Finding of No Significant Impact (FONSI)

and

Crab Race Environmental Assessment (EA)

For Three Projects:

Density Management Thinning,

Snag and Coarse Woody Debris Recruitment,

and

Crabtree Complex ACEC Road Closure

BLM

Salem District

Environmental Assessment DOI-BLM-OR-S040-2011-0002-EA

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United States Department of the Interior
Bureau of Land Management, Oregon State Office
Salem District, Cascades Resource Area
Linn County, Oregon

Project 1
T. 11 S., R. 2 E., Sec. 12 and 13, W. M.
T. 11 S., R. 3 E., Sec. 7, 8, and 9, W. M.
Project 2
Upper Crabtree Creek Watershed,
Including and Surrounding the Location of Project 1.
Project 3
T. 11 S., R. 3 E., Sec. 16

As the Nation's principal conservation agency, the Department of Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering economic use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

BLM/OR/WA/AE-13/032+1792

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Chapter 0: FINDING OF NO SIGNIFICANT IMPACT[1]

Introduction

The Bureau of Land Management (BLM) has conducted an environmental analysis for a proposal to thin approximately 460 acres of 39-54 year old forest stands. The project is located on BLM lands in T. 11 S., R. 2 E. section 12 and 13; and T. 11 S., R. 3 E. section 7, 8 and 9; W.M. in Linn County, Oregon. The Crab Race Environmental Assessment (EA) (#DOI-BLM-OR-S040-2011-0002-EA) documents the environmental analysis of the proposed Project 1, Density Management Thinning commercial thinning activity. The EA is attached to and incorporated by reference in this Finding of No Significant Impact determination. The EA and FONSI will be made available for public review from May 08, 2013 to June 07, 2013 (*EA section 5.2*).

The analysis in this EA is site-specific and supplements analyses found in the *Salem District Proposed Resource Management Plan/Final Environmental Impact Statement*, September 1994 (RMP/FEIS). The proposed thinning activities have been designed to conform to the *Salem District Record of Decision and Resource Management Plan*, May 1995 (RMP) and related documents which direct and provide the legal framework for management of BLM lands within the Salem District (*EA Section 1.3*). Approximately 178 of these acres are in the Matrix land use allocation (LUA), 62 acres are in the Riparian Reserve (RR) LUA overlaid on GFMA, and 220 acres are in Late Successional Reserve (LSR) LUA, including RR overlaid on LSR, as described in the RMP.

Finding of No Significant Impact

Based upon review of the Crab Race Environmental Assessment (EA) and supporting documents, I have determined that the proposed actions are not major federal actions and would not significantly affect the quality of the human environment, individually or cumulatively with other actions in the general area. No environmental effects meet the definition of significance in context or intensity as defined in 40 CFR 1508.27. Therefore, supplemental or additional information to the analysis in the RMP/FEIS in the form of an environmental impact statement (EIS) is not needed. This finding is based on the following discussion:

For Project 1, Density Management Thinning

Context [40 CFR 1508.27(a)]***:*** Potential effects resulting from the implementation of the proposed action have been analyzed within the context of the project area boundaries, and the Upper Crabtree 6th field watershed. This project would affect approximately 1.7 percent of the 26,774 acre 6th field watershed.

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[1] This section of the Crab Race EA is the unsigned Finding of No Significant Impact (FONSI) covering all three proposed projects and is presented here for public review and comment. The Cascades Field Manager will finalize, as appropriate, the FONSI for each project after the public comment period and after signing the Decision Rationale (DR) for each project, and will sign and publish the FONSI concurrently with each respective DR.

Intensity refers to severity of impact [40 CFR 1508.27(b)]. The following text shows how that the proposed project would not have significant impacts with regard to ten considerations for evaluating intensity, as described in 40 CFR 1508.27(b).

1. *[40 CFR 1508.27(b) (1)] – Impacts that may be both beneficial and adverse:* The effects of commercial thinning are unlikely to have significant (beneficial and/or adverse) impacts *(EA Chapter 3)* for the following reasons:
   - The proposed treatments described in EA section 2.3.1.1 and the project design features described in EA section 2.3.1.3 (Table 4) would reduce the risk of effects to affected resources to be within RMP standards and guidelines and to be within the effects described in the RMP/EIS.
   - *Vegetation and Forest Stand Characteristics (EA section 3.3):* Effects to these resources would not have significant impacts because:
     - The proposed action would not adversely affect BLM Special Status Species or former Bureau Assessment Species because no suitable habitat for any species known or likely to be present would be lost or altered to a degree that may impact existing populations. Therefore, the project would not contribute to the need to list any BLM Special Status Species.
     - Any increases in the number of invasive/non-native plants are expected to be short lived because areas with exposed soil (e.g. constructed/renovated roads, culvert replacement sites) would be revegetated with native species (*EA Table 4 #54*); and BLM experience with previous timber harvest areas near to the project area has noted no evidence to indicate that adverse impacts from invasive/non-native plants would occur as a result of the project (*EA section 3.3.1.1*).
   - *Hydrology, Fisheries and Aquatic Habitat (EA sections 3.4; 3.5):* Effects to these resources would not have significant impacts because the project effects on water quality would comply with Oregon Department of Environmental Quality (ODEQ) water quality standards because:
     - The project would maintain current stream temperatures by retaining the current vegetation and shading in the primary shade zone (stream protection zones, or SPZ) and most of the current levels of shading provided by the secondary shade zone.
     - Water quality would be maintained because logging, road construction/renovation, culvert replacement, road maintenance and timber haul project design features (EA Table 4) and SPZ are expected to prevent sediment from reaching streams and causing sediment/turbidity that would exceed ODEQ water quality standards.
     - Water quality would also be maintained because road construction would occur on gentle, stable slopes so no mass movement would be expected which could increase sediment. Runoff from new roads would drain to stable, vegetated slopes where it would infiltrate into the soil rather than connect to stream channels to transport sediment or augment peak flows.
     - No changes in project area hydrology due to project actions are likely to be detectable, including mean annual water yield, base flow and peak flows.
     - The project would not impact stream channels, aquatic habitat or fish populations because it would not cause water quality impacts that exceed ODEQ water quality standards and would not detectably change project area hydrology.
   - *Soils (EA section 3.6):* Effects to this resource would not have significant impacts because:

- Soil compaction is limited to no more than 10 percent of the project area acreage, which is within RMP standards (C-2, C-9) which were analyzed in the RMP/FEIS.
- No loss of growth and yield would be expected at the stand level because thinning treatments typically lead to acceleration of average tree growth and compacted soils affect less than half of the rooting area of individual trees.
- Following completion of harvest, the majority of understory vegetation and root systems and organic matter would remain.
- The project would not lead to any measurable increase in surface erosion and overall erosion would remain within the natural range of background erosion rates.
- The project would maintain sufficient mycorrhizae populations because the root systems of most vegetation would remain undisturbed and there is no evidence that past disturbance of the area has affected mycorrhizae populations.

- *Wildlife (EA section 3.7):* Effects to this resource would not have significant impacts because:
  - Stands proposed for thinning are not presently functioning as late-successional old growth habitat.
  - No remnant old-growth trees would be affected.
  - Existing snags and coarse woody debris (CWD) would be retained on site. Fewer than 10 percent of existing large (≥15 inches and ≥15 feet tall) that would be felled for safety or knocked over by logging operations would be retained as CWD. Fewer than 10 percent of CWD would be impacted by logging and would remain on site.
  - No suitable habitat for BLM Special Status species (SSS) which are known or likely to be present in the project area would be lost. Therefore the project would not contribute to the need to list any SSS.
  - Thinning would not significantly change species richness (a combination of species diversity and abundance) of the Migratory and Resident Bird community. No species would be extirpated in stands as a result of thinning.
  - See Intensity Point # 9 for effects to northern spotted owl.

- *Air Quality and Fire Hazard/Risk (EA section 3.8):* Effects to this resource would not have significant impacts because:
  - After 3 to 5 years the fine fuels generated by thinning would be decayed in the units and the risk of surface fire would decrease to near current levels.
  - The thinning itself would decrease the risk of a canopy fire.
  - The proposed action would comply with State of Oregon Air Quality Standards by strict adherence to smoke management regulations.
  - In project 2 the intensity of the treatment is so low (falling scattered single trees) that changes to fire hazard and risk would not contribute to cumulative fire hazard/risk and would not affect air quality since no burning is proposed.
  - Project 3 would not require any change of tactics in responding to wildfire and a delay in response of approximately 15 minutes would not be unlikely to make a difference in the ability of initial attack firefighters to control fire starts.

- *Carbon Storage, Carbon Emissions and Climate Change (EA section 1.8.3):* Effects to this resource would not have significant impacts because the incremental increase in carbon emissions as greenhouse gasses that could be attributable to the proposed action is of such small magnitude that it is unlikely to be detectable at global, continental or

regional scales or to affect the results of any models now being used to predict climate change.

- *Recreation, Visual Resources, and Rural Interface (EA section 3.9):* Effects to this resource would not have significant impacts because:
  - Changes to the landscape character would comply with Visual Resource Management (VRM) class 4 objectives which allow major modifications of the character of the landscape.
  - Changes from project 1 would comply with VRM guidelines to minimize visual impacts because commercial thinning would maintain a forested setting and not be a major modification to the character of the landscape. Some disturbance to vegetation would be observable after thinning activities and would be expected to develop an undisturbed appearance within five years.
  - Project 2 would not affect these resources because of its low intensity.
  - Project 3 would be expected to enhance recreation and visual resources slightly by simultaneously making the setting more remote and increasing apparent levels of management. No direct impact to visitor use levels would be anticipated and indirect impacts of increased hike-in visitor use may increase by unknown amounts.

2. *[40 CFR 1508.27(b) (2)] - The degree to which the proposed action affects public health or safety* (*EA sections 1.6, 1.7.2, 2.3, 2.3.1 Table 4, 3.4, 3.8, 3.9*)*:* The proposed project would not adversely affect public health or safety because:
   - Public access to much of the proposed project areas is restricted by private gates.
   - OSHA mandated health and safety regulations are applied to all project operations related to the proposed project implementation.
   - All actions of the proposed project must meet national and State of Oregon air and water quality standards, as provided for by the EIS.
3. *[40 CFR 1508.27(b) (3)] - Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas:* Effects to these resources would not have significant impacts because:
   - The proposed project would not affect historical or cultural resources because on site cultural and historic surveys completed have not produced evidence to support the previous or present existence of artifacts of significant cultural or historical value. The single known cultural resource potentially impacted by the proposed projects (remains of a logging sled) would be protected from direct impacts. (*EA Table 4 and section 3.10*)
   - There are no park lands, prime farmlands or wild and scenic rivers to be impacted.
   - Treatments (projects 1 and 2) adjacent to wetlands would be designed to enhance the wetlands by reducing encroachment of conifers. (*EA sections 2.3, 3.3, 3.4, 3.7*)
   - Project 3 (road closure) would be designed to provide increased protection to the ecologically critical areas in three contiguous ACEC/ONA/RNAs. (*EA sections 1.1.3, 1.3.3, 1.4.3, 2.2.3, 2.3.3, 3.3.3, 3.4.3, 3.5.3, 3.6.3, 3.7.3, 3.9.3*)
4. *[40 CFR 1508.27(b) (4)] - The degree to which the effects on the quality of the human environment are likely to be highly controversial:* The proposed project is not unique or unusual. The BLM has experience implementing similar actions in similar areas without highly controversial effects.
5. *[40 CFR 1508.27(b) (5)] - The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks:* The effects of the

project do not have not uncertain, unique or unknown risks because the BLM has experience implementing similar actions in similar areas without these risks, no potential unique or unknown risks were identified by the BLM or by comments submitted in response to scoping, and project design features would minimize the risks associated with the project (*EA sections 2.2.1, 2.3.1.3*). See # 4, above.

6. *[40 CFR 1508.27(b) (6)] - The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration:* The proposed actions would not establish a precedent for future actions beyond the time frames analyzed nor would they represent a decision in principle about a further consideration for the following reasons:
   - The project is in the scope of proposed activities documented in the RMP EIS.
   - The BLM has experience implementing similar actions in similar areas without setting a precedent for future actions or representing a decision about a further consideration. See # 4, 5, above.

7. *[40 CFR 1508.27(b) (7)] - Whether the action is related to other actions with individually insignificant but cumulatively significant impacts:* The Interdisciplinary Team (IDT) evaluated the project area in context of past, present and reasonably foreseeable actions and determined that there is a potential for cumulative effects on water quality and fisheries, and carbon storage and emissions. These effects are not expected to be significant for the following reasons:
   - Water Quality/Fisheries: The proposed action would be expected to temporarily increase stream sediment and turbidity as a result of culvert replacement, road maintenance, and road use (*EA Sections 3.4, 3.5*). These effects are not expected to be significant for the following reasons:
     - Any sediment increase resulting from thinning would be too small to be discernable relative to background sediment yields, would not be expected to exceed ODEQ water quality standards and would decrease quickly over time, returning to current levels within three to five years as vegetation increases (Dissmeyer, 2000).
     - Snag/CWD recruitment in project 2 would not be expected to contribute sediment to streams. (*EA section 3.4.2*)
     - The limited magnitude of sediment inputs (non-detectable on 7th field watershed scale, not visible more than 800 meters downstream of crossings) and duration (primarily major storm events during the first year following disturbance at culvert replacement sites in project 1 and drainage repair site in project 3) of this effect would likely be insignificant for water quality on the watershed scale. Cumulatively, the proposed action and connected actions would be unlikely to result in any detectable change for water quality on a 7th field watershed scale (even less effect on the larger 6th field watershed scale) and would be unlikely to have any effect on any designated beneficial uses, including fisheries. (*EA Section 3.4.1, 3.5.1*)
     - Road use restrictions, road design and maintenance, protection measures and monitoring of road conditions would prevent increases in turbidity that exceed ODEQ standards to maintain water quality. (*EA section 2.3.1.3,*)
   - Carbon storage and carbon emissions (*EA section 1.8.3*): The proposed thinning would contribute to cumulative effects to carbon storage and carbon emissions. The effects are not significant for the following reasons:

- The incremental increase in carbon emissions as greenhouse gasses that could be attributable to the proposed action is of such small magnitude, as determined by analysis of similar projects, that it is unlikely to be detectable at global, continental or regional scales or to affect the results of any models now being used to predict climate change.
- The net carbon emissions would be of short duration, as determined by analysis of similar projects.

8. *[40 CFR 1508.27(b) (8)] - The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources:* The project would not affect these resources because no districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places exist within or near the proposed project vicinity. (*EA section 3.10*)
9. *[40 CFR 1508.27(b) (9)] - The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act (ESA) of 1973:* The proposed project is not expected to adversely affect ESA listed species or critical habitat for the following reasons:
   - *ESA Wildlife - Northern spotted owl (EA Section 3.7):* Effects to the species are not significant because: The project maintains dispersal and suitable habitat, and does not affect suitable owl habitat within and between known owl sites; habitat conditions are expected to improve as thinned stands mature (>20 years); residual trees would increase in size and be available for recruitment or creation of snags, culls and CWD for prey species and nesting opportunities, particularly in Riparian Reserves. Project 2 is designed to enhance late-successional habitat in the long term and project 3 would reduce disturbance to a known owl site and other habitat. ESA Consultation is described in EA section 5.1.1.
   - *ESA Fish – UWR Chinook salmon, UWR steelhead trout (EA Section 3.5):* Effects to ESA fish are not significant because thinning is not expected to affect these species for the reasons stated in the Hydrology section (*EA section 3.4*).
     - Effects of road maintenance and log hauling are not significant because project design features would prevent sediment from entering streams in quantities sufficient to exceed ODEQ water quality standards. The primary haul route is designed and maintained to support year around use and direct most water and sediment onto stable slopes where it infiltrates rather than delivering it to streams. Condition related restrictions and monitoring would prevent generating and delivering sediment to streams. The secondary haul route accessing a small portion of the project area would be used only in the dry season when runoff would not be generated.
     - New road construction would be located in stable locations and would not contribute to degradation of aquatic habitat.
     - ESA Consultation is described in EA section 5.1.2.
10. *[40 CFR 1508.27(b) (10)] - Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment:* The proposed thinning activities have been designed to follow Federal, State, and local laws (*EA section 1.7*)

John Huston, Cascades Resource Area Field Manager – Unsigned, for Review and Comment

Chapter 1: Introduction

This EA analyzes the impacts of three proposed projects and connected actions on the human environment: 1) density management accomplished by commercial thinning, 2) multi-part recruitment of large snags and coarse woody debris (CWD), and 3) closing a segment of a dead-end road within a designated Area of Critical Environmental Concern. The EA provides the decision-maker, the Cascades Resource Area Field Manager, with current information to aid in the decision-making process. Section 1 of this EA provides a context for what will be analyzed in the EA, describes the kinds of actions we are considering, defines the project area, describes what the proposed actions need to accomplish, and identifies the criteria that we will use for choosing the alternative that will best meet the purpose and need for each of the projects proposed.

1.1 Proposed Actions

1.1.1 Project 1: Density Management Thinning

The Cascades Resource Area, Salem District Bureau of Land Management (BLM), proposes to commercially thin approximately 460 acres of 39 - 54 year old[2] forest stands. Connected actions include: habitat improvement such as low density thinning patches and maintaining meadow edge habitat, creating coarse woody debris, tree topping and snag creation; road maintenance, construction, renovation, culvert replacement, and/or improvement; road stabilization and closure; and fuels treatment.

As used in this EA, "density management" and "thinning" are generic terms indicating that only a portion of the trees in a stand are designated for cutting to manage tree densities to achieve defined objectives. "Commercial thinning" is a means of accomplishing stated objectives where designated trees are sold to a purchaser who cuts those trees, removes the logs, and performs connected actions (EA Chapter 2) under the terms of a BLM contract. Terms that may be used interchangeably in this EA include: commercial thinning, CT, thinning, density management, partial cut and treatment, as well as verb tenses of "thin" and "treat".

1.1.2 Project 2: Snag and Coarse Woody Debris Recruitment

The Cascades Resource Area also proposes to extend snag and coarse woody debris (CWD) recruitment / creation actions beyond the borders of the proposed density management thinning project, and to extend the timeframe beyond the proposed timber sale contract period. This would allow the BLM to create snags and CWD in pulses over the next three to four decades in early to mid-seral stands in the Late Successional Reserve and Riparian Reserve throughout the Upper Crabtree watershed. Within the project area for Project 1, the first pulse is analyzed with Project 1 and some or all of the work would be accomplished as part of the timber sale analyzed in Project 1.

[2] Total stand age calculated as of January 2012.

1.1.3 Project 3: Crabtree Complex ACEC Road Closure

The Cascades Resource Area also proposes to close a road within the Crabtree Complex of ACEC[3] (Area of Critical Environmental Concern) by blocking road 11-2E-16.1 in the NW¼NE¼ Section 16, prior to crossing Crabtree Creek, restoring proper water flow at a blocked small culvert in the section of road to be closed, and allowing natural processes to decommission the road.

Connected actions include: providing a turn-around, parking for 2-5 vehicles, a single panel information kiosk, blocking vehicles from leaving the road, and maintaining an open pathway for non-motorized access to Crabtree Lake.

1.2 Project Area[4] Location and Vicinity

The proposed projects are located within Linn County, Oregon within Township 11 South, Range 2 East, Sections 12 and 13 and Township 11 South, Range 3 East, Sections 7, 8, 9 and 16, Willamette Meridian.

The proposed project area is within the Crabtree Creek 5th field watershed, tributary to the South Santiam River. All proposed project units are on BLM-administered land within the Upper Crabtree 6th field watershed (identified as the North Fork Crabtree sub-basin in the Crabtree Creek Watershed Analysis). BLM lands are intermixed with privately-owned industrial timberland, creating a mosaic of ownership patterns. See EA Section 7.2 - Vicinity Map.

Project 1 is within 11S-2E Sections 12 and 13, and 11S-3E Sections 7, 8 and 9. Project 2 would occur in the greater Upper Crabtree 6th Field (North Fork Crabtree) Watershed where Crab Race is located. Project 3 is in 11S-3E Section 16 within the Crabtree Complex ACEC.

1.3 Need for Action

1.3.1 Project 1: Density Management Thinning

The BLM has identified specific forest stands in this area that are overstocked and need immediate density management thinning to reduce tree density to allow the remaining trees sufficient water, nutrients and space for vigorous growth to meet RMP objectives. BLM has analyzed data and examined these stands in the field and confirmed that they are overstocked[5] and relatively homogenous with simple stand structures and declining growth rates.

In overstocked stands growth rates decline, the stands become less vigorous, the lower limbs of the crowns die as they are shaded (a process called "self-pruning"), understories tend to be sparse, and the vigor of these slow growing trees declines and they become more susceptible to insects, diseases and wind damage. Suppressed trees die (a process called suppression mortality or self-thinning), creating large quantities of small diameter dead wood that has relatively limited

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[3] The Crabtree Complex ACEC is composed of three contiguous ACEC/RNA/ONA areas (Area of Critical Environmental Concern / Research Natural Area / Outstanding Natural Area): Carolyn's Crown, Crabtree Lake and Shafer Creek. The road segment proposed for closure approaches Crabtree Lake within this complex of ACECs. Any of the three names may be used casually to refer to the entire complex.

[4] "Project area" is the area proposed for treatment such as thinning or other operations such as road construction and road renovation. "Project vicinity" is the contiguous block(s) of BLM managed lands within the **sections** that contain the project area. The "Vicinity Map" shows the project vicinity and additional area.

[5] "Overstocked" indicates that trees in a stand are overcrowded, or dense, so that they are competing for light, water and nutrients to the point where the stand cannot meet management objectives without removing some of the trees.

habitat value but is common across the landscape and may build up dead fuel levels in the forest and increase the chances of severe wildfire.

The BLM has also identified that openings interspersed through the interior of forest stands are a desirable component of landscape diversity that are scarce in the project vicinity. Large scale clearcuts when the project vicinity was logged resulted in the present large scale, relatively uniform, early-mid seral stands with few small gaps/openings to provide forage species and dense brush patches.

Wet meadows provide large openings and forage in the watershed. Conifer trees are encroaching into the edges of these meadows in some locations, gradually decreasing the size of those meadows.

These trends detract from meeting RMP objectives for all three Land Use Allocations (LUA) in the project area. In LSR and RR lands these trends preclude or delay developing habitat characteristics associated with late-successional and old growth forests such as large diameter trees (including standing and down dead trees), full crowns with large limbs and understory diversity and complexity. The BLM has determined that density management thinning is needed here to reverse these trends and accelerate developing late-successional habitat components to help meet RMP objectives for LSR and RR lands because old-growth stands are generally scattered and small in this part of this watershed.

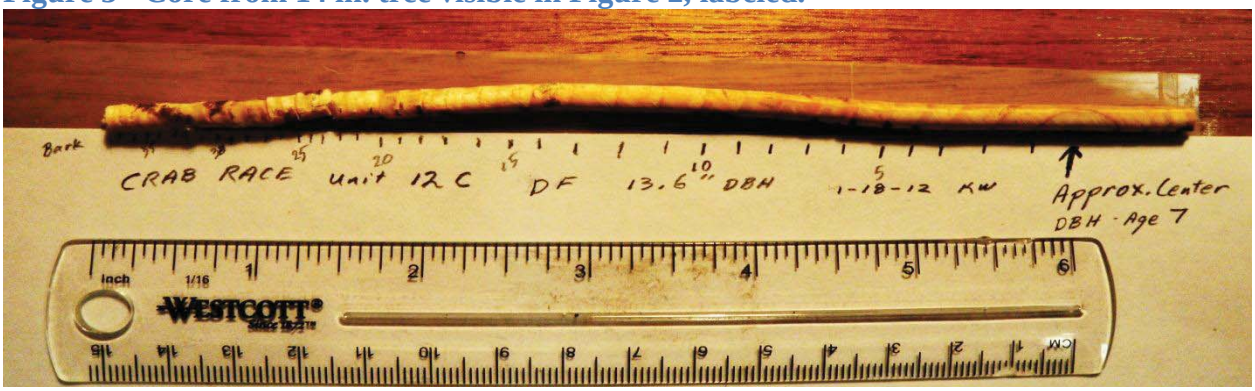
In GFMA lands, these same trends reduce the overall value of wood products produced compared to a managed timber stand.

Figures 1 and 2 show the dense stocking and sparse understory which are typical of forest stands in the project area. Figure 3 shows the declining growth rate, with over two inches of radial growth in ten years when the tree was vigorous and less than one inch of radial growth in ten years currently.

Figure 1 - Dense stand with sparse understory, unit 12D.

Figure 2 - Dense stand with sparse understory, unit 12C.

Figure 3 - Core from 14 in. tree visible in Figure 2, labeled.



Figures 1-3, K. Walton 2012

These are the general RMP Objectives for each Land Use Allocation which indicate the need for action:

Matrix/GFMA (Section 6 12): Lands within the Matrix land use allocation (LUA) are designated to produce a sustainable supply of timber and to provide: connectivity between Late-Successional Reserves (LSR), habitat, important ecological functions and early successional habitat (RMP p. 20). Declining growth rates result in reduced volume yield and value over the planned timber rotation and simple stand structure contributes little to meeting the ecological objectives for this LUA. Active forest management is needed to reverse these trends in the project area stands so the stands will thrive and contribute to future timber production and habitat improvement goals of the NWFP. All Matrix land in this project vicinity is General Forest Management Area (GFMA).

Late-Successional Reserve (Sections 7, 8 & 13): Lands within the Late-Successional Reserve (LSR) LUA are designated to protect, enhance and maintain conditions of functional, interacting, late-successional and old-growth ecosystems to serve as habitat for late-successional and old-growth related species (RMP p. 15). The overriding goal for managing LSRs is to create, protect and maintain late-successional ecosystems (LSRA p. 33).

One of the key findings of the Crabtree Creek Watershed Analysis (CCWA) was that the amount and quality of late seral forest habitat is limited in the Crabtree Watershed (less than 11%), and the watershed is dominated by younger stands, which lack structure and characteristics of late successional stands (CCWA Chp. 5 pp. 4-7; Chp. 7 p. 1).

The Willamette Late Successional Reserve Assessment (WLSRA, or the LSRA) addressing the Crabtree watershed portion of the Quartzville LSR was completed in August 1998. The LSRA states that "Dense uniform stands have always been a part of the landscape; however, the amount and distribution of these stands now occurring in these LSRs is inconsistent with the range of natural conditions. These stands will be the primary focus for manipulating vegetation to provide the structural conditions associated with late successional habitat." (WLSRA p. 120) The

[6] A section is a surveyed and mapped area roughly one square mile, or 640 acres, numbered from 1 to 36 within a township. Sections in this area are identified as "Township ## South, Range ## East, Section ##" which is shortened, using examples from this EA, to T.11S., R.2E., Sec. 12, or simply 11S-2E-12, or even 11-2-12. For more information on the Public Lands Survey System (PLSS) and how to use it please see: http://www.geocommunicator.gov/GeoComm/lsis_home/home/lsis-plss-description.html

LSRA identifies the Crabtree watershed portion of the Quartzville LSR as a high priority for treatment (WLSRA p. 162).

Riparian Reserve (All sections): Lands within the Riparian Reserve (RR) LUA are designated to restore and maintain the ecological health of watersheds and aquatic ecosystems (RMP p. 5, Aquatic Conservation Strategy), and to provide habitat for terrestrial species (RMP p. 9). The need to manipulate vegetation for terrestrial habitat is the same as described above for the LSR. The RR designation overlays the primary LUA for the section. In the LSR, Riparian Reserve objectives and management action/direction work together with and are added to those of the underlying LUA. In the GFMA, RR objectives and management action/direction are different from and supersede those of the underlying Matrix LUA.

1.3.2 Project 2 – Snag and Coarse Woody Debris Recruitment

The BLM has identified the need to recruit large diameter snags and CWD both immediately and in pulses during the next three to four decades to improve the ability of LSR and RR lands in the Upper Crabtree watershed to provide habitat and connectivity for special status species and other terrestrial wildlife.

1.3.3 Project 3 – Crabtree Complex ACEC Road Closure

The BLM has identified a 0.4 mile long road segment which is no longer needed for management activities and is conflicting with management objectives for wildlife habitat, protection of northern spotted owls, and scenic values in the Crabtree Complex ACEC.

The current road barricade and parking area for walking access to Crabtree Lake is within the core area of a Known Owl Site that has been consistently occupied for over three decades. Eliminating vehicle traffic to reduce disturbance in the core area is needed to ensure the site's continued viability.

The meadow, wetland and beaver pond complex adjacent to the current blockade and parking area is one of the identified "outstanding natural features" identified for the Crabtree ACEC/ONA. Only one log prevents vehicle access to this wet meadow complex. Additional measures are needed to prevent potential damage to this habitat by off highway vehicles (OHV).

1.4 Purposes (Objectives) of the Projects

The specific objectives for different Land Use Allocations are elements of the overall RMP objectives and management strategy, which are part of the Northwest Forest Plan. We describe specific objectives for each LUA and each project analyzed in this EA separately as a way to organize information, but they are interrelated and each of these elements contributes collectively and cumulatively to meeting overall RMP objectives and management strategy. They work together and must be considered together to accurately reflect the place of these projects in the concept of ecosystem management. (RMP p. 7)

1.4.1 Project 1: Density Management Thinning

The BLM proposes Project 1, Density Management Thinning to implement the resource management objectives described in the Salem District Record of Decision and Resource Management Plan, May 1995 (RMP), the Northwest Forest Plan (NWFP). The RMP, NWFP and related documents direct and provide the legal framework for management of BLM lands within the Salem District (*EA Section 1.6*).

The proposed project area is within the Matrix (General Forest Management Area (GFMA)), Riparian Reserve (RR), and Late-Successional Reserve (LSR) Land Use Allocations (LUA).

Overall RMP Objectives (RMP p. 1)

1. Contribute to a healthy forest ecosystem with habitat that will support populations of native species and provide protection for riparian areas and waters.
2. Contribute to providing a sustainable supply of timber and other forest products that will help maintain the stability of local and regional economies and contribute valuable resources to the national economy on a predictable and long-term basis.

The specific objectives that this project is designed to implement are described below:

Objectives Common to All Land Use Allocations (*RMP p. 1. See additional references specific to each LUA, below)*

3. Implement an environmentally sound and economically viable timber sale that contributes to meeting the overall RMP Objectives described above and accomplishes specific objectives described below for each Land Use Allocation.
4. Protect, manage, and conserve federal listed and proposed species and their habitats to achieve their recovery in compliance with the Endangered Species Act and Bureau special status species policies (RMP p. 28).
5. Maintain and develop habitat and forage for wildlife species in addition to special status species (IDT defined objective).
6. Maintain and develop a safe, efficient and environmentally sound road system (RMP p. 62) and reduce environmental effects associated with identified existing roads within the project area (RMP p. 11) by:
   - Providing appropriate access for timber harvest, silvicultural practices, and fire protection needed to meet these objectives;
   - Perform road maintenance to prevent road deterioration or failure and to prevent road generated sedimentation that exceeds ODEQ standards.

Objectives Specific to the Matrix LUA (RMP pp. 20, 46, D-2):

7. Manage developing timber stands[7] on available lands to promote tree survival and growth to:
   - Achieve a balance between wood volume production, quality of wood, and timber value at harvest;
   - Increase the proportion of merchantable volume in the stand;
   - Produce larger, more valuable logs;
   - Harvest small trees as commercial wood products instead of letting them decline in vigor and die as the stand develops[8]; and to

[7] A "forest stand" is a contiguous group of trees which is similar enough, and growing on a site that is uniform enough, to be identifiable. "Forest stand" - or simply "stand" – is used in this document as a generic term that does not indicate management objectives. "Timber stand" – or simply "timber" – is used for forest stands (all in GFMA) where commercial wood production is a major objective. Other terms such as "habitat" are used to provide context for other objectives.

[8] The RMP term for this is "anticipate mortality", p. D-2.

- Maintain good crown ratios and stable, wind-firm trees (RMP p. D-2) by applying silvicultural treatments to manage density with a commercial thinning.

8. Supply a sustainable source of forest commodities (primarily timber) from the Matrix LUA to provide jobs and contribute to community stability (RMP pp. 1, 46-48) by developing timber sales that can be successfully offered to the market place. Select logging systems based on the suitability and economic efficiency of each system to successfully implement the silvicultural prescription, protect soil productivity and water quality, and meet other land use objectives (RMP p. 47).

Objectives Specific to the Riparian Reserve[9] LUA *(RMP pp. 2, 5-6, 7-8, 9-15, D-6; NWFP pp. B-31, C-32):*

9. Maintain and restore water quality standards, aquatic ecosystem functions and stream conditions embodied in ACS objectives 1-7 by designing the project to comply with Oregon Department of Environmental Quality (ODEQ) water quality standards:
- Maintain effective shade for streams pursuant to BLM's agreement with the State of Oregon.
- Develop, maintain and use new and existing roads to comply with ODEQ water quality standards for peak flows and sediment.

10. Maintain and restore the species composition and structural diversity of forest plant communities embodied in ACS objectives 8 and 9 by designing the project to:
- Apply silvicultural treatments in the RR to develop forest stand characteristics that maintain and/or restore the hydrology and sediment regimes of the watershed.
- Apply silvicultural treatments in the RR to provide a diverse vegetation community to provide riparian and wetland functions and habitat to support populations of riparian-dependent plant and animal species.
- Apply silvicultural treatments in the RR to develop long-term structural and spatial diversity, and other elements of late-successional forest habitat.
- Conduct thinning operations in forest stands up to 80 years old, regardless of origin, to develop large conifers and hardwoods for habitat and to recruit future large coarse woody debris, large snag habitat and in-stream large wood.

Additional Notes: The NWFP/ROD (p. B-31) states that "Active silvicultural programs will be necessary to restore large conifers in Riparian Reserves." The NWFP/ROD (p. C-32) and the RMP (p. 11) direct the BLM to apply silvicultural practices for Riparian Reserves to control

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[9] The Riparian Reserve Land Use Allocation is a defined management allocation intended to protect riparian ecosystems; provide for the aquatic, hydrologic and terrestrial functions embodied in the Aquatic Conservation Strategy Objectives; and to provide connectivity between upland habitat blocks. Riparian Reserves include both riparian area and upland area. RMP pp. 2, 5-6, 7-8, 9-15)

"Riparian area", as used in this EA, refers to the aquatic habitat and the terrestrial zone where biotic and hydrologic elements interact with and affect each other directly. It is basically the area where plants grow rooted in the water table of streams, springs, wet meadows, etc. Related terms include aquatic zone/habitat, riparian zone/habitat and riparian buffer zone. These related terms are sometimes used in other documents as synonyms, and sometimes to indicate specific parts or functions of the overall riparian area, especially the terrestrial part of the riparian area. (RMP/FEIS 1994, Chp. 6 p. 12; Helms (Editor), 1998, *The Dictionary of Forestry*.)

Another related term used in this EA is Stream Protection Zone which is designated on the ground to include the riparian area and enough additional upland area to protect habitat in the riparian area and water quality. Related terms used in other documents include: stream buffer, riparian buffer, protection buffer, no-entry buffer or no-harvest buffer.

stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives. These objectives would be accomplished by applying density management treatments within the Riparian Reserve LUA concurrent with treatments in the adjacent Matrix or LSR treatment unit. Treatment would be accomplished with commercial thinning that removes merchantable material only when it is consistent with the purposes for which the Riparian Reserves were established (RMP pp. 9-15, D-6, NWFP p. B-31). The RMP (p. D-6) states that merchantable logs may be removed "where such action would not be detrimental to the purposes for which the Riparian Reserves were established". EA section 3.11.1 describes the project's compliance with the Aquatic Conservation Strategy, including the nine ACS objectives.

Objectives Specific to the Late-Successional Reserve LUA (RMP pp. 16-18; WLSRA pp. 25-26, 29, 32-35, 108, 111-113, 117, 120; and objectives defined by the IDT):

The overriding goal for managing LSR is to create, protect, enhance and maintain late-successional ecosystems for the benefit of late-successional forest associated species. (RMP p. 15; MLSRA pp. 33, 108) The Willamette LSRA (WLSRA) provides additional guidance and the objectives presented are similar to those in the RMP, but more detailed.

Objectives for creating late-successional conditions can be accomplished by treating mid-seral stands (biological criteria) up to 80 years old (administrative criteria), regardless of their origin, to accelerate attaining late-successional characteristics (RMP, p. 16). Dense, uniform stands would be the primary focus for manipulating vegetation to provide the structural conditions associated with late-successional habitat. The WLSRA (p. 161) identifies the Crabtree watershed portion of the Quartzville LSR as a high priority for treatment.

11. Accelerate attaining late-successional characteristics both spatially and temporally across the landscape to improve connectivity and habitat for late-successional species. Accelerate this development of late-successional characteristics along the pathways from the current Stem-Exclusion stage to the Understory Re-initiation stage, with some early elements of the Shifting Gap stage, that are normally associated with much older forests than are present in the project area.

12. Specific late-successional forest characteristics to develop include:

- Introduce (create and recruit) some CWD and Snag habitat (> 20 inches diameter[10]) immediately to compensate for the current lack of these habitat features carried over from the previous stands and begin recruiting additional inputs of larger diameter CWD and Snags for the future.
- Overstory trees with healthy crowns and large limbs that will become large (32-48" diameter) and giant (48" +) trees that are currently absent in these stands.
- Medium size (21-32") shade tolerant trees.
- A cohort of healthy small and pole size trees with crowns developed at different levels of the forest overstory.

[10] 20 inches diameter is the minimum diameter, large end, for CWD to meet RMP standards. In the MLSRA and timber sales, 21 inches is often used because even numbers are used to indicate the mid-point of 2-inch diameter classes and 21 inches is the upper end of the 20-inch diameter class. As used in these documents, "21 inches" in the LSRA and timber sale documents, and "larger than 20 inches" in the EA are functionally the same size.

- Gaps with low tree densities to provide forage and brushy thicket habitat.

13. Maintain variability in treated and untreated areas to provide for any unknown elements, functions and processes that may not fully develop in accelerated late-successional pathways.

1.4.2 Project 2: Snag and Coarse Woody Debris Recruitment

The BLM proposes to create large diameter snags and CWD in numerous early and mid-seral forest stands in RR and LSR within the Upper Crabtree Creek 6th field watershed (also identified as the North Fork Crabtree sub-basin in some documents) to meet a portion of the LSR objectives described above.

1.4.3 Project 3: Crabtree Complex ACEC Road Closure

The BLM proposes the Crabtree Complex ACEC Road Closure project to implement the resource management objectives described in the Salem District Record of Decision and Resource Management Plan, May 1995 (RMP), the Northwest Forest Plan (NWFP), the Mid-Willamette Late-Successional Reserve Assessment (MLSRA, 1998), the Crabtree Creek Watershed Assessment (CCWA, July 2001, abbreviated in some documents which are incorporated by reference as "CTWA") management guidelines for the ACECs.

The proposed project area is within the Riparian Reserve (RR) and Late-Successional Reserve (LSR) Land Use Allocations (LUA) and is within the Crabtree Complex ACEC. The specific objectives that this project is designed to implement are described below:

1. Protect nesting northern spotted owls and their critical habitat from human disturbance and damage.
2. Protect wet meadow and other habitats from damage and disturbance by OHV and other human use.
3. Prevent erosion from the closed road.
4. Provide for non-motorized recreation and prevent OHV use in the three contiguous ACECs, including Crabtree Lake itself.

1.5 Decisions to be Made

The following decisions will be made through this analysis:

1.5.1 Project 1: Density Management Thinning

To determine at what level, where, and how to harvest trees on BLM-administered lands to meet objectives within the project area (EA section 1.2.2).

To determine at what level, where and how to meet ACS objectives within Riparian Reserves in the project area.

To determine at what level, where and how to meet additional wildlife objectives such as near-term and long-term snag and down wood habitats within the Late-Successional Reserve in the project vicinity.

1.5.2 Project 2: Snag and CWD Recruitment

To determine at what level, where, how, and when to actively recruit snags and CWD on BLM-administered lands to meet LSR and Riparian Reserve objectives.

1.5.3 Project 3: Crabtree Complex ACEC Road Closure

To implement or not implement proposed road closure and connected actions.

1.6 Decision Factors

For each of the three projects analyzed, the Cascades Resource Area Field Manager will consider the extent to which each alternative meets the objectives described in EA Sec. 1.4, both individually and collectively.

1.7 Conformance with Land Use Plan, Statutes, Regulations, and other Plans

The BLM has designed these projects to comply the Salem District Record of Decision and Resource Management Plan, May 1995 (RMP) and related documents, which direct and provide the legal framework for management of BLM lands within the Salem District.

In summary, the three projects conform to the:

> *Salem District Record of Decision and Resource Management Plan*, May 1995 (RMP): The RMP has been reviewed and it has been determined that the proposed thinning activities conform to the land use plan terms and conditions. Implementing the RMP is the reason for doing these activities (RMP p.1-3).
>
> *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl*, April 1994 (the Northwest Forest Plan, or NWFP).
>
> *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines*, January 2001 (2001 ROD), as modified by the 2011 Survey and Manage Settlement Agreement (July 2011).

The IDT incorporated information from the Crabtree Watershed Analysis, 2001 (CTWA) and the Willamette LSR Assessment, 1998 (WLSRA) into the development of the proposed thinning activities, snag and CWD recruitment, and road closure actions, and into the description of the affected environment and environmental effects (*EA Chapter 3*) and are hereby incorporated by reference.

The above documents are available for review in the Salem District Office. Additional information about the proposed activities is available in the Crab Race EA Analysis File, also available for review at the Salem District Office.

Land Use Plan Update

The court issued a final judgment on May 16, 2012 concerning the Pacific Rivers Council V. Shepard litigation.

The court vacated the Western Oregon Plan Revision (WOPR) Record of Decision, returning the management of the federal lands to the Northwest Forest plan, i.e. 1995 Resource Management Plans that were in place prior to December 30, 2008, as modified (i.e. Salem District RMP). The Northwest Forest Plan was incorporated into the 1995 Salem District RMP.

Survey and Manage Species Review

The three projects analyzed in this EA are designed to be consistent with court orders relating to the Survey and Manage mitigation measure of the Northwest Forest Plan, as incorporated into the Salem District Resource Management Plan.

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.) (Coughenour, J.), granting Plaintiffs' motion for partial summary judgment and finding a variety of NEPA violations in the *Final Supplemental to the 2004 Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines* (USDA and USDI, July 2007).

In response, parties entered into settlement negotiations in April 2010, and the Court filed approval of the resulting Settlement Agreement on July 6, 2011. Projects that are within the range of the northern spotted owl are subject to the survey and management standards and guidelines in the 2001 ROD, as modified by the 2011 Settlement Agreement (IM-OR-2011-063, July 2011).

Previously in 2006, the District Court (Judge Pechman) had invalidated the agencies' 2004 RODs eliminating Survey and Manage due to NEPA violations. On October 10, 2006, following the District Court's 2006 ruling, parties to the litigation entered into a stipulation exempting certain activities from the Survey and Manage standard (Pechman exemptions), including thinning projects in stands less than 80 years old (Exemption A). As part of the 2011 Settlement Agreement, the 2006 Pechman Exemptions remain in force.

The density management thinning project proposal is designed to comply with Pechman Exemption A. The other two projects are not timber sales and the BLM has examined the Settlement Agreement and other court orders discussed above and has not identified any conflicts with them.

1.7.1 Relevant Statutes/Authorities

This section is a summary of the relevant statutes/authorities that apply to these projects. The BLM designed all three projects to conform to these statutes and authorities.

- **Oregon and California Act (O&C) 1937** – Requires the BLM to manage O&C lands for permanent forest production, in accord with sustained-yield principles. Management of O&C lands must also protect watersheds, regulate streamflow, provide for recreational facilities, and contribute to the economic stability of local communities and industries.
- **Federal Land Policy and Management Act (FLPMA) 1976** – Defines BLM's organization and provides the basic policy guidance for BLM's management of public lands.
- **National Environmental Policy Act (NEPA) 1969** – Requires the preparation of EAs or EISs on federal actions. These documents describe the environmental effects of these actions and determine whether the actions have a significant effect on the human environment.
- **Endangered Species Act (ESA) 1973** – Directs Federal agencies to ensure their actions do not jeopardize threatened and endangered species.
- **Clean Air Act (CAA) 1990** – Provides the principal framework for national, state, and local efforts to protect air quality.

- **Archaeological Resources Protection Act (ARPA) 1979** – Protects archeological resources and sites on federally-administered lands. Imposes criminal and civil penalties for removing archaeological items from federal lands without a permit.
- **Clean Water Act (CWA) 1987** – Establishes objectives to restore and maintain the chemical, physical, and biological integrity of the nation's water.
- **Healthy Forests Initiative (HFI) 2002** - Focuses on reducing the risk of catastrophic fire by thinning dense undergrowth and brush in priority locations that are identified on a collaborative basis with selected Federal, state, tribal, and local officials and communities. The initiative also provides for more timely responses to disease and insect infestations.
- **Migratory Bird Treaty Act of 1918 -** Protects migratory birds (16 U.S.C. 703).

Additional authorities and management direction are described in EA section 3.11 Table 18. Additional details pertaining to statutes, authorities and management direction are presented in the discussions of specific resources throughout the remainder of this EA.

1.8 Scoping and Identification of Relevant Issues

1.8.1 Scoping

The Interdisciplinary Team (IDT) of BLM resource specialists conducted internal scoping through the project planning process, which includes record searches, on-site field examinations of the project area by IDT members, professional observation and judgment, literature review and IDT discussion. In the project planning process the IDT considered elements of the environment that are particular to this project as well as elements of the environment that are common to all similar timber management projects.

The BLM conducted external scoping for this project by means of a scoping letter sent out to approximately 59 federal, state and municipal government agencies, nearby landowners, tribal authorities, and interested parties on the Cascades Resource Area mailing list on July 22, 2010. The BLM received approximately seven comment letters/emails during the scoping period.

