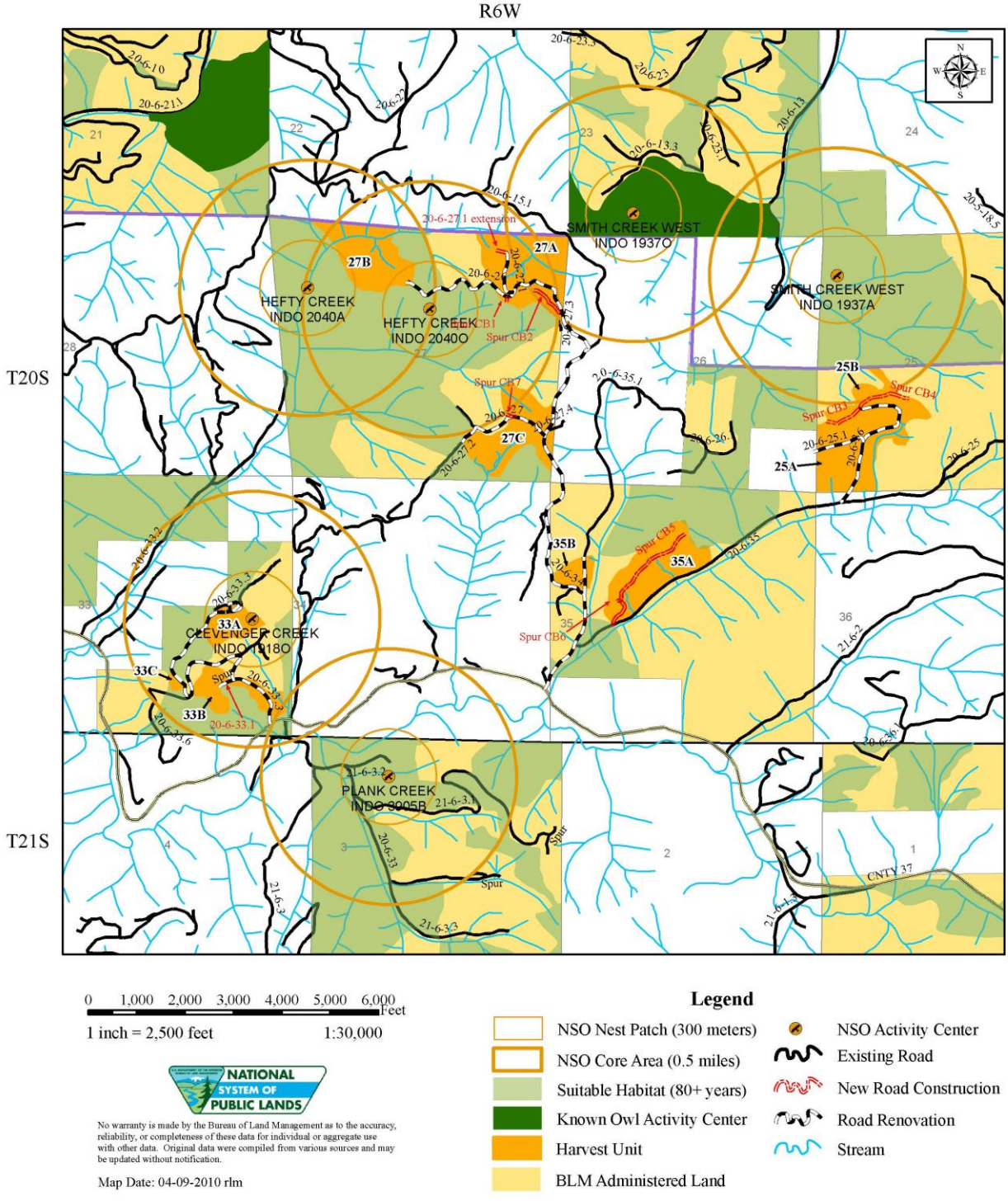
Map Date: 04-09-2010 rlm

Figure 2. Clever Beaver Density Management

Northern Spotted Owls



0 1,000 2,000 3,000 4,000 5,000 6,000 Feet

1 inch = 2,500 feet 1:30,000

Legend

- NSO Nest Patch (300 meters)
- NSO Core Area (0.5 miles)
- Suitable Habitat (80+ years)
- Known Owl Activity Center
- Harvest Unit
- BLM Administered Land
- NSO Activity Center
- Existing Road
- New Road Construction
- Road Renovation
- Stream