The scoping comment letters and emails are available for review at the Salem District BLM Office, 1717 Fabry Rd. SE, Salem, Oregon. EA Chapter 8 addresses the topics raised in the comments.

1.8.2 Relevant Issues

The IDT identified relevant issues based on applicable law, management direction contained in the RMP, and information gathered during the scoping and project planning process. Issues are considered to be relevant if they determine the appropriate range of alternatives to analyze, determine whether the proposed action should be modified, and determine the significance of the project's effects on elements of the environment. Analysis of these issues provides a basis for comparing the environmental effects of action alternative(s) and the No Action alternative, and aids in the decision-making process.

The IDT considered the following issues as it developed and refined the project alternatives, identified project design features (PDF), analyzed the environmental effects, and reviewed scoping comments. EA Chapter 8 shows scoping comments received and the responses to each comment received, including these issues:

Issue 1: The Effects of Management Actions on Vegetation and Forest Stand

Characteristics

Apply to Projects 1 and 2:

How proposed management actions would change vegetation and forest stand characteristics, both short term and long term and how these changes would affect attainment of objectives for each LUA.

How proposed management actions would influence late-successional characteristics, structural complexity, including overstory, understory, dead wood and spatial complexity.

How proposed management actions would affect identified populations of flora (plants, bryophytes, fungi) species with special status (T/E, Survey and Manage, sensitive, etc.).

How proposed management actions would affect invasive/non-native species populations.

The elements of this issue are addressed in the following sections of this EA: 1.1, 1.4, 2.2.1, 2.2.2, 2.3.1, 2.3.2, 3.3, 3.7

Issue 2: The Effects of Management Actions on Hydrology,

Apply to Projects 1 and 3:

How proposed management actions would affect water quality including sediment from roads, sediment from forest management activities, sediment from landslides, sediment caused by unauthorized OHV use, and water temperature.

How proposed management actions would affect stream channels.

Applies to Project 1 only:

How proposed management actions would affect water quantity (peak flows).

The elements of this issue are addressed in the following sections of this EA: 1.1, 1.4, 2.3, 3.4, 3.5, 3.11

Issue 3: The Effects of Management Actions on Fisheries, and Aquatic and Riparian Habitats

Apply to Projects 1 and 3:

How proposed management actions would affect ESA listed fish, resident fish, and aquatic habitat.

How proposed management actions would comply with ACS Objectives in the Riparian Reserve.

How proposed management actions would affect stability of steep slopes above streams.

How proposed management actions would affect large wood recruitment.

The elements of this issue are addressed in the following sections of this EA: 1.1, 1.4, 2.3, 3.4, 3.5, 3.11, 5.1

Issue 4: The Effects of Management Actions on Soils and Site Productivity

Apply to Project 1 only:

How proposed logging operations would affect soil compaction, disturbance and erosion and their effects on site productivity.

How proposed road construction would affect site productivity.

The elements of this issue are addressed in the following sections of this EA: 1.1. 1.4, 3.6

Issue 5: The Effects of Management Actions on Wildlife Populations and Habitats

Applies to Projects 1, 2 and 3:

How proposed management actions would affect protection of terrestrial animals with special status (T/E, Survey and Manage, sensitive, etc.) and their habitats.

How proposed management actions would affect protecting and providing habitat and forage for terrestrial animals, including big game, that do not have special status.

Apply to Projects 1 and 2:

How proposed management actions would affect snag, coarse woody debris, remnant old-growth tree and large tree habitats.

How proposed management actions would affect development of structural complexity and late-successional forest characteristics at stand and landscape levels.

How proposed management actions would affect wet meadow edge habitat.

The elements of this issue are addressed in the following sections of this EA: 1.1, 1.4, 3.3, 3.7, 5.1

Issue 6: The Effects of Management Actions on Fire Hazard, Fire Suppression Capabilities, and Air Quality

Apply to Project 1 only:

How proposed management actions would affect potential wildfire ignition, intensity and resistance to control.

How proposed management actions would affect access for fire suppression resources.

How proposed fuel reduction (pile burning) would affect air quality.

Apply to Project 3 only:

How proposed road closure would affect potential wildfire ignition and access for fire suppression resources.

The elements of this issue are addressed in the following sections of this EA: 1.1, 1.4, 3.8

Issue 7: The Effects of Management Actions on Public Safety, Recreation and OHV Use

Applies to Project 1 only:

How proposed management actions would affect Public Safety, Recreation and OHV use.

Apply to Project 3 only:

How proposed road closure would affect recreation.

How road closure and related actions (e.g. parking area, barricades) would affect unauthorized OHV use.

The elements of this issue are addressed in the following sections of this EA: 1.1, 1.4, 3.6, 3.9

1.8.3 Issues Considered, Not Analyzed in Detail

Economic Viability of Management Actions: The BLM did not analyze the economic viability of the sale because the project was designed to be economically viable in order to meet the need for and purpose of the project, specifically Project 1 objectives 2, 3, 6, 7, and 8 (EA section 1.4.1). The BLM is confident that the sale would be economically viable because similar sales have sold for higher than appraised value to purchasers who would be expected to bid on this sale. Specific concerns about harvest operations are addressed in EA Chapter 8 (Table 20 - Response to Scoping Comments).

Cultural and Historical Resources: No cultural or historical resources requiring protection were identified during Cultural Resources Surveys.

Carbon Storage / Emissions: The BLM did not analyze quantitative carbon storage or emissions for this project because it would not provide any additional information needed for a reasoned choice among alternatives for this project. The BLM has sufficient information from analysis of four previous commercial thinning projects11 in the Cascades Resource Area for the Decision Maker to make an informed decision between alternatives because the Crab Race Thinning project falls within the range covered by the projects analyzed and is expected to have similar results.

The following is a summary of information from those four analyses12:

- Range analyzed for treated acres in the projects: 290 to 1,724 acres.
- Range analyzed for carbon in harvested wood: 7,000 to 107,000 tonnes.
- Range analyzed for total carbon emissions in the 30 year period following harvest: 1,850 - 17,080 tonnes.
- Range of carbon storage in untreated project area at 30 years: 45,420 – 450,270 tonnes.
- Range of carbon storage in treated project area plus carbon in landfills and wood products at 30 years: 42,150 – 342,200 tonnes.

The analysis of each of these projects shows that:

- The calculated total carbon storage for the No Action alternative of each project is higher than the calculated total carbon storage for all action alternatives throughout the 30 year analysis period.
- The carbon emissions attributable to the projects, both individually and cumulatively, and the difference in calculated total carbon storage are of such small magnitude that they are unlikely to be detectable at any scale (global, continental or regional) and thus would not affect the results of any models now being used to predict climate change.

[11] Airstrip, Gordon Creek, Highland Fling, and Power Mill thinning projects.

[12] For each project, carbon analysis was based on more area than was actually treated and more wood volume than was actually sold for harvest. Harvested wood volume is reported here as tonnes (1,000 kilograms, approximately 2,200 pounds) or gigatonnes (Gt, equal to one billion tonnes) of carbon. Carbon emitted is the sum of carbon in harvested wood that would be released in the 30 year analysis period, plus the carbon in diesel fuel used for harvest operations and carbon released by burning piles of logging slash and debris.

Chapter 2: Alternatives

2.1 Alternative Development

Pursuant to Section 102 (2) (E) of the National Environmental Policy Act (NEPA) of 1969, as amended, Federal agencies shall "…study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources."

There were no unresolved conflicts concerning alternative uses of available resources for either project, therefore, this EA will analyze the effects of the current "proposed action" and "No Action alternative" (which provides the baseline to evaluate effects) for each project.

2.2 Planning and Implementation Process

2.2.1 Planning Process

The BLM planned these three projects using an Interdisciplinary Team (IDT) process. An IDT composed of experienced[13] professional resource specialists develops and analyzes proposed actions, alternatives, connected actions, project design features and mitigation measures. The IDT solicits, considers and addresses comments from the public and other interested parties and agencies during this process. The BLM formally requested these comments early in the planning process through "scoping", and invites public review and comment on the projects and information presented in this EA.

The IDT and the Decision Maker evaluate and incorporate information from this process into the final project design (or selection of the No Action alternative) which will be described in the Final Decision Record and Rationale (DR), to be published later. The proposed actions, including the project design features (PDF), form the best management practices (BMP) developed on a site-specific basis for the projects analyzed in this EA (RMP Appendix C, RMP/FEIS Appendix G).

2.2.2 Implementation Process

2.2.2.1 Project 1 – Density Management Thinning

The BLM proposes to implement Project 1, the Crab Race Density Management Thinning Project, as a timber sale. The BLM would determine the locations and boundaries of the thinning units and designate which trees would be retained and which trees would be cut and removed or cut/treated and left in place. The BLM would develop the timber sale contract to implement the actions selected from the proposed, alternative and connected actions and the PDF analyzed in this EA. The contract requires the operator to accomplish the preventive and restorative practices analyzed in this EA. The BLM enforces compliance through normal contract administration procedures where performance is monitored by authorized BLM personnel. The Contracting Officer enforces compliance with the contract and would suspend operations if the operator fails to perform the required preventive and restorative practices. The BLM timber sale contract requires bonding in an amount sufficient for the BLM to complete restoration work if the operator fails to perform the contract requirements.

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[13] The Crab Race IDT has approximately 325 years of combined professional/technical education and experience in the members' fields of expertise.

2.2.2.2 Project 2 – Snag and Coarse Woody Debris Recruitment

The BLM proposes to implement Project 2 in multiple phases:

Within the project area for Project 1, much of the first phase of snag/CWD creation would be accomplished as part of the timber sale proposed as Project 1. Under the timber sale contract, selected trees that were designated for retention but need to be cut or treated (e.g. notched, girdled by attaching equipment, top girdled) to facilitate logging operations would be designated for cutting without removal. The BLM would require a contractor (either as part of the timber sale contract or a separate contract) to create additional snags and/or CWD as directed by the BLM after logging operations are completed.

First phase, or pulse, snag/CWD creation in other LSR and RR stands in the watershed would be done under a separate contract developed and administered by the BLM during the next decade. If needed, additional snag/CWD creation in the project area for Project 1 would be done under this contract.

Future phases/pulses would be done at approximately decadal intervals under contracts developed and administered by the BLM following completion of Project 1 during the three to four decades. The contracts would be developed based on current surveys, land use plans and research at those times.

2.2.2.3 Project 3 - Crabtree Complex ACEC Road Closure

The BLM proposes to implement Project 3, the Crabtree Complex ACEC Road Closure Project, as a service contract, or as an in-house project of the BLM Road Maintenance crew. This project would be separate from the proposed timber sale and would be implemented under a separate DR. If accomplished as a service contract, the BLM would develop contract requirements to implement the preventive and restorative practices analyzed in this EA. The BLM enforces compliance through normal contract administration procedures where performance is monitored by authorized BLM personnel. The Contracting Officer enforces compliance with the contract and would suspend operations if the operator fails to perform the required preventive and restorative practices. The BLM contract requires bonding in an amount sufficient for the BLM to complete restoration work if the operator fails to perform the contract requirements. If accomplished by BLM personnel, the work would be done to the same standards under the direct supervision of authorized BLM personnel.

2.3 Alternatives Developed

2.3.1 Project 1, Density Management Thinning

2.3.1.1 Proposed Action

Project Overview

To meet the objectives described in EA section 1.4, the BLM proposes to commercially thin approximately 460 acres of overstocked 39-54 year old forest stands in three Land Use Allocations (LUA): General Forest Management Area (GFMA) portion of the Matrix, Riparian Reserve (RR) and Late Successional Reserve (LSR).

Proposed Treatments in the Matrix LUA

The BLM proposes to commercially thin 178 acres of overstocked 42-54 year old forest stands within the General Forest Management (GFMA) portion of the Matrix Land Use Allocation

(LUA). For Matrix objectives, refer to EA section 1.4.1. The following is a summary silvicultural prescription (how the stand would be thinned). Specifically, the prescription proposes to:

- Thin approximately 39 percent of the Matrix acres in the project vicinity (See footnote 4, section 1.1.1) as shown in Table 9 (EA section 3.3);
- Retain crop trees that are larger than the average diameter for the stand, emphasizing the largest, healthiest and best formed dominant and co-dominant trees that would be expected to produce the highest long term timber value;
- Retain a component of understory and intermediate trees, especially western redcedar and other shade tolerant species, to provide structural complexity in the developing stand;
- Cut and remove excess suppressed and intermediate trees, and co-dominant trees that are directly competing with the trees selected for retention ("thin from below") to make light, water and nutrients available for healthy growth of those trees to be retained;
- Maintain spacing to provide adequate growing room for retained trees based on target relative density of approximately 30-40. Due to variation between forest stands, this would result in retaining from approximately 50 to 140 trees per acre (see Table 9);
- Maintain an average canopy cover of retained dominant and co-dominant trees of at least 40 percent (typically ranging from 55 to 70) percent following thinning;
- Maintain a mix of the species that are currently present in the stand and increase the proportion of western redcedar;
- Create up to 10 one-acre "low density" thinning areas, retaining approximately 12 trees per acre.

In the Riparian Reserve overlay of Matrix LUA

The BLM proposes to commercially thin approximately 62 acres of overstocked 39-54 year old forest stands as one part of a management prescription to increase forest stand structural diversity within the Riparian Reserve LUA. Specifically, the prescription proposes to:

- Commercially thin up to 14 percent of the Riparian Reserve acres in project vicinity as shown in Table 9 (EA section 3.3) and retain a minimum 50 percent canopy cover;[14]
- Reserve (do not treat) approximately 86 percent of the Riparian Reserve in the project vicinity, allowing these stands to develop naturally and provide a different element of complex stand structure at the landscape level. These untreated areas in the Riparian Reserve include:
    - Stream protection zones (SPZ) – strips of untreated forest adjacent to streams.
    - Potentially unstable slopes;

[14] There are several terms to describe how much of the area above the ground is occupied by tree crowns. Some of the terms used in this EA and documents which are incorporated by reference include: Wildlife reports tend to use the term "canopy cover" where vertical projections from the ground may give results of more than 100 percent canopy cover due to multiple canopy layers. Hydrology reports tend to use "crown closure" to indicate the percentage of vertical projections that hit foliage rather than are open to the sky. Fire and fuels reports refer to crown density or crown bulk density as an indicator of how much potential fuel is in the canopy and silviculture reports focus on several measures of how fully trees are occupying the site.

- Areas where stand structure already provides, or is developing, desired levels of structural complexity without silvicultural treatment;
- Stands that are either older than 80 years or have trees too small to be commercially thinned; and
- Areas where logging is not feasible;

- Retain a component of understory and intermediate trees, especially western redcedar and other shade tolerant species, to provide structural complexity in the developing stand;
- Some of the low-density thinning areas may partially overlap the RR. See LSR section for the description of low-density thinning areas;
- Create snags and CWD as feasible during and/or immediately after timber harvest operations.

In the Late-Successional Reserve (LSR) LUA, Including Riparian Reserve Overlay

The BLM proposes to commercially thin 220 acres of overstocked 39-52 year old forest stands as one part of a management prescription to increase forest stand structural diversity within the Late-Successional Reserve LUA. Specifically, the prescription proposes to:

- Commercially thin up to 15 percent of the LSR acres in the project vicinity as shown in Table 9 (EA section 3.3) and retain a minimum average of 50 percent canopy cover within treatment units;
- Reserve (do not treat) approximately 85 percent of the LSR, including RR, in the project vicinity, allowing these stands to develop naturally and provide different elements of complex stand structure at the landscape level. These areas include:
  - Stream protection zones (SPZ) – strips of untreated forest adjacent to streams.
  - Potentially unstable slopes;
  - Areas where stand structure already provides, or is developing, desired levels of structural complexity without silvicultural treatment;
  - Stands that are either older than 80 years or have trees too small to be commercially thinned; and
  - Areas where logging is not feasible;
- BLM wildlife biologists would modify the basic thinning prescriptions used in LSR by selecting additional western redcedar, hardwood, large, decadent and/or deformed trees to retain as habitat features and as source material for future CWD and snags;
- Retain a component of understory and intermediate trees, especially western redcedar and other shade tolerant species, to provide structural complexity in the developing stand;
- Create snags and CWD as feasible during and/or immediately after timber harvest operations;
- Create up to 10 one-acre "low density" thinning areas, retaining approximately 12 trees per acre. Some of these are in, or partially in, Riparian Reserve.

Wet Meadow Edges which are Adjacent to Thinning Units

Adjacent to the unit boundaries of 12 C and 12 D the BLM proposes to individually designate trees for cut-and-remove, cut-and-leave, or girdling to improve habitat conditions at the edges and retard conifer encroachment into the meadows. These two areas are between the boundaries of thinning units and the open areas of wet meadows. Cut-and-leave and girdling may be done under either project 1 or 2.

Logging Systems

Table 1 Thinning Acres by Logging Systems and Land Use Allocations

T.S. R. E. Unit	Acres	- Unit	- Acres									
				GFMA	LSR	Rip Res	GFMA	LSR	Rip Res	GFMA	LSR	Rip Res
11-2-12A	30	1	25	14	-	11	-	-	-	-	-	-
		2	5	3		-	2	-	-	-	-	-
-11-2-12B	45	1	25	11	-	2	-	-	-	6	-	6
		2	15	4	-	2	-	-	-	5	-	4
		3	5	-	-	-	3	-	2	-	-	-
11-2-12C	35	1	25	22	-	3	-	-	-	-	-	-
		2	10	6	-	4	-	-	-	-	-	-
11-2-12D	35	1	15	9	-	2	-	-	-	-	-	4
		2	20	10	1	2	1	1	2	1	1	1
11-2-12E	95			10	2	1	56	5	14	7	-	-
11-2-13A	25	1	5	-	-	-	-	1	1	-	2	1
		2	20	-	12	3	-	3	1	-	-	1
11-3-07A	45	1	10	8	-	2	-	-	-	-	-	-
		2	35	-	17	7	-	4	5	-	-	2
11-3-07B	60			-	37	6	-	6	3	-	6	2
11-3-07C	15	1	10	-	3	4	-	1	2	-	-	-
		2	3	-	1	2	-	-	-	-	-	-
		3	2	-	-	2	-	-	-	-	-	-
11-3-07D	10			-	5	5	-	-	-	-	-	-
11-3-08A	10	1	5	-	-	-	-	3	2	-	-	-
		2	5	-	-	-	-	-	-	-	3	2
11-3-08B	10	1	5	-	-	-	-	3	2	-	-	-
		2	5	-	-	-	-	2	3	-	-	-
11-3-08C	20			-	5	2	-	-	-	-	3	10
11-3-08D	25	1	5	-	-	-	-	3	2	-	-	-
		2	5	-	2	3	-	-	-	-	-	-
		3	10	-	1	9	-	-	-	-	-	-
		4	5	-	2	3	-	-	-	-	-	-
Total Acres	460			97	88	75	62	32	39	19	15	33
Total by Yarding Method				260			133			67		

Table 2 Project 1 Acres, Untreated Acres and Yarding Systems Acres

LUA	Project Vicinity *	Percent of Project Vicinity	Untreated Area	Project Area*	LUA Percent of Project Area	Yarding Systems - Acres		
						Ground-Based	Skyline	Special
GFMA	235	9	57	178	39	97	62	19
RR/GFMA	402	16	340	62	14	29	18	15
LSR	893	34	758	135	29	88	32	15
RR/LSR	1069	41	984	85	18	46	21	18
Total	2599	100	2139	460	100	260	133	67
Percent			**Percent of Project Vicinity Acres**			**Percent of Project Area Acres**		
			82	18		56	29	15

*Project Vicinity is BLM managed lands in the sections that contain the Project Area. The Project Area is the area proposed for treatment.

2.3.1.2 Connected Actions

Road Work (EA Section 2.3.4; EA Section 7.2-Maps):

The BLM would require the following road work to maintain the transportation system and facilitate logging operations and log hauling.

Table 3 Road Work

Road Work	Road Miles	Acres of vegetation cleared for road right-of-way	Number of Culverts
Road Construction	0.4	1.6	0
Road Improvement	0	0	0
Road Renovation	1.1	0	0
Maintenance – Timber Haul	7.9	0	85 (Crossings)
Maintenance – Rock Haul	4.0		0
New Culvert Installations	0	0	0
Culvert Replacements	0	0	2

"New Construction" is building a road where none existed before. In this project, for analysis purposes, "new construction" also includes reconstruction of deteriorated roads with trees growing in the road bed.

"Road Improvement" upgrades an existing road to a higher design standard than the design of the existing road. "Road Renovation" restores an existing road to its original design standards.

"Maintenance" is the normal, periodic work done to maintain existing, open roads in a useable, safe and environmentally sound condition.

Hauling and Haul Routes

The BLM has identified two major haul routes serving different portions of the project area. See Table 13, EA section 3.5.1 for details of road numbers and distances to listed fish habitat.

The North Haul Route serves units in sections 7, 8, 9, 12 and potentially part of 13. It is designed and maintained to sufficiently high standards to be used year-round, depending on conditions and measures taken to prevent sediment entering streams.

The South Haul Route serves some of the units in section 13. It is not currently designed or maintained to sufficient standards for year-round use so it would be used only during the dry season and dry conditions when sediment would not be generated or transported to streams. There are no known plans to improve this road. If the road were to be improved, the BLM may evaluate it for potential year-round use.

New construction roads in the Matrix LUA and existing natural surface roads may be rocked if needed for efficient logging operations or resource protection.

Rock Source

Approximately 3,000 cubic yards of pit run rock (PRR) would be removed from the Harry Mountain Rock Pit in SW¼ Sec. 4, T. 11 S., R. 3 E. for use in maintaining and renovating roads as shown in Table 3 above, including logging landings on and adjacent to rocked roads.

Landings

The BLM would require the timber sale operator to construct ground based and skyline landings according to the approved logging plan (Project Design Feature, Table 4). The BLM anticipates up to 120 landings based on a potential logging plan developed by BLM foresters. Landings would be located primarily on roads and existing features such as notches or "jump up" platforms for equipment which were cut into the cutbanks of roads during the previous logging. Any additional notches or platforms required would be constructed within existing road rights-of-way. Machinery would be limited to operating on road rights-of-way, approved skid trails, and approved notches and platforms. Vegetation would be cleared in and immediately adjacent to the landings to permit swinging and stacking logs for loading, and for piling logging slash and debris.

Fuels Treatments

Post treatment fuels hazard surveys would be conducted and site-specific fuels treatments would be recommended. Fuel treatment strategies would be implemented in selected areas to reduce the potential for human caused wildfire ignition, to reduce the potential for wildfire to cross property lines between BLM and private land, and to reduce both the intensity and severity of potential wildfires in the long term (after fuels reduction has occurred). Fuel treatments in the low density thinning areas would take place as site preparation for grass and forb establishment, and to remove barriers to big game use of these areas (EA section 2.3.1).

Preventing Unauthorized Off-Highway Motor Vehicle (OHV) Use (RMP p. 41)

Block skid trails and make them impassible for OHV as part of the timber sale contract, as described under Design Features (*EA section 2.3.4*). Block closed roads and make them impassible for OHV to effectively eliminate OHV use while making it feasible for fire suppression personnel to open those roads with bulldozers commonly used for wildland fire initial attack response. Road and skid trail closure methods would be designed for each site to avoid causing erosion and avoid damaging retained trees. See Project Design Features (*Table 4, EA section 2.3.1.3*).

Special Forest Products (SFP) (RMP p. 49)

The BLM would sell permits for collecting Special Forest Products from the harvest units if there is a demand for the products, and collection would not interfere with proposed project operations or have effects beyond those analyzed in this EA. Special Forest Products are useable vegetation that can be

harvested/collected from the forest and may include: edible mushrooms, firewood, posts and poles, and native plants for transplant.

2.3.1.3 Project Design Features

This section summarizes the project design features that would further reduce the project's effects on the affected resources described in EA Chapter 3. Project design features described in this section would be implemented in Project 1, the Crab Race Density Management Thinning.

The interdisciplinary team (IDT) of resource specialists developed this set of site-specific Project Design Features (PDF) to serve as the Best Management Practices for this project. The IDT selected or created these design features to implement management actions/direction and the principles of the design features and best management practices (BMP) described in the RMP/FEIS (pp. 2-35 – 2-37, 4-11 – 4-14, G-1 – G-2, S-1 – S2) and RMP (pp. 23-24, C-1 – C-2). The IDT selected this set of PDF based on its combined experience, training, professional judgment, field analysis of this project area and familiarity with ongoing published research.

The BLM would incorporate these design features into the project layout, contract requirements, and contract administration to ensure that the project is implemented as analyzed in this EA and that the risk of effects to the resources are no greater than those described in EA Chapter 3. The BLM would require the operator to implement each of the following project design features, unless otherwise stated.

Performance would be monitored by authorized BLM personnel according to BLM regulations and contract administration procedures where Authorized Officers inspect for contract compliance at least once weekly during contract operations. The Contracting Officer enforces compliance with the contract and would suspend operations if the operator fails to perform the required preventive and restorative practices analyzed in this EA. The BLM timber sale contract requires bonding in an amount sufficient for the BLM to complete mitigation and restoration work if the operator fails to perform the preventive and restorative requirements of the contract.

The following project design features would:

- Protect special status species (Vegetation); soil productivity (Soil); water quality and quantity (Water); fisheries, listed fish and aquatic habitat (Fish); stand structure, habitat and species (Wildlife); air quality (Fire/Air); public safety, rural interface and recreation (Public); cultural resources (Cultural).
- Prevent or reduce: spread of invasive/non-native plant species populations (Invasives), fire hazards and risks (Fire/ Air)
- Achieve: Desired forest stand composition (Vegetation); Economic Efficiency (Economic), fuel reduction (Fire/Air)

Table 4 Project Design Features

Project Design Features (RMP/FEIS references for key points)	Applicable Resources / Objectives									
	Vegetation	Soil	Water	Fish	Wildlife	Invasives	Fire /Air	Public	Cultural	Economic
In All Logging Operations: RMP/FEIS (pp. 2-34 -- 2-37; 4-11 -- 4-13; G-1,2)										
1. Limit the area compacted by logging operations (skidding, yarding and landings) to less than ten (10%) percent of the harvest area in each unit, outside of road rights-of-way.	♦	♦	♦	♦	♦	♦		♦		♦
2. Locate skid trails and skyline corridors to avoid concentrating runoff water flows that could cause rill or gully erosion with potential to displace soil more than a few feet.	♦	♦	♦	♦						
3. Lift the leading end of all logs off of the ground during yarding (one-end suspension) to prevent the blunt ends of logs from displacing soil in order to prevent creating a channel for erosion. Applies to both skidding and skyline yarding inhaul, but may not be feasible for winching and lateral yarding.	♦	♦	♦	♦						
4. Limit landing size to the minimum area needed for safe and efficient operations. Size varies with terrain, equipment size and log size and usually averages less than 60 feet by 80 feet (approximately 0.1 acre) located on and adjacent to roads.	♦	♦	♦		♦	♦	♦			♦
5. Limit number of landings to the minimum number needed for safe and efficient operations. Number of landings needed varies with terrain, equipment, log size and road access.	♦	♦	♦		♦	♦	♦			♦
6. Retain organic material including duff, litter and logging slash on the forest floor in average amounts not less than are present in the stand prior to management operations to provide soil stability and nutrient cycling.	♦	♦	♦	♦	♦	♦	♦			
7. Implement erosion control measures where BLM management operations have exposed or disturbed soil to prevent rill or gully erosion that would displace soil more than a short distance (several feet). Typical measures include: shaping to modify drainage (water bars, sloping, etc.); tilling; placing logging slash and debris on exposed soil; and seeding with native species.	♦	♦	♦	♦	♦	♦				
8. Prevent unauthorized off-highway motor vehicle (OHV) use through security measures during operations and physically blocking access and/or making potential routes impassible after operations. Road and skid trail closure methods would be designed to avoid causing erosion, to avoid damaging retained trees and to allow closed roads to be opened if needed for firefighting.	♦	♦	♦	♦	♦	♦	♦	♦		
9. Locate unit boundaries to provide Stream Protection Zones (SPZ) of Reserve Area along both sides of all identified streams (SPZ widths are slope distance): • Within 1000 feet of listed fish habitat, SPZs are minimum 100 feet wide on perennial streams and 50 feet wide on intermittent streams. • For all other streams, SPZs are minimum 60-85 feet wide (dependent on tree height and hill slope, Salem District revised guidance 10/08/2010) and 30 feet on intermittent streams.	♦		♦	♦	♦					

Project Design Features (RMP/FEIS references for key points)	Applicable Resources / Objectives									
	Vegetatio	Soil	Water	Fish	Wildlife	Invasives	Fire /Air	Public	Cultural	Economic
10. Directionally fall trees[15] in the harvest units so that they generally do not enter the Stream Protection Zone (SPZ) or adjacent untreated stands.	♦		♦	♦	♦					
11. If any trees or snags in the SPZ must be felled for safe logging operations, the BLM would require the operator to leave them on-site as near to the stump as feasible in order to create CWD habitat.	♦		♦	♦	♦					♦
12. When additional trees are identified for cutting to facilitate safe logging operations, the BLM would designate which trees are to be removed and sold and which trees are to be retained in place as woody debris (including CWD) according to the LUA objectives for each unit. In the LSR and RR, such trees larger than 21 inches dbh would be retained in place as CWD. In Matrix such trees larger than 35 inches dbh would be retained in place as CWD. In all areas western red cedar smaller than 9 inches dbh and all other species of trees smaller than 7 inches dbh would be retained in place as woody debris. BLM employees may approximate the Matrix/RR or Matrix/LSR boundary by experience-based estimate rather than precise measurement.	♦				♦					♦
In Ground-based Logging Operations: RMP/FEIS (pp. 2-34 through 2-37; 4-11 through 4-13; G-2)										
13. Allow skidding (dragging logs behind a skidder) and other ground based logging operations only when the site specific combination of soil conditions, rainfall and operating methods would not result in moderate or heavy soil compaction or soil displacement on more than 10 percent of the harvest area (RMP, p. C-2), and prevent erosion where soil would be moved off of the unit (RMP/FEIS pp. 4—12-13).	♦	♦	♦	♦		♦				♦
14. Re-use existing skid trails whenever feasible for logging operations according to the approved logging plan.	♦	♦	♦	♦		♦				♦
15. Locate new skid trails generally on slopes not greater than 35 percent (RMP, p. C-2; RMP/FEIS, p. 2—35) to avoid gouging, soil displacement, and erosion with effects exceeding those analyzed in the RMP/FEIS.	♦	♦	♦	♦		♦				♦
16. Generally limit uphill skidding to slopes where skidders would not break traction to avoid soil displacement.[16]	♦	♦	♦	♦						♦
17. Allow use of mechanized falling/processing and log handling machinery on slopes up to 45 percent where the machinery design and operating techniques would prevent gouging, soil compaction and displacement, and erosion with effects exceeding those analyzed in the RMP/FEIS.	♦	♦	♦	♦						♦

[15] Directional felling means to cut trees so that they fall in a specific, desired direction to achieve objectives such as: to avoid impacts to the SPZ, roads, adjacent stands or private property; reduce fuel accumulation next to roads or property lines; and protect retained trees. Directional felling is also used to increase efficiency of operations and worker safety by orienting felled trees within a logging unit to facilitate yarding and prevent trees from rolling/sliding onto workers.

[16] Traction is a highly variable combination of the power required to skid logs, equipment characteristics and soil strength. The potential to break traction increases as slope steepness increases. BLM field experience confirms that 20 percent slope consistently provides for adequate traction when skidding uphill while steeper slopes require additional site-specific evaluation.

Project Design Features (RMP/FEIS references for key points)	Applicable Resources / Objectives									
	Vegetatio	Soil	Water	Fish	Wildlife	Invasives	Fire /Air	Public	Cultural	Economic
In Skyline Yarding Operations:[17] RMP/FEIS (pp. 2-34 through 2-37; 4-11 through 4-13; G-1,2)										
18. Design the skyline yarding layout so that corridors average at least 150 feet apart on at least one end of the corridors and to laterally yard logs to the skyline to limit the ground area impacted by yarding.	♦	♦	♦	♦						♦
19. For lateral yarding operations fall trees to orient logs so that they cause the least soil disturbance and damage to retained trees during lateral yarding.	♦	♦	♦	♦	♦					♦
20. When reserved trees are used to attach cables, jacks or blocks the BLM would designate which trees are to be removed and sold and which trees are to be retained in place as snags or CWD according to the LUA objectives for each unit.	♦				♦					♦
In Other Operations: RMP/FEIS (pp. 2-34 -- 2-37; 4-8 -- 4-13; G-1,2)										
21. Hazardous fuels surveys would be conducted and site specific plans for hazard fuels reduction treatments would be implemented by the Authorized Officer following harvest operations.	♦						♦	♦		♦
22. A Prescribed Fire Burn Plan would be initiated and signed by the Authorized Officer prior to any prescribed burning activity.							♦	♦		♦
23. Burning would be conducted in accordance with the Salem District RMP, Oregon State Implementation Plan and Oregon Smoke Management Plan as administered by the Oregon Department of Forestry and would comply with the provisions of the Clean Air Act. It would be conducted under good atmospheric mixing conditions to lessen the impact on air quality in Smoke Sensitive Receptor Areas.	♦	♦				♦	♦	♦		♦
24. Prescribed burning may include landing pile or machine pile burning, swamper burning, or handpile construction and burning and may be used individually or in combination in areas where fuel loading is heavy or the fire risk is determined to be high.	♦	♦				♦	♦	♦		♦

[17] In skyline yarding operations, a cable is suspended above the ground (a line in the sky) which holds a carriage that uses another cable to pull logs sideways across the slope to the skyline (lateral yarding). A yarder (machinery with a tower, cables and winches) located on the landing then pulls the carriage up the skyline and pulls (yards) logs up to the landing. The leading end of the log is typically lifted off the ground while being moved (one end suspension). In some situations the entire log is lifted off the ground while being moved toward the landing (full suspension).

Project Design Features (RMP/FEIS references for key points)	Applicable Resources / Objectives									
	Vegetatio	Soil	Water	Fish	Wildlife	Invasives	Fire /Air	Public	Cultural	Economic

25. When hand, machine, or landing piles are identified by the Authorized Officer as the specified fuels treatment the following requirements would apply:
• Piles would be located as far as possible from large snags, green trees, and other reserved trees to minimize damage.
• Large woody debris greater than six inches in diameter would be retained on site and not piled.
• Piles would not be constructed on top of stumps or existing coarse woody debris (CWD).
• Piles would be covered with 4 mil (.004 inch thick) black polyethylene plastic. The plastic shall adequately cover the pile to ensure ignition and would be placed and anchored to help facilitate the consumption of fuels during the high moisture fall/winter burning periods.
• In skyline yarding areas:
  • Machine and landing piles would only be constructed within 25 feet of designated roads and landings.
  • Equipment used in the construction of machine and landing piles would remain on the roads or landings during the construction.
• In ground based yarding areas:
  • Machine piles would not be constructed within 25 feet of property lines and unit boundaries, or on slopes greater than 35 percent.
  • Operating techniques would be designed to prevent gouging, soil compaction and displacement, and erosion.
  • Equipment would operate only during periods of low soil moisture on existing roads and skid trails, on top of a slash mat, and/or would be limited to a single pass to protect the soil surface.
	♦	♦	♦				♦			♦

26. Lopping and scattering of fuels would be incorporated where fuel loading is relatively heavy but not heavy enough to warrant burning.	♦						♦	♦		♦
27. Pullback of fuels would be incorporated where fuel loading is relatively light (especially along roads and property lines) but not heavy enough to warrant burning.	♦						♦	♦		
28. Restrict or suspend ground disturbing activities immediately if prehistoric cultural resources are encountered during project implementation. Conduct a professional evaluation of the resource site and develop appropriate management practices to protect the site/cultural values.									♦	
Road Use, Construction, Renovation, Maintenance, Stabilization and Closure: RMP/FEIS (pp. 2-22,68,69; 2-75,76; 4-11 -- 4-19; G-2 -- G-7)										
29. Locate, design and construct roads wherever feasible to drain surface water to adjacent slopes where it would infiltrate into the soil and groundwater; and to avoid collecting water (in ditches and on road surfaces) where it could be channeled directly to streams (Wemple et al. 1996).		♦	♦	♦						
30. Locate, design and construct roads in upland areas on stable ground with side slopes generally less than 30 percent that do not require extensive cut-and-fill construction methods, in order to avoid increasing mass failure (landslide) potential and to avoid intercepting groundwater.		♦	♦	♦						♦

Project Design Features (RMP/FEIS references for key points)	Applicable Resources / Objectives									
	Vegetatio	Soil	Water	Fish	Wildlife	Invasives	Fire /Air	Public	Cultural	Economic
31. Conduct all in-stream activities (e.g. culvert removal and/or installation) during the designated In-Water Work Period. If water is flowing, divert (pipe or pump) water around the work site.			♦	♦						
32. Install sediment traps and/or filters in ditches that drain to stream crossings to prevent sediment transport that would cause a visible increase in turbidity from entering streams wherever it is not feasible to drain water from roads directly onto adjacent slopes. Typical methods include: maintain vegetation in the ditch; create small settling basins; or install artificial filters such as straw bales or wattles.			♦	♦						♦
33. Haul logs on forest roads only during times and road conditions that would not generate sediment that would enter streams and cause a visible increase in stream turbidity.			♦	♦						♦
34. BLM authorized personnel would visually monitor turbidity (a visible reduction in water clarity)[18] caused by road-generated sediment entering the stream at stream crossings on the haul route to ensure ongoing compliance with Oregon Department of Environmental Quality (ODEQ) water quality standards of no visible (less than ten percent) increase in turbidity.			♦	♦						♦
35. BLM authorized personnel would check for turbidity beyond the mixing zone downstream (about 100 meters) if turbidity is visible in the stream at the crossing. If water clarity is visibly altered beyond the mixing zone, the BLM would suspend hauling and other operations immediately and implement site specific measures to reduce fine sediment runoff into the stream. Allow operations to resume when weather and road conditions, combined with measures taken to reduce sediment transport to streams are deemed sufficient to comply with State of Oregon turbidity standards.			♦	♦						♦
36. If sediment transport to streams and the resulting turbidity does not comply with ODEQ water quality standards during the wet season, the BLM would not allow log hauling from this project in order to prevent adding to cumulative effects of sediment and turbidity.			♦	♦						
37. Close and stabilize all natural surface roads after use to reduce changes to natural drainage patterns, prevent erosion, and prevent unauthorized use by motor vehicles (including OHV).	♦	♦	♦	♦	♦	♦	♦	♦		♦
38. To close roads, use techniques such as barricades, debris, or roughening to make these roads impassable for motor vehicles.	♦	♦	♦	♦	♦	♦	♦	♦		♦

[18] Turbidity is a measurement of water clarity and is not convertible into a volume measurement of sediment yield unless correlated to suspended sediment data. "A visible increase in turbidity" has been found in field experience to correspond closely to Oregon DEQ standards for turbidity.

Project Design Features (RMP/FEIS references for key points)	Applicable Resources / Objectives									
	Vegetatio	Soil	Water	Fish	Wildlife	Invasives	Fire /Air	Public	Cultural	Economic
39. To stabilize roads apply a site-specific combination of techniques such as: use water bars or other surface shaping to drain runoff water to vegetated slopes; sediment traps; surface tilling; seeding with native species; mulching, covering roadbeds with logging slash and debris; and/or other techniques to promote infiltration, to prevent erosion and sediment transport to streams that would cause a visible increase in turbidity, and to prevent increases in peak flows.	♦	♦	♦	♦	♦	♦	♦	♦		♦
40. Culverts and subgrades of closed and stabilized roads would be left intact so that the road can be renovated for future use or fire control with minimal disturbance and expense.	♦						♦	♦		♦
41. When natural surface roads would be kept intact over winter for use on this project the next year, use one or more of the following methods to prevent erosion and sediment transport to streams that would cause a visible increase in turbidity: matting, mulching, constructing water bars or other surface shaping to drain runoff water to vegetated slopes, seeding, sediment traps and blocking the entrance to prevent unauthorized motor vehicle use.		♦	♦	♦				♦		♦
42. Restrict road construction, renovation, maintenance and stabilizing operations to times, weather conditions and soil conditions when the subgrade would not be damaged by operations and no sediment laden runoff would be generated.		♦	♦	♦						♦
43. Seed and mulch all disturbed soil at stream crossings with native species seed approved by the BLM and sterile mulch (free of non-native seed). Place rock, logs or woody debris as necessary to stabilize disturbed soil.	♦	♦	♦	♦	♦	♦				
Stand Structure, Wildlife Habitat and other Vegetation: RMP/FEIS (pp. 2-17,21,22,26,32-33,37-38,59-62,80-92; 4-11 through 4-13; G-1,2; K-1--3)										
44. Retain old growth trees[19] and protect them from logging damage that would potentially affect the health or function of the trees. Individually designate old growth trees that are found inside unit boundaries for retention.	♦				♦					♦
45. Maintain at least ninety (90) percent of snags larger than 15 inches diameter and taller than 15 feet intact and standing during logging activities.[20] (IDT BMP based on Wildlife Report)					♦					♦
46. Retain existing Coarse Woody Debris (CWD) meeting RMP standards of at least 20 inches diameter (large end) and 20 feet long wherever feasible and protect them from logging damage. Design skid trail location and operating techniques that require minimal movement of CWD to protect its physical integrity. (RMP p. 21)		♦			♦					♦
47. Plan road and landing locations to avoid impacts to snags larger than 15 inches diameter and taller than 15 feet whenever the BLM determines it is safe and feasible to do so.					♦			♦		♦

[19] Trees older than 200 years – RMP/FEIS, Table 3-16, p. 3-28 and glossary. Experienced BLM personnel typically identify these trees by observed characteristics of size, bole, bark, crowns, limbs, disease and surrounding stand features. Stand exam data provides core sample/ring count ages of the largest trees sampled.

[20] Snags would be cut to provide for safe operations as required by Oregon Occupational Safety and Health Division (OR-OSHA, Oregon Occupational Safety and Health Standards, OAR Chapter 437, Division 7, Forest Activities).

Project Design Features (RMP/FEIS references for key points)	Applicable Resources / Objectives									
	Vegetatio	Soil	Water	Fish	Wildlife	Invasives	Fire /Air	Public	Cultural	Economic
48. Plan road and landing locations to avoid impacts to old-growth trees and snags and other live trees larger than 36 inches DBH whenever the BLM determines it is safe and feasible to do so.	♦				♦					♦
49. Retain the following categories of green trees to meet objectives described in EA section 2.3.1.1: In all LUA retain: • Western redcedar (WRC) – all trees larger than 19 inches dbh and all trees smaller than 9 inches dbh; • Hardwood trees – all trees larger than 17 inches dbh. • All conifer species (except WRC, see above) – all trees larger than 35 inches dbh and all trees smaller than 7 inches dbh. In RR and LSR retain all of the above plus: • All conifer species (except WRC, see above) – all trees larger than 25 inches dbh. To retain these trees means that they would not be removed from the forest stand. They may be felled (cut or knocked over) to provide for safe and efficient logging. If they are felled, they would be left onsite and left as near to their original location as feasible while providing for safe and efficient logging practices.	♦				♦					♦
50. As feasible, retain trees that have desirable characteristics for wildlife habitat (e.g. asymmetrical crowns with multiple or broken tops, large limbs, dead areas being used by cavity excavators, deep crevices and cavities).	♦				♦					
51. Avoid incidental unapproved damage[21] to more than two retained trees per acre using techniques such as: requiring extra precautions to prevent damage when falling and yarding during the spring growing season when bark is easily damaged (typically March through June); directional falling to lead with skid trail or skyline corridor alignment; lateral yarding to skylines; using selected "cut" trees as rub trees in locations where logs "turn a corner" during logging; or using protective bumpers on retained trees used as rub trees. Trees identified in the logging plan to be used to facilitate logging (e.g. lift or tail trees, intermediate supports, guyline anchors, rub trees, cribbing, etc.) may be in addition to the two per acre.	♦				♦					♦
52. Retain trees which have been girdled, topped, damaged or felled to facilitate logging (up to 2 per acre each of standing and felled) in LSR and RR LUA when retaining those trees is consistent with safe and efficient logging practices.	♦				♦					♦
53. Low density thinning (LDT) areas would be located to provide small areas (up to one acre each) of early seral habitat with up approximately 12 trees per acre retained. Locations would be determined by BLM based on site examinations. LDT areas would generally be circular. Up to 20 such areas are proposed for this project.	♦				♦					♦

[21] The standard for "damage" is bark damage on more than 50 percent of the tree's circumference.

Project Design Features (RMP/FEIS references for key points)	Applicable Resources / Objectives									
	Vegetatio	Soil	Water	Fish	Wildlife	Invasives	Fire /Air	Public	Cultural	Economic
54. Seed and mulch exposed soil using native plant species seed and sterile mulch, in order to stabilize the soil and prevent establishing invasive/non-native plant species on disturbed soil in the project area.	♦	♦	♦	♦	♦	♦				
55. Clean all ground-disturbing logging and road construction equipment to be free of off-site soil, plant parts and seed prior to entering the project area to prevent introducing invasive and non-native plants into the project area.	♦					♦				
56. No habitat modifying operations (falling, yarding and road construction) would be allowed within disturbance range (0.25 miles) of known northern spotted owl (NSO) sites during the nesting season(March 1 – July 15) unless appropriate NSO surveys indicate that there are no nesting spotted owls within the disturbance range.					♦					♦
57. Restrict or suspend operations, or modify project boundaries at any time if plant or animal populations that require protection are found during ongoing surveys or are found incidental to operations or other activity in the project area.	♦				♦					
Cultural Resource Protection:										
58. Avoid direct impacts to identified cultural resources by flagging location, directional falling away from the site, and avoiding equipment operations which would disturb the site.									♦	

Seasonal Restrictions and Operational Periods

The Seasonal Restrictions, Modifications and Operating Periods are summarized in Table 5.

Table 5 Summary of Seasonal Restrictions and Operational Periods

Seasonal Restriction	Reason	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Most logging, road work and site preparation operations Units 11S-2E-12D, 12E; and 11S-3E-8A, B, C, and D	Spotted owl breeding and nesting season, March 1-July 15			■	■	■	■	■					
Hauling North haul route, based on conditions	Water quality and sedimentation, protect fish	▒	▒	▒	▒	▒						▒	▒
Hauling South haul route, no waivers	Water quality and sedimentation, protect fish	■	■	■	■	■						■	■
Skidding operations	Soil protection, site productivity, water quality	▒	▒	▒	▒	▒					▒	▒	▒
Other ground-based logging operations	Soil protection	▒	▒	▒	▒	▒						▒	▒
Road Construction / Decommissioning	Erosion control, road damage	■	■	■	■	▒				▒	▒	▒	■

Seasonal Restriction	Reason	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
In-water work: stream culvert maintenance	Protect fish and aquatic habitat	■	■	■	■	■	■	■		■	■	■	■
Logging operations	Fire season, ODF regulated use												

KEY			
	Operations typically do not require additional PDF to protect this resource.	Operations may be prohibited (restricted) or add PDF to protect this resource, or allowed as planned depending on conditions.*	Operations are often prohibited (restricted). If allowed, are typically modified by added PDF to protect this resource.

* Seasonal conditions, equipment, operations plans and other factors would be considered by the BLM to determine whether operations may proceed normally, whether additional site specific restrictions and operating methods would be required, or whether all operations of this type would be prohibited to achieve objectives and protect resources.

2.3.1.4 No Action Alternative

The No Action alternative describes the baseline against which the effects of the proposed action can be compared, i.e. the existing conditions in the project area and the continuing trends in those conditions if the BLM does not implement the proposed project. Consideration of this alternative also answers the question: "What would it mean for the objectives to not be achieved?" The "No Action alternative" means that no timber management actions, fuel reduction treatments, or connected actions would occur.

If this alternative were to be selected, the following activities would not take place in the project area at this time: silvicultural treatments; timber harvest; road construction, renovation, improvement or closure; stream crossing restoration projects such as culvert upgrades or removal of failing culverts; and fuel reduction projects (both within and outside of timber harvest areas). Selection of the No Action alternative would not constitute a decision to change the Land Use Allocations of these lands. Selection of the No Action alternative would not set a precedent for consideration of future action proposals.

Only normal administrative activities and other uses (e.g. road use, programmed road maintenance, harvest of special forest products on public land) would continue on BLM within the project area.

On private lands adjacent to the project area, forest management and related activities would continue to occur.

2.3.1.5 Alternatives Considered But Not Analyzed In Detail

Treatment of Other Forest Stands Within the Riparian Reserve LUA Overlay of GFMA:

The IDT evaluated all Riparian Reserve stands adjacent to proposed harvest units to determine whether treatment would contribute to attaining ACS objectives for habitat. Two general criteria were used in this screening process: 1) If the stand has a simple structure that would benefit from thinning to accelerate development of elements of complex structure for habitat enhancement; and 2) If the stand can be treated in conjunction with the adjacent Matrix unit. Riparian Reserve stands that did not meet both of the above conditions were dropped from further consideration for treatment.

Units Added To or Dropped From the Proposed Action:

The IDT considered adding and then dropped a proposal to thin three units in section 9, a total of approximately 65 acres. As the IDT gathered more information about the stands they were dropped for a variety of reasons, including: thinning would not appreciably contribute to meeting LSR and RR

objectives in these stands; extensive road renovation and culvert replacement would have been needed to access one of the units; unmapped streams were observed that contributed to making logging infeasible with conventional methods; and immediate proximity to the ACEC complex. These were not included in the scoping map.

The IDT considered adding and then dropped a proposal to thin approximately 60 acres of a 35-40 year old plantation in section 7, identified as 7E on the scoping map. The upper half of the unit had previously been thinned to a wide (16X16 ft.) spacing and bear damage has further reduced stocking to the point where the IDT concluded that additional thinning at this time would not meet LSR objectives. Preliminary evaluation of the lower half of the unit indicated that benefits to meeting LSR and RR objectives would be marginal and logging would be economically inefficient.

The IDT reduced the size of most of the proposed units based on additional field work done after scoping, dropping the proposed action from approximately 700 acres in scoping, to 510 acres evaluated in detail by the IDT, to approximately 460 acres analyzed in this EA. The IDT reduced the size of the proposed units for a variety of reasons, including: to leave untreated areas for diversity; infeasible logging; unmapped streams and wetlands; stand characteristics such as stocking density not as originally mapped; and treatment would not contribute appreciably to meeting LUA objectives.

Access to Units:

The IDT considered and dropped two alternate routes for roads to access the north end of unit 12A.1 (GFMA). A potential route from the north was dropped because it would require building road through a remnant old-growth stand. A potential route from the west would have required installing and removing a large, temporary culvert in a perennial stream on private land. This culvert would have been expensive and would have created sediment in a perennial stream within ½ mile of listed fish habitat, twice. Even though both of those alternatives would have been within the scope of effects analyzed in the RMP/FEIS, the IDT concluded that the proposed road location and logging plan would better meet project objectives.

The IDT considered temporarily replacing a culvert and renovating then re-decommissioning more of road 11-3E-7 to access the south end of unit 7B to facilitate more economical logging operations. The IDT concluded that LSR and RR objectives would be better served by not replacing this culvert, even temporarily. While the logging costs would be higher without the additional road segment, it is still economically feasible to treat the south center part of the unit without using this road.

Reserve the Stands in the Project Area for Carbon Storage:

This alternative was not analyzed in detail for the following reasons. This Alternative:

- Does not respond to the purpose for the project (EA section 1.2);
- Is not in conformance with the RMP which sets the basic policy objectives for the management of the project area, in which Matrix lands are managed primarily for timber production, and Riparian Reserves are managed to help develop late successional habitat conditions in line with the Aquatic Conservation Strategy. The RMP does not include a Land Use Allocation that reserves lands or stands for carbon storage; and this alternative
- Is substantially similar in design to the "No Action alternative" which is analyzed in the EA, in that this alternative would leave the stands unaltered and unmanaged just as under the "No Action alternative".

2.3.2 Project 2: Snag and Coarse Woody Debris Recruitment

2.3.2.1 Proposed Action

Proposed Treatments

The BLM proposes to create/recruit large snags and coarse woody debris (CWD) in various early and mid-seral forest stands in the LSR and RR in the Upper Crabtree watershed. Snags and CWD would be recruited in pulses over the next three to four decades. Pulses within an individual stand would be done several years apart while different stands in the watershed would be on different cycles so some treatment may be occurring within the watershed more frequently or even annually. Before actively recruiting snags or CWD in any stand at any time, the stand would be evaluated based on current inventories, current land use plans, and current research.

The forest stands to be treated would be individually selected throughout the watershed. Specific stands would be evaluated and documented in a decision document as resources become available, but due to limited resources the BLM would probably treat a relatively small proportion of these stands in the watershed. Stands not selected for treatment in this project would continue to develop by natural processes.

In the short-term (next ten years), the first pulse, recruiting snags typically consists of creating them by base girdling live conifer trees, or topping low in the crown so the tree (or at least a large part of the crown) dies. Recruiting CWD in this first pulse usually means creating it by felling live conifer trees, though sometimes a live tree or a snag falls naturally or gets knocked over during logging.

Within any LSR thinning units implemented under Project 1, part or all of the short-term snag and CWD creation would be accomplished as part of the timber sale contract. Additional areas would be treated under a separate Decision and action.

In the long-term (three to four decades from now), snags and CWD would be recruited in two to four additional pulses by a combination of cultural practices, natural events, and creating snags and CWD as described above. There is a lot of speculation in the following description of long-term recruitment because the BLM expects that resources, knowledge, and possibly management plans will change during the next 30-40 years and we want to allow the professional land managers of the future to have the flexibility to use the best resources and practices available to them at that time. Stand surveys and site specific prescriptions would be an integral part of each treatment cycle.

Thinning to increase growth rate, such as in Project 1 or precommercial thinning, is the primary cultural practice that contributes to recruiting large snags and CWD in the long-term. Logging operations to implement Project 1 would break or wound some trees and potentially introduce decay fungi that are part of the natural snag/CWD creation process. Natural events such as decay, wind and snow will create some snags and CWD over time. The BLM would create additional snags and CWD as needed until natural processes are providing sufficient dead wood habitat.

2.3.2.2 Connected Actions

Surveys would be done throughout the watershed to determine areas that are the highest priority for treatment and the timing of those treatments at times throughout the next three to four decades. These surveys would also gather information for other management purposes as needed and available.

2.3.2.3 No Action Alternative

Some snags and CWD would be created by implementation of Project 1. No trees would be girdled or felled to create snag or CWD habitat outside of those thinning units as a result of this project. Snag and CWD habitat would develop only by natural processes throughout the rest of the LSR and RR in this watershed unless a different project was to be implemented. Other projects may or may not be proposed at another time.

2.3.3 Project 3: Crabtree Complex ACEC Road Closure

2.3.3.1 Proposed Action

Road Closure: Block access to the road system at the junction where the road turns into the interior of the Crabtree Complex ACEC. Use boulders to create a barricade and provide a more natural aesthetic.

Drainage Modification: Modify drainage at the plugged culvert to prevent further erosion and sedimentation. The preferred method of modifying the drainage would depend on the conditions at the time the project is done and on the capabilities of the equipment available. A decision would be made by BLM personnel at that time to unplug the culvert, bypass the culvert and shape the road for proper drainage, or remove the culvert and shape the resulting declivity for proper drainage.

Road Decommissioning: Remove the pre-cast concrete barriers that currently block the road. Allow natural processes to decompact and revegetate the roads within the Crabtree Complex of ACECs.

2.3.3.2 Connected Actions

Recreation Access to Crabtree Lake Area: Construct a turn-around and parking area for 2 to 5 vehicles adjacent to the road closure. Provide for pedestrian access to Crabtree Lake and the existing trail system between Crabtree Lake and the Quartzville Creek road system.

Install a single panel kiosk at the barricade to post information.

Annually, or as needed and resources are available, trim vegetation with hand tools and/or chainsaws to maintain foot access to Crabtree Lake via the closed roads. The trail would be on the existing road surface, no further trail improvements would be done.

2.3.3.3 No Action Alternative

No management actions would be done to change the road closure location, correct drainage problems, remove the concrete barriers, provide parking, provide an information kiosk, or provide additional barriers to prevent vehicle access to the wet meadow.

Current levels of informal maintenance of the walking trail would probably continue and provide access to Crabtree Lake.

2.3.3.4 Alternatives Considered but Not Analyzed in Detail

Remove the Culvert and Reshape the Streambed

The IDT considered an alternative to remove the culvert crossing Crabtree Creek at the road closure point and restore the stream channel. A connected action was to plan for crossing the stream channel on foot or horseback to access the trail to Crabtree Lake area. This was the proposal presented in Scoping.

The proposal was dropped from further consideration because the IDT determined that all specific resource objectives would be met without removing the culvert (the proposed action and the No Action

alternative), removing the culvert would make foot and horseback access to the area more difficult, and the cost of removing the culvert would be high.

The 60 inch diameter culvert is sufficiently large to pass water and debris in a 100 year flood event, the stream at the crossing is stable, and the culvert is not impeding fish passage. The restored stream channel would still not be "natural". Culvert removal and shaping the stream channel would introduce sediment during and after operations similar to the effects analyzed for other culvert removal or replacement operations which the BLM has previously analyzed, with turbidity increased for less than 800 meters (1/2 mile) downstream. A stream crossing suitable for foot and horse traffic would have to be designed to provide safe access that would not create a pathway for sediment to enter the stream. The alternative was dropped from further consideration before design ideas were developed or evaluated.

Removing and disposing of the culvert would cost approximately $1,600. The cost of installing a foot and horse crossing is unknown. The installed culvert is considered a "capital improvement" that would be destroyed. Future vehicle or equipment access was not a consideration since management plans, including fire suppression, do not require vehicle or equipment access beyond the road closure point.

Active Restoration of Existing Roadbeds

The IDT agreed that there were no identifiable objectives in any of the three ACEC plans that would be met by ripping and/or reshaping the existing roadbeds, and that alder and other vegetation which have started a "natural restoration" process would be disrupted. The alternative was dropped from further consideration before any cost estimates were made.

Chapter 3: Affected Environment and Environmental Effects

Sources Incorporated by Reference: Crabtree Watershed Analysis (2001); Willamette Late-Successional Reserve Assessment (1998).

3.1 Analysis Assumptions

General

- Timber management activities will occur on BLM-administered lands allocated to planned, sustainable harvest. The type, quantity, and impacts of allocating these lands for the type and quantity of these timber management activities were analyzed in the Salem RMP/FEIS for both the short-term (10 years) and long-term (decades). Under the RMP, this applies to Matrix/GFMA lands in the proposed project area.
- Future timber management activities on those BLM-administered lands will re-use the transportation system of skid trails, landings and truck roads proposed for this project.
- The Riparian Reserve (RR) LUA on BLM-administered lands will be managed for protection of watershed values such as water quality and aquatic habitat and for terrestrial wildlife habitat on both a local and landscape level. Where the RR overlays Matrix the management actions/direction supersedes GFMA direction. Where the RR overlays LSR, the management actions/direction are added to those of the LSR.
- If the proposed action is implemented, no further silvicultural treatments would be done for approximately the next 20 years in Matrix stands. In Matrix stands the BLM would evaluate the stands for potential timber harvest in approximately 20 years – either a second entry commercial thinning or regeneration harvest.

- In LSR and RR stands, the BLM would evaluate these stands, and other stands in the watershed, approximately each decade to determine if further silvicultural treatment is needed to recruit snags and/or CWD or to meet other LSR or RR objectives.
- Potential warming and drying trends predicted by some global climate change models within the next 20 years would not change these management recommendations because BLM's experience with similar projects has demonstrated that the same principles and effects apply to similar forest stands in warmer and drier areas further south and at lower elevations within the Tsuga heterophylla (western hemlock) forest zone classification. Warming and drying could theoretically increase stresses in overcrowded stands, but the BLM cannot reliably quantify this effect with current modeling tools and believes that the range of forest conditions and effects would continue to be within the ranges analyzed.
- Most private industrial forest lands in these watersheds will be intensively managed with regeneration harvests scheduled on commercial economic rotations occurring at 30-60 year intervals (PRMP/FEIS 1994, p. 4-3 and BLM observations of recent trends in industrial forest management).

Vegetation/Silviculture

- As relative density (RD)[22] increases above 50 percent, competition for light, nutrients and water begins to reduce growth rates and increase stresses on individual trees and on the stand as a whole.
- Forest stands with relative densities above 65 percent have lower tree vigor, higher mortality of suppressed trees, and higher susceptibility to insects, disease, and more severe fire behavior than stands with lower densities (Perry, 1994; Hann and Wang 1990; Curtis 1982). These conditions reduce stand resiliency and resistance to environmental stresses.

Soils

- There would be no impacts to fragile sites that are not suitable for forest management because BLM practice is to locate proposed timber harvest unit boundaries to avoid those areas which are classified as "Non-suitable". All BLM managed lands are classified as Suitable for timber production, Suitable but Fragile for a variety of reasons (e.g., nutrient status, compacted surfaces, slope gradient, etc.), or Non-suitable.
- Potential reductions in growth and yield from compaction caused by logging operations are within the standards analyzed in the FEIS/RMP because less than ten percent of the ground surface is compacted (≥10 percent increase in soil bulk density) by logging operations including ground based equipment, landings, and skyline yarding.
- There is no potential productivity loss from post-harvest erosion because field monitoring of commercial thinning projects from 2007-2012 has shown that soil erosion resulting from the proposed action would be so minimal as to not affect site productivity.

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[22] Relative density (RD) is a measure of crowding in a stand of trees, expressed as a percentage of density (based on number and size of trees) relative to a theoretical maximum density. Curtis Relative Density (RD) is calculated by dividing the basal area per acre by the square root of the quadratic mean diameter. Other common ways of communicating density in a forest stand include trees/acre, basal area/acre, average spacing and crown or canopy closure.

Air Quality/and Fire Hazard /Risk

- Climate change may increase the duration and severity of wildfire season to an unknown extent during the project period (three to five years), but that any such overall increase would not be expected to exceed the conditions used to model fire potential for this time period.

Recreation/Visuals/Rural Interface

- Access to the project area will continue to be a combination of uncontrolled access from public roads and access controlled by private gates and road owner policy.

3.2 Methodology

General

- The forest condition information was compiled from a variety of sources.
- The RMP/FEIS provided general vegetation information for the Salem District planning area as of September 1994.
- Research publications provided ongoing baseline information specific to forest vegetation and the impacts of managing or not managing forest stands (see specialist reports for publications specifically relied upon in developing the Crab Race Density Management Thinning project).
- GIS data, aerial photographs and satellite imagery, BLM's Forest Operations Inventory (FOI) records, resource specific field surveys (see the following EA sections for specific surveys conducted) and field reconnaissance by BLM resource specialists were used to describe vegetation, habitat and plant and animal species present on BLM lands.

Vegetation

- For stand structure information, Stand Exams were conducted in 2001-2008 and additional stand information was gathered by BLM personnel.
- The BLM analyzed the data using the ORGANON growth analysis and projection computer program and used it as the basis for the description of existing vegetation and forest stand characteristics and for developing the prescriptions that would be implemented under the proposed action (EA Table 9, Silvicultural Report pp. 7-9).
- Threatened/Endangered/Special Status/Special Attention Botanical Species: The BLM botanist for Cascades Resource Area conducted two types of surveys within the project area and vicinities; Known Site Surveys (Data Search) and Field Surveys (Botanical Inventory).

Hydrology

- The Cascades Resource Area no longer runs modeling for erosion and sediment. The Water Erosion Prediction Project (WEPP) soil erosion model was previously used to predict potential changes in erosion and sediment yield from proposed commercial thinning operations, but field monitoring consistently demonstrated that no such erosion and sediment production occurred even though WEPP consistently predicted that it would.

Fisheries and Aquatic Habitat

- Resident fish distribution was determined from surveys, including snorkel surveys, of project area streams conducted by BLM Fisheries Biologists in May, August and September 2011.
- Locations and conditions of existing culverts, proposed stream crossings, and log hauling roads were examined by BLM civil engineering staff, logging systems engineer, fisheries biologist and hydrologist at various times during 2011 and 2012.

Soils

- Soil maps and descriptions of project soil characteristics are available at the Natural Resource Conservation Service web site: http://www.or.nrcs.usda.gov/pnw_soil/or_data.html.
- Site specific conditions on BLM lands in the project area were mapped and field-verified in the Timber Production Capability Classification (TPCC) database. (Power and Tausch, 1987)
- BLM Resource Specialists for soil and hydrology visited the project area multiple times, performing both formal surveys and informal reconnaissance, including digging small pits, to evaluate site specific conditions.

Wildlife

Cascades Resource Area Wildlife Biologists assessed potential effects to terrestrial species by using the following methodologies:

- For Special Status/species of concern wildlife biologists compiled a list of Wildlife Special Status/species of concern in the Cascades Resource Area using BLM wildlife databases, BLM Special Status Species lists (BLM IM OR-2012-018), Oregon Biodiversity Information Center lists (ORBIC 2010), various wildlife field guides, literature, and texts.
- The presence of special habitats, and the amount of snags and down logs present was based on stand exam data, aerial photos, and field review by specialists.
- BLM wildlife biologists visited the project area during the 2011 and 2012 field seasons and examined habitats in and adjacent to proposed Crab Race Density Management Thinning project units.
- From the Cascades Resource Area list, the wildlife biologists compiled a list of Special Status/species of concern documented or suspected to occur in the Crab Race Density Management Thinning Project Area based the proposal's geographic location, elevation, and knowledge of habitats present gained through air photo interpretation, stand exam data, GIS information, and field reconnaissance. For each of those species they determined habitat associations and the presence or absence of suitable habitat. The resulting list of special status species which are known or suspected to occur in the Crab Race Project Area and their habitat preferences are included in Table 6 of the Wildlife Report (not EA Table 6).
- For migratory and resident birds the wildlife biologists developed a list of migratory and resident birds and addressed them according to new interim guidance in Instruction Memorandum BLM-IM-WO-2008-50. Species lists and sources are listed in Appendix A of the Wildlife Report.
- For northern spotted owl (NSO): The Crabtree Creek Area has a long history of northern spotted owl surveys that date back to the late 1970s. Additional surveys for northern spotted owls will be conducted to determine presence in the future.
- No surveys for red tree voles or Survey and Manage mollusks were conducted because all of the stands proposed for thinning are under 80 years of age (Pechman exemption, 2006).

Cascades Resource Area wildlife biologists assessed the suitability for treatment of Riparian Reserve stands adjacent to proposed Matrix thinning units, including wet meadow edges, by:

- Conducting visual "walk through" examinations of those Riparian Reserve stands to assess stand complexity and other habitat characteristics based on their training and professional experience.
- Consulting with the Silviculturist and examining stand exam data.
- Consulting with the Cascades Resource Area Logging Systems specialist to determine if treatment is feasible using existing roads or roads to be constructed for managing Matrix land.

Fire and Fuels

The Cascades Resource Area Fuels Management Specialist assessed air quality and fire hazard and risk by using the following methodologies:

- For Coarse Woody Debris (CWD) information, Stand Exams were conducted in 2007 and 2010. Additional stand information was gathered by BLM personnel.
- Fire Regime and Condition Class descriptions to determine fire frequency and vegetation characteristics are located at: (http://www.nwcg.gov/teams/wfewt/archive/message/FrccDefinitions.pdf)
- The modeling predictions for fire regime and condition class come from the LANDFIRE Rapid Assessment Vegetation Models.
- (http://www.fs.fed.us/database/feis/fire_regime_table/fire_regime_table.html)BLM
- Wildfire frequency information was gathered from the Oregon Dept. of Forestry web site and is available at: (http://oregon.gov/ODF/FIRE/HLCause.pdf).
- Fuel models were determined by using the Aids to Determining Fuel Models For Estimating Fire Behavior General Technical Report INT-122 National Wildfire Coordinating Group U.S. Department of Agriculture, U.S. Department of the Interior, National Association of State Foresters. National Interagency Fire Center, BLM Warehouse, Boise, Idaho (Anderson, 1982)
- Current and potential logging slash residues were determined by conducting a visual "walk through" and by consulting the Stereo Photo Series for Quantifying Forest Residues in Coastal Oregon Forests: Second-Growth Douglas-Fir---Western Hemlock Type**,** Western Hemlock---Sitka Spruce Type, and Red Alder Type. General Technical Report PNW-GTR-231 U.S. Department of Agriculture - Forest Service, Pacific Northwest Research Station. Siuslaw National Forest. (Ottmar, Hardy, 1989), and the Stereo Photo Series for Quantifying Forest Residues in Douglas-fir hemlock Type of the Willamette National Forest. General Technical Report PNW-GTR-258 U.S. Department of Agriculture - Forest Service, Pacific Northwest Research Station. Siuslaw National Forest. (Ottmar, Hardy, Vihnanek, 1989).

3.3 Vegetation and Forest Stand Characteristics

Sources Incorporated by Reference: Bonney, 2012, Crab Race Commercial Thinning (Silvicultural Prescription), Stand Exam Data and Analysis

3.3.1 Project 1: Density Management Thinning

Affected Environment

Stand Development and Current Structure– Applies to all LUA

Prior to extensive clearcut logging in the watershed during the 1950s and 60s, the Crabtree watershed contained large stands of late-successional and old growth forest. Douglas-fir, western hemlock and western red cedar were the predominant species at lower elevations with increasing components of noble and silver fir in the higher elevations. Stands of old-growth trees that remain in the project vicinity are scattered and often relatively small. (BLM archival records – *Metzger's Atlas* timber sale records; BLM GIS data; aerial photography and field observations.)

BLM archival records show a series of timber sales that covered most of the project area being active from 1951 through the early 1960s. Long term timber production was the primary land use objective on both public and private lands in that era, so clearcuts followed by site preparation, reforestation and thinning were the core of the silvicultural systems used to produce a sustainable crop of timber.

Site preparation was most commonly broadcast burning (ignite fire throughout the entire unit), which was often done as the fall rains began. Fall burning was efficient because cured fuels burned thoroughly to leave the ground clean and ready for reforestation, and because the fall rains would "mop up" remaining fire with minimal time and cost to prevent large-scale forest fires. At that time snags and cull logs were considered to be a nuisance that harbored insects and disease and were a fire danger, all of which threatened the future value of the timber crop. The hot fires in dry fuels "efficiently" burned up snags and large rotten and cull logs so that they would not create a long-term fire hazard or interfere with reforestation and other future operations.

Reforestation was commonly accomplished by "natural seeding" from trees that survived site preparation and trees in adjacent stands. Site preparation was intended to expose mineral soil, which was essential to provide a seedbed for reforestation by natural or aerial seeding. When stocking surveys indicated a need, supplemental aerial seeding or planting tree seedlings would be used to supplement the natural seeding. Most of the stands in the project area were apparently reforested with natural seeding since BLM records show supplemental seeding or planting for only a few of the units. Unit 12E was aerial seeded and planted, and unit 8B was planted with Douglas-fir seedlings.

Almost all of the stands in the project area were pre-commercially thinned (PCT) in 1977 (12x12 feet spacing) or 1982 and 84 (14x14 feet spacing) to promote growth and timber values. Unit 13A and one third of unit 12E were not thinned. The 12x12 and 14x14 feet spacing (approximately 300 and 225 trees per acre respectively) was prescribed with the assumption that the stands would be commercially thinned in 20 to 30 years. At that time the BLM generally planned for a second commercial thinning to be done in another 20 to 30 years, followed by regeneration harvest 20 to 30 years later at culmination of mean annual increment (CMAI). CMAI is a measure of when the growth rate of the timber stand slows down. This full cycle from timber harvest through planting, thinning and other treatments to harvest of the next generation of timber is called a "rotation".

Stand exams show that the project area stands range from 39- 54 years old (as of 2012) and are predominantly Douglas-fir with components of western hemlock, noble fir and western red cedar. The crowns in these stands have grown together to the point where self-pruning, crown recession, and suppression mortality are beginning to occur, and are prevalent in the stands which were not thinned.

Most of the stands have suppressed hemlock and cedar advanced regeneration from 5 to 20 feet tall, which is struggling to grow in the shade of the dense tree canopy. Some cedar is found in different levels of the stand structure, otherwise understory vegetation is sparse to almost non-existent. Dwarf mistletoe is common on the west end of the project area in Units 12A-E and 7A. The hardwood component is minor, consisting mostly of red alder, with trace amounts of black cottonwood, big-leaf maple and golden chinquapin, primarily found along roads and in openings in and near project units.

These stands are generally healthy with little evidence of disease, except for some dwarf mistletoe in western hemlock trees, especially in the northeast part of unit 12E. There are no old-growth remnant trees and very few snags larger than 15 inches diameter in the project units. There is little or no hard Coarse Woody Debris (CWD) in these stands, though some stands have some soft CWD. Unit 13A has some hemlock dominated areas which have numerous 3-8 inch diameter logs from suppression mortality covering the ground.

Field observations show that conifer forests are encroaching on the wet meadows, reducing their size. Encroachment occurs as conifer seedlings become established, often in a strip adjacent to the forest edge at the margin of the meadow grasses, and appear to modify the microclimate at the edge of the meadow to allow more seedlings to become established at the new edge.

The following tables, compiled from the CCWA, chapter 5, pp. 4-6, show the seral stage acres in the Crabtree Creek 5th Field Watershed, seral stage acreage on federal lands by LUA, and the definitions used for seral stages.

Table 6 Seral Stage Acres by Ownership

Seral Stage	BLM Ownership Acres	Non-Federal Ownership Acres	All Lands Acres
Old-growth	3,821	3	3,819
Mature	2,588	4,269	6,852
Closed Sapling	3,078	22,762	25,844
Open Sapling/Brush	7,641	10,756	18,395
Early-Grass/Forb	288	9,839	10,122
Nonforest	591	34,376	34,990

Table 7 Seral Stage Acreage on Federal Lands by LUA in the Crabtree Watershed

Seral Stage		GFMA	%	CONN	%	LSR	%
Early/grass/forb		146	2%	57	1%	85	1%
Open Sapling/brush		3,205	44%	2,127	53%	2,309	35%
Closed Sapling		2,412	34%	460	11%	206	3%
Mature	Late Seral	939	13%	367	9%	1,282	19%
Old-Growth		440	6%	1,018	25%	2,363	35%
Non-forest		66	1%	31	1%	494	7%
Totals		7,209		4,061		6,738	

Table 8 Seral Stage Definitions Used for Crabtree Creek Watershed Analysis

Seral Stage	Age Class	Size Class	Diameter Range
Open/Grass/Forb	**0 to 10 years**	**0**	**0**
Open sapling/brush	**10 to 40 years**	**1**	**less than 10 inches DBH**
Closed Sapling	**40 to 80 years**	**2**	**11 to 20 inches DBH**
Mature	**80 to 200 years**	**3**	**21 to 30 inches DBH**
Old-growth	**> 200 years**	**4**	**> 30 inches DBH**

Table 9 Stand Information by Unit

T-R-S Unit	Sub Unit	OI No.	Initial Ac.[1]	EA Ac.[2]		Stand Age[3]	CWD[4]	Snags[5]		Trees/Ac		Curtis RD		Average Diameter			
							Hard/Soft	15-25”	25”+	Now	After Thin	Now	After Thin	Now	20 Yr. No Thin	Immed. After Thin	20 Yr. After Thin
11-2-12A	1	030	58	30	25	49	0/175	0+	0	180	58	76	35	18.2	21.3	23.1	28.0
	2				5												
11-2-12B	1	070 120	54	45	25	51	0/30	0	0	147	76	58	34	17.4	21.1	19.0	24.0
	2				15	42				289	78	86	31	14.4	18.1	17.5	23.2
	3				5												
11-2-12C	1	050	33	35	25	45	0/175	0	0	200	69	72	34	16.3	20.1	19.9	25.6
	2				10												
11-2-12D	1	110	39	35	15	51	0/195	0+	0	224	72	74	35	15.5	18.9	19.9	24.6
	2				20												
11-2-12E		120	107	95	23	42	0/240	0	0	289	78	86	31	14.4	18.1	17.5	23.2
		121			24	41				245	114	62	31	13.0	15.5	14.2	18.5
		150			48	45				167	98	53	33	15.0	18.2	15.6	19.7
11-2-13A	1	010	39	25	5	50	0/135	0+	0	276	80	76	34	13.6	17.2	18.2	23.2
	2				20												
11-3-7A	1	12-090	28	45	10	54	0/270	0	0	196	51	84	34	18.4	20.9	24.8	27.9
	2	010			35	47				204	60	79	34	17.2	21.7	22	29.3
		080				46				276	107	69	33	12.8	15.6	14.8	19.2
11-3-7B		050	63	60		46	0/185	0	0	265	72	81	34	14.7	18.1	19.5	24.5
11-3-7C	1	080	10	15	10	46	0/320	0	0	276	107	69	33	12.8	15.6	14.8	19.2
	2	030			3	52				282	77	88	34	14.8	18.2	18.6	23.9
	3				2												
11-3-7D		030	9	10		52	0/175	0	0	282	77	88	34	14.8	18.2	18.6	23.9
		040				39				242	139	55	35	12.0	15.8	13.0	17.8

T-R-S Unit	Sub Unit	OI No.	Initial Ac.[1]	EA Ac.[2]	Stand Age[3]	CWD[4]	Snags[5]		Trees/Ac		Curtis RD		Average Diameter			
						Hard/Soft	15-25”	25”+	Now	After Thin	Now	After Thin	Now	20 Yr. No Thin	Immed. After Thin	20 Yr. After Thin
11-3-8A	1	030	6	10	46	0/230	0+	0	278	79	76	34	13.6	18.5	18.4	24.2
	2			5												
11-3-8B	1	060	10	10	45	0/50	0+	0	224	102	57	35	13.0	17.0	15.8	21.3
	2			5												
11-3-8C		110	16	20	48	0/35	0	0	175	66	62	32	16.1	19.9	20.1	26.0
		180			39				242	139	55	35	12.0	15.8	13.0	17.8
11-3-8D	1	100	38	25	46	0/75	0	0	109	74	49	32	18.9	23.4	18.7	24.3
	2			5												
	3			10												
	4			5												
Total			510	460												
Average							0	0								

Notes for Table 9

1. Initial Acres – The approximate mapped area proposed to be examined by IDT.
2. EA Acres – The approximate area selected by the IDT to include in the proposed action.
3. Stand Age – As of 01/18/2012, calculated as a weighted average of ages sampled in Stand Exams.
4. Coarse Woody Debris – Linear feet per acre of dead and down wood, minimum dimensions of 20 inches diameter large end X 20 feet long, from Stand Exam data. Displayed as Ft. Hard CWD / Ft. Soft CWD. Hard CWD is decay classes 1 and 2. Soft CWD is decay classes 3, 4 and 5.
5. Snags – “0+” is less than 1 snag per 100 acres. Number per acre of dead standing trees, minimum dimensions of 15 inches diameter (DBH) X 15 feet tall, from Stand Exam data. (Converted from “Snags/100 Acres” in the stand exam and Wildlife reports, rounded to 0.01, equivalent to 1 snag/100 acres.) “0+” indicates that snags were observed but either were not sampled or were found in densities lower than 1 snag/100 acres

Threatened or Endangered (T/E), Special Status Plant Species (SSS) and Survey and Manage (S&M)

No T/E vascular plants or suitable habitat were found during field surveys and there are no known sites within the project area as determined by a known site data search.

No SSS or S&M species were found during field surveys and there are no known sites within the project area as determined by a known site data search.

Invasive / Non-native Plant Species

During field surveys the following invasive/non-native species were found to occur adjacent to the proposed harvest areas within road corridors of the proposed project area; tansy ragwort (*Senecio jacobaea*), Canadian thistle (*Cirsium vulagre*), St. John's wort (*Hypericum perforatum*), scotch broom (*Cytisus scoparius*), and herb Robert (*Geranium robertianum*).

Environmental Effects

3.3.1.1 Proposed Action

Stand Structure and Development - Matrix (GFMA) LUA

Observed Characteristics and Direct Effects Immediately after Thinning:

Immediately following timber harvest the thinned stands would appear less crowded with space between the crowns of trees that allows light to reach lower limbs and the forest floor. The average diameter of the stand would be increased because most of the small merchantable trees would be removed from the stands. The stands would be more uniformly spaced and more uniform in diameter and height than before treatment. Most of the diseased and low vigor trees would be removed from the stand though some deformed trees would still be present. Low density thinning areas would act as lightly shaded openings where forage species would grow. A minimal amount of logging damage (see EA section 2.2.1.4, Project Design Features (PDF)) would be evident.

Observed Characteristics and Trends in the Long Term:

Tree crowns in the forest canopy would expand and fill the spaces between trees until the site is fully occupied in approximately 20 years, resulting in an increased growth rate until crown closure, followed by a gradual reduction in growth rate if the stand is not treated (thinning, partial cut or regeneration harvest) at that time. Understory vegetation, both forage species and brush, would increase as light gets to the forest floor, then become less vigorous as the canopy closes. During this cycle brush species and conifer regeneration would out-compete forage species, especially in low density thinning areas. Established understory conifers would increase in vigor and growth rate and additional conifer regeneration would be expected until the canopy closes again. These trends develop because any forest site has the resources – nutrients, water and light – to support a given amount of growth which is distributed among either many small trees or fewer large trees.[23] Some trees would be expected to develop decay, die, and/or

[23] This is the same concept as thinning carrots in a vegetable garden. Typically, many more seeds sprout than the garden can support and the crowded carrots would be small and unhealthy if the number of carrots is not reduced (density management or thinning). When a lot of the seeds sprout, the first thinning may be done when the carrots are too small to be used in a salad

fall because of logging damage, wind damage, insects, disease, suppression mortality of understory conifers, and/or lightning.

Indirect Effects:

The increased growth rate of the retained trees would result in these trees growing larger in diameter over the next twenty years than they would if the stand were not thinned (EA Table 9). Larger average diameters in a timber stand typically result in higher timber values, consistent with Matrix objectives (EA section 1.4.1). Larger diameter trees also provide source material for higher quality snags, CWD and legacy trees for future stand management. Larger crowns are correlated with increased vigor of individual trees and of forest stands and provide habitat for species which prefer large limbs and crowns. Increased vigor and density of understory brush and ground cover would provide forage, cover and habitat for a variety of species through its growth cycle.

Stand Structure and Development - Riparian Reserve Overlay of Matrix/GFMA LUA

Observed Characteristics and Direct Effects Immediately after Thinning:

Immediately following timber harvest the thinned stands would be very similar to the adjacent Matrix stand. The stands would be more uniformly spaced and more uniform in diameter and height than before treatment, but would likely be more variable than in the adjacent Matrix because the BLM would mark additional large and deformed trees for retention and CWD recruitment. Most of the smaller than average diameter, diseased and low vigor trees would be removed from the stand though some deformed trees would still be present. A minimal amount of logging damage would be evident. Some (up to 2 per acre each) additional snags (girdled trees) and CWD would be retained by not removing some merchantable material which would be damaged or felled to facilitate logging. (EA section 2.2.1.4, Project Design Features (PDF))

Observed Characteristics and Trends in the Long Term:

Tree and forest stand growth patterns would be similar to those described above for the adjacent Matrix stands. In addition, the following characteristics also occur in the Matrix stands, but are described here because they contribute to achieving stand structure objectives for this LUA. As the tree crowns grow into the open spaces, limbs would grow much larger diameter and longer because they live longer rather than dying and self-pruning while they are still relatively small diameter.

Understory trees retained or regenerated in the stands after logging would grow faster over the next 20 years or so than they would under a closed canopy, then some of them would die from suppression mortality after the crowns close again in approximately 20 years and become snags and down woody debris. Additional decadent trees, snags and down woody debris would develop over the next several decades as trees die and/or fall due to disease, lightning, windthrow, snowbreak, and silvicultural treatments to create decadence, asymmetrical tops and dead wood habitat.

(precommercial thinning). When some of the carrots are harvested during the growing season they may be large enough to use (commercial thinning) and the ones left in the ground will grow larger until harvested in the fall (regeneration harvest).

Indirect Effects:

As described above for the adjacent Matrix stands, increased growth rates would result in fewer, larger diameter trees in the stands compared to unthinned stands. In addition to the effects described for the adjacent Matrix stands, the following effects which contribute to meeting the objectives of this LUA are described here:

Just as with the larger diameter of the overstory (dominant and co-dominant) trees, retained trees in the understory (intermediate and suppressed) would also grow larger in diameter due to increased sunlight penetrating through the canopy until the canopy closes and again suppresses those trees over the following several decades. Some of those would eventually die from suppression mortality in the next several decades and the resulting snags and down woody debris would persist longer as dead wood habitat and be valuable to more species than if they had died while they were small diameter trees.

The trees would develop deeper crowns which have more whorls of live limbs growing on a larger proportion of the total height of the trees because the limbs live longer. Deep crowns and large limbs provide microclimate and habitat features that are different from the shallow crowns and small diameter limbs found in an overstocked stand and provide habitat for species which prefer large limbs and crowns.

When large trees with large crowns die or fall over the next several decades, additional sunlight would reach the forest floor and stimulate growth in patches of the understory. Where a closed canopy remains intact, the understory would decline in vigor over the next several decades. These differences increase the structural complexity of the understory.

Stand Structure and Development - Late Successional Reserve (LSR) LUA and Riparian Reserve (RR) Overlay of LSR

Observed Characteristics and Direct Effects Immediately after Thinning:

Immediately following timber harvest the thinned stands would be very similar to the Matrix and RR stands described above with some differences. The stands would be more widely spaced with larger average diameter and height than before treatment. However, the retained trees would be more variable than in the stands described above because the BLM would designate additional trees to retain through special marking and contract requirements, including: additional large (>20 inches diameter (DBH)) and deformed trees, where they are available, for future snag and CWD recruitment; trees <7 inches DBH; and cedar and hardwood trees. Most of the other trees which are smaller than average diameter and low vigor trees would be removed from the stand though many of the decadent and deformed trees would still be present. A minimal amount of logging damage would be evident. Some additional snags, CWD, and trees with girdled/deformed tops would be present because contract stipulations and contract administration practices would be implemented to retain these features in LSR sections rather than remove merchantable material as would be done in Matrix units. (EA section 2.3.1.2, Connected Actions and section 2.3.1.3 Table 4, Project Design Features (PDF))

Observed Characteristics and Trends in the Long Term:

Tree and forest stand growth patterns would be similar to the Matrix and RR stands described above, with some differences.

Understory trees retained or regenerated in the stands after logging would grow faster over the next 20 years or so than they would under a closed canopy, then some of them would die from suppression mortality after the crowns close again in approximately 20 years. Some decadent

trees, snags and down woody debris would develop naturally over the next several decades, especially in smaller diameter classes, as trees die and/or fall due to disease, lightning, windthrow and snowbreak. Snags and CWD of varying decay classes would accumulate on BLM lands throughout the watershed, including project units, over the next several decades as silvicultural treatments to create decadence and dead wood habitat are done in pulses according to needs identified in ongoing surveys.

Indirect Effects:

In addition to the effects described for above Matrix and RR stands, the following effects which contribute to meeting the objectives of this LUA are described here:

The BLM expects levels of dead wood to accumulate from suppression mortality over time, similar to the Matrix/RR stands described above.

Snags and CWD created as a result of logging and related treatments in this project would provide the first pulse of these dead wood structural components. As they decay they would persist for a few to several decades as they progress through the decay classes. Additional pulses of snag and CWD creation, as needed, over the next four decades would continue to progress toward a full range of decay classes of dead wood, see Project 2 of this EA.

Understory trees (intermediate and suppressed) would grow larger in diameter, providing understory structure until they die and become dead wood habitat, as described for RR, above. Overstory trees would develop deeper crowns as described above.

As large trees with large crowns die or fall naturally or as part of treatments to create dead wood pulses over the next several decades, changes in the levels and locations of sunlight reaching the forest floor would create a mosaic of understory brush and ground cover vegetation which is a recognized component of late successional forest structure.

Structure and Development - Wet Meadow Edges which are Adjacent to Thinning Units

Observed Characteristics and Direct Effects Immediately after Treatment:

Immediately following treatment there would be fewer live conifer trees around the edges of the meadows where they are adjacent to thinning units. The resulting reduction in tree crowns would allow more sunlight to reach the understory ground cover and shrub component plant species in these areas. Cut-and-leave trees and slash and debris from cut-and-remove trees would add dead wood to the ground surface. Larger cut-and-leave trees may qualify as CWD under RMP management direction. Girdled trees would begin to die and become snags.

Observed Characteristics and Trends and Indirect Effects in the Long Term:

Meadow vegetation (ground cover and understory shrub component species) that had been reduced by shade would be expected to increase in vigor and area covered. In the short term the rate of encroachment would be expected to reduce. In the long term the remaining conifers and new seedlings would continue to grow and continue to encroach on the meadow over time. Dead wood, including CWD recruited, would cycle nutrients and provide habitat elements for varying time frames, directly related to the size of the dead wood. Base and top-girdled trees would develop into snag and asymmetrical crown trees over time, providing those habitat elements. Future treatments under Project 2 may prolong these trends.

Untreated edges would provide for a variety of edge habitat characteristics around the perimeters of these meadows. The treated and untreated portions would provide a long-term comparison of the relative effects of managed and unmanaged edges.

Threatened, Endangered, Special Status and Survey and Manage Plant Species

There would be no identifiable effects on T/E species or habitat within the project area because there are no known populations or habitat in the project area.

Invasive/Non-native Plant Species

In past timber harvest areas near to the proposed project area there was no evidence to indicate that adverse impacts from invasive/non-native species would occur as a result of the proposed project.

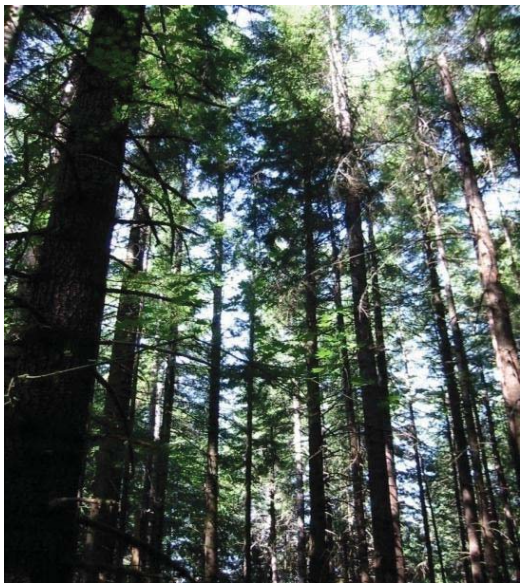
Figure 4: Typical dense stand before treatment.

Additional Comments on Figure 4: Typical dense stand with complete canopy closure, similar to those proposed for treatment. Note the lack of ground cover vegetation and understory. Sec. 25, T10S, R1E. T. Fennell 2008

Figure 5: Typical stand a few years after thinning.

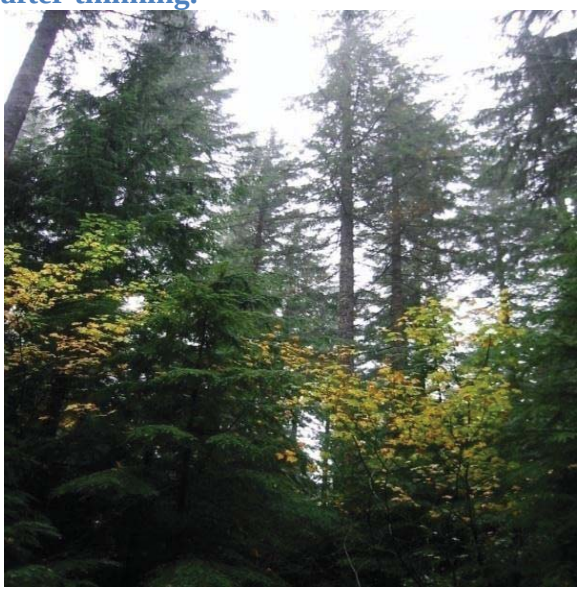
Additional Comments on Figure 5: Typical stand resulting after treatment, approximately five years after thinning. Note the typical understory development and snag. Sec. 12, T1S, R5E. File photo by K. Walton 2006

Figure 6: Canopy of dense stand.