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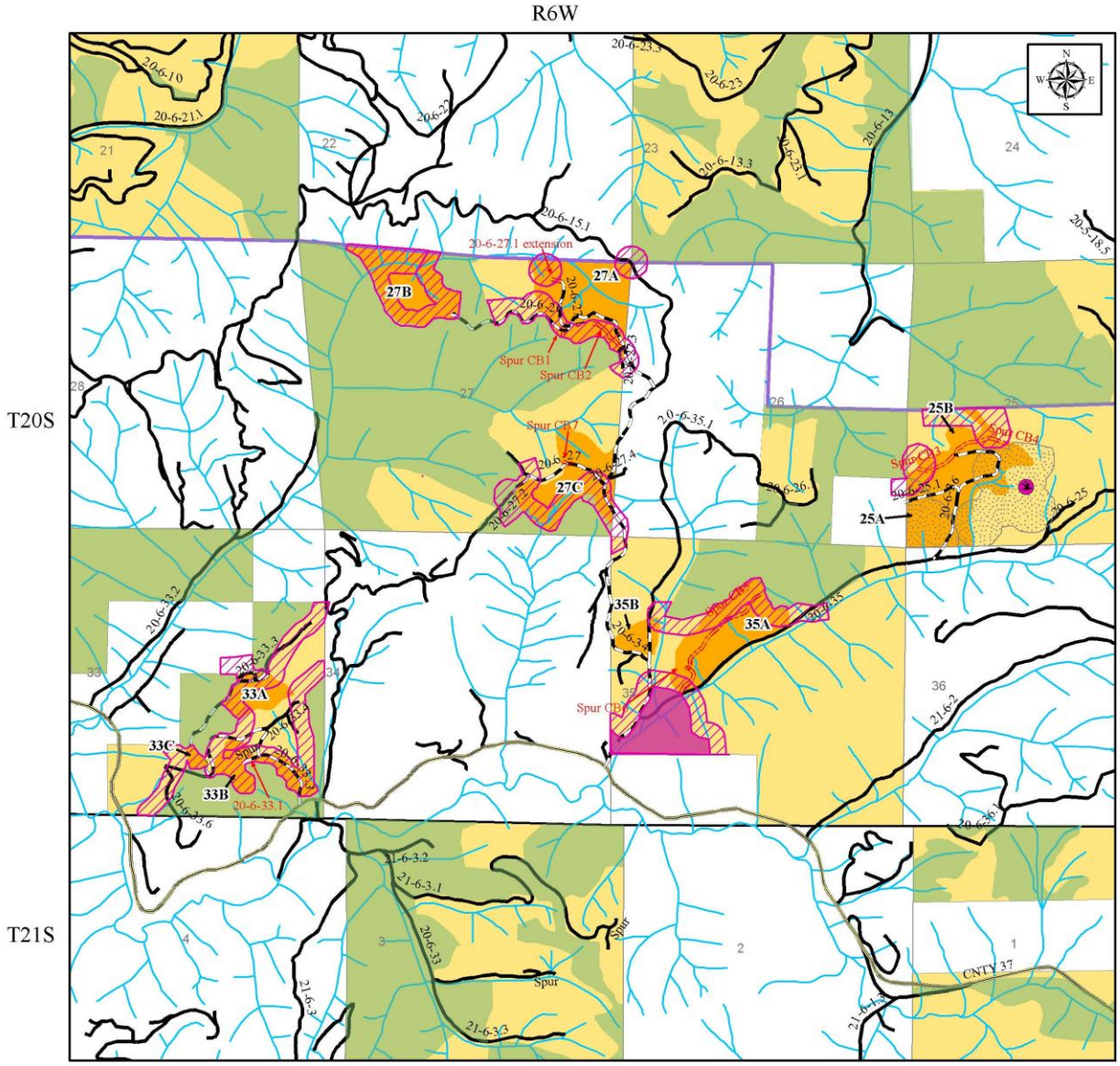
Map Date: 04-09-2010 rlm