Additional Comments on Figure 6: Dense canopy in a typical stand proposed for thinning treatment, similar to stands proposed for thinning in this project. Sec. 1., T1S, R5E. File photo, K. Walton 2007

Figure 7: Canopy of stand a few years after thinning.



Additional Comments on Figure 7: Canopy view approximately 5 years after thinning treatment, a typical example of tree crown spacing and developing understory. Sec. 12, T1S, R5E. File photo by K. Walton 2006

Cumulative Effects

No short term (1 decade) cumulative effects at the Upper Crabtree Creek Watershed level would be expected with regard to stand structure and development because the proposed thinning would maintain a forested setting in the same age class as before thinning and would not change overall vegetation patterns in the watershed.

Long term (2 or more decades) cumulative effects are expected to begin accelerating development of late-successional forest characteristics on 220 LSR acres (including LSR/RR).

No cumulative effects to Threatened, Endangered (T/E) and Special Status Species (SSS) are expected because no suitable habitat to support T/E species was identified within the proposed project boundaries and no SSS were found.

Suitable habitat for SSS will remain in the proposed thinning area because thinning would modify but not remove such habitat, and suitable habitat for SSS would remain undisturbed adjacent to the proposed thinning areas. The proposed project would not contribute to the need to list any SSS as Threatened or Endangered.

No cumulative effects are expected with regard to invasive /non-native plants because: project design features for the project would generally prevent the spread of invasive species populations or introduction of new species in the project area; any populations that may establish would be short lived (<10 years) because native species are strong competitors and would revegetate the sites; and because projects similar to that of the proposed project had little to no difference in their invasive/non-native species population composition or numbers. (Botanical Report)

3.3.1.2 No Action Alternative

Stand Structure and Development (all land use allocations)

In the short term these stands would remain overstocked and changes to their current condition would be slow. The BLM has observed the following trends in similar overstocked stands which are not treated:

Height growth would continue at approximately the current rate while diameter growth continues to slow. Slower diameter growth develops stronger wood with a higher proportion of heartwood compared to faster growth, but it takes longer to develop source material (large diameter live trees) for recruiting the large-diameter dead wood (snags and CWD) that are especially valued as habitat (EA section 3.7, Wildlife).

The limbs of closely spaced trees in an overstocked stand touch and interlock, blocking most of the sunlight from reaching anything below the dense canopy. Lower limbs of dominant and co-dominant trees, the entire crown of trees in the intermediate and suppressed positions, and understory vegetation in the stand would continue to be shaded. In addition to competing for light, all vegetation would compete for limited nutrients and water. Competition for site resources of light, water and nutrients leads to the following trends:

- As lower limbs in the crown self-prune, crown size relative to the height of the tree (crown ratio) would continue to decrease. This leaves tall, clean boles with no limbs below a relatively small crown. As this trend continues trees begin to look like "Christmas trees on top of telephone poles". Since lower limbs are shaded by adjacent trees, very few crowns develop large diameter limbs.
- The smallest trees would die from lack of sufficient site resources, a process called "suppression mortality" which naturally thins the stand. Over time, suppression mortality limits or eliminates conifers from the understory positions in the stand. This natural thinning process creates relatively large numbers of small diameter snags from the smallest trees in the stand. Small diameter snags tend to be short-lived in the stand, falling to become short-lived, small diameter woody debris on the forest floor.
- Understory vegetation including conifer reproduction, brush and ground cover plants would decrease in abundance, size and species diversity without sufficient light reaching the forest floor.

The accumulation of small diameter dead and decaying wood on the forest floor increases fuel loads without green vegetation to hold moisture. This increases potential for fire spread and resistance to control in the stand (EA section 3.8, Fire).

Windthrow potential would increase because individual trees in overstocked stands develop weak root systems so that resistance to windthrow comes from the cumulative strength of many trees with interlocked crowns rather than individual trees having strong root systems and strength in the bole. When something changes from normal wind conditions (e.g. an exceptionally strong storm or an industrial timber style clearcut adjacent to the stand), windthrow can occur at scales from a few trees to several acres.

In GFMA stands, trees would continue to grow and a slower rate of diameter increase, yielding larger numbers of smaller diameter stems with denser wood (higher ring count per inch) and a higher proportion of heartwood compared to thinned stands. The future logging costs per unit of wood volume would be higher for many small logs compared to fewer large logs. The market for wood with those characteristics would probably be different from the faster grown wood that

results from thinning, but there are too many market variables to predict relative value. Suppression mortality would result in those trees never being harvested for wood products, reducing the total net yield and value of the stands over the full rotation.

In Riparian Reserve and LSR stands, the long term, indirect effects of stands developing from overstocked stands delay or preclude characteristics associated with some late-successional and old-growth stands including: large diameter trees, snags and CWD; large crowns with large diameter limbs; healthy conifers in understory and intermediate canopy positions; and well developed understories of brush and ground cover species. A variety of stand types across the landscape (diversity) provides habitat for a wider variety of species than large tracts of uniform stands do.

The dominant trees in some old-growth stands have long (100 feet), clean boles, while others developed with large limbs much nearer the ground (less than 50 feet). It appears (BLM observations, personal communication) that the first type grew from dense stands that self-pruned and the large trees survived for centuries while many of the smaller trees died and allowed multiple stories to develop.

Tappenier et al. (1997) determined that the complex stand structure associated with some old-growth forest stands with large limbs lower on the bole apparently developed with low stocking levels (as low as 40-50 trees per acre) rather than from self-thinning of overstocked stands. Stands with this type of old-growth trajectory based on lower densities would be rare in the uniform stands in this watershed without management action.

Conifers would be expected to continue to encroach into the edges of the wet meadows, reducing their size over a period of several decades to centuries. The edge-habitat would be continually refreshed by new seedlings becoming established.

Threatened/Endangered/Special Status/Special Attention/ Survey & Manage Plant Species and Invasive / Non-native Plant Species (including Noxious Weeds)

No changes to existing conditions and trends would be expected.

3.3.2 Project 2: Snag and Coarse Woody Debris Recruitment

3.3.2.1 Proposed Action

Observed Characteristics, Direct Effects and Indirect Effects:

In addition to the direct and indirect effects described above for Project 1, additional operations done to create/recruit snags and coarse woody debris both within the units thinned in project 1 and in other stands in the Upper Crabtree watershed would have the following effects.

Immediately following each pulse of snag and CWD recruitment (dead and down wood larger than 20 inches diameter at the large end and longer than 20 feet meets RMP requirements for Coarse Woody Debris) (EA section 2.3.1.1), girdled and felled trees would die, resulting in hard snags and CWD with limbs. Twigs and small branches would decay and fall off in 2-4 years while progressively larger limbs would break off over several years or even decades for snags, somewhat faster for CWD. These are the first stages of these two important elements of late-successional forest structure.

Insects and fungi would establish in this dead wood and the decay process would begin. The decay process would take many years to several decades for snags and CWD to progress through

the decay classes until they become part of the organic layer of the soil. During this process, snags would become weak and fall, often the upper portions would fall first, leaving a shorter snag that would persist for several more years or decades. Creating snags and CWD in decadal pulses in a given stand would provide snags and CWD at various stages of decay over the next several decades.

Removing individual tree crowns from the canopy by girdling or falling these trees would create small openings in the canopy, allowing sunlight to reach the forest floor and stimulate understory growth for a few years. If groups of trees are selected, larger brush and understory tree thickets would be stimulated. This understory variability is also considered to be important elements of late-successional forest structure that would develop more quickly with treatment than without. Also, limbs growing into the open spaces would grow longer and larger than if they were shaded and self-pruned.

The BLM currently anticipates that with these created snags and CWD in place, in 3-5 decades natural processes such as lightning strikes and disease would recruit sufficient snags and CWD for the indefinite future.

By treating multiple stands across the watershed, structural diversity at a landscape level would be enhanced by creating a mosaic of thinned stands with and without snag/CWD recruitment, and heavily stocked unthinned stands with and without snag/CWD recruitment. This spatial diversity at a landscape level would develop more quickly with treatment than without.

Cumulative Effects

No cumulative effects would be anticipated beyond continuing the direct and indirect effects described above.

3.3.2.2 No Action Alternative

Without action to create snags and CWD larger than 20 inches diameter in these stands, the trees that die would generally be small diameter for a few decades. Desired levels of larger diameter snags and CWD to provide late-successional stand structure would take a few to several decades longer to develop compared to the proposed action. See the No Action description for Project 1, section 3.3.1.2.

Threatened/Endangered/Special Status/Special Attention/ Survey & Manage Plant Species and Invasive / Non-native Plant Species (including Noxious Weeds)

No changes to existing conditions and trends would be expected.

3.3.3 Project 3: Culvert Removal and Restoration of Existing Roads

No direct, indirect or cumulative effects to vegetation, stand structure, special status species or invasive/non-native species would be anticipated from either the proposed action or the no action alternatives for Project 3, except that with the proposed action alder and other vegetation would begin to grow in the road prism and right-of-way when maintenance operations cease.

3.4 Hydrology

Sources Incorporated by Reference: Hydrology/Channels/Water Quality: Specialist Report for the Proposed Crab Race Density Management Thinning Project, etc., (Hawe, 2012) (Hydro Report); Fisheries Report; Crabtree Watershed Analysis.

3.4.1 Project 1, Density Management Thinning

3.4.1.1 Proposed Action

Affected Environment

Project Area Precipitation and Basin Hydrology

The project area is located in the Oregon Western Cascades range at elevations between 2,200-3,800 feet[24]. Most of the project units are in the transient snow zone (TSZ), an elevation zone subject to rain-on-snow events (ROS) that have the potential to increase peak flows during winter or spring storms. This zone varies with temperature during winter storms but is estimated to occur between 1,500 - 3,000 feet in elevation. The project area receives approximately 95-105 inches of rain annually and has a mean 2-year precipitation event of 4.4 inches in a 24-hour period (estimated at: http://www.nws.noaa.gov/ohd/hdsc/noaaatlas2.htm).

The project watershed is in the headwaters of Crabtree Creek (Lat 44.62, Long -122.50), near the ridgeline divide between Crabtree and Quartzville Creeks**.** It drains to three separate 7th field "catchments" with approximately 8,395 acres (13 square miles) in combined drainage area. All are tributary to the 26,774 acres (42 square miles) Upper Crabtree Creek 6th field "subwatershed". The 100,022 acres (156 square miles) Crabtree Creek 5th field "watershed" provides the scale for the Crabtree Watershed Analysis. Crabtree Creek is tributary to the 4th field South Santiam River (HUC #17090006).

The 6th field subwatershed provides the scale for most of the analysis in the EA because it is the smallest scale that contains the entire proposed project. Some elements of water quality such as sediment/turbidity are analyzed at the 7th field watershed because any impacts for these elements are more likely to be detectable at the smaller scale.

Crabtree Creek is a part of the drinking water source for the City of Jefferson and thus the project lies within the municipal watershed.

Project vicinity stream channels (ACS Objective 3)

The project area is situated in the Western Cascades physical province and streams reflect the geologic origin of the area (Benda et al. 2005). Most of the terrain around the treatment units is composed of Basaltic and Andesitic rock from the upper and middle Miocene. There are remnant glacial deposits along the main stem of upper Crabtree Creek and a large lobe of landslide and debris flow deposits forms the western boundary of the 7th field watersheds in the project area.

Stream channels immediately adjacent to the proposed treatment areas are a mix of first order headwater channels with intermittent flow that converge in 2nd - 3rd order perennial channels tributary to the Crabtree Creek main channel (see Table 10).

[24] Unless otherwise indicated, geographic information is an estimate derived from the BLM GIS database.

Table 10 Streams Adjacent to Treatment Units

Section Number	Stream Flow: Perennial or Intermittent	Stream Order	Number of channels
12	Intermittent	1st	11
	Perennial	2nd	2
	Perennial	5th	1
7	Intermittent	1st	6
	Perennial	3rd	1
	Perennial	5th	1
8	Intermittent	1st	3
	Perennial	2nd	2
	Perennial	5th	1
9	Intermittent	1st	1
13	Intermittent	1st	5

The Cascades Resource Area Hydrologist determined that all channel reaches he observed in the project vicinity were in "proper functioning condition" (PFC) (USDI, 1998) because there is adequate vegetation, landform, or large woody debris present to: dissipate stream energy, filter sediment, aid ground-water recharge, aid floodplain development, stabilize streambanks and maintain channel characteristics. [25]

Intermittent channels

The small headwater tributary channels formed in the deep soils of the benches and ridges in the project vicinity flow intermittently on the surface before disappearing underground, returning to surface flow again down-slope. It's likely that ground water and subsurface flow, as opposed to surface run-off, is the primary system of water delivery to these channels. Most are moderate gradient (4-10%) with small substrates (sands and small gravels) reflecting the adjacent soils. Utilizing the Montgomery-Buffington typology (Montgomery & Buffington, 1997), these channels would be classified as colluvial: "small, headwater streams at the tips of a channel network that flow over a colluvial valley fill and exhibit weak or ephemeral fluvial transport." Most of the intermittent streams adjacent to project units have too low of a gradient to be subject to debris torrents or landsliding.

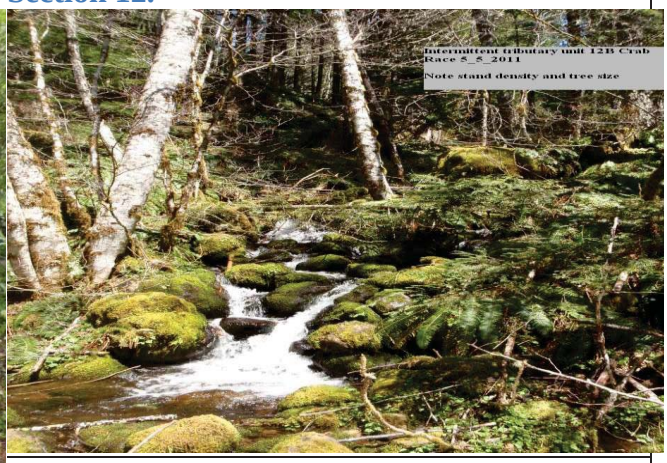
Some of the small tributaries in the project vicinity are steeper (>12 percent) and the channels are incised into resistant bedrock, Rosgen A3/4A+ channel types (Rosgen, 1996). These channels may be subject to debris flows and have steep side slopes that are prone to landsliding. Because the stream-adjacent slopes are unstable they tend to have relatively open canopies dominated by deciduous tree and brush species and have large quantities of downed wood.

[25] A determination of "proper functioning condition" means that the channel elements and physical processes are in working order relative to an area's capability and potential. It does not mean that the channel is functioning at full biological potential or that nothing could be improved by human intervention (i.e., placing additional wood structure, repairing infrastructure, thinning adjacent forest, etc.).

Figure 8: Intermittent headwater tributary in Section 7.

Hawe, July 2011

Figure 9: Intermittent headwater tributary in Section 12.



Hawe, May 2011

Figure 10 Crabtree Creek in Section 12.

Perennial channels

The small headwater tributaries adjacent to the proposed treatment units eventually reach larger perennial channels that flow to the main Crabtree Creek channel. These larger 3rd order streams have entrenched into the relatively resistant bedrock forming constrained valleys with moderately steep adjacent slopes (average 50-60%). There is a low to moderate supply of gravel and cobble sized material actively transported in these Rosgen "B3" channel types. Utilizing the Montgomery-Buffington typology, these perennial streams would be classified as step-pool channels: "Step-pool morphology generally is associated with steep gradients, small width to depth ratios, and pronounced confinement by valley walls."

Some of these channels are shaded by dense stands of second growth conifer, often dominated by hemlock. Wood and shade are in abundant supply, banks are stable and channel morphology is controlled by bedrock features with a cobble-boulder bed. These channel types are highly resilient and unlikely to be altered significantly by disturbance.

Existing roads and stream channels

There are approximately 85 road-stream intersections on the access roads to Crab Race. Where roads cross streams, channel morphology (the shape, size and slope of a channel) is generally altered in a predictable manner. Within the area occupied by the road prism the original channel is buried by road fill, and the channel morphology is reduced to the dimensions of the culvert.

In most locations culvert dimensions (shape, area and slope) are adequate to allow for the transport of the water, sediment and organic materials from upstream and the stream is said to be "at grade" and channel morphology upstream of the road fill is not affected. However, in other cases, the culverts and/or collapsed road beds have restricted the passage of water, sediment and organic materials from upstream resulting in the deposition of sediment above the crossing and the stream is said to be "aggraded". For the small streams in the project vicinity the Resource Area Hydrologist observed that aggradation generally extends less than 100 feet upstream.

Hawe, May 2011

Without regular maintenance, culverts with aggraded stream channels may collect debris which can block the culvert and lead to failure of the culvert and fill.

There are several perched culverts along the main road entering section 12 and throughout the project area. A culvert is "perched" when it was either installed with the outlet above streambed level or the outflow erodes the channel bed, effectively creating a waterfall. Perched culverts may restrict upstream passage of fish and other aquatic organisms.

There are two stream crossings with undersized culverts and failing fills on road 11-2E-12.4. The failing fill is adding sediment to the streams and causing chronic erosion and turbidity at these sites. Undersized culverts have higher potential for catastrophic failure because of being plugged or overwhelmed by high flows than properly sized culverts.

Figure 12 Wetland/Wet Meadow adjacent to unit 12D.

Hawe, 2011

Project area wetlands

There are several wetlands throughout the project vicinity identified from BLM GIS data, National Wetlands Inventory maps, aerial imagery and field reconnaissance.

Project Area Hydrology (ACS Objective 6)

Stream flow

Based on the gage hydrograph from the USGS gaging station (#14188610) on Schafer Creek which is tributary to Crabtree Creek in Section 8 near the projects, stream-flows in the project vicinity are typical of smaller Western Cascades streams (Moore, et al, 2005) where most runoff occurs during winter storm events. Peak flows occur during prolonged rain-on-snow (ROS) events, such as in February 1996 when the Shafer Creek gage recorded over 400 cubic

feet/second (cfs), estimated to be at or above a 100 year flood return interval event. Smaller peak flows occur regularly in April and May during spring snowpack melt-off.

Base-flow, or low-flow, occurs during late summer and early fall when mean stream flow drops below one cfs. Many small headwater channels dry up completely during this period and are referred to as "intermittent" streams.

The morphology of smaller intermittent streams which are in softer soil materials on gentle gradients in the project vicinity adjusts to accommodate storm flows. Higher than normal (1-5 year frequency) flows can cause channel and bank damage, leading to increased fine sediment transport and turbidity. (Tonina et al. 2008) Streams in the project vicinity that are on steeper slopes with bedrock channels are highly resistant to change and channel morphology generally does not adjust in response to flow increases that could result from ROS events (Grant et al. 2008).

Potential for peak flow augmentation due to current conditions of forest harvest

Analysis for the risk of increases in peak flow in the Upper Crabtree Creek 6th field watershed as a result of forest harvest indicates that there is currently a low risk for peak-flow enhancement due to forest openings in the project area (OWEB, 1997). This analysis is based on the proportion of the watershed in ROS area (14,032 acres), and the proportion of the ROS area that has crown closure of less than 30 percent (8,995 acres), based on BLM's review of GIS data and recent satellite imagery. Table 11 shows the summary data used for these calculations and Figure 14 shows the graph used by OWEB for estimating the risk of peak flow enhancement.

Table 11 Risk of Peak flow Enhancement by Sixth Field Watershed in Crab Race

6th Field Subwatershed Name	*Watershed Area (acres)*	*Percent of Watershed in ROS Areas*	*Percent of ROS area with <30% Current Crown Closure*	*Peak-Flow Enhancement Risk*
Upper Crabtree Creek –6th	26,774	52% (14,032 acres)	64% (8,995/14,032 acres)	Low

Figure 13 Graph (Figure 3 in OWEB Manual) for determining risk of peak flow augmentation.

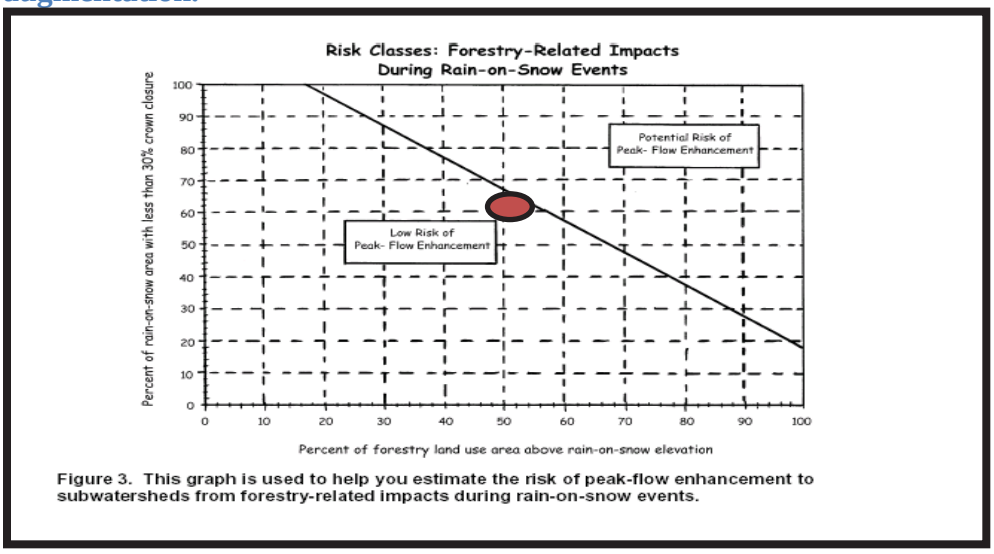


Figure 3. This graph is used to help you estimate the risk of peak-flow enhancement to subwatersheds from forestry-related impacts during rain-on-snow events.

Peak Flow/Water Quality Effects from Roads

The project vicinity is currently at a low risk for augmentation of peak flows due to the road network in the watershed. Both project vicinity 7th field watersheds analyzed have a seven percent increase in stream length (hence, drainage density) due to stream/road intersections and the BLM accepts this as representative of the project vicinity as a whole. Seven percent increase in drainage density indicates that the watershed is currently at low risk for augmentation of peak flows due to the road network in the watershed. The Wemple study (2003) implies that drainage density increases of approximately 20 percent due to stream/road intersections have the capacity to alter the timing and quantity of peak flows.

Road systems can have a measurable effect on stream flow which may include an augmentation of peak flows on a watershed scale (Wemple et al, 2003). The increase in drainage density due to road/stream intersections was calculated for two 7th field watersheds in the project vicinity as an indicator of the risk of increasing peak flows due to roads in the project vicinity. For this calculation the BLM assumed 200 feet of stream extension at each road/stream intersection. The BLM accepts this calculation as a surrogate for risk in the project vicinity because ditches which drain intercepted rain and groundwater directly to streams act as a measurable "extension" of the stream network which the BLM assumes for calculation purposes to cause a proportional increase in flow. The exact relationship of road surfaces to altered stream flow has not been quantified.

Figure 15 shows the channel network expansion from stream/road intersections relative to the line drawn at 20 percent as indicated in the Wemple study for the two 7th field watersheds analyzed.

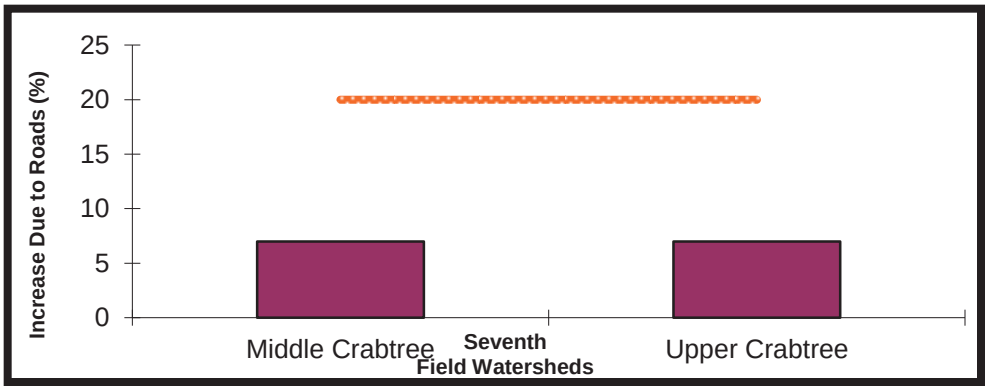


Figure 14: Estimated channel network expansion for two 7th field watersheds in the project vicinity.

Cascades Resource Area Hydrology and Fisheries specialists inspected the roads in the project vicinity and the haul route to determine their potential for channeling runoff and sediment into area streams. Most road surfaces on the northern proposed haul route (see project maps, EA section 7.2) are well maintained and in good condition with little potential to contribute fine sediment to area streams with normal use patterns year-round. Road 11-2E-14.1 is also generally in good condition but runs parallel and near to Crabtree Creek and has numerous stream crossings which provide a potential route for road-generated sediment to reach Crabtree Creek. Much of the private section of the southern haul route is not designed or maintained to the same standards and has moderate to high potential to drain water and sediment directly to tributaries of Crabtree Creek if the road surface is disturbed by log truck traffic or natural events during the wet season.

Project area ground water

The Oregon Department of Environmental Quality (ODEQ) has not identified any groundwater pollution problems within project watersheds. The Oregon Water Resources Department (OWRD), together with ODEQ is responsible for the regulation and protection of ground water quality and quantity in Oregon.

Factors affecting the quantity, quality, location and flow of groundwater and the interactions between surface flow and subsurface flow are understood only in a general sense. The endless variability of topography (land form), soil type and condition, lithography (rock formations), weather patterns and vegetation cannot be reliably quantified. Local conditions which potentially influence groundwater resources in the project vicinity include:

- The moderately deep soils in the project vicinity uplands are well drained and generally do not have layers that impede water infiltration. These soils have infiltration rates between 0.25 – 2 inches/hour. Under natural conditions, most precipitation either drains through the soil profile or is transpired by vegetation rather than becoming surface runoff.
- Deeply compacted soil surfaces, usually skid trails, from previous logging have reduced rates of water infiltration and more potential for surface runoff. These compacted areas are generally scattered and at different stages of recovery so runoff infiltrates vegetated soil within a few feet of where rain falls on compacted soils so it does not have an identifiable effect on overall infiltration or groundwater in the project vicinity.
- Forest roads and landings can intersect groundwater and reroute it through ditches to surface streams, which can alter subsurface flow and may result in a proportionate reduction in water available for ground water storage. When cross-drains route the water from ditches back to stable, vegetated slopes it infiltrates back into the soil within a short distance. Forest roads have been continuously present in the project vicinity for several decades and both of these situations are associated with them.
- Local lithology also dictates the quality of groundwater and, by extension, sets the base conditions for the quality of surface water. Ground water in Western Cascades volcanic material is typically low in dissolved salts and nutrients with a slightly acidic pH. Temperature is a function of the soil and subsurface temperatures which vary only slightly throughout the year, hovering between 5-10 degrees Celsius.

Water Quality and Beneficial Uses

Oregon Department of Environmental Quality (ODEQ)

The ODEQ, under the Clean Water Act, has been delegated authority to protect the quality of all waters in the State of Oregon. Established water quality standards "not to be exceeded" for all waters of the state are published in the Oregon Administrative Rules (OAR) Chapter 340, Division 41. http://www.oregon.gov/DEQ/WQ/index.shtml. In addition, updated water quality standards have recently been approved by the United States Environmental Protection Agency (USEPA).

Designated Beneficial Uses and Water Rights

Water quality standards are ultimately meant to protect beneficial uses of water in the state, as designated by the State of Oregon, http://www.deq.state.or.us/wq/standards/uses.htm. Designated uses of surface water downstream of the project area include: salmon rearing and spawning; resident fish and aquatic life; irrigation and domestic; drinking water and municipal water. Water rights are administered by the Oregon Department of Water Resource (OWRD) and recorded, with

maps, in the Water Rights Information System (WRIS), http://www.wrd.state.or.us/OWRD/WR/index.shtml. Additional beneficial uses downstream of the project area include: industrial water supply; wildlife & hunting; fishing; boating; anadromous fish passage; water contact recreation and aesthetic quality.

The City of Jefferson withdraws water from the Lower North Santiam to treat and provide city residents with drinking water. A *Source Water Assessment* for the water provider is available on-line at: http://www.deq.state.or.us/wq/dwp/docs/swasummary/pws00408.pdf. The source water assessment identified 61 potential sources of contamination within the watershed; forestry related activities (road building, harvest, etc.) were cited once as a potential source of sediment due to surface erosion.

Stream Temperature

The average temperature in Crabtree Creek where it flows through BLM land (above river mile (RM) 32.7) adjacent to the project area is currently within state water quality standards for temperature (≤16.0°C) and does not exceed critical levels for salmon and trout spawning and rearing. (South Santiam Water Quality Restoration Plan (WQRP), USDI BLM, 2007, pp. 30-35, citing Shafer Creek as the reference standard.)

Downstream of RM 32.7 stream temperatures increase and in its lower reaches Crabtree Creek is included in the ODEQ 2010 Integrated Report (http://www.deq.state.or.us/wq/assessment/2010Report.htm) on surface water quality 303(d) list as "water quality limited" for salmon and trout spawning, rearing and migration as well as core cold water due to summer stream temperature which exceeds standards.

Dissolved Oxygen, pH, and Conductivity

DO and pH levels are probably within the range of natural variation and meet state standards based on the low summer temperatures described above for the project vicinity, full forest cover (Hydrology report p. 16), and data collected by the South Santiam Watershed Council (CCWA ch. 5, p. 29). No data for these variables in the immediate project vicinity was located for this assessment.

Sediment Supply, Transport and Turbidity in Crabtree Creek

Mass wasting

No active sites threatening slope failure and mass wasting have been observed in the project vicinity. Mass wasting is the primary process responsible for the bulk of sediment production and transport in mountainous terrain and is dominated by large, episodic events such as the three day storm event in 2004 that transported 64 percent of the suspended sediment for the entire year. (*North Santiam River Basin Turbidity and Suspended-Sediment Study:* http://or.water.usgs.gov/proj/or00311/index.html). Mass wasting and its impacts on sediment transport and yield need to be evaluated and understood over longer time frames than are analyzed in this EA.

Surface erosion, stream bank and channel erosion

Surface erosion (particularly following fire), channel cutting and bank erosion are the other important processes that have the potential to increase sediment transport and affect water quality in forested streams.

Surface erosion, or overland flow, occurs when water moves over the surface with the energy to erode soil and is rarely observed on forest slopes (Leopold, 1997). Surface erosion on

undisturbed forested land in the project area is rare due to the high infiltration capacity of native soils, heavy vegetative growth and deep layers of surface organic material.

Stream bank erosion and channel cutting (horizontal or lateral) are potentially affected by changes in channel roughness (e.g. rocks, wood and vegetation), stream energy (generally a function of flow) or direction of stream-flow (influenced by rocks, wood, mass wasting, culverts, etc.). (Lane, 1955) Some stream bank erosion and channel cutting has been observed at some culverts in tributaries to Crabtree Creek but they are generally stable as described above. Crabtree Creek shows evidence of previous changes in the channel which are visible to the casual observer in many places.

Turbidity and Sediment

During winter field reviews of area streams water clarity appeared high and high turbidity levels were not noted except at the two failing culverts. No site specific data for stream turbidity in the project area was located for this assessment.

Environmental Effects

Channel and Wetland Morphology/Physcial Integrity (ACS Objective 3)

Direct and Indirect Effects - Channel and Wetland Morphology

In general, there would be no direct alteration of the physical features of project area stream channels or wetlands from timber harvest or logging operations. Stream banks, channel beds and wetlands are protected from direct physical alteration or disturbance by harvesting equipment with stream protection zones (SPZ) where no harvest would harvest or logging equipment operations would be done.

The proposed action would not result in detectable effects to channel morphology such as increases in bank erosion, channel incision, scouring of substrates or gravel deposits utilized by fish for spawning, loss of floodplain connectivity or alteration of local wetland hydrology because the project is unlikely to alter the volume or timing of stream flows.

No channel alterations would be caused by road construction because no new stream crossings would be constructed. No wetlands would be crossed by new road construction.

Replacement of two culverts would be done in locations where the stream banks and channels have already been altered by the existing crossings. Replacing these culverts would provide improved stream flow and passage of sediment, organic materials and aquatic organisms and eliminate the chronic erosion and turbidity at these sites. Some slight channel adjustment to grade or width may occur within the first year following disturbance as the channel reaches equilibrium with flow and sediment transport. Based on previous experience with these type of channel crossings the BLM's field hydrologist determined that long term effects to channel function or morphology from disturbance at these sites would be unlikely because the channels are resilient (i.e., they resist change) and would adjust to accommodate the disturbance without creating bed or bank instability. Channel morphology adjustments would be unlikely to extend more than 100 feet upstream or downstream from the site of disturbance.

Cumulative Effects - Channel and Wetland Morphology

Stream channels in the project area already have properly functioning dimensions and form (see discussion in Affected Environment) so there is currently no cumulative effect to contribute to. With the exception of disturbance to the channel at the culvert replacement sites, this proposal would not result in any direct effects to channel or wetland morphology and therefore would have no cumulative effect. Stream channel adjustments at the culvert replacement sites would be short duration (within one year) and low magnitude because they would not extend more than 100 feet downstream or upstream from the disturbance and would not result in alterations to channels or floodplains downstream or elsewhere in the watershed.

Project Area Hydrology (ACS Objective 6)

Mean Annual Water Yield

The project would likely increase mean annual water yield in the project area because removing part of the conifer overstory would reduce the amount of precipitation intercepted by vegetation and returned to the atmosphere by either sublimation (snow converting directly to water vapor without melting into liquid water) or evapo-transpiration. (Bosch et al., 1982; Troendle et al., 2006) Potential increase cannot be reliably calculated but is expected to be too small to detect because 40-70 percent of the forest canopy would be maintained and the proportion of the watershed treated is small. Other than the augmentation of peak and/or base flows (discussed below) the "increase in fall and winter discharge from forest activities is likely to have little biological or physical significance" (USEPA, 1991).

Base Flow and Fog-Drip

The potential increase in mean annual water yield may result in a slight increase in base flow (summer low flow). (MacDonald, 1991) Any increase is unlikely to be detectable.

The project would not likely affect water yield due to changes in fog-drip. No studies have been located for this analysis to indicate that fog drip is a large contributor to stream flow in the project area and no studies have documented reductions in fog drip with forest stand thinning.

Peak Flow

The increase in snow accumulation and melt-off during ROS events would remain below a level likely to result in measureable increases in peak flows according to the State of Oregon risk assessment methodology (see Affected Environment, above). While it is reasonable to assume that some increase in snow accumulation on the ground may occur in thinned stands, canopy closure will remain >30% in this proposal (except for up to 20 one-acre low density thinning areas scattered through the project area) so models used to calculate this risk in the TSZ do not show a measurable increase.

It is also unlikely that runoff from soils compacted by logging operations would increase peak flows because compaction would be limited to less than ten percent of the project area, resulting in less than 0.2 percent of the watershed area compacted by project operations. The area compacted by logging operations would often coincide with existing compacted surfaces and any runoff would be quickly routed to undisturbed forest soils where it would infiltrate.

Peak Flow Effects from Roads

Road construction for this project has a low risk of altering watershed hydrology or peak flows in the Crabtree Creek watershed, which is currently at low risk for augmentation of peak flows due

to the road network in the watershed. Intercepted water does not reach stream channels any faster than precipitation which falls on the forest floor because:

- The 0.36 mile of new road construction proposed for this project is located on gentle slopes of less than 30 percent which do not require benched or cut and fill construction that would cut into the soil profile deeply enough to affect sub-surface or groundwater flow, so it would have no effect on the timing or volume of stream flow in the watershed (Wemple et al, 2003); and
- There are no additional stream crossings so there would be no additional routes for water intercepted by roads to reach streams and intercepted rainfall on these roads would be drained to the adjacent undisturbed forest floor where it quickly infiltrates into the ground.

Groundwater

The proposed action has little capacity to affect groundwater patterns because they are intimately linked to peak or base flows at the surface, which are unlikely to be affected by the project.

Watershed Hydrology: Cumulative Effects

The proposed project carries no risk for contributing to any existing cumulative effects to watershed hydrology because the watershed is currently at a low risk for impacts and there would not be any discernible direct or indirect effects to the watershed's surface flows or ground water.

Water Quality (ACS Objective 4)

Direct and Indirect Effects - Water Quality

Summer Stream Temperature Maximums in Perennial Streams.

The project would be unlikely to result in any detectable change in stream temperature, would maintain stream temperatures in their current range and would protect beneficial uses. The streams are all currently well shaded and the project would maintain that shade by maintaining SPZ that do not remove any vegetation from the primary shade zones and by retaining minimum 50 percent canopy in the secondary shade zones so there would be no increase in sunlight on the water to warm the water. The project meets or exceeds the requirements *Northwest Forest Plan Temperature TMDS Implementation Strategies* (USFS and BLM, 2004) designed to protect summer stream temperatures by maintaining shade. Wilkerson, et al (2005) and Groom, et al (2011) found that similar or less (maintaining 25 percent density to within 25 feet of streams) shade retention resulted in no detectable changes in stream temperature.

Summer Stream Temperature Maximums in Intermittent Streams

The project would be unlikely to result in any measurable alteration of temperature regime in intermittent streams in the project area. Water does not flow on the surface during most summers and temperature is influenced directly by soil temperature which is primarily a function of elevation, aspect and soil type rather than direct solar radiation. These streams are further protected by SPZ which maintains shade, even though reducing stand density near the streams would be unlikely to result in increased water temperature.

Dissolved Oxygen (DO), pH and Conductivity

It is unlikely that this proposal would have any measurable effect on DO levels in project area streams because it would not increase temperature, sedimentation or fine organic material, or

reduce re-aeration which are the factors that reduce DO in small forested streams (Hall and Lantz, 1969).

Available data indicates that most forest management activities have little effect on pH or conductivity (USEPA, 1991).

Turbidity

Road construction and maintenance

There would be no sediment delivery to streams from new roads because new road construction would be done on stable surfaces and well away from streams where they would not be connected to the stream system so no pathway would exist for delivery of fine sediment which could increase turbidity in streams.

There would likely be some increased turbidity (a visible reduction in water clarity) relative to background water clarity during the first winter following maintenance (adding rock, blading road surfaces) and maintaining, replacing or repairing stream crossing culverts if storm events wash some of the fines (very small particles) off of disturbed surfaces and into streams. Any increased turbidity would be unlikely to be visible or detectable beyond 800 meters below the site of the disturbance based on research (Foltz and Yanosek, 2005) conducted at culvert replacement projects in forested watersheds. At that point turbidity would be unlikely to exceed the water quality standards of <10% increase relative to background levels set by the State of Oregon. Therefore, water quality standards would be maintained and beneficial uses protected on streams adjacent to treated forest.

If there is water in the stream during and immediately after in-stream projects such as culvert replacement/repair or blading the road surface, a turbidity plume may be visible beyond the mixing zone, approximately 100 meters downstream. If so, turbidity would likely decrease by an order of magnitude within two hours after disturbance ceases as fines are removed and the channel bed becomes "armored". Since these activities would be completed within one work day, any such increase in turbidity would be unlikely to last longer than eight hours.

To further reduce potential increases in turbidity, BLM staff would visually monitor turbidity as required by the State of Oregon during in-channel work at these sites. If Oregon State Standards were exceeded at anytime, BLM would stop all in-stream activities and require the contractor to take appropriate steps to reduce turbidity to acceptable levels.

Hauling – General

It is unlikely that the proposed alternative would result in a discernible effect to the levels of turbidity or water clarity in Crabtree Creek. Similarly, turbidity levels would be unlikely to reach levels that would cause additional treatment expense or technical difficulties for the downstream water providers. Sediment transport normally increases during large storm events which results in increasing turbidity and reduced water clarity, therefore turbidity increases from the haul route roads would be unlikely to be discernible relative to background turbidity by the average observer. As stream flows recede sediment would deposit and turbidity would return to background levels at low flow.

Hauling – Dry Conditions

Hauling (log truck traffic) during dry conditions would not be expected to increase fine sediment delivery to streams during or after hauling, as confirmed by the BLM field Hydrologist's observations on numerous BLM timber sales over the past two decades. Any increased turbidity

attributable to dry condition hauling would be unlikely to exceed the State of Oregon water quality standard for turbidity or be detectable beyond 800 meters below the stream crossing (Foltz and Yanosek, 2005) and would therefore protect beneficial uses downstream.

Hauling – Wet Conditions

Project design features (EA section 2.3.1.3, Table 4) would prevent prolonged incidences of sediment transport by:

- limiting hauling to weather patterns and conditions when traffic generally does not pump fines to the road surface and when water is not flowing on roads and in ditches;
- diverting water to stable vegetated slopes where it would infiltrate and trap any sediment in vegetation;
- placing sediment traps such as straw bales or wattles; and
- frequent monitoring during contract administration.

As part of contract administration the BLM authorized officer would visually monitor the road network and turbidity levels up and downstream of each crossing. If water clarity is visibly altered below the mixing zone it will be assumed that it is approaching limits set by the Oregon DEQ and correction would be implemented immediately.

Timber hauling during periods when water is flowing on roads and into ditches could potentially increase stream turbidity and suspended sediment transport with indirect detrimental effects on the streams physical and biological attributes (Cederholm et al. 1980). If sediment laden water were found to be flowing into streams, log hauling would be immediately suspended and not allowed to resume unless and until the problem was corrected and measures were implemented to prevent their reoccurrence.

Cumulative Effects to Water Quality

The proposed action has little potential for contributing to any cumulative effects to these water quality attributes in these watersheds and is unlikely to have any measurable direct or indirect effect on stream temperatures, pH, or dissolved oxygen. Current conditions and trends in water quality would likely be maintained under the Proposed Action.

Turbidity increases from the proposed action would be non-detectable on the scale of the seventh field watershed (since the 7th field watershed is smaller than the 6th, it would show any effects more readily than the larger watershed) and would be unlikely to contribute cumulatively to turbidity levels in the watershed. Potential direct effects in the short term (during the action and the first winter following) include increased turbidity levels directly below road/stream intersections which would be maintained below the limits required by Oregon DEQ. Cumulatively, because of the limited magnitude (not visible more than 800 meters downstream of crossings) and duration (primarily the first winter following road repairs), turbidity would be within Oregon DEQ water quality standards.

Sediment Regime (ACS Objectives 5)

Forest Management Practices, Introduction

Forest management practices included in the proposed action which have been historically identified with the potential to accelerate sediment supply to stream channels include: road construction and maintenance, hauling, tree harvest, yarding and burning.

Road Construction, Maintenance and Use (Hauling)

The proposed action would not increase sediment transport to project vicinity/haul route streams that would exceed ODEQ water quality standards, therefore the amount of sediment delivered to streams would not cause a measurable difference in the sediment regime of these streams. The potential for these proposed actions to contribute sediment have been discussed at length above relating to water quality. Oregon DEQ water quality standards for suspended sediment as indicated by turbidity are also designed to protect streams from changes to the sediment regime.

Tree Harvest

The proposed action would not increase bank erosion or channel cutting by altering channel roughness, redirecting flows or altering bank-stabilizing vegetation. As discussed previously in the Hydrology section, project design features (PDF) would prevent direct impacts to streams from logging operations (falling and yarding), would not change streamside vegetation, would not redirect flows and would not be likely to increase stream energy due to alterations of peak flows.

Increases in sediment delivery to streams due to mass wasting induced by loss of root strength and increases in soil pore pressure as a result of the proposed action are unlikely to occur. No tree harvest would be done on unstable slopes adjacent to streams or any other areas prone to mass wasting as identified by the BLM TPCC and field examinations.

Tree Harvest and Logging Operations

There would be no detectable increase in sediment supply or transport as a result of the proposed action. Field reviews of similar BLM harvest units logged by skyline yarding (aka "cable logged") by the BLM field Hydrologist during intense rainstorm events from 2007-20012 found no evidence of overland flow or sediment transport on skyline corridors where erosion models had predicted sediment transport under similar conditions. Skyline yarding areas were selected for review because slopes steeper than approximately 20 percent adjacent to stream protection zones (SPZ) are typically yarded with skyline or other cable yarding systems and the yarding corridors tend to be oriented straight up and down slopes.

Ground-based yarding areas adjacent to SPZ tend to be on gentler slopes and/or slopes which do not drain directly to the stream. Skid trails are designed to avoid concentrating overland flow or directing it toward streams (PDF), so they have less theoretical potential for overland flow, erosion and sediment transport than the skyline yarding areas which showed no evidence of such flow.

If yarding system design alone does not prevent potential sediment transport, additional PDF such as waterbars or other drainage modification would be applied as needed to prevent sediment transport.

Pile Burning Operations

Pile burning would be unlikely to have any influence over water quality, stream channels or watershed hydrology and any effects to soils and hydrology would be short term and limited to the immediate site because the piles to be burned would be located on level ground outside of riparian areas so there is no delivery mechanism by which ash or soil from the pile locations could reach stream channels. Other fuel treatment methods, such as lop and scatter or mastication, do not create ash or erosion, so none could be introduced into streams.

Sediment Yield Cumulative Effects

Since there would be no detectable increase in sediment supply or transport as a result of the proposed action, there is no possibility to contribute to a cumulative effect.

3.4.1.2 No Action Alternative

The No Action alternative would result in the continuation of current conditions and trends at this site as described in the Affected Environment, above. Any existing effects in the watershed would continue to occur from the development and use of private and other agency lands (primarily agriculture, timber harvesting and road building).

3.4.2 Project 2 – Snag and CWD Creation

The hydrology for project 2 is the same as for project 1 because they are in the same area.

The proposed action would not have any foreseeable effect on hydrology resources in the project area or Crabtree Creek watershed.

3.4.3 Project 3 – Road Closure

Affected Environment

Where road 11-3E-16.1 crosses Crabtree Creek the streambed and banks are stable, the culvert is large enough to meet current standards, and the culvert is not perched.

The wetland near where the road is currently blocked is typical of wet meadows in the area, similar to the one shown in Figure 12. This meadow has an active beaver pond.

One cross-drain/intermittent stream culvert in the currently closed portion of the road is plugged water is flowing across the road and eroding the surface and subgrade. Some of this sediment probably reaches Crabtree Creek during storms.

Environmental Effects

Closing the road prior to the stream crossing at Crabtree Creek would not be likely to affect the stream. It could theoretically reduce the amount of road generated sediment introduced to streams, but the current amount is already too small to detect.

Closing the road would reduce the risk of OHV damage to the wet meadow and beaver pond adjacent to the road by keeping vehicles further away from the access to the meadow.

Repairing the drainage at the plugged culvert would potentially introduce sediment into the intermittent stream for a short time during the first winter until the disturbed site becomes armored, as described for culvert replacement in Project 1.

3.5 Fisheries and Aquatic Habitat

Sources Incorporated by Reference: Crab Race Fisheries Specialist Report, Zoellick, 2013) (Fisheries Report) and , Hydrology Report. Additional Sources Referenced: Logging Systems Report

Affected Environment

Fish Presence and Fish Habitat in the Project Area

Coastal cutthroat trout (*Oncorhynchus clarki clarki*; Behnke 1992) are common in the Crabtree Creek watershed, and inhabit Crabtree Creek, White Rock Creek, and one unnamed 4th order tributary and two unnamed 3rd order tributary streams to Crabtree Creek. 1st and 2nd order

headwater tributaries in the project area too small to support fish populations with the exception of the lower 0.1 mile of an unnamed 2nd order tributary of Crabtree Creek located between Units 7A and 7C. Almost all have intermittent stream flows.

Both upper Willamette River (UWR) winter run steelhead trout (*O. mykiss*), and UWR spring Chinook salmon (*O. tshawytscha*) inhabit Crabtree Creek. UWR steelhead and UWR spring Chinook are listed as 'threatened' under the Endangered Species Act of 1973 (ESA).

Winter steelhead trout formerly were distributed 35.7 miles up Crabtree Creek, from its confluence with the South Santiam River to a high gradient boulder and bedrock reach in the SE ¼ of Section 12 (T.11S, R.2E; Streamnet 2006; USBLM 2001). A 12.5 ft. tall falls over a bedrock ledge (Photo 2) is now the upstream limit of steelhead distribution (Streamnet 2012). It is located in the NE ¼ of SW ¼ of Section 14, about 2.8 miles downstream of the mapped upstream end of steelhead distribution in Crabtree Creek (32.9 miles above the confluence with the South Santiam River). Prior to the 1-in-100 year magnitude flood in 2006, it is thought that the current falls location was a steep boulder section of the stream which allowed adult steelhead to pass. The flood apparently washed the boulders downstream, exposing the bedrock ledge that forms the falls.

ODFW spawning surveys show steelhead have not spawned above the falls since 2006. Very low numbers of juvenile salmonids were observed in the lower 1 mile of Crabtree Creek in Section 12 (BLM fish inventories, September 2011), very few (<5) of which were potentially juvenile rainbow trout or steelhead. No juvenile steelhead were observed in the lower 0.5 mile.

Spring Chinook salmon inhabit 32.9 miles of Crabtree Creek, with their upstream distribution ending at the confluence of an unnamed 4th order tributary stream in Section 14, T.11S, R.2E (Streamnet 2012). This location corresponds to the distance to the falls described above.

The project units are located 0 to 2.6 miles upstream of the nearest designated winter steelhead trout habitat as delineated in 70 FR pp. 52630-52858, and 1.8 to 5.4 miles upstream of designated spring Chinook salmon habitat (Table 12).

Distances from project units to identified habitat for cutthroat trout and two ESA Listed fish species are shown in Table 12. Distances in feet (ft.) are from unit boundary to the stream bank where habitat is adjacent to the unit. Distances in miles (not labeled) are stream miles downstream from where the stream is adjacent to the unit boundary to habitat.

Table 12 Distances to Fish Habitat

Unit Number	Stream	Distance to Cutthroat trout habitat	ESA Listed Fish Species	
			Distance to Steelhead trout habitat*	Distance to Chinook salmon habitat*
12A	Crabtree Creek and unnamed tributary	≥100 ft	0.2	2.1
12B, and 12E	Crabtree Creek	≥100 ft	≥100 ft	2.1
12C	Unnamed tributary to Crabtree Creek	0.5	0.5	2.9
12D	Crabtree Creek	≥100 ft	≥100 ft	2.7
13A	Unnamed tributaries to White Rock Creek	0.6	0.6	1.8

Unit Number	Stream	Distance to Cutthroat trout habitat	ESA Listed Fish Species	
			Distance to Steelhead trout habitat*	Distance to Chinook salmon habitat*
7A	Unnamed tributary to Crabtree Creek	0.1	0.4	3.2
7B	Unnamed tributaries to Crabtree Creek	0.2	0.8	3.6
7C	Crabtree Creek	≥100 ft	0.4	3.2
7D	Crabtree Creek	≥100 ft	0.8	3.6
7E	Unnamed tributaries to Crabtree Creek	0.3	1.1	3.9
8A	Unnamed tributary to Crabtree Creek	0.3	1.8	4.6
8B	Unnamed tributary to Crabtree Creek	0.3	2.4	5.2
8C	Crabtree Creek	≥70 ft	1.1	3.9
8D	Crabtree Creek	≥70 ft	1.8	4.6
9A	Unnamed tributary to Crabtree Creek	≥70 ft	2.3	5.1
9B	Unnamed tributary to Crabtree Creek	≥70 ft	2.6	5.4

* The upstream limits of Designated Critical Habitat are defined in the Federal Register Notice 70FR pp. 52630-52858. Stream distances were measured using ArcGIS software.

Aquatic Habitats

Stream channels of tributary streams in the project area are stable (generally gravel dominated; BLM Fish Inventories 2011) and well-shaded (>90% effective shading; Hydrology Specialist Report 2012), and streambanks are stable (>90% of banks vegetated with riparian and streamside vegetation; BLM Fish Inventories 2011). Cobble or boulder dominated substrates comprise most of the channel of an unnamed Crabtree Creek tributary located to the east of Unit 8B. Most 3rd order streams in the project area flow through confined valleys (gradients of 2-4%) with narrow floodplains (Rosgen B-channel type; Rosgen 1994). First and second order headwater tributary streams in and adjacent to units drop steeply towards larger streams with channel gradients of >10%.

Crabtree Creek in section 12 adjacent to Units 12B, 12D, and 12E has an average channel gradient of 6% (Rosgen A and B-channel types; Rosgen 1994) and is confined by steep valley slopes, with substrates dominated by cobble and boulder (BLM Fish Inventories 2011). Streambanks are stable and well vegetated, with about 5% of banks vegetated with early seral vegetation due to bank erosion and a landslide from road 11-2E-16.1 that resulted from a large storm and associated flood flows in February 1996 (USBLM 2001). Adjacent to Units 7C, 7D, 8C, and 8D in sections 7 and 8, Crabtree Creek is less confined by side valley slopes (valley slopes averaging 2%) with channel substrates dominated by gravel (Rosgen B and C-channel types; Rosgen 1994). Streambanks are stable (>95% of banks vegetated with riparian and streamside vegetation; BLM Fish Inventories 2011, USBLM 2001).

ODFW inventoried instream habitats of Crabtree Creek and found large wood (LW) levels were low (<160 pieces per mile; USBLM 2001). We also visually estimated LW amounts to be low in

in sections 7, 8, and 12, with much of the wood present appearing to be old and decadent (BLM Fish Inventories 2011). Pool frequency is lower than desired due to lack of large wood (USBLM 2001). LW levels in Crabtree Creek are low because of past timber harvest practices and the relatively young age of streamside forest stands. Within the project area, 75% of the riparian areas within 30m of Crabtree Creek are vegetated with young conifer stands (<80 years old) that have low LW recruitment potential (USBLM 2001).

Summer stream temperatures of Crabtree Creek in the project area are cold (12.8 – 14.4 C) and fully support beneficial uses (BLM Hydrology Specialist Report 2012; South Santiam WQRP, BLM 2007).

Roads and Stream Crossings

Table 13 shows haul route locations, length of road segments used, surface type, stream crossings, and proximity to ESA listed critical habitat for UWR winter steelhead and UWR spring Chinook salmon.

The North Haul Route may be used year-round, depending on conditions and measures taken to prevent sediment entering streams. The South Haul Route would be used only during the dry season and dry conditions when sediment which could be transported to streams would not be generated. (EA section 2.3.1.2)

Table 13 Haul Routes and Listed Fish Habitat

Haul Route	Miles of Haul	Road Type[1] (P,A,N)	Season of Use	Number of Crossings Over:				Nearest Distance (ft) from Crossing to LFH/CH by Type		Road Length Within 100' of LFH/ EFH (ft)
				LFH		Other Peren.[2]	Inter.[3]	Perennial	Interm.	
				Bridge	Culvert					
North Haul Route										
11-1E-19.0 Snow Peak	6.5	P,A	Year	1	1	2	20	115	225	950/950
11-2E-21.0 Private	0.5	A	Year	0	0	0	0	NA	NA	0
11-2E-21.1 Private	3.5	A	Year	0	0	12	10	815	1,220	0
11-2E-22.0 Private	0.2	A	Year	0	0	0	3	NA	1,500	0
11-2E-14.2	0.4	A	Year	0	0	0	2	NA	2,495	0
11-2E-14.1	3.0	A	Year	0	0	4	10	1,145	610	0
11-2E-12.0	0.9	A	Year	0	0	1	0	3,645	NA	0
11-2E-12.1	2.1	A	Year	0	0	2	8	3,970	3,767	0
Spur roads to North Haul Route										
11-3E-07.0	0.2	A	Year	0	0	0	0	NA	NA	0
11-2E-01.1	0.09	N	Dry	0	0	0	0	NA	NA	0
11-2E-01.1 Private	0.04	N	Dry	0	0	0	0	NA	NA	0
11-2E-11.1 Private	0.6	A	Year	0	0	0	0	NA	NA	0
11-2E-12.4	0.3	A	Year	0	0	0	2	NA	1,865	0
11-2E-12.10	0.3	A,N	Dry	0	0	0	0	NA	NA	0
11-2E-12.13	0.02	N	Dry	0	0	0	0	NA	NA	0
11-3E-8.0	1.5	A	Year	0	0	3	5	10,920	10,375	0
11-3E-17.0	0.8	A	Year	0	0	0	3	NA	13,200	0
11-2E-12.2	1.0	A	Year	0	0	0	3	NA	5,940	0

Haul Route	Miles of Haul	Road Type[1] (P,A,N)	Season of Use	Number of Crossings Over:				Nearest Distance (ft) from Crossing to LFH/CH by Type		Road Length Within 100' of LFH/ EFH (ft)
				LFH		Other Peren.[2]	Inter.[3]	Perennial	Interm.	
				Bridge	Culvert					
South Haul Route – an additional 6.5 miles of 11-1E-19.0 is shown on North Route (used on both routes)										
11-1E-19.0 Snow Peak	1.5	A	Year	1	0	1	5	2,932	350	0
11-2E-22.0 Private	2.3	A	Dry	1	0	3	7	225	245	0
11-2E-14.0 Private	1.4	A	Dry	0	0	4	4	1,090	1,265	0
11-2E-14.0	0.6	A	Dry	0	0	0	3	NA	3,198	0
11-2E-13.1 Private	0.4	A	Dry	0	0	1	0	3,365	NA	0
11-2E-13.1	0.9	A	Dry	0	0	0	1	NA	4,735	0
Spur roads to South Haul Route										
11-2E-13.2	0.2	A	Dry	0	0	0	2	NA	4,710	0
11-2E-13.4 Private	0.2	A	Dry	0	0	0	0	NA	NA	0
11-2E-13.4	0.1	A	Dry	0	0	0	2	NA	2,730	0
11-2E-13.3	0.2	A	Dry	0	0	0	0	NA	NA	0
11-2E-12.3	0.3	A	Dry	0	0	0	0	NA	NA	0
11-2E-12.11	0.1	N	Dry	0	0	0	0	NA	NA	0
11-2E-12.12	0.1	N	Dry	0	0	0	0	NA	NA	0

Notes: Distances are estimates based on BLM 1:24,000 stream hydrography maps using ARCMap software. Notes continued…
1. Road surface types; P=Paved, A=Aggregate, N=Natural Surface
2. Peren. = Perennial Stream
3. Inter. = Intermittent stream

Environmental Effects

3.5.1 Project 1 – Density Management Thinning

3.5.1.1 Proposed Action

Fish and Aquatic Habitat (ACS Objectives 2, 3, 8)

Stream Channels

The proposed thinning would not impact channel conditions and fish habitat because the Stream Protection Zones (SPZ) which serve as no-disturbance buffers are adequate to intercept and infiltrate water carrying sediment, preventing its delivery to streams and aquatic habitats (Olson and Rugger 2007; Rashin et al. 2006; CH2MHILL et al. 1999).

Stream Shading and Temperature

The SPZ would prevent disturbance from project actions to the primary shade zone of all streams in the project vicinity and maintaining at least 50 percent canopy in all thinning in the secondary shade zone would result in no change in solar radiation input and stream temperature in the project vicinity (Groom et al. 2011; Wilkerson et al. 2006; U.S. Forest Service and Bureau of Land Management 2005). In addition, summer stream temperatures of intermittent tributaries in the project vicinity would not be affected by thinning because no surface water would be present in these channels during the summer.

The low density thinning areas (1 acre each) would not affect shade levels or stream temperatures because they are all at least 200 feet from stream channels.

Large Wood (LW)

Potential changes to LW supplies from thinning would be so small that effects to listed fish habitat would be immeasurable. Within the project's SPZ no treatment would be done so no changes to LW recruitment would be caused by the project. In the project area adjacent to SPZ the trees would grow faster than they would without thinning, but statistically little LW is recruited from more than 60-100 feet (the minimum widths of SPZ on perennial streams) from perennial streams so that this would not have a discernible effect.

Thinning adjacent to SPZ on tributaries to Crabtree Creek is unlikely to affect LW supplies to Crabtree Creek. Thinning is unlikely to contribute appreciable amounts of LW to tributary channels because of minimum SPZ widths of 30-50 feet on intermittent and 60-100 feet on perennial tributary channels in the project vicinity and because the size of perennial and intermittent tributaries are too small to move LW to Crabtree Creek (<5 m wide, May and Gresswell 2003). Likelihood of debris torrent movement of large wood down these channels is extremely remote as channel gradients are moderate (7-10%) and the area is not landslide prone (slopes <50%).

Sediment and Roads

New roads to be constructed would not impact aquatic habitats or fish populations because they would not increase the size of the stream network (Wemple et al. 1996) or deliver sediment to any stream because they would be located and designed to avoid connecting to any live stream. They would be located on gentle slopes at least 175 feet from streams and designed so that runoff is drained to stable, vegetated slopes where it would infiltrate into the soil and ground water. Therefore there would be no pathway for increased amounts of water or sediment to reach streams.

Renovated roads would not impact aquatic habitats or fish populations because little, if any, sediment from these roads would reach stream channels. The roads already exist and renovation would not increase the size of the stream network, and renovation would be designed to drain nearly all runoff to stable, vegetated slopes where it would infiltrate into the soil and ground water rather than draining to streams via ditches.

Replacing culverts at two existing crossings of 1st order streams has a low potential to result in small amounts of turbidity reaching Crabtree Creek during the first heavy fall rains following the culvert replacement. Effects of the potential turbidity in Crabtree Creek on aquatic habitats of fish populations would be so small as to be immeasurable, both because of the small amount of inflow of the tributaries relative to that of Crabtree Creek, and because very little fine sediment is currently present in Crabtree Creek in Section 12 (steep 6% gradient channel, dominated by cobble and boulder; ODFW stream surveys 2005). Foltz et al. (2005) showed that turbidity from culvert work can move up to 0.5 mile (800 meters) downstream before sediment settles and diffuses enough to be imperceptible and the two culverts to be replaced are 0.35 and 0.5 mile upstream of fish habitat in Crabtree Creek. In addition, replacing these two culverts prevents further erosion and potential catastrophic failure which could result in sediment reaching fish habitat in Crabtree Creek.

Roads used for log hauling are grouped into two main haul routes (EA section 2.3.1.2):

- Log hauling and other project traffic on the "North Haul Route" would not impact fish and aquatic habitat because project design features would maintain water quality within ODEQ standards by avoiding sediment input to streams. Avoiding sediment input would be accomplished by: monitoring road surface and weather conditions, avoiding log hauling and other heavy traffic when sediment could be generated and transported to streams, and trapping sediment before runoff enters streams where it cannot be diverted to stable, vegetated slopes.
- Log hauling and other project traffic on the "South Haul Route" would not impact fish and aquatic habitat because project design features would preclude log hauling during the wet season and wet conditions to prevent generating sediment which could be transported to streams by runoff.

Threatened and Endangered Species

The Crab Race density management thinning project and associated actions "may affect, but are not likely to adversely affect" UWR steelhead trout and UWR spring Chinook salmon and their habitat in Crabtree, Rock, and White Rock Creeks. The "may affect" portion of the determination is based on the proximity of haul routes to listed fish habitat (LFH). The project is "not likely to adversely affect" listed fish or their habitat because roads proposed for use are either well-constructed and maintained or their use would be restricted to dry season and conditions, so no more than immeasurable amounts of sediment would be anticipated to reach streams with LFH.

Similarly, two culvert replacements on 1st order intermittent streams located 0.35 to 0.5 mile upstream of LFH, would contribute no more than immeasurable amounts of sediment to LFH, both because of the small amount of inflow of the tributaries relative to that of Crabtree Creek, and because very little fine sediment is currently present in Crabtree Creek in Section 12.

Thinning adjacent to and upstream of LFH in upper Crabtree Creek would not impact listed fish or their habitat because project design features including the thinning prescription and SPZ would prevent direct impacts to LFH. As described above, the thinning would not cause changes to stream temperature or water quality, would not affect stream flows, and any change in large wood availability would likely be immeasurable and positive.

Consultation with the National Marine Fisheries Service (NMFS) on the potential effects of the Crab Race density management thinning project would be completed before project implementation. Potential project effects to Essential Fish Habitat (EFH) as designated under Magnuson-Stevens Fishery Management Act would also be consulted on with the NMFS prior to project initiation.

Cumulative Effects

The proposed action would not have cumulative effects to fish populations, fish habitat including LFH, or other aquatic habitat because the project would not change the magnitude, duration, extent or likelihood of any of the potential affects analyzed.

The proposed action would have no direct impacts (except as analyzed for culvert replacements on two intermittent 1st order streams) to channel morphology (channel shape and form) of streams in the project vicinity and hence no cumulative effects to channel morphology. With no direct or cumulative impacts to channel morphology, instream fish habitat (i.e. pool habitat, instream cover, stream depth, etc.) would not be affected.

Cumulatively, the limited magnitude and duration of sediment effects from roads in the project area would be unlikely to affect spawning and rearing success of fish populations. Indirect impacts of the proposed action to fish habitat and fish populations would likely be limited to a potential short term increase in suspended sediment and turbidity in <0.5 mile downstream of culvert installations. Short-term increases in sediment delivery and turbidity could occur with the culvert installations, once surface flows resume during fall rains. Over the long term, culvert repairs should help reduce risks to water quality and watershed hydrology that these roads currently pose.

No direct or cumulative impacts to peak flows are expected (Hydrology Report).

3.5.1.2 No Action Alternative

Aquatic Habitat

No changes to natural cycles and processes would occur because of not implementing the project. The effects of these cycles and processes include:

Under the No Action Alternative, canopy closure in primary and secondary shade zones along stream channels would remain similar to current levels, except for changes to tree canopy and consequently stream shade levels resulting from snow or ice break, wind storms, and wildfire. Unless these natural events were to occur, no changes to stream temperature would be expected.

No management actions would cause changes to flows or sediment delivery, so changes to flows, flow related changes to channels, or sediment delivery events would depend solely on natural causes.

Dense stands of trees near streams would self-thin over time, contributing LWD to stream channels. Windthrow from storms would also contribute LWD to streams.

Threatened and Endangered Species

The No Action alternative would have "no effect" on UWR steelhead trout and UWR spring Chinook salmon because no actions would be done to change natural processes.

3.5.2 Project 2 - Snag and CWD Recruitment

Any change to LW availability from recruiting snags or CWD in the LSR would be immeasurable due to the low intensity of the project. There would be no discernible difference in effects to fisheries and aquatic resources between the proposed action and No Action alternatives.

3.5.3 Project 3 – Road Closure to ACEC

The effects of the project on sediment are described in the Hydrology section, above, and would be of such low magnitude and intensity that no potential impacts to fish or aquatic habitat would be expected.

No other detectable direct, indirect or cumulative effects to fisheries and aquatic resources would be expected because no streams, lakes or adjacent vegetation would be modified.

3.6 Soils

Source Incorporated by Reference: Hawe, 2012 Soils Specialist Report for the Proposed Crab Race Project (Soils Report)

Affected Environment

Soil Series and Characteristics

Typical soils in the project vicinity formed in colluvium (material rolling downhill) from sedimentary, tuffaceous, basalt, and andesite rock and volcanic ash. Soils in river floodplains formed in alluvium (water transported materials) or glacial till. Soils series mapped in the project vicinity (Table14) are primarily: Bensley, Valsetz and Crabtree stony loams; Kinney, Klickitat and Moe gravelly loams; and Acanod silt loam.

In the steeper forested slopes near the ridgeline, soils tend toward stony loams on 30-60% slopes with slightly higher hazard of erosion than other soil series in the project vicinity. With the exception of Acanod, project soils are well-drained and moderately deep, with some local areas of rock outcropping on ridgetops. Acanod, primarily found in section 12, has low permeability and may have a seasonal water table due to a restrictive soil-rock layer at around 60 inches in depth. Project soils are suited for growing Douglas fir and western hemlock.

Table 14 Project Specific Soils Series for Density Management Thinning Project

Soil Map Unit	Soil Series[1]	Slope[2]	% Clay	Erosion Factor (*Kw*)[3]	Coarse Fragments[4]
2D	Acanod silt-loam	2-25%	18-27%	0.28	0-20%
10E	Bensley stony loam	2-30%	15-25%	0.10	15-25%
11F	Bensley-Valsetz stony loam	30-50%	15-25%	0.10	15-25%
11G	Bensley-Valsetz stony loam	50-75%	15-25%	0.10	25-35%
30D	Crabtree stony loam	2-25%	15-25%	0.10	30-45%
52G	Keel gravelly silt loam	45-75%	------	0.20	5-10%
59G	Kinney-Klickitat complex	50-70%	20-27	0.10	15-30%
70F	Moe gravelly loam	25-50%	18-27	0.17	0%

1 Principal soil series in Soil Data Mart data for Linn County Area, Oregon (USDA Natural Resources Conservation Service, 2005). http://www.or.nrcs.usda.gov/pnw_soil/or_data.html
2 Slope values in parentheses are for approximately less than 5% of the unit; estimated from classified DEM (Digital Elevation Model), cell size: 10 Meters.
3 Soil erodibility factor, Revised Universal Soil Loss Equation (RUSLE); 0.0-0.2 = readily infiltrated, 0.2-0.3 = intermediate infiltration and moderate structural stability, >0.3 = more easily eroded with low infiltration capacity (Brady 1996, Wischmeier and Smith 1978).
4 Rock fragments greater than 3 inches diameter in A and B horizons.

Based on GIS mapping of slope classes in the project area, approximately 50% of the proposed project units are on low slope gradient of 0-35%. The remaining 50% of the units proposed for treatment are on moderate slopes of 35-65%. A few steeper areas (>65%) are outside the proposed treatment units and are primarily located on slopes adjacent to Crabtree Creek.

Environmental Effects

The BLM has observed the effects of logging operations in thousands of acres of commercial thinning for several decades under a variety of conditions. The following descriptions of direct

effects are drawn primarily from those observations (including formal monitoring and measurements as well as observations during the course of other duties). The following descriptions of indirect effects are based on analysis in the RMP/FEIS as reflected in the RMP Best Management Practices (BMP), on published research, and on BLM field observations.

3.6.1 Project 1, Density Management Thinning

3.6.1.1 Proposed Action

Direct Effects on Soil Compaction / Disturbance / Displacement

For all Logging Operations

Following completion of the harvest, the majority of understory vegetation and root systems would remain, along with surface soil litter and slash from harvested trees. The expected 5-9 percent of surface area soil displacement and soil compaction from harvest operations would not exceed 10 percent of each project area, consistent with RMP BMP (pp. C-1-2) because less than 10% of surface soils would be subject to operations that could result in compaction or soil displacement.

The proposed action would maintain sufficient mycorrhizae populations because the root systems of most vegetation would remain undisturbed and there is no evidence that past disturbance of the area has affected mycorrhizae populations.

The narrow openings created by skid trails (12 ft. wide), cable yarding corridors (12 ft.) and natural surface road construction (37 ft.) would not noticeably affect average tree spacing of 18 to 27 feet average after treatment. The listed widths of these openings are between tree trunks, tree crowns extend into the "open" area.

Ground Based Logging Operations

Skidding would cause a moderate amount of top soil displacement and moderate to heavy soil compaction on skid trail surfaces, comprising approximately 6-8 percent of the area skidded. Some of the skid trail would be located on existing skid trails used during the original logging of the sites. Skidding typically leaves trails of exposed soil up to 12 feet wide. 260 acres would potentially be skidded. Other, less common, ground based logging systems which have equal or lesser impacts may be used on part or all of the ground based logging area. Uncommonly, areas of analyzed for ground based logging may be logged with cable systems which have lesser impacts, as described below.

The tracked equipment used for mechanized harvest (cut, limb and buck trees into logs) and/or placing logs adjacent to skid trails (or cable yarding corridors) would cause some light compaction and displacement between skid trails when working on a slash mat as described in project design features. Harvester operations typically place slash in rows for the machinery to travel and operate on slash mats.

Hand falling operations would not cause discernible compaction or disturbance and would leave logging slash and debris evenly distributed over the ground.

Cable Yarding Operations

Cable yarding operations, including skyline and special yarding leave discontinuous trails of lightly compacted and disturbed soil in a narrow strip, typically less than 4 feet wide within a 12 feet wide corridor between trees. Due to variations in terrain, amount of suspension, number of logs yarded and amount of logging slash and debris on the ground in the corridor, short stretches

(<50 feet) of compacted and disturbed surfaces would be interspersed with longer stretches (>100 feet) of fairly undisturbed soil. The total area impacted would range from 3-7 percent of the 200 acres proposed for cable-yarding.

Landings:

Log landing construction and use would compact the soil and displace top soil at the site. However, about half of the surface area used for landings would be the existing road surface (which is already compacted). The additional area adjacent to roads that would be needed for landing area is estimated to be approximately 1% of the total project area (4.6 acres). The degree of soil disturbance and compaction in areas where logs are sorted or decked would be expected to be low (shallow and relatively quick to recover) except for small areas where equipment travels or turns frequently. Soil disturbance from landings would be local to the landing area and would not affect soil resources on a watershed or landscape scale.

Road Work:

Total construction of new roads in section 12 would displace topsoil and compact subsoil on less than two acres, based on 0.4 mile of road construction with average 25 feet wide "footprint". This footprint consists of average 15 feet width compacted with a roller and five feet on each side of that potentially disturbed or displaced. The road to be constructed would be on gentle topography with slopes ranging from 15-30 percent. Clearing width would average approximately 37 feet between tree trunks.

Rock Source:

Removal of rock from the Harry Mtn. Rock Pit would not affect soil productivity because this is already a developed rock pit.

Direct Effects on Soil Erosion

The proposed action would not lead to any measurable increase in surface erosion, and soil erosion would remain within the range of background rates. BLM field reviews (Hawe, 2012) of cable and ground based logging units on BLM land during intense rainstorm events from 2007-2012 found no evidence of surface erosion or overland flow on units where erosion models had predicted surface erosion and sediment transport after logging under similar conditions. The project would have no effect on mass wasting processes, as described under Hydrology.

Indirect Effects on Site Productivity due to Soil Compaction, Displacement and Disturbance

The effect on overall site productivity from light compaction caused by skyline yarding and mechanized harvesters operating on slash mats between skid trails is expected to be low (no expected measurable reduction in overall yield for the project area).

No loss of growth and yield would be expected because of moderate to heavy compaction, disturbance and displacement in heavily used skid trails and light to moderate compaction in lesser use trails. No research reviewed for this project documented a reduction in growth at the stand level from skid trails, cable yarding roads and single lane natural surface roads. Thinning typically leads to acceleration of tree growth and compacted areas affect much less than half of the rooting area of trees adjacent to the skid trail, resulting in higher overall growth.

Approximately five acres (1.1 percent of the project acres) of compacted road surfaces and landings in the project area would remain far below potential conifer site productivity levels for

many decades. Other vegetation would grow. Compacted soil recovers over time through natural processes such as root growth, freeze-thaw cycles, animal and insect burrowing, etc.

Pile Burning

Burning would remove surface organic material (O-horizon) and the heat would potentially damage the upper soil layer (A-horizon) in small, localized areas where piles were burned. Any soil displaced by rain would be filtered and retained by the intact vegetation immediately surrounding the burn pile spots. Since burning would occur when soils were damp, heat damage would be moderated. No loss in site productivity would be expected because the areas affected would be scattered and small.

Skid Trail Stabilization

Stabilizing skid trails and natural surface roads by shaping (such as water bars), seeding with native species, and covering them with slash and debris would promote drainage and prevent water from accumulating in large quantities that could cause erosion. Accumulated litter-fall on the road surfaces would further reduce any potential for surface erosion over the next several years. Blocking skid trails would prevent vehicle use which could cause erosion.

Cumulative Effects

An overall maximum 41 acre increase (9 percent of 460 project acres) in compacted/disturbed surfaces in the 26,774 acre Upper Crabtree Creek watershed would result in less than a 0.2 percent increase in total compacted surfaces (estimated as 5 percent, or 420 acres) in the watershed. This would decrease over time and approach current levels within a decade as soil surfaces decompact through natural processes.

3.6.1.2 No Action Alternative

With no management actions, there would be no changes to natural processes affecting soil conditions and characteristics.

3.6.2 Project 2 – Snag and CWD Recruitment

Felling trees and leaving them in place for CWD would cause minor soil displacement and compaction where the tree falls, but no more so than the impact of a natural tree fall and would have no measurable effect on soil resources, erosion or site productivity. Felled trees left as CWD would help cover the soil surface and prevent surface erosion. Snag creation by girdling or topping would have no effect on soils.

3.6.3 Project 3 – Crabtree Complex Road Closure

Operations would have no impact on soil resources or site productivity because all proposed operations would take place within the right-of-way of an existing road.

3.7 Wildlife

Sources incorporated by reference: Cascades Resource Area EA Wildlife Report, Crab Race Project, England and Murphy, 2013 (Wildlife Report); Bonney, D. 2012. Crab Race Thinning and Silvicultural Prescriptions (Silviculture Report), Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.;USDI, Bureau of Land Management, Salem District, Cascades Resource Area. 2001, Crabtree Creek Watershed Analysis (CCWA 2001); USDI, Bureau of Land Management; Fish and Wildlife Service; USDA Forest Service. April 2012. Biological Assessment of Not Likely to Adversely Affect Projects with the Potential to Modify the Habitat of Northern Spotted Owls, Willamette Planning Province – FY2013 (BA 2013);

USDI Fish and Wildlife Service. June 2012. Letter of Concurrence and Conference Concurrence Regarding the Effects of Habitat Modification Activities within the Willamette Province, FY2013, Proposed by the Eugene District, Bureau of Land Management; Salem District, Bureau of Land Management; Mt. Hood National Forest; Willamette National Forest; Columbia River Gorge National Scenic Area on the Northern Spotted Owl and its Critical Habitat; FWS Reference #01EOFW00-2012-I-0105 (LOC 2013).

3.7.1 Project 1, Density Management Thinning

Affected Environment

Descriptions of stand conditions as they relate to wildlife habitat are based on stand exam data, aerial photo interpretation and field review by BLM resource specialists in wildlife biology (wildlife biologist) and silviculture (silviculturist).

General Stand Condition

General stand development and condition are described in the Vegetation section of this EA (section 3.3). The specific stand conditions relevant to wildlife habitat are discussed in this section.

When these forest stands were established and treated to promote timber production, little or no consideration was given to habitat issues. Consequently, the forest stands proposed for treatment in the Density Management Thinning project area and vicinity are typically even-aged stands lacking species diversity, ground cover and deciduous shrub understory layers.

Stands initiated and managed in this way with relatively uniform age, species composition and spacing are not "equivalent" to similar-aged unmanaged stands and the trajectory originally intended for many of these stands "would neither contribute to nor perpetuate old-forest characteristics on these landscapes" (Hunter, 1993). Variation in forest stand conditions within stands and at the landscape level have been identified as a key factor in providing habitat for a diversity of forest organisms (Hayes et al, 1997; Muir et al, 2002).

These stands lack structural heterogeneity, especially large remnant overstory trees and standing dead material (snags). Very little evidence of the previous stands is apparent, except for scattered concentrations of large CWD and scattered snags in advanced stages of decay. Canopy cover is generally 70-95 percent, so understory shrub development has generally been retarded and ground cover is sparse (generally less than 10 percent).

Dead wood in the form of snags and down logs, remnant live trees, and vertical and horizontal variation in tree and understory canopies in a stand have been found to be important contributors to habitat diversity. Habitat diversity makes the stands habitable by a broader range of forest-associated animal species, also called "species richness". Also, hardwood trees and shrubs in particular have been found to be important contributors to forest biodiversity, providing habitat substrate, food sources, foraging substrate, and nesting opportunities. All of these features are generally lacking in the managed stands proposed for thinning.

Snags, Down Logs, Old-Growth Remnants and Special Habitats

Dead wood in the forms of snags and down logs, remnant old-growth trees and special habitats provide important ecological functions for many wildlife species.

Snags are standing dead trees. Management direction for snag retention in the Matrix (RMP p. 21) is based on the number of snags necessary for five cavity-excavating woodpecker species to maintain 40 percent of potential population levels (Nietro et al, 1985), Most wildlife species that utilize snags are associated with snags greater than 14.2 inches (Rose et al, 2001), so only snags

15 inches and larger diameter are used to meet management direction. Smaller snags have less volume so they provide less habitat and do not persist as long in the forest environment as larger material. Table 15 summarizes the snags currently present in the project area.

Table 15 Summary of snags currently available by project unit

Crab Race Project Area: Snags at least 15' tall/ 100 acres						
Unit #	Snags 15-25" dbh		Snags greater than 25" dbh		Total snags (15"+ dbh)	
	Hard	Soft	Hard	Soft	Hard	Soft
12A	0	0+	0	0	0	0+
12B	0	0	0	0	0	0
12C	0	0	0	0	0	0
12D	0+	0	0	0	0+	0
12E	0	0	0	0	0	0
13A	0+	0	0	0	0+	0
7A	0+	0	0	0	0+	0
7B	0	0	0	0	0	0
7C	0	0	0	0	0	0
7D	0	0	0	0	0	0
8A	0+	0	0	0	0+	0
8B	0+	0	0	0	0+	0
8C	0	0	0	0	0	0
8D	0	0	0	0	0	0

The use of 0+ in the table denotes trace numbers of snags observed to be present but that were not found on stand exam plots.

Within the mid seral stands in the project area and vicinity there is a near-term snag deficit and snag habitat within the proposed units does not meet the management direction of 40 percent of maximum population densities. The snags that are present are small (less than 15" diameter). Trees that could have developed into large snags and down logs were removed by past clearcutting and site preparation.

Down logs are also useful to forest floor associated wildlife species. Existing hard down logs in the project area are the result of recent suppression mortality in overstocked stands and are less than 20 inches in diameter. The large logs that are currently present in these stands are soft logs in advanced decay classes. Small logs are much less useful for forest floor-associated wildlife species because they have less volume so they provide less habitat, moisture content cycles to wider extremes and faster, and they persist for shorter periods of time (usually less than two decades) compared to larger material. The material present in these forest stands is not adequate to meet all the needs of dead wood associated species and doesn't meet management direction of 240 linear feet per acre of hard down wood (decay classes 1 and 2) in pieces that are at least 20 inches diameter at the small end and at least 20 feet long, known as coarse woody debris, or CWD (RMP pp. 21, 25).

Existing soft down logs (decay classes 3-5) found in the project area are usually remnants of old-growth "cull" trees that were felled but not removed after harvest, or large CWD carry over from the previous stand. These logs provide valuable habitat for a host of down CWD associated wildlife species (O'Niell et al, 2001), and they persist for many decades before passing through advanced decay classes to become unrecognizable as down logs. Table 16 shows the linear feet per acre of both hard and soft down logs in each unit based on data from stand exams.

Old-growth remnants are conifer trees older than 200 years. There are no remnant old-growth trees or large second growth remnant trees (larger than 35 inches DBH) present in the proposed Crab Race units. Table 16 shows the presence/absence of remnant old-growth trees in the project area. BLM resource specialists usually identify old-growth trees based on observations of tree size and form, bark characteristics, limb development, and sometimes by ring counts using increment borer cores.

Special habitats consist of wet and dry meadows, wetlands, talus, cliffs and rock outcrops. There are wet areas with seasonal ponds adjacent to units 12 A, B and C, and a wetland located adjacent to unit 12D. There are wet meadows associated with some, adjacent to units 12 C and 12 D, of the wet areas and wetlands in the project vicinity and adjacent to Project 3 (see Figure 12, EA Section 3.4.1 and Section Maps, EA Section 7.2). Field examination shows that conifers are encroaching from the edges of some of these meadows, reducing their size. Table 16 shows the presence/absence of special habitats in and adjacent to the project area.

Outside of the proposed density management units, large snags, down CWD and high quality old-growth trees are abundant in the remaining mature/old-growth stands and there are a variety of special habitats in the Upper Crabtree Watershed where the Crab Race project is located (CCWA Chp. 5 p. 11; IDT field observations; GIS data).

Table 16 Summary of Seral Stage, Down Logs, Remnant Old-Growth Trees, and Special Habitats Present by Project Unit

Name/Unit	Location	Seral Stage	Down Logs*	Remnant Old-Growth Trees**	Special Habitats
12A	11S-2E-12	Mid Seral	0'/175'	No	wet area#
12B	11S-2E-12	Mid Seral	0'/30'	No	wet area#
12C	11S-2E-12	Mid Seral	0'/175'	No	wet area#
12D	11S-2E-12	Mid Seral	0'/195'	No	wetland#
12E	11S-2E-12	Mid Seral	0'/240'	No	No
13A	11S-2E-13	Mid Seral	0'/135'	No	No
7A	11S-3E-07	Mid Seral	0'/270'	No	No
7B	11S-3E-07	Mid Seral	0'/185'	No	No
7C	11S-3E-07	Mid Seral	0'/320'	No	No
7D	11S-3E-07	Mid Seral	0'/175'	No	No
8A	11S-3E-08	Mid Seral	0'/230'	No	No
8B	11S-3E-08	Mid Seral	0'/50'	No	No
8C	11S-3E-08	Mid Seral	0'/35'	No	No
8D	11S-3E-08	Mid Seral	0'/75'	No	No

Seral Stage Age Classes (years) based on Stand Exam data: Early Seral = 0-30; Early Mid Seral = 30-40; Mid Seral = 40 – 60; Late Mid Seral = 60 -80; Early Mature Seral = 80 - 120; Mature = 120 - 200; Old Growth =200+

* *Linear ft/acre ≥20 inches diameter & ≥20 feet long, hard (decay classes 1-2)/soft (decay classes 3-5) logs.*

* *Conifers older than 200 years.*

\# *Presence of adjacent special habitat, wetland, pond is adequately protected with no treatment buffer.*

Federally Listed Species

Threatened - Northern Spotted Owls

The proposed thinning units provide 460 acres of dispersal habitat in the Crabtree Creek Watershed. Of this 460 acres, 220 are in LSR and associated Riparian Reserves and 60 acres are in Riparian Reserves associated with the Matrix. The remaining 180 acres are Matrix/GFMA. None of the units are located in 2012 Critical Habitat and or unmapped Late Successional Reserves (LSRs) which are 100 acre core areas of known spotted owls as of January 1994. None of the units meet the stand level conditions characteristic of Recovery Action 32 Habitat (RA 32) according to the Northern Spotted Owl Recovery Plan (NSO 2011 pp. III-67-68).

There are three known spotted owl sites within the provincial home range (PHR) radius (1.2 miles) of the Crab Race project area. Barred owls have been detected in all three of these sites. Thinning would occur within disturbance range (0.25 miles) of one known spotted owl site. Units 12D,E and 13A,B,C,D are within this disturbance range.

Special Status, Survey and Manage, and other Species of Concern

Thirty-seven BLM Special Status, Survey and Manage (S&M) and other Species of Concern (SOC) were reviewed for potential presence in the Crab Race project area based on field inventories of the habitats present in and adjacent to the project area and a review of existing literature. In addition to the Northern Spotted Owl (described above), the red legged frog (a Species of Concern) is documented to occur in the project area. Twelve SSS, S&M and SOC are suspected to occur in the project area and twenty-one species were determined to be unlikely to occur in the project area (Wildlife Report, Table 6).

Vegetation surveys (stand exam data) indicate that most of the stands proposed for thinning are lacking in habitat elements that support diverse populations of wildlife species, especially snags, down logs, deciduous understory and ground cover vegetation, or deep accumulation of leaf litter. Habitat, range data, and previous surveys for mollusks and amphibians conducted over 9000 acres on the Cascades Resource Area since 1991 indicate that no Bureau Sensitive mollusk species are likely to be present in the proposed thinning units. The BLM is only required to address species with Federal Status, Bureau Sensitive Species and Migratory Birds.

Johnson's Hairstreak (*Callophrys johnsoni*) – **Bureau Sensitive:** This species is an obligate old-growth butterfly whose larvae feed on dwarf mistletoe and may be found in younger forests that contain dwarf mistletoe (Hoffman and Lauvray 2005). Units 12A-E and 7A have low to moderate amounts of dwarf mistletoe and are within the elevation range of the Johnson's hairstreak and it could be present in the project area. No surveys for this species were conducted because they live high in tree canopies and surveys are limited in their ability to detect their presence (Davis and Weaver, 2011).

Bats: There are no Bureau Sensitive bat species suspected to occur in the Crab Race project area. Four bat species of concern are suspected to occur in the remaining old-growth forest stands in the Crab Race project vicinity (silver-haired bat, long-eared myotis, long-legged myotis, and Yuma myotis), but there is no suitable habitat (caves, mines, bridges, buildings, cliffs, old-growth trees/snags) for these species in the project area.

Oregon Slender Salamander – Former Bureau Sensitive: This species is no longer a Bureau Sensitive species (BLM IM OR-2012-018) and is on List 4 according to the Oregon Biodiversity Information Center C (ORBIC 2010). It is expected to occur in portions of the project areas

where down CWD of adequate size occurs. Oregon slender salamander has been found throughout the Cascades Resource Area in stands across the full range of seral stages.

Red Tree Vole – Survey & Manage: This species is an arboreal vole associated with conifer forests west of the Cascades summit below about 3,500 feet elevation. The project area is within the upper elevation range for the species and red tree voles could be present in the project area, but the habitat is marginal at best because of their location and stand age. No surveys were conducted because all of the stands proposed for treatment are younger than 80 years and meet the Pechman exemption. None of these stands meet the stand-level criteria described in the Red Tree Vole Protocol (Huff et al. 2012).

Cascades axe tailed slug *(Carinacauda stormi)* - **Bureau Sensitive:** The Cascades axe tailed slug is associated with conifer and leaf litter debris in Douglas-fir, western hemlock and vine maple woodlands. Habitat conditions for the slug in the project area are poor due to a lack understory vegetation characteristic of the slug's habitat, and heavy ground disturbance from the previous clearcut harvests. The Cascades Resource Area has 15 sightings, and the adjacent Mount Hood and Willamette National Forest have over 300 records of its occurrence, indicating that it may be more common than previously thought.

Migratory and Resident Bird Species: Bird species richness at the stand level has been correlated in some recent studies with habitat patchiness, densities of snags, and density by size-class of conifers (Hagar, McComb, and Emmingham, 1996; Hansen et al, 2003). Even-aged conifer stands provide habitat for a relatively high abundance of a few bird species, many of which feed on insects gleaned from conifer foliage. The most common species include chestnut-backed chickadee, Pacific-slope flycatcher, hermit warbler, golden-crowned kinglet, varied thrush, winter wren, red-breasted nuthatch, and Swainson's thrush - species which are also common or more abundant in mature conifer stands (Hansen et al, 1995).

The proposed thinning areas are even-aged conifer stands the mid seral, stem exclusion stage. These forest conditions are structurally simple and characterized by an even-aged, single-layered, closed-canopy with poor understory development, and are low in landbird species richness. The light-limited understory of unthinned stands does not provide for a diverse community of shrub and ground cover plant species that are important in providing insect and plant food resources for bird species which rely on living deciduous trees, shrubs, and leaf litter (Hagar, 2004). Abundance of arthropod prey species has been correlated with understory and midstory vegetation, particularly tall shrubs and hardwoods. These habitat elements are lacking or poorly-developed in the stands proposed for thinning.