Figure 3. Clever Beaver Density Management

Marbled Murrelets



0 1,000 2,000 3,000 4,000 5,000 6,000 Feet

1 inch = 2,500 feet 1:30,000

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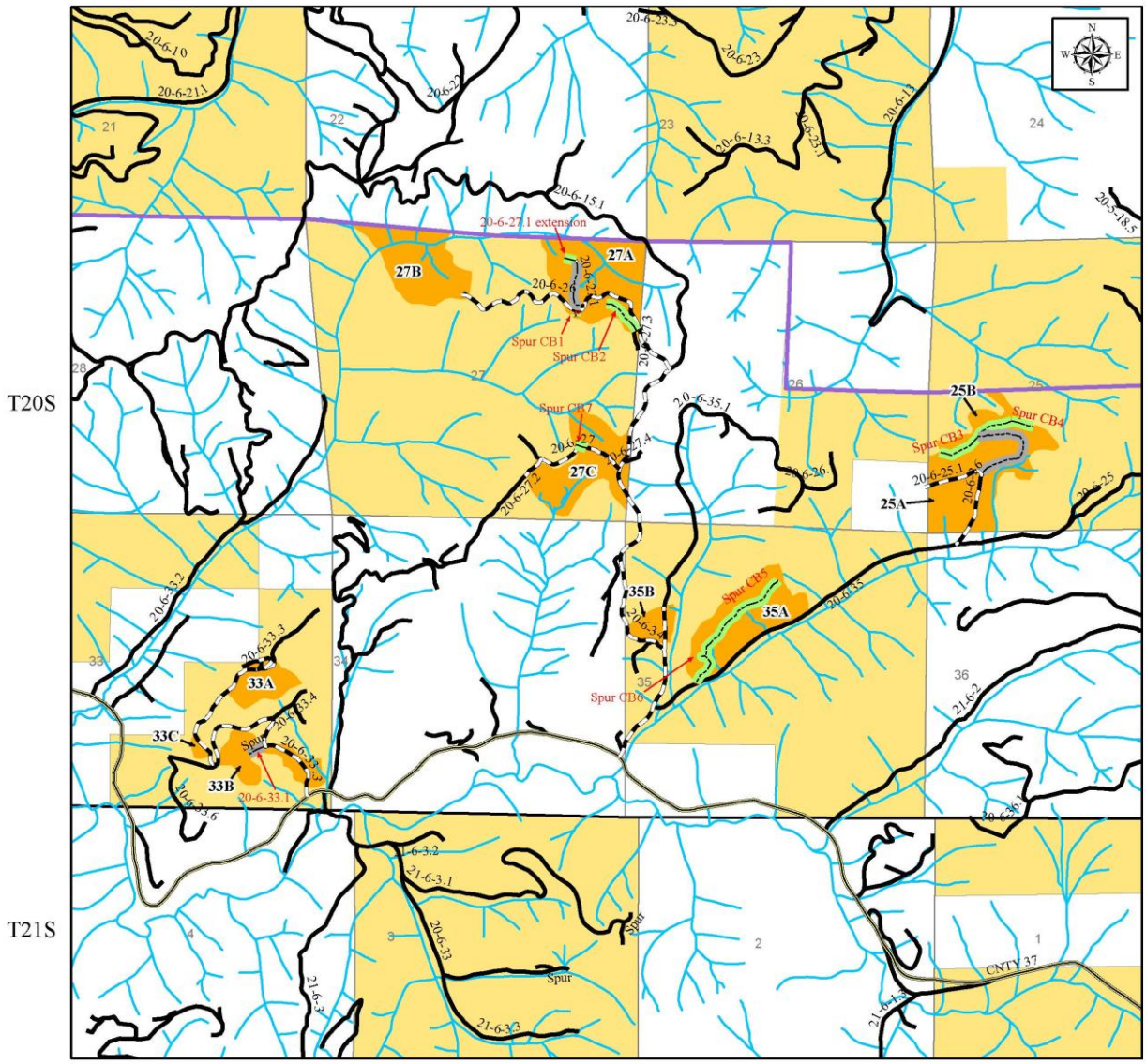
Map Date: 04-09-2010 rlm

Legend

- Occupied Murrelet Stand
- Disruption Buffer (100 yards)
- Suitable Habitat (80+ years)
- Surveys Planned for 2010
- Harvest Unit
- BLM Administered Land
- Murrelet Detection
- Existing Road
- New Road Construction
- Road Renovation
- Stream

Figure 4. Clever Beaver Density Management

Subsoiling



0 1,000 2,000 3,000 4,000 5,000 6,000 Feet

1 inch = 2,500 feet 1:30,000

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 Date: 04-09-2010 rlm

Legend

- Existing Road to be Subsoiled
- New Road Construction to be Subsoiled
- Harvest Unit
- BLM Administered Land
- Existing Road
- New Road Construction
- Road Renovation
- Stream