In the western Oregon Cascades there is temporal variability of breeding bird species and individuals of the same species in forested habitats. For example some owls and woodpeckers begin breeding in February or March while some flycatchers do not finish breeding until August. The majority of birds in the Pacific Northwest complete their breeding cycle within the April 15 to July 31 time period (Altman, Hagar 2007).

Big Game: Big game species that are found in the project area include Roosevelt elk (*Cervus elaphus roosevelti*) and black-tailed deer (*Odocoileus hemionus*). The project area units are in mid seral stands which provide hiding and low quality thermal cover. Early to mid seral stage stands are predominant in the Crabtree Watershed, especially on private lands in the vicinity. The Salem District Record of Decision and Resource Management Plan (RMP) approved May 1995, identifies no critical winter or summer range in the project vicinity (RMP p.26). Big game

use is highest during the snow free months which varies from year to year, typically occurring from late spring through early fall. Big game use is highest in units 12A-D, and 7A.

Environmental Effects

3.7.1.1 Proposed Action

Stand Structure

All Land Use Allocations

The proposed density management thinning treatment would have both short term (less than 5 years) and long term (more than 5 years) effects. In the short term, thinning these structurally simple mid-seral stands would result in a reduction of suppression mortality, canopy cover, understories and ground vegetation. In the longer term, there are trade-offs of thinning these mid seral stands in terms of a loss of smaller diameter suppression mortality that would occur without thinning versus an increase in stand complexity as a result of thinning. While thinning these stands would reduce the number of small diameter (less than 15 inches DBH) snags that would otherwise die from suppression mortality, there would be an increase in understory development, crown structure and growth of the residuals. The long term effect of thinning would be to increase canopy structure, tree diameters and spacing of the leave trees; and increase understory development. Stand conditions and structural complexity would improve as canopies close and thus improve habitat quality for mid to late successional wildlife species.

Research that has occurred since the 1980s has determined that it is possible to develop desired structural and compositional diversity in young managed stands through specific actions (Bailey and Tappeiner, 1997; Chan et al, 2006). Thinning forest stands produces what has been described as "cascading ecological effects" (Hayes, Weikel and Huso 2003) that result from reduced competition between overstory trees and increased availability of solar radiation to the forest floor. Growth, size, branch diameter, and crown ratio of the remaining trees is increased, and development of understory and ground cover vegetation is stimulated. These changes effectively increase structural complexity and alter habitat quality. The increase in structural diversity would improve habitat for many species by providing more opportunities for foraging, nesting/breeding, resting, hiding and escape cover/habitat for a variety of species in the forest environment, including invertebrates, songbirds, and small mammal species. These changes are considered to be beneficial since there is an abundance of simplified mid seral stands in the Crabtree Creek Watershed (CCWA Chp. 5 pp. 4-7; Chp. 7 p. 1).

Proposed road construction and renovation, skid trails and skyline corridors under the proposed action would create narrow linear openings through the vegetation, disturbing, reducing or removing ground vegetation and creating breaks in the canopy, which allow more light to reach the forest floor. The effects on wildlife habitat would be a short term (less than 5 years) disturbance and reduction in ground vegetation and canopy closure that would increase access to the stand by certain wildlife species, specifically larger mammals such as big game, coyotes, and avian predators. In the long term (more than 5 years) ground vegetation would become re-established due to increased light to the forest floor and the breaks in the canopy would close.

The proposed action includes up to 20 one acre low density thinning patches. These openings would increase understory layering, structural diversity and ground cover, adding complexity to the forest stands. Species which are expected to benefit from low density thinning patches are ruffed grouse, Wilson's warbler, warbling vireo, song sparrow and big game species.

Late Successional and Riparian Reserves

The age classes proposed for thinning provide the greatest opportunities for acceleration of tree diameter growth and understory development through thinning and density management (CCWA, Chp. 7, pp. 5-6). It is anticipated that thinning would improve habitat conditions in the Reserves for wildlife by accelerating development of late seral forest stand characteristics. Desirable late seral forest stand characteristics include larger trees for a large green tree component and recruitment of large standing dead and down CWD in future stands, multi-layered stands with well-developed understories, and multiple species that include hardwoods and other minor species.

At the landscape level, connectivity for species such as the spotted owl is expected to improve as late successional conditions develop in the Reserves. Other species which would benefit from the development of older forests in the Reserves include many species of mollusks, amphibians, bats, the red tree vole, blue grouse, red-breasted sapsucker, pileated woodpecker, Cooper's hawk, Pacific-slope flycatcher, Swainson's thrush, black-throated gray warbler, and black-headed grosbeak, olive-sided flycatcher, brown creeper, and hermit warbler.

Snags, Down Logs (CWD), Old-Growth Remnants and Special Habitats

All Land Use Allocations

Thinning these stands would reduce the number of small diameter (less than 15 inches DBH) snags over the next 20 to 40 years because thinning from below removes the smaller suppressed and intermediate trees that would otherwise die from suppression mortality and become snags within that time period. Also, some of the existing smaller diameter/taller snags (between 9 and 15 inches DBH and greater than 25 feet tall), would be felled for safety reasons, or fall incidental to thinning operations. These smaller snags have less value for wildlife species than the larger material over 15 inches (Rose et al, 2001). In unmanaged forests the presence of cavity nesting birds has been linked to the presence of snags, particularly greater than 50 cm (19.26") (Carey et al. 1991, Huff and Raley 1991). Snag associated species such as chestnut backed chickadees, red breasted nuthatches, brown creepers and hairy woodpeckers have shown selectivity to foraging habitats based on deciduous trees, large diameter conifers, and large diameter heavily decayed snags and logs (Weikel, 1999). Approximately 90 plus percent of existing snags over 15 inches diameter would remain standing after treatment while 10 percent or less of these large snags are fragile and fall incidental to operations or need to be felled to maintain safe project operations.

Up to two trees per acre would become snags or CWD when retained trees are damaged by logging or must be felled to facilitate safe and economical logging operations and are left in place (EA Table 4, Project Design Features) to provide habitat for dead-wood associated species.

Small dead wood created through suppression mortality would be abundant in adjacent untreated areas. Analysis shows that there are about 2,500 acres of mid seral stands on BLM lands in the Upper Crabtree sub watershed. A total of 460 acres are planned for thinning, leaving 80 percent of these mid seral stands untreated. There would be untreated areas to provide small dead wood from suppression mortality, and improved growth rates of retained trees in thinned areas to provide for future recruitment of larger diameter dead wood.

Throughout the project area, approximately 50 to 140 green trees per acre would be retained for green trees, and recruitment of snags and down logs in the future stands (RMP p. 25). As a result of thinning, growth of retained live trees would be accelerated, so that larger trees would be available sooner for recruitment as snags and down logs than without thinning.

Existing large diameter down logs in more advanced decay conditions would persist and contribute to forest floor wildlife habitat conditions for many decades before passing through decay class five to become unrecognizable as down logs. It is anticipated that less than ten percent of existing down CWD would be directly impacted by logging because less than ten percent of the thinning area would be directly impacted by skidding/yarding, which is the operation with the highest potential impact to existing CWD. BLM oversight of skyline corridor and skid trail locations would ensure that they were located to avoid impact to high value CWD whenever feasible.

There would be no impacts to the wetland adjacent to unit 12D and the wet areas adjacent to units 12A, 12B, and 12C from standard density management thinning due to unthinned strips created during unit boundary marking. Cutting and removing individually selected trees immediately adjacent to the wet meadows in 12 C and 12 D in the unthinned strips would open the understory of grass, forbs and shrub component to additional sunlight and stimulate their growth. Cut-and-leave, or base or top-girdling trees in this area would create CWD, snags and also allow additional sunlight to reach the understory and stimulate it further. Dead wood recruited adjacent to these wetlands could result in beneficial effects by providing more snags and down logs closer to these areas for wildlife use and further retarding the rate of conifer encroachment into the wetland. These treatments may be partially completed with Project 1 and partially with Project 2.

There would be no effects to old-growth remnants since the proposed units lack these structures. There is old-growth adjacent to Units 12A-C, 12E; 7A-D; 8A, and 8C. Approximately 10 percent of the thinning boundaries are adjacent to old-growth stands and less than 2 percent of the old-growth in the Upper Crabtree sub-watershed basin is adjacent to thinning boundaries. All of these edges were created as high contrast edge when adjacent stands were clearcut, and have been exposed for 30 to 50 years. Understory layers and conifer reproduction is much thicker along these edges as a result. The conifer reproduction and understory edge would remain intact and the impacts of thinning would be low. Currently they are low contrast edge, and will remain low contrast edge after thinning.

Matrix/GFMA

In the Matrix, the treatment units are expected to remain in a snag deficit condition for two to four decades, until enough live trees become large enough (at least 20 inches diameter) to provide for recruitment of large snags and down logs which would meet RMP management direction. As a result of increased growth rates of retained trees, the RMP management actions/direction for snags (approximately two per acre) and down logs (240 plus linear feet per acre of material in decay classes 1 or 2, at least 20 inches in diameter at the large end, and 20 feet in length) in the Matrix could be met in 2 to 4 decades.

Late Successional Reserves and Riparian Reserves

In addition, snags and down logs would be created from up to two trees per acre in LSR and Riparian Reserves upon completion of thinning. See Project 2, below, for long range recruitment of snags and down logs.

Federally Listed Species

Threatened - Northern Spotted Owl

The Density Management Thinning may affect, but is not likely to adversely affect the northern spotted owl due to modification of dispersal habitat (BA2013; LOC2013). Thinning would

occur in dispersal habitat within the provincial home range of three known spotted owl sites. No suitable habitat would be treated and the viability of these sites would remain unchanged (ITS 2008).

The Crab Race project proposal is consistent with the Revised Northern Spotted Owl Recovery Plan (NSO 2011), and conforms with Recovery Actions 6 and 32. Recovery Action 6 recommends implementation of silvicultural treatments in plantations, overstocked stands and modified young stands to accelerate the development of structural complexity and biological diversity (NSO 2011 p. III-19). Recovery Action 32 recommends land managers maintain high quality suitable habitat. The proposed units do not meet the stand level conditions characteristic of Recovery 32 Habitat (NSO p. III-67)

The short term effect of thinning will be alteration of dispersal habitat. Current habitat conditions for the spotted owl would be maintained after treatment. "Maintain" habitat means light to moderate thinning in which forest stand characteristics are altered but the components of spotted owl habitat are maintained such that spotted owl life history requirements are supported. The functionality of the habitat used by spotted owls remains intact post treatment because dispersal habitat is maintained with a canopy cover of over 40 percent along with other habitat elements (including snags, down wood, tree-height class-diversity, and older hardwoods) to adequately provide for spotted owl dispersal.

Forest stands can be altered in a manner that is not necessarily expected to change the habitat function for spotted owls (Forsman et al. 1984; USFWS 2007). Such treatments can have long-term benefits to spotted owls by encouraging late-successional characteristics to occur more rapidly (BA p.14; LOC p.18). Thinning would accelerate the development of suitable habitat characteristics, especially in LSRs and Riparian Reserves. As thinned stands mature, habitat conditions are expected to improve.

Canopy closures would increase and the stands that are currently dispersal would attain suitable habitat conditions within 20 to 40 years. These stands would develop foraging and nesting structure and residual trees will increase in size and be available for recruitment of snags, culls and down logs for prey species and nesting opportunities for spotted owls. Subsequent treatments to create snags and down logs to meet LSRA CWD objectives would help move these stands toward suitable habitat conditions.

Thinning would occur within disturbance range (0.25 miles) of one known spotted owl site. Disturbance associated with thinning (logging, road-building, etc,) may have temporary effects on the presence or movement of spotted owls. However, thinning would maintain dispersal habitat, therefore maintaining the ability of the habitat to accommodate movement of birds after thinning is completed.

Seasonal restrictions on all habitat modifying activities on units 11S-2E-12D, 12E; and 11S-3E-8A, B, C and D during the critical nesting season would minimize the risk of disturbance to spotted owls (BA p. 11; LOC pp. 16).

Table 17 Spotted Owl Habitat Modification by Treatment Type, Land Use Allocation, Pre/Post Treatment Habitat Type, Habitat Modification Type, and Effect Determination[5]

5th. Field Watershed	Project	Township-Range-Section#	Proposed Treatment[1]	Acres	Land Use Allocation[2]	Pre/Post Treatment Habitat Type[3]	Habitat Modification[4]	Effect[5]
Crabtree Creek	Crab Race	11S-2E-12	moderate thin	180 ac	GFMA/RR	Dispersa l /Dispersal	Maintain	NLAA
Crabtree Creek	Crab Race	11S-2E-12	moderate thin	60 ac	GFMA	Dispersal / Dispersal	Maintain	NLAA
Crabtree Creek	Crab Race	11S-3E-7,8	moderate thin	220 ac	LSR	Dispersal / Dispersal	Maintain	NLAA
TOTAL				**460 ac**				

Notes and definitions for Table 17 (BA 2013, pp. 3-4, 14; LOC 2013, p. 18).

[1] Treatment Type:

Light to moderate thinning in dispersal or suitable habitat can be for forest health or to improve the structural characteristics of a stand or to provide commodity. Such treatments may be described as commercial thinning, density management, selective cut, partial cut, or mortality (standing) salvage. Such thinnings maintain a minimum of 40 percent average canopy cover. Light to moderate thinnings can have long-term benefits to spotted owls by encouraging late-successional characteristics to occur more rapidly.

[2] Land Use Allocations: GFMA=General Forest Management Area Matrix; RR=Riparian Reserve; LSR=Late Successional Reserve.

[3] Habitat Types:

Suitable habitat consists of conifer-dominated, 80 years old or older and multi-storied in structure, and have sufficient snags and downed wood to provide opportunities for owl nesting, roosting and foraging. The canopy cover generally exceeds 60 percent. No suitable habitat is proposed for thinning.

Dispersal habitat consists of conifer and mixed mature conifer-hardwood habitats with a canopy cover greater than or equal to 40 percent and conifer trees greater than or equal to 11 inches average diameter at breast height (DBH). Generally, spotted owls use dispersal habitat to move between blocks of suitable habitat, roost, forage and survive until they can establish a nest territory. Juvenile owls also use dispersal habitat to move from natal areas. Dispersal habitat lacks the optimal structural characteristics needed for nesting.

[4] Habitat Modifications:

Maintain habitat means to alter forest stand characteristics but maintain the components of spotted owl habitat within the stand such that spotted owl life history requirements are supported (i.e. the functionality of the habitat used by spotted owls remains intact post treatment). For spotted owl dispersal-only habitat a canopy cover of >40 percent along with other habitat elements (e.g. including snags, down wood, tree-height class-diversity, and older hardwoods) will be maintained post treatment to adequately provide for spotted owl dispersal.

[5] Effect: NE=No effect; NLAA=May affect, but not likely to adversely affect; LAA=May affect and likely to adversely affect.

Special Status, Survey and Manage, and other Species of Concern

Bureau Sensitive – Johnson's Hairstreak: Impacts to Johnson's hairstreak would be limited to removing individual trees in habitat that is marginal due to young age and low to moderate amounts of dwarf mistletoe. Primary habitat for Johnson's hairstreak is older forests with dwarf mistletoe and any populations in the project vicinity more likely to be present in adjacent old-growth stands which have a high incidence of dwarf mistletoe in the Western hemlock. Any reduction in available habitat would be short term because hemlock dwarf mistletoe is known to be very persistent and virtually impossible to eliminate without aggressive clearcutting (Hawksworth, Wiens 1996), and would persist after treatment.

Former Bureau Sensitive – Oregon Slender Salamander: The proposed thinning would have minimal effects to Oregon slender salamanders or their habitat. Oregon slender salamander's

primary habitat is CWD and less than 10 percent of existing CWD in the project area could be disturbed to facilitate logging. There would be a short term disturbance to up to 10 percent of this habitat, but it will remain present in the stand after treatment. Post-thinning treatment surveys in the Keel Mountain Density Management Study Area indicate that Oregon slender salamanders are not significantly affected by thinning (Rundio and Olson 2007). Oregon slender salamanders would be expected to persist at sites within stands where CWD of adequate size currently exists. The CWD currently on-site prior to thinning would continue to provide refuge for terrestrial salamanders many years after treatment.

Bats: No identifiable effects to bats would be expected to occur as a result of the project because there are no large snags with sloughing bark, large trees or old-growth which extend above the canopy to provide habitat for bats which would be affected by the project. These structures are present in the surrounding old-growth stands, some of which are adjacent to the proposed units. These old-growth forests provide higher quality roost sites than younger forests and many species prefer older forests (Thomas and West 1991, Perkins and Cross 1988).

Structural changes in stands caused by thinning may benefit bats by creating habitat structure in young stands that bats are able to use more effectively (Humes, Hayes, Collopy 1999). Bat activity appears to be higher in thinned versus unthinned stands.

Bat species are also associated with buildings, bridges, mines, cliff crevices and caves. None of these features are present in the Crab Race Project Area.

Survey and Manage – Red Tree Vole: The effects to red tree vole are expected to be minimal due to poor quality of this mid seral habitat. No habitat is being removed as a result of this proposal. In the short-term, undetected nests could be destroyed or disturbed during thinning. Thinning can temporarily inhibit dispersal and make habitat less suitable because of wider spacing between crowns (Hayes et al. 1997). After thinning is completed, stands would acquire older forest characteristics sooner than without thinning. Habitat conditions for red tree voles would gradually become more suitable after thinning as the stands continue to mature and develop older forest characteristics. Adjacent old-growth stands provide optimal habitat.

Cascades axe tailed slug *(Carinacauda stormi)*: The effects to the axe tailed slug are expected to be limited to very few or no individuals because these slugs are not expected to be present, and because logging activity would occur during the drier seasons when any mollusks that are present would be less active. Habitat conditions for the slug are poor because of the lack of understory vegetation characteristic of the slug's habitat and the effects of heavy ground disturbance during the previous clearcut harvests. Habitat conditions in adjacent old-growth stands are more favorable, with undisturbed ground and abundant vine maple in well-developed understories.

Migratory and Resident Birds: Unintentional take of nests, eggs, nestlings and nesting failure would be likely if harvest operations occur during active nesting periods. However, the impacts would be short term, involving loss of nests and unintentional take during one nesting season so the project would not reduce the persistence of any bird species in the watershed or populations at the regional scale. Some individual birds may be displaced during harvest operations in the project area due to disturbance. Adjacent untreated areas and areas where active operations are not occurring would provide refuge and nesting habitat, which would minimize short term disturbance.

Changes in habitat structure are expected to have immediate effects on bird communities in thinned stands. Thinning densely-stocked conifer stands would be expected to immediately

enhance habitat suitability for species which prefer a less dense conifer canopy, and reduce habitat suitability for species that prefer continuous conifer canopies. Reducing the canopy closure and opening up stands is expected to have short term negative effects on the brown creeper, golden-crowned kinglet, hermit warbler, Pacific-slope flycatcher and varied thrush however, these species are also common or more abundant in mature conifer stands as well (Hansen etal. 1995). The thinning would have no effects or even positive long term effects on this same set of species as understories develop and habitat quality improves.

Overall bird species richness (a combination of species diversity and abundance) would be expected to gradually increase for up to 20 years as hardwood components of stand structure develop, plant species composition becomes more complex, and hardwood shrub layers, epiphyte cover, and snag density become more prominent within the stands. The future development of hardwood/deciduous tree/bush components and canopy layers would favor species such as the band-tailed pigeon, ruffed grouse, red-breasted sapsucker, Wilson's warbler, Hutton's Vireo and black-throated gray warbler. The low density thinning patches would encourage the development of hardwood/deciduous tree/shrub components and canopy layers more rapidly, and would further benefit this same set of species.

Big Game: Big game species would be temporarily disturbed during the implementation of the proposed action. Logging equipment noise and human presence may cause animals to avoid or disperse from the project areas temporarily. Thermal and hiding cover would be maintained after harvest. Thermal and hiding cover quality would decrease in the short-term as a result of thinning, opening new roads, renovating roads and road improvements (Cole et al. 1997; Trombulak and Frissell 1999; USDA (PNW) 2006). Vegetative forage such as saplings, shrubs, grasses and forbs would increase as a result of thinning and road closures after thinning. As a result of increased light, forage quantity would increase and attract early successional species such as elk and deer to the thinned areas. This response of early seral plant species will be especially evident in the low density thinning areas.

In the long term (5 plus years), thermal and hiding cover quality would increase and vegetative forage such as saplings, shrubs, grasses and forbs would gradually decrease as a result of canopy closure decreasing the amount of light reaching the forest floor. Vegetative forage would persist longer in the low density thinning areas.

Cumulative Effects

Snags and Down Logs (CWD)

Thinning these stands would reduce the number of small diameter (less than 15 inches DBH) snags over the next 20 to 40 years from trees that would otherwise die from suppression mortality and become snags. Analysis of the Upper Crabtree sub basin shows that 80 percent of the sub basin would remain untreated. Closer analysis shows that in the immediate vicinity of the treated areas, 40 to 50 percent of these stands would remain untreated. Small dead wood would still be present and available in adjacent untreated areas. Design features would retain at least 90 percent of existing down logs 20+ inches and snags 15+ inches diameter and it is probable, based on BLM experience with similar commercial thinning, that all hard snags of this size would be retained. Any snag that falls for any reason as a result of thinning operations would remain on-site to become down woody debris, providing important habitat for a different, but also, key group of dead-wood associated species (Aubry 2000; Bowman et al. 2000; Butts and McComb 2000). Up to two trees per acre would become snags or down logs through

logging where leave tree damage occurs and/or reserve trees 20+ inches diameter are felled to facilitate logging and left onsite as CWD.

Beneficial long term (20 to 40 years) cumulative effects to larger CWD and associated wildlife species would occur as a result of implementing the projects, since larger trees would be available sooner than without thinning to contribute additional large snags and CWD recruitment in future stands. Snags and down logs would be created out of this material in incremental treatments with the objective of meeting long term CWD objectives, see Project 2.

Northern Spotted Owl

The scale for cumulative effects for the northern spotted owl is the provincial home range of known spotted owl sites, 1.2 miles for the Cascades of Western Oregon (BA, p. 3; LOC, p. 12), and the location of the project in relationship to adjacent known spotted owl sites and Late Successional Reserves (LSR). The scale was chosen because the Northwest Forest Plan (NWFP) goal for conservation and recovery for spotted owls is to maintain suitable owl habitat within LSRs and the provincial home range of known owl sites; and maintain dispersal habitat between LSRs and known owl sites.

Cumulative effects to spotted owls and their habitat were analyzed thoroughly at multiple scales in the BA, including the current Environmental Baseline (2013 BA pp.18-27), and Cumulative Habitat Effects Summary (2013 BA p. 53). Unit Specific Data, including the environmental baseline and effects of proposed projects that are likely to adversely affect spotted owls, are summarized by Administrative Units in the Willamette Province (2013 BA pp. 57-113), including the Cascades Resource Area where the Crab Race Project is located (2013 BA pp. 65-76).

The LOC issued by the USFWS concurred with the analysis in the BA that the combined effects to spotted owl habitat and populations of all of the actions proposed in the Willamette Province (including the Crab Race Project) are not likely to adversely affect spotted owls or spotted owl critical habitat (2013 LOC pp. 40-41). The proposed project would not contribute to cumulative effects to spotted owls because the proposed action would maintain suitable and dispersal habitat within and between known owl sites. In the long term the silvicultural prescription should promote multi-aged and multi-storied stands and may increase the quality of spotted owl habitat over time (LOC p. 23).

BLM Special Status Species and Survey and Manage Species

The proposed action would not contribute to cumulative effects to any Special Status or Survey and Manage Wildlife species. Habitat within the project areas is low quality due to young age classes, dense stands, and a lack of important habitat elements required for suitable Special Status/Survey and Manage wildlife species habitat. A high percentage of similar habitat in the vicinity would remain untreated, and high quality suitable habitat for Special Status/Survey and Manage species would remain intact. Implementation of the project would not eliminate connectivity between proposed units or adjacent untreated stands under BLM management.

In the long term, larger trees would be available sooner than without thinning to contribute additional large CWD in future stands. The creation of snags and down logs with the objective of meeting long term CWD objectives would be beneficial. Stand conditions and structural complexity would improve as canopies close and thus improve habitat quality for mid to late successional wildlife species.

In conclusion, thinning in the project area would not be expected to contribute to the need to list any Bureau Sensitive species under the Endangered Species Act (BLM 6840) because habitat for the species that is known to occur in the project area would be not be eliminated, habitat connectivity would not be changed, any habitat alteration would have only short-term negative effects, and long-term effects would be beneficial.

Migratory and Resident Birds

No cumulative effects to birds are expected. The proposed action would not reduce the persistence of any bird species in the watershed or populations at the regional scale. Habitat changes resulting from the proposed action would not eliminate any forest cover type, change any habitat or patch size, and therefore would not contribute to fragmentation of bird habitat. Thinning would not contribute to a fundamental change in the species composition of existing bird communities within the watershed. In the long term, the thinning would have the potential to improve habitat for bird species as these stands reach maturity.

Big Game

No adverse cumulative effects to big game species populations are expected. The proposed action would not fundamentally change or eliminate any forest cover type or change any habitat patch size. Therefore, thermal and hiding cover present before treatment would be maintained after harvest. Variable density thinning, including the low density thinning areas are expected to improve the quality of forage and cover both in the short and long term.

3.7.1.2 No Action Alternative

Habitat Structure, Snags and Coarse Woody Debris:

The majority of the stands in the project area have low vigor and small crowns, and would grow more slowly compared to thinned stands. Self-thinning would occur with suppression mortality, but diameter growth would not accelerate as fast as in treated stands. Snags and down logs created by suppression mortality would not be large enough to meet RMP standards until later in the life of the stand (approximately 30 to 60 years) when suppressed co-dominates achieve these diameters before dying. No CWD creation would occur, and CWD development would occur over a longer time period through self-thinning than with treatments over time (see also Project 2). Understory and ground cover development would take longer than if these stands were thinned. Without management intervention, stands would take longer to develop late successional habitat conditions and remain less diverse for a longer period of time. Without treatment, crowns would continue to recede, resulting in less development of large limbs and deep crowns compared to thinned stands.

Northern Spotted Owl:

There would be no immediate change in spotted owl habitat and no effect to spotted owls from management action. Habitat conditions would remain as described in the Affected Environment, and would continue to develop slowly over time for reasons stated above. In unthinned areas that are currently dispersal habitat, it would take approximately 30 to 60 years to develop suitable habitat conditions if left untreated.

BLM Special Status Species and Survey and Manage:

In the short term, there would be no immediate change in current habitat conditions for Survey and Manage and BLM Special Status Species. In the long term trees would grow more slowly, and material available for CWD recruitment would average smaller in diameter than if thinning

were to occur. The amount of dwarf mistletoe in these stands would steadily increase, and marginal habitat for Johnson's hairstreak would remain unaffected. Since no new disturbance to the conifer canopy would occur, no undetected red tree vole nests would be affected. Optimal habitat for Johnson's hairstreak and the red tree vole would develop more slowly without thinning, and stands would remain as closed mid seral stands longer.

Migratory and Resident Birds:

Habitat conditions would remain as described in the Affected Environment, and would continue to develop slowly over time. Species richness of bird communities would reflect the simple, single storied, mid-seral stages for a longer period of time and overall bird species richness would be less than if these stands were thinned. Bird species richness may not noticeably increase, and legacy features in the future stand would likely be smaller and less persistent, especially those that provide habitat for cavity-nesting species.

Big Game

In the short term, there would be no disturbance effects due to the proposed action. Thermal and hiding cover quality would remain the same as current conditions. There would be no increase in vegetative forage due to increased light to the forest floor. In the long term, thermal and hiding cover quality would gradually decrease as overstocked stands mature hindering mobility. Forage quantity would continue to decrease over time as less light reaches the forest floor.

3.7.2 Project 2, Snag and CWD Recruitment

Affected Environment

The Affected Environment description for Project 1 generally applies to all stands within the same age range and elevations in the Upper Crabtree watershed. In addition, within the treatment units of the project area for Project 1, the affected environment for Project 2 incorporates the environmental effects described for Project 1. Specifically, within the Project 1 units, snags or CWD would have been recruited from up to two trees per acre prior to any actions taken under Project 2.

Environmental Effects

3.7.2.1 Proposed Action

Snag and CWD recruitment would be done in locations where periodic surveys indicate both sufficient green trees which are generally at least 21 inches dbh and an identified need for more snags and/or CWD to develop late-successional habitat characteristics. This would ensure that there are sufficient green trees to maintain desired canopy structure and recruit snags/CWD in areas where they are most needed.

The canopy openings created by killing (usually by girdling, though other methods may be selected as available and feasible) individual trees or felling them would create small openings where light would reach the forest floor and stimulate understory growth. The snags would begin to host insects and decay fungi within a few years to two decades and begin to be used by primary excavators, followed by other cavity nesters and other species. CWD would begin to decay within a few years and provide down wood habitat as it progresses through the stages of decay.

Recruiting snags and CWD in pulses as described would provide snags and CWD in various stages of decay over the next three to five decades. By that point in stand development, trees larger than 21 inches diameter should be dying from natural causes and continuing snag and CWD recruitment throughout the life of the stand. Future periodic surveys would confirm that natural recruitment was beginning to occur, or provide the basis for future treatment recommendations. Snag and down CWD guidelines in the LSR could be met in 20 to 40 years.

Disturbance in any given location would be infrequent and small scale because snag and CWD recruitment would be done across the Upper Crabtree watershed at different times during the decadal cycle. Snag and CWD recruitment would be distributed across the landscape in response to needs identified by these ongoing surveys. The low intensity of treatments in both time and area would prevent modifying habitat or causing disturbance to degrees which would impact wildlife species during nesting or other critical life cycle stages or modifying habitat in ways that would negatively impact its use.

Bird species which utilize snags and down logs would benefit from moving stands toward long term CWD objective in the LSRs and Riparian Reserves. This could be especially beneficial adjacent to the wet areas in units 12A-D.

Cumulative Effects

The cumulative effects of the proposed action combined with the density management thinning proposed in Project 1 and non-commercial LSR enhancement thinning projects recently conducted and proposed in the Upper Crabtree watershed would accelerate the development of structural complexity and biological diversity by modifying young stands (NSO 2011 p. III-19). The short term effects would be dispersed, small scale alteration of dispersal habitat in a manner that is not expected to change the habitat function for spotted owls (Forsman et al, 1984; USFWS 2007c) and would maintain dispersal habitat conditions for spotted owls.

In the long term, these treatments would benefit spotted owls and other species by encouraging late-successional characteristics to develop more quickly, including large diameter trees, deep crowns with large limbs, decadence, snags and CWD in various stages of decay and multi-layered vegetation.

3.7.2.2 No Action Alternative

The No Action alternative means that no trees would be killed or felled to recruit snags and CWD except those recruited as part of Project 1, if implemented. Snags and CWD would be recruited through suppression mortality and would generally be numerous and small diameter as described in the Affected Environment and the No Action alternative for Project 1. Meeting management direction and objectives for suitable snags and CWD in the watershed would probably require more than three to four decades because the naturally occurring large diameter trees necessary for recruiting large diameter snags and CWD are the least likely to die from natural causes.

3.7.3 Project 3, Crabtree Complex ACEC Road Closure

Affected Environment

In the Crabtree Complex Area of Critical Environmental Concern (ACEC) there are a number of special habitats, including a wetland, wet meadow and Crabtree Lake. The current parking area

is close to the wetland and the lake is less than a quarter mile walk. Vehicle access to the wetland is impeded primarily by a single down log.

The Crabtree known owl site is adjacent to the current parking area and surveys since the late 1970s have shown that the Crabtree pair has been very productive. The Crabtree ACEC is within the 2012 Critical Habitat designation for the spotted owl.

Environmental Effects

3.7.3.1 Proposed Action

Special Habitats

Closing road 11S-3E-16.1 into this area would have beneficial effects on special habitats and associated wildlife species in the Crabtree ACEC by reducing disturbance factors since vehicles would be kept farther away people would be walking by sensitive areas rather than the more concentrated activities around the parking area. Closing the road further away from the wet area and wet meadow habitats would reduce potential vehicle incursion to near zero. The road closure would be implemented outside of the critical nesting season for most species, which would reduce short term disturbance of the project itself.

Spotted Owls

Closing road 11S-3E-16.1 into Crabtree ACEC would have beneficial effects on spotted owls by reducing disturbance, especially during the critical nesting season (March 1 to July 15). Disturbance would be reduced because people would be walking by the nesting area rather than parking and concentrating activities in the current parking area near the nest site.

Machinery operations to repair the failed culvert on the currently closed portion of the road, remove the current concrete barrier, and block the road and improve parking at the proposed location would disturb any nearby owls for one to three days for four to eight hour periods. These operations would be implemented outside of the critical nesting season, which would reduce short term disturbance of the project itself.

3.7.3.2 No Action Alternative

If the portion of road 11S-3E-16.1 is not closed as proposed, disturbance in the vicinity of the Crabtree known spotted owl site would continue to occur. Disturbance to special habitats and their associated wildlife species would also continue to occur. Recreational use and vehicular traffic is expected to increase with time as more people become familiar with the area.

3.8 Air Quality and Fire Hazard/Risk

Source Incorporated by Reference: Cascade Resource Area Fuels Specialist Report, Crab Race Project, Mortensen, September 2012 (Fuels Report)

Affected Environment

Air Quality

The major potential sources of air pollutants within the Crab Race analysis area would come from fire starts and from associated resource management activities including prescribed burning (hand, machine, and landing piles), and dust from the use of natural-surfaced roads.

The Willamette Valley experiences periods of air stagnation. When this occurs during winter months, cold air often becomes trapped near the valley floor with slightly warmer air aloft, creating temperature inversion conditions, causing air pollutants to become trapped near the ground. Wintertime temperature inversions contribute to high particulate levels. Stagnant periods in the summertime contribute to increases in ozone levels, causing the local air quality to deteriorate. The State of Oregon has designated the Willamette Valley as a Smoke Sensitive Receptor Area.

Fire Hazard/Risk

The climate in Northwest Oregon is generally mild and wet in the winter. In the North Cascade mountain range, snowfall will remain at higher elevations for an extended period of time. Summers are warm with periods of dry weather usually during the months of July, August, and September. Summer temperatures during this period average approximately 60° F with high temperatures reaching the mid to upper 90s, and occasionally topping 100° F for short periods of time. During average weather years, the conditions under the forest canopy remain relatively moist.

Fire is a natural disturbance process in the analysis area. Fire effects on forested areas are influenced by fire frequency, fire duration, and fire intensity (Van Wagner 1965). These factors vary with forest type, depending on fuel type and structure, topography, and weather variables. Fire can influence vegetation, nutrient cycling, successional pathways, fish and wildlife habitat, vegetative species composition, age, and structure, and insect and disease susceptibility.

The main cause of wildfires across the analysis area is people. Dry lightning (lightning that that has no accompanying moisture) that occurs during the summer months is rare in Northwest Oregon. Within the Oregon Department of Forestry's Northwest Oregon Area - South Cascades District - Sweet Home Unit over the last ten years four fire starts were attributed to lightning while sixteen were human caused. The average size of the lightning fires is approximately 29 acres. The average size of the human caused fires is approximately 0.9 acre. (http://oregon.gov/ODF/FIRE/HLCause.pdf). The majority of the analysis area is located behind locked private gates, further reducing access by the public, and the risk of a fire start.

Fire Regime and Condition Class (FRCC)

The Fire Regime classifies the role fire would play across the landscape in the absence of modern human intervention. The Condition Class classifies the amount of departure from the natural fire regime. The modeling predictions for fire regime and condition class come from the LANDFIRE Rapid Assessment Vegetation Models.
(http://www.fs.fed.us/database/feis/fire_regime_table/fire_regime_table.html)

The model identifies the analysis area as falling within the Pacific Northwest Forested landscape. The analysis area's potential natural vegetation group is listed as Douglas-fir-western hemlock (dry mesic) and Douglas-fir-western hemlock (wet mesic), and it falls within two different Fire Regimes. For a description of Fire Regimes and Condition Class see:
(http://www.nwcg.gov/teams/wfewt/archive/message/FrccDefinitions.pdf)

Fire Regime III is characterized by a moderate to low fire return interval with a mixed severity and is associated with south and west facing slopes. Fire Regime V is characterized by a low fire return interval with a high severity and is associated with north facing slopes. More than 80% of fires are characterized as mixed or low severity.

The timber stands in the analysis area generally fall within Condition Class 2 or 3 with species composition and structure functioning outside their natural (historical) range due to overstocking and past harvest treatments.

Management of the surrounding private land affects the Condition Class to such an extent that actions within the Crab Race project area are unlikely to change the Condition Class rating across the landscape.

Timber Stand and Fire History

The fire history of the Crab Race analysis area is not well documented, although it is known that Native Americans burned within the Willamette Valley, to what extent this burning extended into the valley foothills and up the river corridors is not specifically known. Fire does play a major role as a natural disturbance agent, as do people. The analysis area has experienced forestry related management activities in the past. All of the proposed project areas were previously harvested during the 1950's and 1960's. Many harvest units of this time period had broadcast burning or spot burning associated with them, both for hazard reduction and for site preparation prior to planting. Tree cores and fire scars collected throughout the Willamette Province from trees harvested from 1950 to 1980 provide evidence that historic fire return intervals in the analysis area range from 50-150 years in the lower elevations and south facing aspects, and up to 300 years in the higher elevations and north aspects.

The average fire return interval increased following the advent of fire suppression in 1910. It has been decades since the most recent man-caused disturbance (logging) occurred. Although fire has been excluded from the landscape, the analysis area is still well within the range of a normal fire return.

Environmental Effects

3.8.1 Project 1, Density Management Thinning

3.8.1.1 Proposed Action

Air Quality

Travel would occur over BLM and other roads. Dust created from vehicle traffic from proposed project activities on gravel or natural-surface roads would contribute short-term (during project work) effects to air quality. These effects would be localized to the immediate vicinity of the operations.

Following density management thinning, gap creation, and snag and coarse woody debris treatments, the fuel load would increase. Post treatment fuels surveys would be conducted and the Stereo Photo Series for Quantifying Forest Residues in the Douglas-fir Type of the Willamette National Forest (General Technical Report PNW-GTR-258, Ottmar, Hardy, Vihnanek May 1980) or the Stereo Photo Series for Quantifying Forest Residues in Coastal Oregon Forests (General Technical Report PNW-GTR-231, Ottmar, Hardy) would be used to help identify areas with increased fuel loads. If these methods determine that an increased fire hazard exists, prescribed burning would be conducted and smoke would be generated.

Hand, machine, and landing pile construction and burning in the density management project areas, and along roads or property lines would be targeted for treatment because human activity and the risk of ignition is greatest in these areas. Approximately 50 acres could be treated with prescribed fire. This would remove approximately 45 tons of slash per acre or approximately 2250 total tons from the highest risk areas within the project.

All prescribed burning would require a project level Prescribed Fire Burn Plan that adheres to smoke management and air quality standards, meets the objectives for land use allocations, and maintains or restores ecosystem processes or structure. The burn plan would comply with the NWOR Fire Management Plan for the Eugene District BLM, Salem District BLM, Siuslaw National Forest, and the Willamette National Forest dated May 20, 2009. All burning would be coordinated with the local Oregon Department of Forestry office in accordance with the Oregon State Implementation Plan and Oregon Smoke Management Plan.

Burning would be conducted when the prevailing winds are blowing away from Smoke Sensitive Receptor Areas (SSRAs) in order to minimize or eliminate the potential for smoke intrusions. The potential for a smoke intrusion would be further reduced by burning under atmospheric conditions that favor good vertical mixing so that smoke and other particulate matter is borne aloft and dispersed by upper elevation winds.

Prescribed burning would cause short-term impacts to air quality that would persist for one to three days within one-quarter to one mile of units. None of the treatment units are sufficiently close to any major highways that motorist safety would be affected. The overall effects of smoke on air quality are predicted to be local and of short duration. Activities associated with the proposed action would comply with the provisions of the Clean Air Act.

Fire Hazard/Risk

Following treatments the fuel load, risk of a fire start, and the resistance to control of a fire would all increase as a result of the proposed action, and would be greatest during the first season following treatment when needles dry but remain attached to tree limbs. The modeling predictions for fire behavior (Anderson, April 1982) based on the National Fire Danger Rating System (NFDRS) fuel models would move the variable density thinning stands from a Fuel Model 8 (Closed timber litter) to Fuel Model 11 (Light logging slash), or Fuel Model 12 (Medium logging slash). All treatment areas would see a short-term (0-5 year) increase in fire ignition potential because of the increase in fine dead fuels.

Thinning trees would decrease both the amount of potential ladder fuels and the available fuel density in the canopy (canopy bulk density). A relative density of 35-45% basal area or lower has been identified as the point where canopy bulk density is unlikely to sustain a high intensity crown fire (Agee, 1996). The silvicultural prescription for all of the units in the analysis area falls within or below this range.

The project includes design features to reduce the risk of a fire by decreasing the fuel load in areas that are accessible to people. Surface fuels would be reduced in strategic locations such as along roads, property lines, and within density management thinning areas. The treatments would reduce the amount of surface fuels, resulting in lower fire intensity, rates of spread and flame lengths. Most of the project area is located behind locked private gates, further reducing access by the public and the risk of a fire start.

The Oregon Department of Forestry has responsibility for fire protection on BLM managed land in western Oregon. Their ability to successfully control wildfires in the fuels treatment areas as small, low intensity, ground fires would remain high. For the short-term (0-5 years), the fire risk would increase in the density management thinning and low density treatment areas. Due to decreased crown density and reduction in ladder fuels, containment of wildfires at less than 10 acres in size should continue to be attainable during initial attack.

When harvest has been completed, fuels surveys would be conducted and project areas that are identified as containing hazardous fuels may have hand or machine piles constructed within

areas containing dense slash. Machine piles may be constructed along roads, or property lines, and landing piles may be constructed where logs are yarded to roads. If fuel loads are relatively light along roads or property lines, slash pullback may be incorporated as the desired fuels treatment.

3.8.1.2 No Action Alternative

Air Quality

Under the No Action alternative there would be no commercial thinning, road construction, log hauling, or any need for prescribed burning and, therefore, no localized effects to air quality. However, as the timber stands continue to grow, the increased stocking density would cause the stands to become more susceptible to a stand replacement fire event. In the event of a wildfire, poor air quality is expected due to the high volume of smoke produced.

Fire Risk

The analysis area would continue on its current trend. The current risk of a fire start would remain low. There would be a slow increase in the coarse woody fuel load (1000 hour fuel class and in the smaller size fuel classes, (1, 10, and 100 hour fuels) in these timber stands as stress-induced mortality within the stands increases. Ladder fuel densities would increase as trees are suppressed in the understory, shade tolerant species seed in, and dominant trees grow larger. The potential for these stands to eventually succumb to a wildfire would continue to increase as they near the maximum fire return interval and the condition class departs further from the natural fire regime.

Cumulative Effects

There would be no cumulative effects to air resources, because the direct and indirect effects from the project would be local and of short duration, and there would be no other uses in the project area affecting this resource. Based on past experience with handpile burning in this and other similar areas, confirming the short duration of smoke and effectiveness of adherence to smoke management plans, there are no expected cumulative effects on air quality from the planned fuels treatment under this proposal.

There would be an increase in fuel loading and resultant fire hazard in the short-term (0-1 year). In the density management thinning and snag and coarse woody debris recruitment areas, along roads, and property lines, the hazard and risk would be minimized by the use of fuels reduction treatments. The localized increase in fire risk would diminish to background levels over time as slash decomposes. There would be positive benefits to the thinned stands in the longer term due to the wider spacing between tree crowns and the removal of most of the ladder fuels that are conducive to the spread of fire into the tree canopy. At a watershed scale, the thinning of approximately 460 acres of forest habitat would have very little effect on fire intensity or starts. However, due to reduced bulk density and ladder fuels, the potential for the stand to carry a crown fire would reduce in the long term (>5 years).

3.8.2 Project 2: Snag and Coarse Woody Debris Recruitment

Affected Environment

See description of the affected environment for project 1.

Environmental Effects

3.8.2.1 Proposed Action

Air Quality

Travel would occur over BLM and other roads. Dust created from vehicle traffic from proposed project activities on gravel or natural-surface roads would contribute short-term (during project work) effects to air quality. These effects would be localized to the immediate vicinity of the operations and would be too small in scope and intensity to contribute to cumulative effects to any resource.

Fire Hazard/Risk

In addition to the effects described above for Project 1 (if implemented), additional operations undertaken to create/recruit snags and coarse woody debris both within the units thinned in Project 1 and in other timber stands in the Upper Crabtree watershed would have the following effects.

Immediately following each pulse of snag and CWD recruitment the fuel load, risk of a fire start, and the ability to control a fire, would all increase as a result of the proposed action, and would be greatest during the first season following treatment when needles dry but remain attached to tree limbs. Removing individual tree crowns from the canopy by girdling or falling these trees would create small openings in the canopy. This small decrease in stocking levels would still decrease both the amount of potential ladder fuels and the available fuel density in the canopy (canopy bulk density). A relative density of 35-45% basal area or lower has been identified as the point where canopy bulk density is unlikely to sustain a high intensity crown fire (Agee, 1996). Within thinned stands the silvicultural prescription for all of the units in the analysis area falls within or below this range. In project areas outside of the density management thinning the basal area would not change perceptibly and the potential for a fire to climb into the canopy from available ladder fuels would remain the same. The intensity of changes to fire hazard and risk would be so small that there would be no contribution to cumulative effects.

3.8.2.2 No Action Alternative

See the discussion of effects for the No Action alternative for Project 1, above.

3.8.3 Project 3: Crabtree Complex ACEC Road Closure

Affected Environment

See description of the affected environment for project 1.

Environmental Effects

3.8.3.1 Proposed Action

Air Quality

Travel would occur over BLM and other roads. Dust created from vehicle traffic from proposed project activities on gravel or natural-surface roads would contribute short-term (during project work) effects to air quality. These effects would be localized to the immediate vicinity of the operations and would be too small in scope and intensity to contribute to cumulative effects to any resource.

Fire Hazard/Risk

In addition to the effects described above for Project 1 (if implemented), additional operations undertaken within the Crabtree Complex ACEC to restore water damage on an existing road and then block access to the road with boulders would have the effect of lengthening the amount of time that it would take for Oregon Department of Forestry (ODF) crews to respond to a wildfire start because it would lengthen the walk-in distance by approximately ½ mile, causing a delay of less than 15 minutes. The ACEC/ONA management plan restricts the use of heavy equipment and requires the use of "light hand tactics" to control any fire start so little or no change in tactics would be required by preventing vehicle or equipment access from using this road.

No Action Alternative

Vehicles could approach to the current road closure, extending the range of initial attack with water from an engine by approximately ½ mile. Crews could respond approximately 15 minutes sooner to a fire in the interior of the ACEC/ONA where this road provides access. These effects would be unlikely to make a difference in the ability of initial attack firefighters to control fire starts at less than 10 acres.

3.9 Recreation, Visual Resources and Rural Interface

Source incorporated by reference: Crab Race Timber Sale: Recreation/VRM/Social Talking Points, Milnor 2013 (Recreation Report).

3.9.1 Project 1 – Density Management Thinning

3.9.1.1 Proposed Action

Affected Environment

Access

The project area is relatively remote and difficult to access when compared to other BLM lands within the Salem District. The main access from the west comes from Snow Peak mainline and is gated at the boundary of BLM ownership at section 11/12 boundary. To access this area, the public must use the Quartzville mainline and a maze of several BLM-administered, gravel-surfaced roads before reaching BLM Rd 11-2E-14.1. This trip takes almost 1.5 hours from the nearest community (Sweet Home).

Recreation

Use of the Crab Race project area outside of the Crabtree Lake vicinity appears to be low, with little evidence of camping, hunting, target shooting, hiking or other typical dispersed recreation activities. While the area remains accessible to the public, the lack of recreational use can be attributed to the long travel times and similarity of the recreation setting to other, more easily accessible public lands within Linn County.

Designations

The Crab Race project area falls within the Yellowstone Special Recreation Management Area (SRMA). An SRMA is an administrative designation that identifies where BLM will spend resources to manage and enhance recreation use. The Yellowstone SRMA includes Quartzville Creek, three recreation sites and Crabtree Lake. None of the proposed project units are nearby to any of these listed features.

There are no designated Wild and Scenic Rivers or Wilderness Areas within the project areas. In addition, there are no eligible or suitable Wild and Scenic Rivers or BLM lands that contain wilderness characteristics.

Visual Resources

All of the proposed units fall in VRM Class 4 and are dominated by visually homogenous even aged conifer stands. VRM Class 4 areas allow major modifications of the character of the landscape. Management goals are to manage for moderate levels of change to the characteristic landscape and attempt to minimize visual effects of activities even though management activities may dominate the view and be the major focus of attention.

Rural Interface Areas (RIAs)

The proposed project area is not within a rural interface zone as defined in the Salem District Resource Management Plan page 39. None of the proposed units are located in proximity to residential dwellings.

OHV Designation and Use

Off-highway vehicle (OHV) usage of the project area is restricted to existing roads and designated trails. The primary OHV classification of this area is Limited to Designated Roads. No designated OHV trails are within the project area.

Environmental Effects

Access

The proposed action would not change access to the area except for log truck traffic and the road occasionally being blocked by operations for short periods during the three year contract period.

Recreation

Dispersed recreation use within the proposed units would be moderately restricted approximately three to five years during timber harvest and associated management activities. Recreational visitation should return to prior usage upon completion of activities. Other BLM and Forest Service lands nearby would remain available for recreational opportunities. Recreational users in the vicinity would hear the noises of the timber operations and may experience traffic delays of minutes to hours or lack of access for safety reasons. Tree removal from the proposed units would leave the undergrowth vegetation crushed. Most undergrowth vegetation would return within five years.

Visual Resources

The proposed project would comply with VRM Class 4 objectives. Visual disturbance of the project area would be associated with modifications to vegetation and other ground disturbing activities from timber harvest and road decommissioning operations. Commercial thinning of all the units would be noticeable but would not alter the overall visual character of the project area. Some short term disturbance would be observable in the foreground, but a forested setting would be maintained. Evidence of harvest activities would fade as understory vegetation returns to a more natural appearance and the remaining stand continues to mature.

Fuel treatment of logging debris, if burned, would result in short-term decline in visual quality from smoke and the blackened remains of burn piles. Fuel treatments would comply with state smoke management regulations thus reducing the affect to visual quality to a few days. Understory vegetation and the remaining trees would rebound, grow, and continue to green up covering logging debris and burn pile scars.

Rural Interface Areas (RIAs)

Due to the lack of rural interface areas directly adjacent to this proposed action, there is not expected to be concerns from nearby property owners that would attributable to this project.

OHV Designation and Use

Project design features for this project are expected to minimize the potential for off-road vehicle travel within the project area. Harvest activities would obliterate any unauthorized trails. No reconstruction of unauthorized trails would be allowed.

Cumulative Effects

The project is not expected to have cumulative effects to these resources which would change the nature, duration or extent of the impacts described for the project.

3.9.1.2 No Action Alternative

With the exception of unexpected changes (i.e. wildfire or disease), the proposed units would continue to provide a forest setting for dispersed recreation opportunities. Access to Crabtree Lake would remain unchanged and visitor access, use patterns and activity types would continue on their current trajectory. Timber management activities and log truck traffic would continue on both private and public lands in the vicinity. No modifications to the landscape character of the project area would be expected to occur. Modifications to the landscape character in the area around the projects would still be expected, as a result of activities on other lands.

3.9.2 Project 2 – Snag and CWD Recruitment

The affected environment is the same as for Project 1. No effect on these resources is expected from low intensity operations to recruit snags and CWD. Outside of operations directly associated with Project 1, disturbance would be limited to the sounds of chainsaws and falling trees from areas generally out of sight of roads.

3.9.3 Project 3 – Crabtree Complex Road Closure

Affected Environment

The area surrounding Crabtree Lake is the most visited part of the three contiguous ACEC/RNA/ONA areas. The unique old growth forest and lake scenery have made Crabtree Lake a destination for some recreationists. The area has been identified in several guidebooks and directions are available online from several hiking groups. Current access is either from the route described above or by parking near the lake on BLM Rd 11-2E-16.1 and walking a decommissioned segment to the lake.

Current Use: Use of Crabtree Lake appears modest, with an estimated 100 to 200 visitors per year. These visitors come to camp, fish and observe the unique forests of the area. During September 2011, evidence of recent public use was visible at established campsites, along user-created trails and around the lakeshore. BLM receives about 10 requests per year about this area and provides a map that shows drive in and walk in access routes. Currently vehicles are able to drive 0.4 miles beyond this creek, park and walk to the lake.

Environmental Effects

The proposed action to modify vehicle access near Crabtree Lake and the provision of limited visitor information will affect the recreation setting by simultaneously making the setting more remote, while increasing apparent levels of management. Blocking vehicle access to the area 0.4 miles further away from the lake than the current road closure is not expected to have a direct effect on the level of visitation (in terms of visitors, visitor days or activity types). Day hiking, camping and fishing are expected to remain the primary activity types. Overall visitor use is likely to be more impacted (increased use, amount unknown) by the connected action of advertising that the area has a recreation trail, rather than any changes to physical access.

The No Action alternative would maintain the current status and trends.

3.10 Cultural Resources

Sources incorporated by reference: Cultural Resource Pre-Disturbance Inventory Report – Crab Race Density Management Thinning, F. Greaterex and H. Ulrich, 2013.

Resource Specific Methodology

The BLM Cultural Resources specialist reviewed BLM records to identify previously recorded cultural resource sites and examined additional historical references and aerial photographs to identify field locations of reference sites and determine areas of potential cultural resource site occurrences.

Under the direction of the District cultural Resource Specialist, Cultural Resource assistants then surveyed the project area, focusing on previously recorded sites and on areas having potential to contain cultural resources, based on observations of topography, water sources, trails and improvements that may have been suitable for camping, settlement and other human activities.

Affected Environment

The entire project area has been disturbed by logging in the 1950s and 1960s. Several lithic scatter sites and isolated partial points/tools have been found in disturbed sites in the project vicinity, but none in the project area. These sites were mapped and no further value has been identified.

A deteriorated logging (donkey) sled is in unit 12C near the north unit boundary. Miscellaneous bolts, broken tools/parts and cans were found, none of which has diagnostic value.

Environmental Effects

3.10.1.1 Proposed Action

The sled would be protected from damage by unit layout, retained tree selection and the logging plan to be developed prior to operations. No other resources would potentially be affected by operations.

Cumulative Effects

No direct effects to cultural resources would be expected, therefore no cumulative effects would be expected.

3.10.1.2 No Action Alternative

Current status and trends would continue and the sled would continue to deteriorate. Projects 2 and 3 would not have any anticipated effects on cultural resources.

3.11 Review of Elements of the Environment Based On Authorities and Management Direction

Table 18 Elements of the Environment Review based on Authorities and Management Direction

Element of the Environment /Authority	Remarks/Effects
Aquatic Conservation Strategy	In compliance with PCFFA IV (Civ. No. 04-1299RSM), this project complies with the Aquatic Conservation Strategy described in the Northwest Forest Plan and RMP. This project also complies with the PCFFA II (265 F.3d 1028 (9th Cir. 2001)) by analyzing the site scale effects on the Aquatic Conservation Strategy. EA section 3.11.1 shows how the Crab Race projects meet the Aquatic Conservation Strategy in the context of the PCFFA cases. EA chapter 3 analyzes specific effects of the proposed actions.
Air Quality (Clean Air Act as amended (42 USC 7401 et seq.)	This project is in compliance with this direction because air quality impacts would be of short duration (one burn period during implementation of prescribed fire). Addressed in Text (EA Section 3.8).
Cultural Resources (National Historic Preservation Act, as amended (16 USC 470) [40 CFR 1508.27(b)(3)], [40 CFR 1508.27(b)(8)]	This project is in compliance with this direction and the project would have no effect on this element because cultural resource inventories of the affected area have been conducted and management actions will avoid damage to cultural resources.
Ecologically critical areas [40 CFR 1508.27(b)(3)]	Projects 1 and 2 would have no effect on this element because there are no ecologically critical areas present within the project areas. Project 3 would have a beneficial effect on the Crabtree Complex ACEC because the project is designed to correct ongoing erosion and to reduce vehicle access and related impacts into the ACEC. Addressed throughout the EA, see table of contents.
Energy Policy (Executive Order 13212)	This project is in compliance with this direction because this project would not interfere with the Energy Policy (Executive Order 13212).
Environmental Justice (E.O. 12898, "Environmental Justice" February 11, 1994)	This project is in compliance with this direction because project would have no effect on low income populations.
Fish Habitat, Essential	This project is in compliance with this direction because

Element of the Environment /Authority	Remarks/Effects
(Magnuson-Stevens Act Provision: Essential Fish Habitat (EFH): Final Rule (50 CFR Part 600; 67 FR 2376, January 17, 2002)	impacts of the proposed project would be limited to no more than immeasurable amounts of sediment reaching streams with EFH (conclusion in the Biological Assessment for the Crab Race Timber Sale). Therefore project impacts would be considered insignificant to spring Chinook salmon habitat, and would not result in adverse modification of EFH.
Farm Lands, Prime [40 CFR 1508.27(b)(3)]	The project would have no effect on this element because no prime farm lands are present on BLM land within the Cascades RA.
Floodplains (E.O. 11988, as amended, Floodplain Management, 5/24/77)	This project is in compliance with this direction because the proposed treatments would not change or affect floodplain functions.
Hazardous or Solid Wastes (Resource Conservation and Recovery Act of 1976 (43 USC 6901 et seq.) Comprehensive Environmental Repose Compensation, and Liability Act of 1980, as amended (43 USC 9615)	This project would have no effect on this element because no Hazardous or Solid Waste would be stored or disposed of on BLM lands as a result of this project.
Healthy Forests Restoration Act (Healthy Forests Restoration Act of 2003 (P.L. 108-148)	This project is in compliance with this direction because treatments would decrease the risk of fire and help restore forests to healthy functioning condition (EA Section 3.3, 3.8)
Migratory Birds (Migratory Bird Act of 1918, as amended (16 USC 703 et seq)	This project is in compliance with this direction because treatments would restore natural resources that could degrade habitat for migratory birds. Addressed in text (EA Section 3.3, 3.7).
Native American Religious Concerns (American Indian Religious Freedom Act of 1978 (42 USC 1996)	This project is in compliance with this direction because no Native American religious concerns were identified during the scoping period (EA section 1.8).
Noxious weed or non-Invasive, Species (Federal Noxious Weed Control Act and Executive Order 13112)	This project is in compliance with this direction because Project Design Features would prevent establishment of new populations of invasive plant species and because vegetation development would result in decline in both number and vigor of invasive plant populations in the project area. Addressed in text (EA Sections 2.3, 3.3)
Park lands [40 CFR 1508.27(b)(3)]	The project would have no effect on this element because there are no parks within or adjacent to the project area.

Element of the Environment /Authority	Remarks/Effects
Public Health and Safety [40 CFR 1508.27(b)(2)]	The project would have no effect on this element because the public would be restricted from the active parts of the project 1 area during operations, operations under project 2 would not be near roads which are the primary area where the public is likely to be, operations under project 3 would be small scale and could be paused for public passage, and the projects would not create hazards lasting beyond project operations. (EA section 2.3, 3.9)
Threatened or Endangered Species (Endangered Species Act of 1983, as amended (16 USC 1531)	This project is in compliance with this direction because there would be no adverse effects on Threatened or Endangered Species (EA Section 3.3, 3.7, 5.1.1).
Water Quality –Drinking, Ground (Safe Drinking Water Act, as amended (43 USC 300f et seq.) Clean Water Act of 1977 (33 USC 1251 et seq.)	This project is in compliance with this direction because Oregon State water quality standards would be adhered to and the area hydrology would not be changed measurably. Addressed in text (EA Sections 3.4)
Wetlands (E.O. 11990 Protection of Wetlands 5/24/77) [40 CFR 1508.27(b)(3)]	This project is in compliance with this direction because no wetlands are within the project area and adjacent wetlands would be protected by buffers except for two acres where cutting and removing selected trees would be done to retard conifer encroachment into the wet meadows. (EA Sections 1.3, 2.3, 3.3, 3.7)
Wild and Scenic Rivers (Wild and Scenic Rivers Act, as amended (16 USC 1271) [40 CFR 1508.27(b)(3)]	This project is in compliance with this direction because there are no Wild and Scenic Rivers within or adjacent to the project area.
Wilderness (Federal Land Policy and Management Act of 1976 (43 USC 1701 et seq.); Wilderness Act of 1964 (16 USC 1131 et seq.)	This project is in compliance with this direction because there are no Wilderness Areas or areas being considered for Wilderness Area status in or adjacent to the project area.

3.11.1 Compliance with the Aquatic Conservation Strategy

Based on the environmental analysis described in the previous sections of the EA, Cascades Resource Area Staff have determined that the project complies with the ACS on the project (site) scale. The project complies with the four components of the Aquatic Conservation Strategy, as follows:

- ACS Component 1 - Riparian Reserves: The project would comply with Component 1 by maintaining canopy cover along all streams and wetlands, which protect stream bank stability and water temperature. Stream Protection Zones (SPZ) would protect streams

from direct disturbance from logging. Road and landing locations have been minimized in Riparian Reserves. Addressed in text (EA sections 3.3.2-3.3.3)

- ACS Component 2 - Key Watershed: The project would comply with Component 2 by establishing that the [name of project] Thinning project is not within a Key watershed. (RMP p. 7).
- ACS Component 3 - Watershed Analysis: The project would comply with Component 3 by implementing practices that contribute to meeting the following Terrestrial Recommendations (TR), Aquatic Recommendations (AR) and Social Recommendations (SR) from the CCWA, Chapter 7 (*EA sections 1.1, 1.3, 1.4, 2.3, 3.3, 3.4, 3.5, 3.7, 3.9*):
    - TR1. Timber harvest should emphasize enhancement and restoration opportunities…Implement density management prescriptions to develop and maintain late seral forest stand characteristics…include larger trees for a large green tree component and recruitment of [snags and CWD] in future stands, multi-layered stands…
    - TR2. …green tree retention for the recruitment and development of standing dead/down CWD and to contribute to the development of late seral forest stand characteristics.
    - TR6. Coordinate management and protection around KOSs…
    - AR1. Plan and implement riparian silvicultural project designed to accelerate growth of riparian conifers… (Note: AR1 focus is actually on stands closer to streams than allowed for this project since part of the purpose is to "improve potential for LWD recruitment". The project applies this principle to other portions of the Riparian Reserve.)
    - AR2. …promote large conifer development in riparian areas through density management and thinnings. (See note above.)
    - AR5. …replace culverts that do not meet 100 year flood standards…
    - AR6. Comply with the Water Quality Restoration Plan for stream temperature (TMDL), which was not yet developed when the CCWA was written.
    - AR7. Improve shade – project was designed to not reduce shade.
    - SR4. …[establish] multi-use non-motorized trails in…Crabtree Lake area.

  Density management thinning in Riparian Reserve to develop and maintain late seral stand characteristics. Thinning in this project is designed to develop the large tree component faster, leading to earlier potential for recruiting CWD, LWD, snag and large tree habitat and to develop understory vegetation. Maintains minimum 50% average crown closure in Riparian Reserve. Untreated areas provide additional range of species and density mix. Two culverts would be upgraded to meet 100 year flood standards. Foot trail access to Crabtree Lake would be expanded.

- ACS Component 4 - Watershed Restoration: The project would comply with Component 4 by the combination of thinning and unthinned areas in Riparian Reserves, which would further enhance terrestrial habitat complexity in the long and short term. Thinning in all LUAs would be expected to result in long-term restoration of large conifers and the potential for material that would contribute to in-stream habitat complexity in the long-term.

Cascades Resource Area Staff have reviewed this project against the ACS objectives at the project or site scale with the following results. The No Action alternative does not retard or prevent the attainment of any of the nine ACS objectives because this alternative would maintain

current conditions. The proposed action does not retard or prevent the attainment of any of the nine ACS objectives for the following reasons.

ACSO 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.* Addressed in Text (*EA sections 3.3, 3.4, 3.5*). In summary:

No Action Alternative: The No Action alternative would maintain the current trajectory of stand growth, understory growth, crown and canopy development, and natural recruitment of snags and woody debris (some portion of which may be large diameter) on all Riparian Reserve and LSR acres.

The extensive uniform stands would eventually develop diversity and complexity due to natural events and site factors over several decades. These natural events are not predictable and it is unknown how diversity and complexity would be distributed across the landscape within Riparian Reserves and LSR. There would be no management action to develop elements of diverse, complex watershed and landscape features faster than they develop naturally or to encourage wide distribution of these features across the landscape.

Proposed Action, Project 1: The proposed combination of thinning from below in 12 percent of the Riparian Reserve and LSR stands in the project vicinity would result in forest stands that exhibit attributes typically associated with stands of a more advanced age and stand structural development (larger trees, a more developed understory, and an increase in the number, size and quality of snags and down logs) sooner than would result from the No Action alternative. Maintaining unthinned areas in the other 88 percent (derived from data in EA Table 2) of the Riparian Reserve and LSR LUAs would result in stands that continue to develop as described for the No Action alternative.

This mix of treated and untreated stands would immediately contribute to restoring watershed and landscape scale diversity and complex features by introducing some changes to the current uniformity. Several elements of complexity such as large tree crowns would continue trends of diversity and complexity while other elements of complexity such as dead wood and understory development may or may not trend toward similarity after several decades.

The stream protection zones (SPZ) would provide undisturbed corridors for travel and provide resources for aquatic and riparian dependent plant and animal species. The increased structural and plant diversity would provide resources for a wide variety of other late-successional associated plants and animals, and ensure protection of aquatic systems by maintaining and restoring the distribution, diversity and complexity of watershed and landscape features.

Proposed Action, Project 2: Actively recruiting large diameter snags and coarse woody debris would accelerate restoration of these elements of structural diversity across the watershed and landscape, compared to waiting for sufficient numbers of large green trees to die and/or fall naturally.

Proposed Action, Project 3: Blocking the road segment would reduce human activities which could reduce the risk of degrading habitats or aquatic systems and reduce the risk of impacts to known spotted owl sites.

ACSO 2: *Maintain and restore spatial and temporal connectivity within and between watersheds.* Addressed in Text (*EA sections 3.3, 3.4, 3.5, 3.7*) In summary:

No Action Alternative: The No Action alternative would have little effect on connectivity except that forest stands would continue to grow in the long term (several decades) within the affected watersheds.

Proposed Action, Projects 1 and 2: Both terrestrial and aquatic connectivity would be maintained, and over the long-term, as the Riparian Reserve and LSR LUAs develop late successional characteristics, lateral, longitudinal and drainage connectivity would be restored. The proposed action would accelerate development of some types of stand structure in treated areas to increase habitat diversity across the watershed while maintaining connected forest stands throughout the Riparian Reserves.

Proposed Action, Project 3: The proposed action would maintain aquatic connectivity and restore habitat connectivity in the affected area by reducing vehicle access and associated human activities.

ACSO 3: *Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.* Addressed in Text (*EA sections 3.3, 3.4*). In summary:

No Action Alternative: The current condition of physical integrity would be maintained because there would be no management actions to change any of these features. The two culverts proposed for replacement would continue to be at risk for failure which could impact the physical integrity of the stream channels at those locations at an unpredictable time and to an unknown degree depending on whether the failure is gradual or catastrophic.

Proposed Action, Project 1: Physical integrity of channels at existing stream crossings would be altered for one to several years following replacement of two culverts. In the long term, replacement of these two culverts would prevent impacts to the physical integrity of these streams by eliminating almost all potential for failure. Within the road prism (estimated at 30 feet maximum width), the channel surface, banks and bed would be compacted (bulk density of soils increased by as much as 30%), vegetation would be disturbed or removed from the banks within the road prism, and the bed/banks would be reshaped and stabilized with woody debris and vegetation after use. Due to the stable nature of the channels and the low gradient and vegetation both up and downstream from the sites and that these stream crossings currently have culverts installed, little to no additional disturbance to channel morphology would be expected either upstream or downstream from the crossings.

Proposed Action, Projects 1, 2 and 3: Other than the culvert replacements described above, it is assumed that the current condition of physical integrity would be maintained because none of these features would be changed by management actions.

ACSO 4: *Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems.* Addressed in Text (*EA sections 2.3, 3.4, 3.5*). In summary:

No Action Alternative: The BLM expects that the current condition of the water quality would be maintained because no management actions would change things that currently contribute to water quality.

Proposed Action, Project 1: Water quality would be maintained by retaining stream protection zones (SPZ) in the Riparian Reserve LUA to prevent measurable changes to sediment input from the slopes above the streams and prevent measurable effects on stream temperatures, pH or dissolved oxygen. Proposed new roads and road renovation would be done in places where there would be no increased hydrologic connection or sediment input into streams or riparian areas, except as described in the following paragraph.

Sediment transport and turbidity in the watershed is likely to increase in the short term as a direct result of replacing two culverts. Sediment increases would not be visible beyond 800 meters (0.5 mile) downstream from the culvert replacement sites, would be of low magnitude and short duration (hours to days), and would not be expected to affect fish, aquatic species or human uses. Over the long term (generally beyond the first season after culvert replacement, fully beyond 3-5 years), the risk of high level sediment inputs from catastrophic failure of the culvert would be reduced and current conditions/trends in turbidity and sediment yield would likely be maintained.

Log hauling would not be expected to visibly increase turbidity for more than a few hours, if at all, because project design features (PDF) to prevent sediment transport and to restrict use of unsuitable haul routes would prevent generating sediment and to immediately detect and correct any sediment transport that might occur. Any such sediment increases would be of low magnitude and short duration (hours), and would not be expected to affect fish, aquatic species or human uses.

Removing trees from portions of the edges of wet meadows (wetland habitats) in projects 1 and 2 would maintain and restore the aquatic systems here by retarding conifer encroachment that reduces the size and function of those meadows.

Proposed Action, Projects 2 and 3: The BLM expects that the current condition of the water quality would be maintained because no management actions would change things that currently contribute to water quality.

ACSO 5: *Maintain and restore the sediment regime under which aquatic ecosystems evolved.* Addressed in Text (EA sections *2.3, 3.4, 3.5*). In summary:

No Action Alternative: The BLM expects that the current levels of sediment inputs into streams would be maintained, except for the potential failure of the two culverts proposed for replacement which would not be replaced under the No Action alternative.

Proposed Action, Project 1: Stream protection Zones (SPZs) in RRs would be maintained (minimum of 60 feet on fish bearing streams and 30 feet on non-fish bearing streams in treatment areas, increased to 100 ft. and 50 ft. within 1,000 feet of listed fish habitat). Hauling restrictions and sediment control measures would minimize sediment delivery. Short-term localized increases in stream sediment can be expected after replacing two culverts and routine repair and maintenance of existing culverts, but BMPs and mitigation measures would be implemented to limit acceleration of sediment delivery to streams. Any such sediment increases would be of low magnitude (<800 meters below source) and short duration (hours), and would not be expected to affect fish, aquatic species or human uses.

Proposed Action, Projects 2 and 3: The BLM expects that the sediment regime would be maintained as in the No Action alternative because none of the actions proposed would affect

sediment delivery to streams except for restoring proper runoff flows from one plugged culvert on a currently closed road as described in Project 3.

ACSO 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.* Addressed in Text (*EA sections 2.3, 3.4, 3.5, 3.7*). In summary:

No Action Alternative: In-stream flows and related habitats and patterns would be maintained because there would be no management actions or predictable natural events that would change inputs to stream flows or sediment, nutrient and wood inputs.

Proposed Action, Project 1: In-stream flows would be maintained because the proposed actions would retain more than half of the forest canopy in treated areas, treated areas would comprise less than two percent of the 6th field watershed, only a small fraction of forest cover would be removed for new roads and landings, and the stream network would not be increased by road construction. A preliminary analysis for the risk of increased peak flow as a result of forest harvest, using the Oregon Watershed Assessment Manual watershed analysis methods for forest hydrology (OWEB, 1997) indicates that the proposed action would be unlikely to produce any measurable effect on stream flows.

Riparian, aquatic and wetland habitats and patterns of sediment, nutrient and wood routing would be maintained because the proposed action would maintain riparian microclimate conditions by maintaining intact stream protection zones (SPZ) that retain the primary shade zone and retain substantial portions of the canopy in the secondary shade zone. The SPZ would retain patterns of sediment and nutrient inputs and retain more than 90 percent of the trees that would potentially contribute to wood routing.

Removing trees from portions of the edges of wet meadows (wetland habitats) in projects 1 and 2 would maintain and restore the aquatic systems here by retarding conifer encroachment that reduces the size and function of those meadows.

Proposed Action, Projects 2 and 3: In-stream flows and related habitats and patterns would be maintained because there would be no management actions or predictable natural events that would change inputs to stream flows or sediment, nutrient and wood inputs. The theoretical potential decrease in wood routing from snag/CWD recruitment in project 2 would be too small to calculate because of the small numbers of trees affected and their distance from streams that could potentially route wood to Crabtree Creek.

ACSO 7: *Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.* Addressed in Text (*EA sections 2.3, 3.4, 3.5*). In summary:

No Action Alternative: The current condition of flood plains and their ability to sustain inundation and the water table elevations in meadows and wetlands is expected to be maintained because no management actions or predictable natural events would occur to cause changes.

Proposed Action, Project 1: The current condition of floodplain inundation and water tables would be maintained because there would be no alteration of any stream channel, wetland or pond morphological features. All operations, equipment and disturbances are kept a minimum of 60 feet from all wetlands and perennial stream channels, and 30 feet from all intermittent stream

channels (increased to 100 ft. and 50 ft. within 1000 ft. of LFH) except for removing trees adjacent to some parts of the edges of wet meadows to retard conifer encroachment. The low intensity of disturbance from cutting and removing individually selected trees from near meadow edges would not alter morphological features of the wet meadow/wetland and retarding conifer encroachment would be expected to restore inundation patterns that are potentially impacted by conifer encroachment.

ACSO 8: *Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.* Addressed in Text (*EA sections 2.3, 3.4, 3.5, 3.7*). In summary:

No Action Alternative: The current species composition and structural diversity of plant communities would be maintained by continuing along the current trajectory. Diversification would occur over a longer period of time compared to the proposed action alternatives.

Proposed Action, Project 1: SPZs would maintain the current trajectory of species composition and structural diversity of plant communities in riparian areas and wetlands from 30 feet (intermittent streams) to 60 feet (perennial streams) (50 to 100 feet minimum within 1000 feet of LFH) in the project area.

The proposed action would restore structural diversity in the upland portions of the Riparian Reserve by accelerating growth and development of some elements of structural diversity that are normally associated with late successional forests, such as shrub component, understory development, large diameter trees, and deep crowns with large limbs. It would accelerate development of large diameter snags and down wood by accelerating tree growth to provide potential source material for this dead wood. It would immediately recruit some snags and CWD by girdling or felling some trees larger than 21 inches diameter.

Proposed Action, Project 2: Structural diversity would be restored by girdling (base and top) and felling trees larger than 21 inches diameter in pulses over the next 3-4 decades to provide large dead wood structural components that would take much longer to develop through natural processes.

Proposed Action, Project 3: Structural diversity would be maintained by closing 0.4 mile of road and reducing the potential for human impacts, especially from vehicle use.

ACSO 9: *Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.* Addressed in Text (*EA sections 2.3, 3.4, 3.5, 3.7*). In summary:

No Action Alternative: Habitats would be maintained over the short-term and continue to develop over the long-term with no known impacts on species currently present.

Proposed Action, Project 1: The proposed action would maintain riparian habitat for dependent species by maintaining stream protection zones with minimum widths of 30 feet on intermittent streams and 60 feet on perennial streams (increased to 50 and 100 feet on streams within 1000 feet of LFH) where habitats and populations would not be disturbed.

The proposed action would restore the upland portions of these habitats in the long term by diversifying habitat characteristics across the landscape, accelerating development of some late successional characteristics to provide habitat for a wider variety of plant and animal species across the landscape at the 6th field watershed level. The proposed action would have no adverse effect on riparian dependent species. Although thinning activities may affect some invertebrates within the treatment areas, adjacent non-thinned areas should provide adequate refugia for the species. In the long term, the treatments would restore elements of structural diversity to treatment areas in the Riparian Reserve LUA. These attributes would help to provide resources currently lacking or of low quality, and over the long-term, would benefit both aquatic and terrestrial species.

Proposed Action, Project 2: This proposed action would restore large dead wood (snag and CWD) habitat to support these species sooner than it would develop without management actions. No discernible impacts to species already present would be expected because of the low intensity of these treatments across the watershed.

Proposed Action, Project 3: This proposed action would maintain habitats by reducing current and potential levels of human disturbance to populations using the wet meadow, beaver pond, forest habitat and Crabtree Lake.

3.11.2 Comparison of Alternatives with Regard to the Objectives for the Projects

This section compares the alternatives with regard to the project objectives in EA section 1.4. The objectives from EA section 1.4 are reprinted here *in italics* for the reader's convenience, followed by the comparison of alternatives.

3.11.3 Project 1: Density Management Thinning

1. *Contribute to a healthy forest ecosystem with habitat that will support populations of native species and provide protection for riparian areas and waters.*

No Action: The No Action alternative would eventually achieve a healthy forest ecosystem through natural processes which develop habitat diversity and late-successional characteristics over several decades. No actions would be taken to potentially reduce protection for riparian areas and waters and there are no known threats which suggest a need for action.

Proposed action: The proposed density management would immediately introduce an additional element of diversity by treating a portion of the uniform stands that dominate this watershed and accelerate development of some late-successional characteristics. This would provide areas with more favorable habitat for some species while leaving large tracts to provide habitat for species which prefer the habitat provided by stands which continue to develop naturally. BLM experience with similar projects shows that the projects would provide adequate protection for riparian areas and waters.

2. *Contribute to providing a sustainable supply of timber and other forest products that will help maintain the stability of local and regional economies and contribute valuable resources to the national economy on a predictable and long-term basis.*
3. *Implement an environmentally sound and economically viable timber sale that contributes to meeting the overall RMP Objectives described above and accomplishes specific objectives described below for each Land Use Allocation.*

No Action: The No Action alternative would not contribute to meeting either of these two objectives because no timber sale would be implemented.

Proposed Action: The proposed action would result in a timber sale that BLM experience shows would be successfully offered to the marketplace, fulfilling objective 2 and the economic viability portion of objective 3. The project was developed and designed to be environmentally sound, as shown in this EA, fulfilling the remainder of objective 3.

4. *Protect, manage, and conserve federal listed and proposed species and their habitats to achieve their recovery in compliance with the Endangered Species Act and Bureau special status species policies (RMP p. 28).*

No Action: The No Action alternative would meet this objective by maintaining the status quo. It would not manage habitat to enhance or accelerate development of additional habitat features to provide additional benefit to any species. It would passively contribute to achieving recovery of ESA listed and Bureau special status species.

Proposed Action: The proposed action would meet this objective by maintaining the status quo in approximately 82 percent of the project vicinity (all LUA, EA Table 2) and managing forest land specifically to enhance late-successional habitat development on eleven percent of project vicinity acres (RR and LSR) and providing habitat diversity on an additional seven percent of the project vicinity in conjunction with timber management on GFMA land. It would actively manage less than 1/5 of the project vicinity (less than 1/50 of the 6th field watershed) to accelerate habitat development which would help achieve recovery while not compromising the passive recovery associated with "no action" on the remainder.

5. *Maintain and develop habitat and forage for wildlife species in addition to special status species (IDT defined objective).*

No Action: The No Action alternative would not contribute any additional forage for wildlife species. It would maintain current habitat and its development by natural processes. Conifer encroachment into the wet meadows would continue on its trajectory.

Proposed Action: The proposed action would create small (up to 1 acre) openings in the forest to provide forage for ungulates and open/edge habitat for species which prefer this habitat. Conifer encroachment along selected edges of two wet meadows would be slowed by management under the proposed action.

6. *Maintain and develop a safe, efficient and environmentally sound road system (RMP p. 62) and reduce environmental effects associated with identified existing roads within the project area (RMP p. 11) by:*

- *Providing appropriate access for timber harvest, silvicultural practices, and fire protection needed to meet these objectives;*
- *Perform road maintenance to prevent road deterioration or failure and to prevent road generated sedimentation that exceeds ODEQ standards.*

No Action: The No Action alternative partially meets this objective because the current main road system would remain in place and be maintained according to the District schedule. It would not meet part of the objective because it would not prevent or slow deterioration of unmaintained spur roads or of the two under-sized and failing culverts proposed for replacement.

Proposed Action: The proposed action would meet this objective by maintaining the current road system as part of the proposed timber sale as well as normal maintenance. It would maintain spur roads and replace two failing culverts to prevent deterioration and sedimentation, then stabilize and close those spur roads to prevent erosion and unauthorized use.

7. *Manage developing timber stands on available (Matrix/GFMA) lands to promote tree survival and growth to:*

- *Achieve a balance between wood volume production, quality of wood, and timber value at harvest;*
- *Increase the proportion of merchantable volume in the stand;*
- *Produce larger, more valuable logs;*
- *Harvest small trees as commercial wood products instead of letting them decline in vigor and die as the stand develops; and to*
- *Maintain good crown ratios and stable, wind-firm trees by applying silvicultural treatments to manage density with a commercial thinning.*

No Action: The No Action alternative does not meet objective 7 because without a timber sale these stands would not be managed and natural processes would result in a different stand development trajectory.

Proposed action: The proposed action would meet this objective by offering a timber sale that implements a prescription for thinning that is designed to achieve these results.

8. *Supply a sustainable source of forest commodities (primarily timber) from the Matrix LUA to provide jobs and contribute to community stability by developing timber sales that can be successfully offered to the market place. Select logging systems based on the suitability and economic efficiency of each system to successfully implement the silvicultural prescription, protect soil productivity and water quality, and meet other land use objectives.*

No Action: The No Action alternative does not meet this objective because it does not result in a timber sale or any other commodities produced.

Proposed Action: The proposed action meets this objective by implementing a timber sale that would be designed to achieve the elements of this objective. BLM experience shows that similar timber sales are successfully offered to the market place and that the logging systems proposed meet the objective.

9. *Maintain and restore water quality standards, aquatic ecosystem functions and stream conditions embodied in ACS objectives 1-7 by designing the project to comply with Oregon Department of Environmental Quality (ODEQ) water quality standards:*

- *Maintain effective shade for streams pursuant to BLM's agreement with the State of Oregon.*
- *Develop, maintain and use new and existing roads to comply with ODEQ water quality standards for peak flows and sediment.*

No Action: The No Action alternative meets this objective by maintaining current conditions and processes.

Proposed Action: The proposed action meets this objective because project design features would be implemented to maintain water quality within ODEQ standards.

10. *Maintain and restore the species composition and structural diversity of forest plant communities embodied in ACS objectives 8 and 9 by designing the project to:*

- *Apply silvicultural treatments in the RR to develop forest stand characteristics that maintain and/or restore the hydrology and sediment regimes of the watershed.*
- *Apply silvicultural treatments in the RR to provide a diverse vegetation community to provide riparian and wetland functions and habitat to support populations of riparian-dependent plant and animal species.*

- *Apply silvicultural treatments in the RR to develop long-term structural and spatial diversity, and other elements of late-successional forest habitat.*
- *Conduct thinning operations in forest stands up to 80 years old, regardless of origin, to develop large conifers and hardwoods for habitat and to recruit future large coarse woody debris, large snag habitat and in-stream large wood.*

No Action: The No Action alternative meets the first two elements of this objective by maintaining current conditions and trends without management action. It does not meet the last two elements of this objective because it does not treat stands to develop elements of late-successional forest habitat including structural and spatial diversity or large trees for habitat and snag/CWD recruitment faster than would occur without treatment.

Proposed Action: The proposed action meets this objective by maintaining the hydrology/sediment regime element of the objective and by treating forest stands in accordance with the RMP by implementing a prescription designed to accelerate development of large trees, shag/CWD recruitment and structural/spatial diversity. The proposed action would also reduce conifer encroachment into established wet meadows. It would maintain riparian habitat and large woody debris (LWD) processes because no treatments would be done in stream protection zones that include riparian habitat and provide the source for over 90 percent of LWD.

11. *Accelerate attaining late-successional characteristics both spatially and temporally across the landscape to improve connectivity and habitat for late-successional species. Accelerate this development of late-successional characteristics along the pathways from the current Stem-Exclusion stage to the Understory Re-initiation stage, with some early elements of the Shifting Gap stage, that are normally associated with much older forests than are present in the project area.*

No Action: The No Action alternative would not achieve this objective because no project would be done to accelerate attaining these elements of the objective.

Proposed Action: The proposed action meets this objective by treating the stands with a prescription designed to accelerate development of these late-successional characteristics.

12. *Specific late-successional forest characteristics to develop include:*

- *Introduce (create and recruit) some CWD and Snag habitat (> 20 inches diameter) immediately to compensate for the current lack of these habitat features carried over from the previous stands and begin recruiting additional inputs of larger diameter CWD and Snags for the future.*
- *Overstory trees with healthy crowns and large limbs that will become large (32-48" diameter) and giant (48" +) trees that are currently absent in these stands.*
- *Medium size (21-32") shade tolerant trees.*
- *A cohort of healthy small and pole size trees with crowns developed at different levels of the forest overstory.*
- *Gaps with low tree densities to provide forage and brushy thicket habitat.*

No Action: The No Action alternative would partially meet this objective as these characteristics develop slowly and irregularly through natural processes.

Proposed Action: The proposed action would meet this objective by implementing a prescription that actively recruits snags and CWD, slows crown recession allow trees to develop with large healthy crowns, accelerates growth on retained trees, and provides openings to allow light to reach small and pole size trees, and creates gaps.

13. *Maintain variability in treated and untreated areas to provide for any unknown elements, functions and processes that may not fully develop in accelerated late-successional pathways.*

No Action: The No Action alternative would partially meet this objective by maintaining all areas as untreated stands. It would not provide for any areas where development of characteristics would be accelerated because no treatments would be done.

Proposed Action: The proposed action would meet this objective by treating a small portion of the forest stands in the watershed with a prescription designed to accelerate development of some late-successional characteristics while maintaining large areas of untreated stands.

3.11.4 Project 2: Snag and Coarse Woody Debris Recruitment

Snags and CWD are elements of forest habitat, especially late-successional forest habitat, which form key elements of Project 1 objectives 1, 4, 5, 10, 11, 12 and 13 described above. This section compares the alternatives with respect to these objectives as a group.

No Action: The No Action alternative partially meets the snag and CWD elements of these objectives because natural processes will eventually (4-6 decades or more) recruit adequate amounts of large snags and CWD.

Proposed Action: The proposed action would meet the snag and CWD elements of these objectives because management action would accelerate the process of recruiting large snags and CWD in varying stages of decay by girdling or falling large trees in pulses over the next 3-4 decades to provide dead wood at varying stages of decay until natural processes are providing sufficient amounts.

3.11.5 Project 3: Crabtree Complex ACEC Road Closure

1. *Protect nesting northern spotted owls and their critical habitat from human disturbance and damage.*

No Action: The No Action alternative partially meets this objective by maintaining the status quo. Nesting owls have so far tolerated the current levels of human activity and may continue to do so for an unpredictable time.

Proposed Action: The proposed action meets this objective by providing additional protection to the known owl sites by keeping vehicles, with the associated noise and activities, further away from nesting owls and their habitat.

2. *Protect wet meadow and other habitats from damage and disturbance by OHV and other human use.*

No Action: The No Action alternative partially meets this objective because no OHV damage has occurred so far and may not occur for an unpredictable time.

Proposed Action: The proposed action meets this objective by more thoroughly blocking OHV and other motor vehicle access further away from sensitive areas, further reducing potential for damage.

3. *Prevent erosion from the closed road.*

No Action: The No Action alternative does not meet this objective because no project would be done to fix the ongoing erosion at the failed culvert.

Proposed Action: The proposed action meets this objective because the project would be designed to repair the existing damage and prevent future erosion.

4. *Provide for non-motorized recreation and prevent OHV use in the three contiguous ACECs, including Crabtree Lake itself.*

No Action: The No Action alternative partially meets the objective because it maintains the status quo and current motorized recreation is limited to rocked roads on the boundary of the ACEC. However, there is potential for OHV use that circumvents existing barriers and provides access to some parts of the ACECs and wet meadow.

Proposed Action: The proposed action meets the objective because it stops motorized traffic further away from the current barricade and places it at a stream crossing where it is unlikely that it could be circumvented to provide OHV access into the ACECs.

Chapter 4: List of Preparers

Table 19 List of Preparers

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Reviewed and released for public comment by Cascades Resource Area Field Manager

Date: 5/7/13

Chapter 5: Contacts and Consultation

5.1 Consultation

5.1.1 US Fish and Wildlife Service (USFWS)

The Crab Race thinning proposal was submitted for Informal Consultation with U.S. Fish and Wildlife Service (USFWS) as provided in Section 7 of the Endangered Species Act (ESA) of 1973 (16U.S.C. 1536 (a)(2) and (a)(4) as amended) during the FY2013 consultation process. The *Biological Assessment of Not Likely to Adversely Affect Projects with the Potential to*

Modify the Habitat of Northern Spotted Owls, Willamette Planning Province – FY2013 (BA) was submitted in April 2012. Using effect determination guidelines, the BA concluded that the Crab Race thinning proposal may affect, but is not likely to adversely affect the northern spotted owl due to modification of dispersal habitat (BA, pp. 28-32, 68); and would have no effect on spotted owl Critical Habitat (BA, p. 43).

The *Letter of Concurrence Regarding the Effects of Habitat Modification Activities within the Willamette Province, FY2013* (LOC) associated with the Crab Race Project was issued in June 2012 (FWS reference #01EOFW00-2012-I-0105). The LOC concurred that the habitat modification activities described in the BA, including the Crab Race Thinning, are not likely to adversely affect spotted owls and are not likely to adversely affect spotted owl Critical Habitat (LOC, p. 41-42). Furthermore, the proposed action is not likely to diminish the effectiveness of the conservation program established under the NWFP to protect the spotted owl and its habitat on federal lands within its range including designated spotted owl critical habitat (LOC, p. 41).

All applicable General Standards described in the Biological Assessment and Letter of Concurrence will be incorporated into the proposal (BA, pp. 10-12; LOC, pp. 14-15). This may include a seasonal restriction within disruption distance of known spotted owl sites during the critical nesting season, and monitoring/reporting on the implementation of this project to the U.S. Fish and Wildlife Service.

5.1.2 National Marine Fisheries Service (NMFS)

BLM initiated consultation with the National Marine Fisheries Service on the potential effects of the proposed project on UWR spring Chinook salmon and UWR steelhead trout in April 2013. The Biological Assessment for the Crab Race Timber Sale concluded that the effects determination for the Crabrace Project is "may affect, not likely to adversely affect" (NLAA) UWR winter steelhead and spring Chinook salmon, and for critical habitat of UWR winter steelhead and UWR spring Chinook salmon. A letter of concurrence is expected from NMFS by May or June 2013. Consultation will be completed (letter of concurrence obtained) prior to the Field Manager selecting an alternative and implementing the decision.

5.1.3 Cultural Resources: Section 106 Consultation with State Historical Preservation Office

Cultural resource surveys were conducted throughout the sale area during June and July 2012 (Report # C1208). Records indicate homesteading, logging and trail building activities in the general sale area beginning in the 1920s. Cultural resource inventories did not identify any pre-contact archaeological sites within the project area. A historic donkey sled was recorded within one of the units and will avoid being impacted by project design. A summary report of the cultural resource inventory will be sent to the State Historic Preservation Office.

5.2 Public Scoping and EA Public Comment Period

For the results of project scoping, see EA section 1.8. The EA and FONSI will be made available for public review from May 08, 2013 to June 07, 2013 and posted at the Salem District website at http://www.blm.gov/or/districts/salem/plans/index.php. The notice for public comment will be published in a legal notice in the ***Albany Democrat Herald*** newspaper. Written comments should be addressed to John Huston, Field Manager, Cascades Resource Area, 1717 Fabry Road S., Salem, Oregon 97306. Emailed comments may be sent to OR_Salem_Mail@blm.gov. Attention: John Huston

Chapter 6: List of Interdisciplinary Team Reports Incorporated by Reference

The Interdisciplinary team reports can be found in the Crab Race EA project file and are available for review at the Salem District Office.

Bonney, D., 2012. Crab Race Density Management Thinning and Silvicultural Prescription – Commercial Thinning (Silviculture Report), Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

England, Jim and Corbin Murphy, 2012. Cascades Resource Area EA Wildlife Report Crab Race Project (Wildlife Report) Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Fennell, T., 2012. Cascades Resource Area Botanical Report Proposed Crab Race Timber Sale (Botany Report), Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Greatorex, Fred and Heather Ulrich 2013. Cultural Resource Inventory Reports, Crab Race Density Management Thinning Timber Sale Pre-project Surveys. Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Hawe, W. P., 2012. Hydrology/Channels/Water Quality: Specialist Report: Crab Race Project, (Hydro Report), Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Hawe, W.P. 2012. Soils Specialist Report for the Proposed Crab Race Thinning Project (Soils Report) Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Macalady, Seth 2012. Crab Race Density Management Logging Systems Report (Logging Report), Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Milnor, Adam 2013. Recreation, Visual and Rural Interface Resources Report. Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

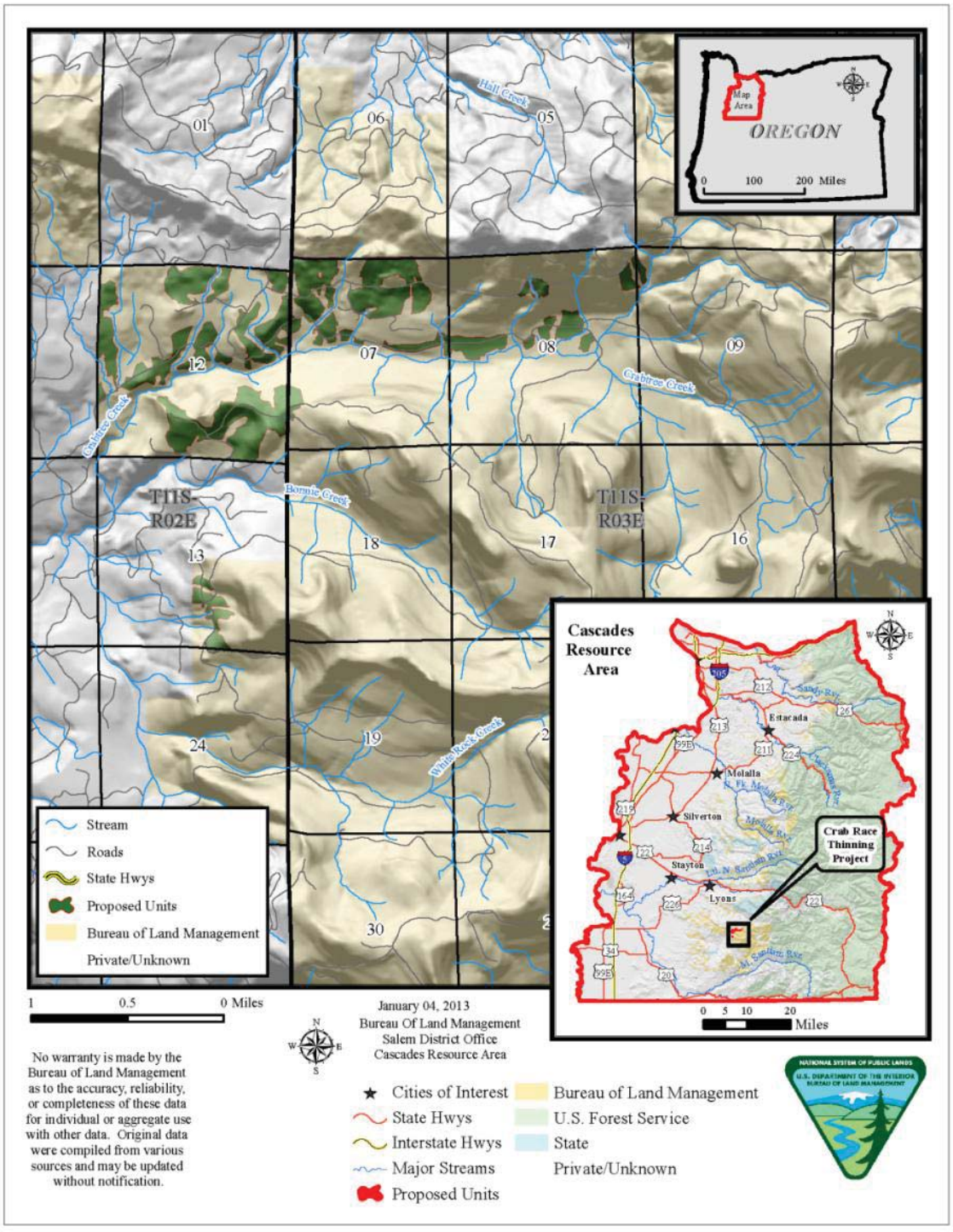
Mortensen, K., 2013. Cascades Resource Area Fuels Specialist Report, Crab Race Project, (Fuels Report) Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Zoellick, B., 2012. Crab Race Fisheries Specialist Report (Fisheries Report) Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

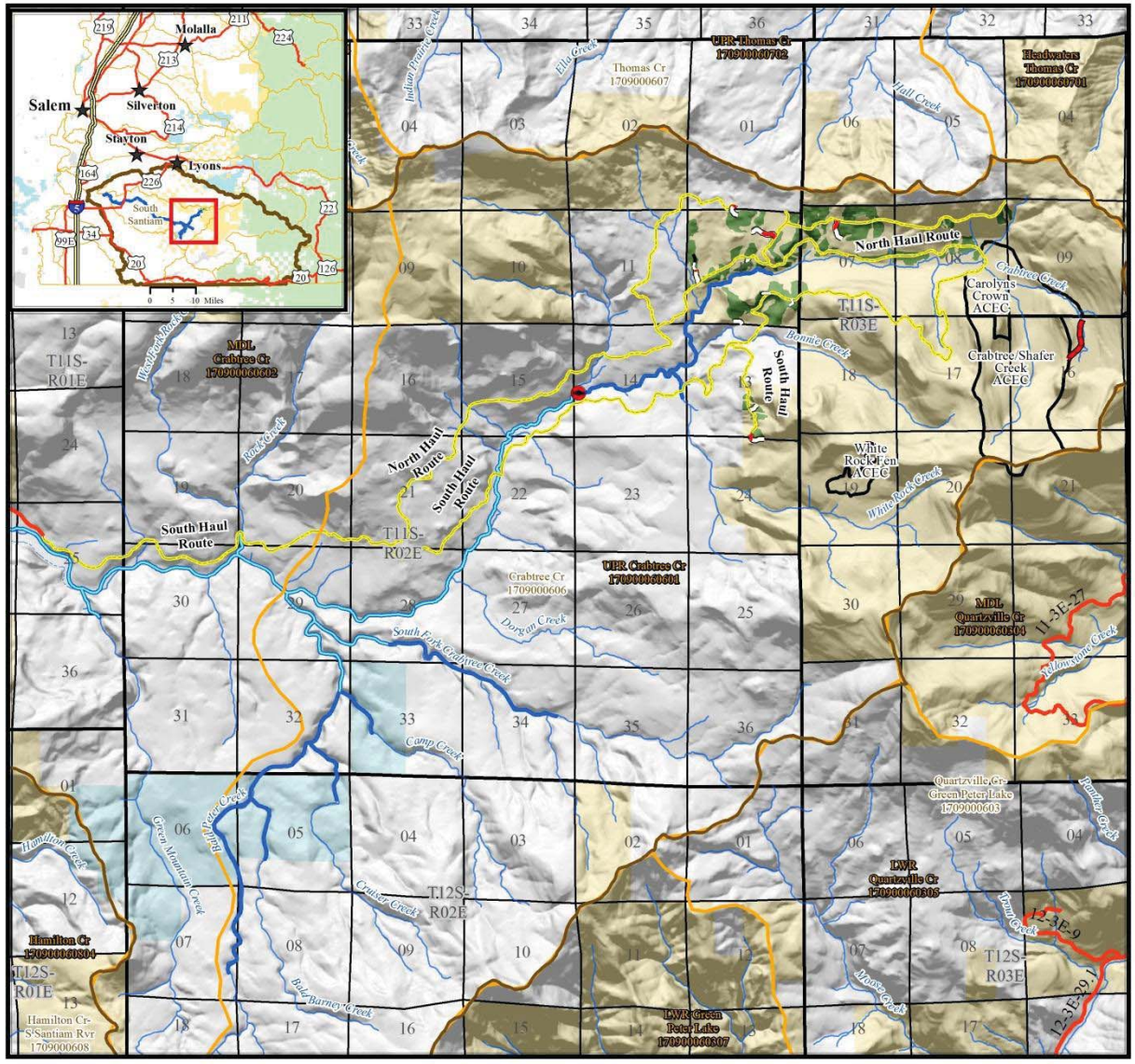
Chapter 7: Additional Tables, Project Maps, Glossary and Acronyms

7.1 Maps of the Proposed Action

Crab Race Density Management Thinning: Project Locator Map



Crab Race Project 1, Density Management Thinning Project Overview Map



Cascades Resource Area
Salem District BLM
Crab Race
Timber Sale Area

- Fish Barrier Falls
- Project Units
- Paved Road
- Haul Route

Road Work

- Proposed Closure
- New Construction
- Renovation
- Intermittent
- Perennial
- Chinook CH
- Steelhead CH
- ACEC Boundary (Designated)
- 5th Field Watershed
- 6th Field Watershed
- Bureau of Land Management
- State
- Private/Unknown

0 0.5 1 Miles

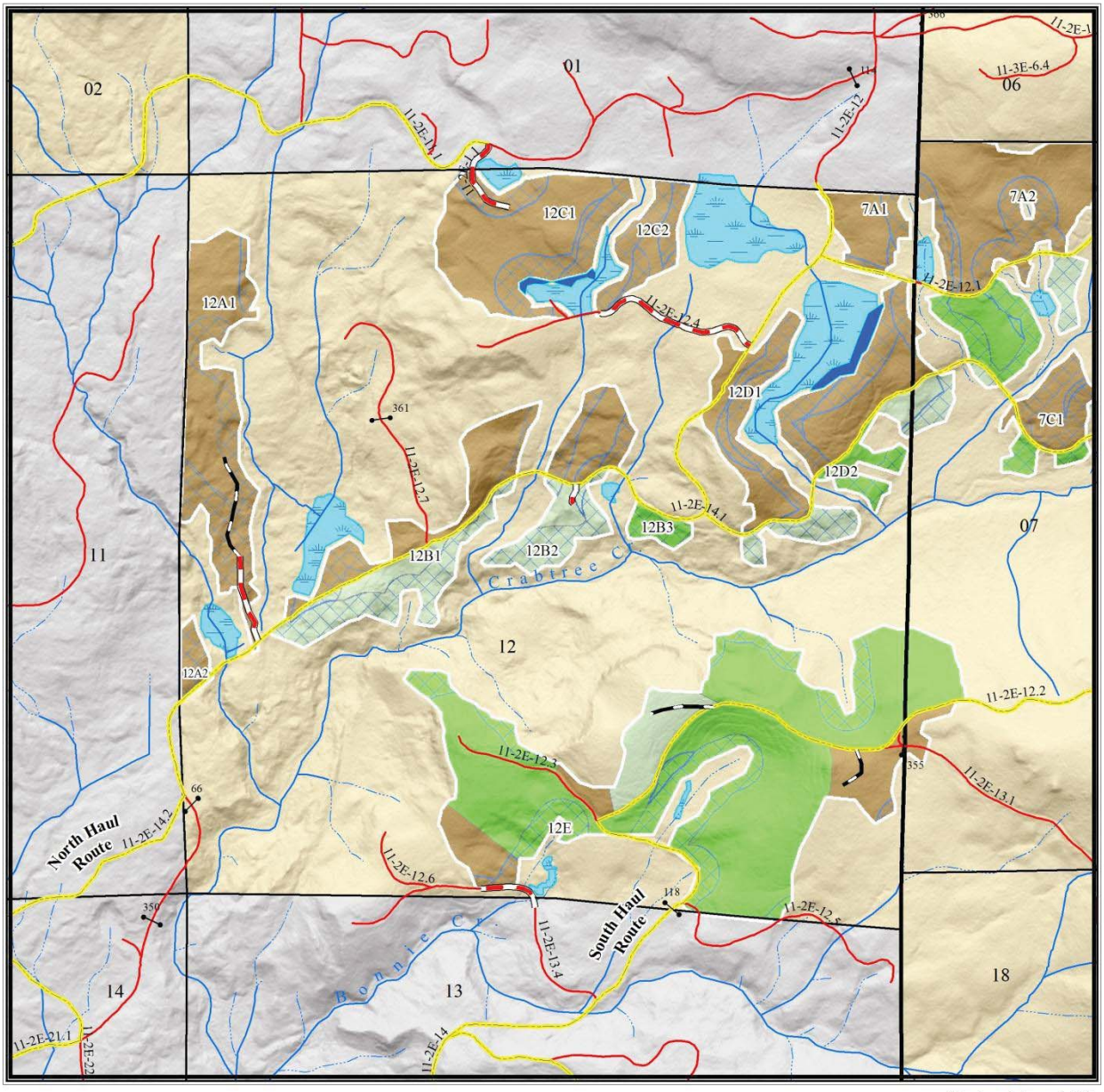
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources and may be updated without notification.

Crab Race Timber Sale Project

Section Map

April 26, 2013

T11S-R02E Sec 12



1,000 500 0Feet

Contour Interval: 20'

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.

- Closure Device
- New Construction
- Renovation
- Haul Route
- Intermittent
- Perennial
- Wet Meadow Edge trt
- Wet Area
- Cable Riparian
- Cable
- Ground Riparian
- Ground
- Special Riparian
- Special

NATIONAL SYSTEM OF PUBLIC LANDS
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

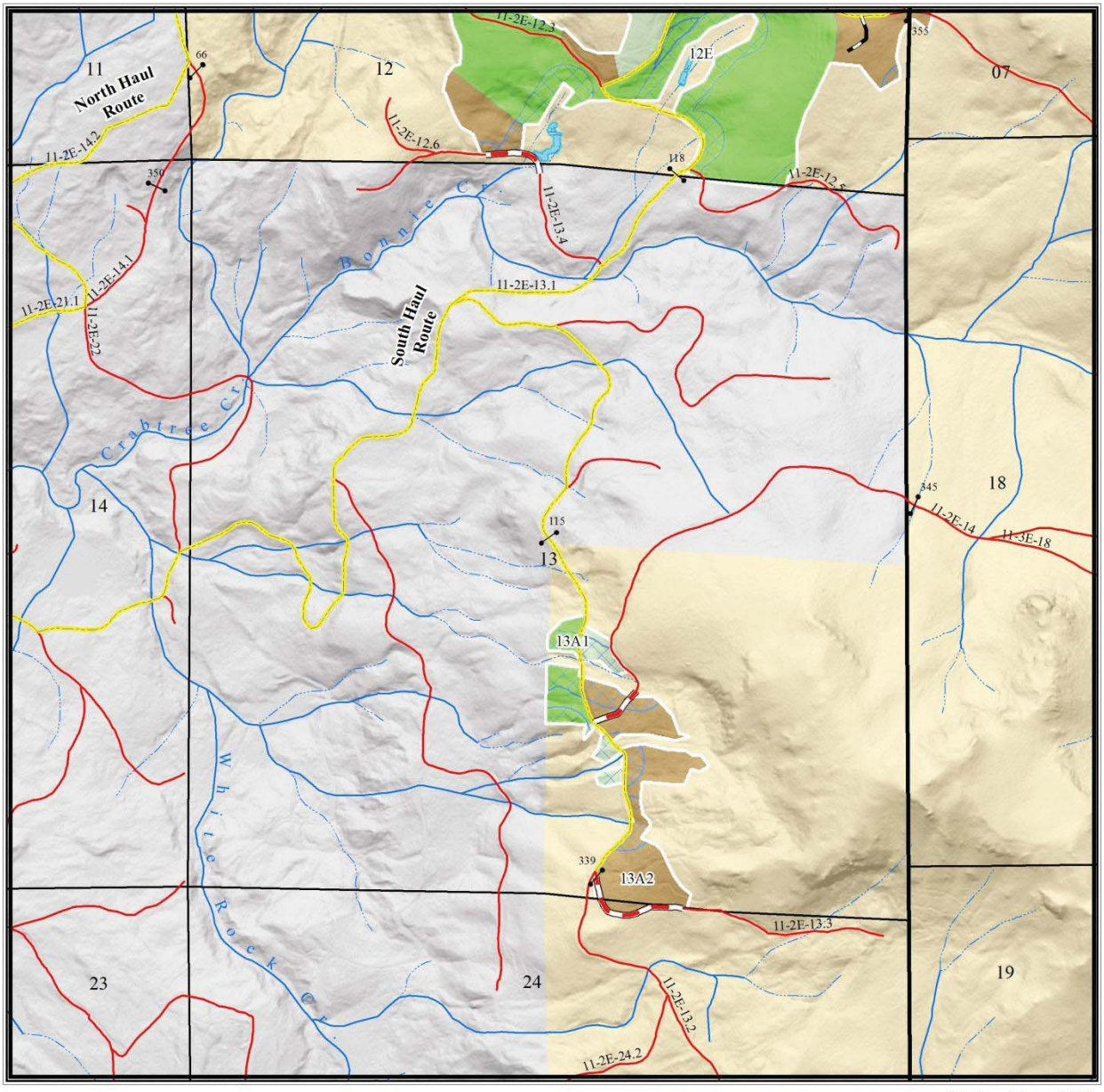
N W E S

Crab Race Timber Sale Project

Section Map

April 26, 2013

T11S-R02E Sec 13



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Contour Interval: 20'

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.

- Closure Device
- New Construction
- Renovation
- Haul Route
- Intermittent
- Perennial
- Wet Area
- Cable Riparian
- Cable
- Ground Riparian
- Ground
- Special Riparian
- Special

NATIONAL SYSTEM OF PUBLIC LANDS
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

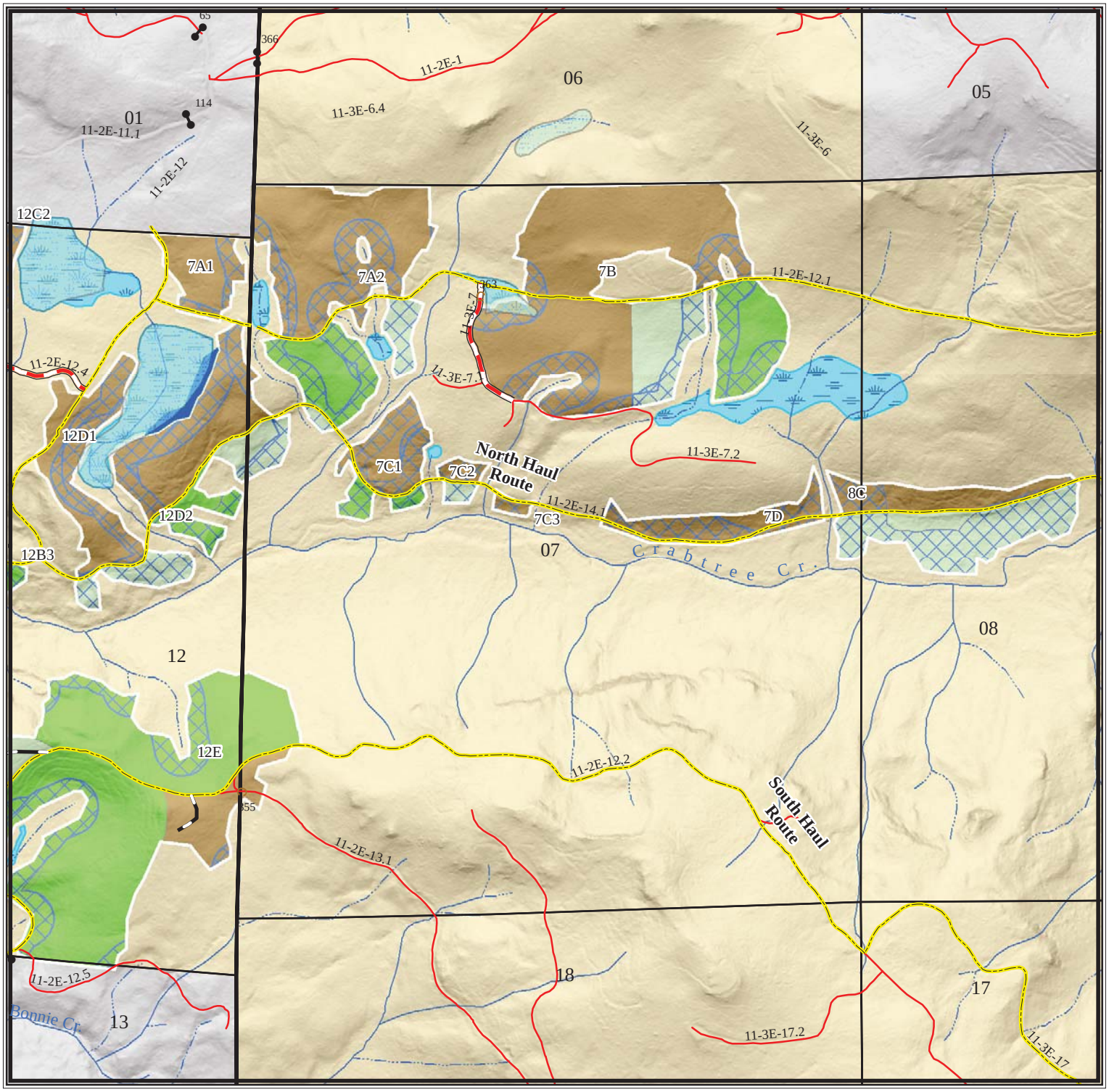
N W E S

Crab Race Project

Section Map

May 08, 2013

T11S-R03E Sec 07



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Contour Interval: 20'

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.

- C Earth Berm
- Gate
- New Construction
- Renovation
- Haul Route
- Intermittent
- Perennial
- Wet Meadow Edge trt
- Wet Area
- Cable Riparian
- Cable
- Ground Riparian
- Ground
- Special Riparian
- Special
- Swamp or Marsh

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U.S. DEPARTMENT OF THE INTERIOR
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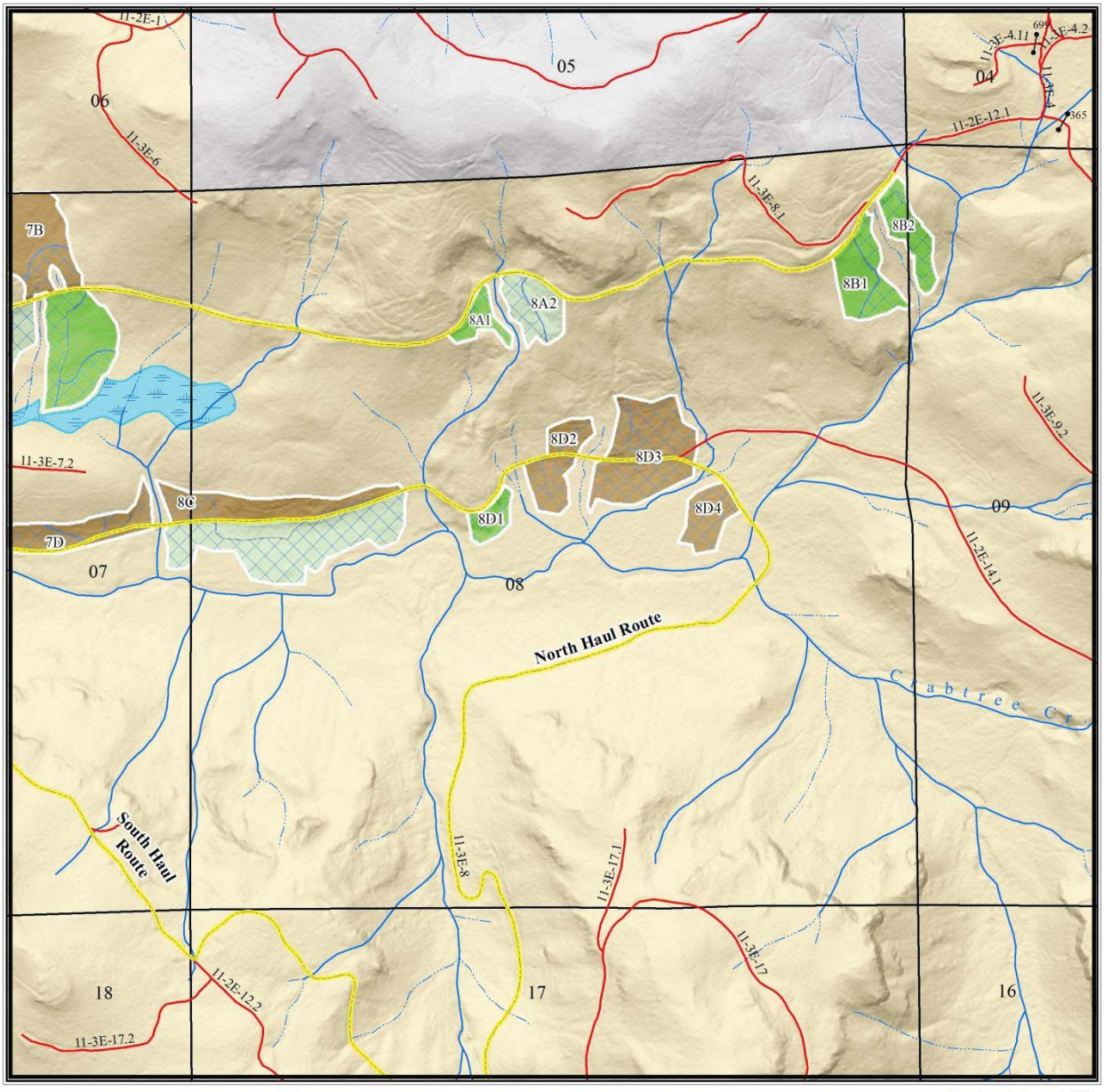
Crab Race Timber Sale Project

Section Map

April 26, 2013

T11S-R03E Sec 08 & 09



1,000 500 0Feet

Contour Interval: 20'

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.

- Closure Device
- Haul Route
- Intermittent
- Perennial
- Wet Area
- Cable Riparian
- Cable
- Ground Riparian
- Ground
- Special Riparian
- Special

NATIONAL SYSTEM OF PUBLIC LANDS
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

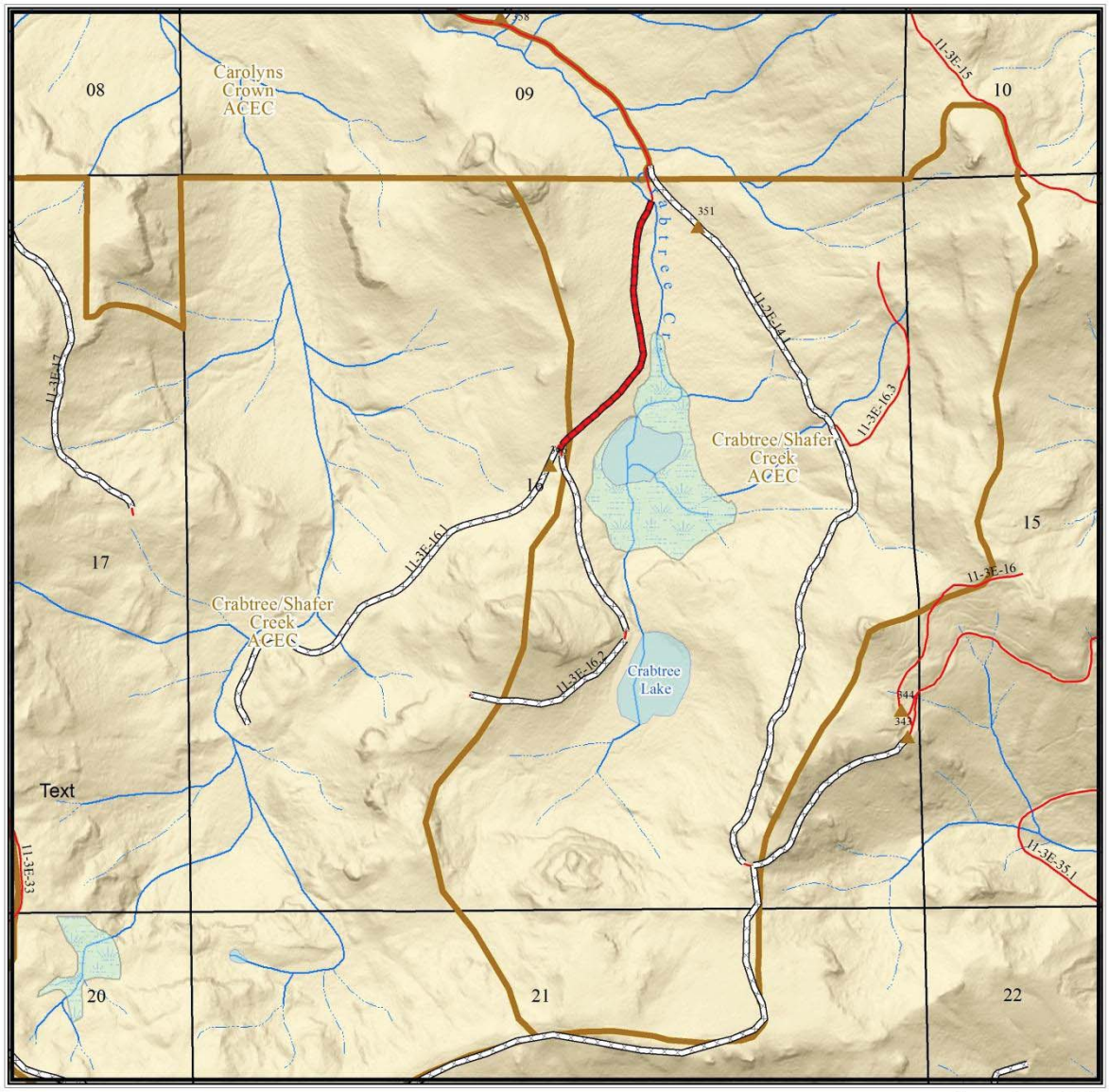
N W E S

Crab Race Projects

Section Map

May 06, 2013

T11S-R03E Sec 16



1,000 500 0Feet

Contour Interval: 20'

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.

- Earth Berm
- Proposed Closure
- Currently Closed Road
- Intermittent
- Perennial
- ACEC Boundary (Designated)
- Waterbody
- Swamp or Marsh

NATIONAL SYSTEM OF PUBLIC LANDS
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

N W E S

7.2 Glossary

activity fuel - Debris (wood chips, bark, branches, limbs, logs, or stumps) left on the ground after management actions, such as logging, pruning, thinning, or brush cutting, versus debris left after storms or fires.

age class - A management classification using the age of a stand of trees

alternative - One of several proposed management actions that have been studied and found to meet the goals and objectives of a project's purpose and need and, as a result, is suitable to aid decision-making.

anadromous fish - Fish that are born and reared in freshwater, move to the ocean to grow and mature, and return to freshwater to reproduce. Includes species such as salmon and steelhead. Also see salmonid.

(ACS) Aquatic Conservation Strategy - A Northwest Forest Plan methodology designed to restore and maintain the ecological health of watersheds and aquatic ecosystems, consisting of four components: riparian reserves, key watersheds, watershed analysis, and watershed restoration.

baseline - The starting point for the analysis of environmental consequences, often referred to as the Affected Environment. This starting point may be the condition at a point in time (e.g., when inventory data is collected) or the average of a set of data collected over a specified number of years.

beneficial use - In water use law, such uses include, but are not limited to: instream, out of stream, and ground water uses; domestic, municipal, and industrial water supplies; mining, irrigation, and livestock watering; fish and aquatic life; wildlife watering; fishing and water contact recreation; aesthetics and scenic attraction; hydropower; and commercial navigation.

(BMPs) Best Management Practices - BMPs are defined as methods, measures, or practices selected on the basis of site-specific conditions to ensure that water quality will be maintained at its highest practicable level. BMPs include, but are not limited to, structural and nonstructural controls, operations, and maintenance procedures. BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters (40 CFR 130.2, EPA Water Quality Standards Regulation).

canopy cover - The ground area covered by the crowns of trees or woody vegetation as delimited by the vertical projection of crown perimeter and commonly expressed as a percent of total ground area.

(CWD) coarse woody debris - That portion of trees that has naturally fallen or been cut and left in the forest. Usually refers to pieces at least 20 inches in diameter. There are four classes used to describe coarse woody debris. The classes range from Class I (which has the least decay, intact bark, and a hard log) to Class IV (i.e., the coarse woody debris has decayed to the point of nearly being incorporated into the forest floor).

commercial thinning - Any type of thinning producing merchantable material at least equal to the value of the direct cost of harvesting. See thinning.

crown fire - Fire that moves through the upper part of a tree that has live branches and foliage (i.e. crown) independent of any surface fire. Crown fires can often move faster and ahead of ground fires.

cumulative effect - The impact on the environment that results from incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions regardless of which agency or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

diameter at breast height (DBH) - The diameter of the stem of a tree measured at 4.5 feet above the ground level on the uphill side of the stem.

dispersal habitat (spotted owl) - Forest habitat that allows northern spotted owls to move (disperse) across the landscape; typically characterized by forest stands with average tree diameters of greater than 11 inches, and conifer overstory trees having closed canopies (greater than 40 percent canopy closure) with open space beneath the canopy to allow owls to fly.

dropped – dropped from this proposed action. The actions may be considered in the future and would be documented in an environmental analysis with a new decision. Dropping these areas does not constitute a change in land use allocations.

effective shade - The proportion of direct beam solar radiation reaching a stream surface to total daily solar radiation.

environmental effects - The direct, indirect and cumulative effects of a proposed action or alternative on existing conditions in the environment in which the action(s) would occur.Also see baseline.

fine sediment - Fine-grained soil material, less than 2mm in size, normally deposited by water, but in some cases by wind (aeolian) or gravity (dry ravel).

fuel loading - The dry weight of all accumulated live and dead woody and herbaceous material on the forest floor that is available for combustion, and which poses a fire hazard.

green tree - A live tree.

land use allocation - A designation for a use that is allowed, restricted, or prohibited for a particular area of land, such as the Matrix, adaptive management, late-successional reserve, or critical habitat land use allocations.

late-successional forest - A forest that is in its mature stage and contains a diversity of structural characteristics, such as live trees, snags, woody debris, and a patchy, multi-layered canopy.

long term - A period of time used as an analytical timeframe; starts more than 10 years after implementation of a project, depending on the resource being analyzed. Also see short term.

mass wasting - The sudden or slow dislodgement and downslope movement of rock, soil, and organic materials.

mature stage - Generally begins as tree growth rates stop increasing (after culmination of mean annual increment), and as tree mortality shifts from density-dependent mortality to density-independent mortality.

merchantable - Trees or stands having the size, quality and condition suitable for marketing under a given economic condition, even if not immediately accessible for logging

multi-layered canopy - Forest stands with two or more distinct tree layers in the canopy.

old-growth forest - A forest stand usually at least 180-220 years old with moderate to high canopy closure; a multilayered, multispecies canopy dominated by large overstory trees; high incidence of large trees, some with broken tops and other indications of old and decaying wood

(decadence); numerous large snags; and heavy accumulations of wood, including large logs on the ground.

overstory - That portion of trees forming the uppermost canopy layer in a forest stand and that consists of more than one distinct layer.

short term - A period of time used as an analytical timeframe and that is within the first 10 years of the implementation of a resource management plan. Also see long term.

silvicultural prescription - A planned series of treatments designed to change current stand structure to one that meets management goals.

snag - Any standing (upright) dead tree.

thinning - A silvicultural treatment made to reduce the density of trees primarily to improve tree/stand growth and vigor, and/or recover potential mortality of trees, generally for commodity use.

timber - Forest crops or stands, or wood that is harvested from forests and is of a character and quality suitable for manufacture into lumber and other wood products rather than for use as fuel.

(USFWS) United States Fish and Wildlife Service - A federal agency under the United States Department of the Interior that is responsible for working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats.

watershed - All of the land and water within the boundaries of a drainage area that are separated by land ridges from other drainage areas. Larger watersheds can contain smaller watersheds that all ultimately flow their surface water to a common point.

wetland - land with presence and duration of water, sufficient to support wetland vegetation

wildfire - Any nonstructural fire, other than prescribed burns, that occurs on wildland.

(WUI) wildland/urban interface- The area in which structures and other human development meet or intermingle with undeveloped wildland. The term used primarily for wildfire prevention and suppression. Rural/Urban Interface is used primarily for other recreation and forest management activities.

windthrow - A tree or trees uprooted or felled by the wind.

7.3 Additional Acronyms

BLM – Bureau of Land Management

BS – Bureau Sensitive, a category of species under the Oregon/Washington Special Status Species Policy

DBH – diameter at breast height

EA - Environmental Assessment

ESA – Endangered Species Act

FONSI – Finding of No Significant Impact

GFMA – General Forest Management Area land use allocation (Matrix)

NEPA – National Environmental Policy Act (1969)

ODEQ – Oregon Department of Environmental Quality

RIA – Rural-Urban Interface (recreation, visual and sociological issues)

RMP/FEIS – Salem District Proposed Resource Management Plan / Final Environmental Impact Statement (1994)

ROW – right-of-way (roads)

RR – Riparian Reserve Land Use Allocation (Riparian Reserves)

SPZ – Stream Protection Zone (no-cut protection zone)

TMDL – total maximum daily load

USDI – United States Department of the Interior

USFS – United States Forest Service

Chapter 8: Scoping Comments

Table 20 Scoping Comments and Responses

	Comment (Comments listed in the order received by the BLM.)	**Response**
Vegetation and Forest Stand Characteristics – Issue 1, EA Section 3.3, 3.7		
Project 1		
1	Thinning appears to be an appropriate management tool for plantations of this age (39-54 years old). However, thinning should be of variable density, with some small (<1 acre) gaps and some stands left to thin naturally, particularly in riparian areas. (KS – an individual)	Noted.
2	Species diversity should be encouraged. (KS)	
3	We also support the thinning projects within these stands 40-50 years old. (Cascadia Wildlands)	
4	However, we want to ensure that these thinnings, within the LSR and RR LUA, are the final designed thinnings for these areas. After this phase of thinning, these areas will likely develop the native characteristics necessary to support old growth species and need not be disturbed again. (See Transportation System for continued comment.) (Cascadia Wildlands)	Noted. Currently planned as the only thinning but this decision cannot be binding on future Resource Management Plans.
5	The Rocky Mountain Elk Foundation [RMEF] strongly supports this project because it proposes to provide conditions which will enhance the development of early seral stage vegetation in an area where it is in critically short supply and well below its historical proportion of the land area. (RMEF)	Noted
6	Thin the forest to a canopy cover of less than 50% to encourage early seral plant species (RMEF)	Noted, prescription differs from this comment.
7	Seed all disturbed soil…with a native seed mix of high forage value for deer and elk (RMEF)	Noted. Native seed mix used was selected for soil stabilization, forage value is incidental.
8	Retain and enhance all natural meadows by removing encroaching conifers (RMEF)	Some edges to be treated.
9	[Create]…gaps…as large as possible, tend toward 2 to 3 acres on Matrix LUA and at least one acre in LSR LUA (RMEF)	Gap size differs from comment.
10	[S]ite gaps to receive sunlight to encourage early seral species response ideally on slopes less than 30% away from open roads. Avoid reforestation in created gaps. Within RR, consider planting western red cedar in any gaps created. Consider planting native shrubs producing browse, fruit and nuts for wildlife in created gaps. (RMEF)	
11	AFRC [American Forest Resource Council] would like the BLM to look for opportunities to pursue regeneration harvests on their Matrix land in addition to thinning…The near absence of any type of regeneration harvest over the past 15 years has eliminated an entire cohort of trees needed to maintain [long term timber] sustainability. This may not seem to affect timber supply now, but in the future there will be a huge shortage of stands available for harvest. While thinning…is important, it is more important at this time to implement regeneration harvests in order to get the BLM's timber supply on track.	Noted. Not included in this proposal, age class is too young.

#	**Comment** (Comments listed in the order received by the BLM.)	**Response**
12	AFRC is glad to see the BLM is being proactive in treating riparian reserves…accelerates the stands trajectory to a mature successional condition…has no affect on stream temperature with adequate buffers…insignificant short-term affect on down wood…ultimately a positive effect on long-term [CWD]… (AFRC)	Noted. Riparian Reserve treatments addressed in EA.
Project 3		
13	My main concerns are…Avoid the introduction of invasive species. (KS)	Invasives addressed in EA.
14	I am also concerned that any foot traffic allowed in the road closure area be sensitive to the ACEC's special values – i.e., avoid botanical/wildlife areas "of concern". (KS) (Duplicated in Recreation)	Noted. Primary foot access is on the existing road bed.
Hydrology and Water Quality – Issue 2, EA section 3.4		
15	No hydrology or water quality comments submitted specifically for projects 1 or 2.	
Project 3		
16	My main concerns are…protecting the integrity of stream hydrology and water quality (culvert removal). (KS)	Culvert no longer planned for removal. EA 1.1.3, 1.3.3, 1.4.3, 2.3.3, 2.3.3.4
Fisheries and Aquatic/Riparian Habitat – Issue 3, EA Section 3.5		
Project 1		
17	Please survey for and protect all Survey and Manage/Sensitive Species in riparian/aquatic areas in particular. (KS) (comment duplicated in Wildlife and Terrestrial Habitats)	Addressed
Soils and Site Productivity – Issue 4, EA Section 3.6		
18	No comments submitted about soils and site productivity.	
Wildlife and Terrestrial Habitats – Issue 5, EA Section3.7		
Project 1		
19	All legacy trees should be left in place, as well as large snags/downed wood, and the sale designed to avoid having to fell these trees as "hazard" trees. (KS)	Addressed
20	Please survey for and protect all Survey and Manage/Sensitive Species in riparian/aquatic areas in particular. (KS) (comment duplicated in Fisheries and Aquatic/Riparian Habitat)	See above, Fisheries…
21	Impose seasonal restrictions as necessary to protect breeding wildlife. (KS) (comment duplicated in Economic Viability)	Addressed
22	Increasing the proportion of early seral habitat will increase wildlife diversity because far more native species are obligated to the early seral vegetation type than are obligated to the closed canopy condition that now exists. (RMEF)	Noted.
23	The additional forage opportunity provided by the new early seral vegetation produced by the project will help reduce the forage pressure elk and deer now place on the wet meadows that currently have the only quality forage in the area. (RMEF)	Noted.
24	See RMEF comments about forage species and other specific recommendations under Vegetation, and about slash treatment under Fuels Treatment. (RMEF)	Refer to specific comments listed in this table.
25	My main concerns are…protecting terrestrial species (road removal). (KS)	Noted.
Air Quality, Fire Hazard, Fuels Treatment and Fire Suppression Capabilities – Issue 6, EA Section 3.8		
Project 1		
26	Treat slash by burning, sawing and scattering, chipping or other disposal in the created gaps to provide for readily accessible use by big game. (RMEF)	EA
Public Safety, Recreation and OHV Use – Issue 7, EA Section 3.9		
Project 1		
27	Protect scenic and recreational values[.] (KS)	Noted.
Project 2		
28	I'm also concerned that any foot traffic allowed in the road closure area be sensitive to the ACEC's special values – i.e., avoid botanical/wildlife areas "of concern". (KS) (comment duplicated in Vegetation/Forest Stand Characteristics)	See previous response to this comment, above.
29	Crabtree Lake is a popular recreational area for hunters and fishermen. Gate the road, but leave the road way undisturbed for foot access of hunters and fishermen. (RMEF)	Foot access maintained.
Economic Viability, Transportation System and Logging Systems – EA Section 1.8.3, 2		
Project 1		
30	[A]void road building which is expensive and, looking at the map, appears to be unnecessary. (KS)	Noted.
31	Impose seasonal restrictions as necessary to protect breeding wildlife. (KS) (comment duplicated in Wildlife)	Table 5

#	**Comment** (Comments listed in the order received by the BLM.)	Response
32	(See comment 4 as introduction) Therefore, we would encourage further road removal [in addition to project 3] in these areas [LSR, RR] as well. (Cascadia Wildlands)	Removal of existing roads under project 1 not proposed in EA.
33	AFRC [American Forest Resource Council] would like to see all timber sales be economically viable. Appropriate harvesting systems should be used to achieve an economically viable sale and increase the revenues to the government. (AFRC)	Noted.
34	We would like to see flexibility in the EA and contract to allow a variety of equipment access to the sale areas. We feel that there are several ways to properly harvest any piece of ground, and certain restrictive language can limit some potential bidders, thus driving the bid value down. Including language in the EA and contract that specifies damage tolerance levels rather than firm restrictions gives the operator flexibility to utilize their equipment to its maximum efficiencies. [Examples given.] (AFRC)	Noted. EA addresses best management practices and effects. Timber sale contracts address equipment and operations.
35	Consistent and steady operation time throughout the year is important…not only to supply a steady source of timber for their mills, but also to keep their employees working. Opportunities for dry weather operation during the wet season are critical to achieve this goal. (AFRC)	Noted. Table 5
36	The units in section 12 of this proposal are allocated as Matrix for perpetual timber production and AFRC [urges] the BLM to allow the roads built to be rocked as permanent roads [to allow] the opportunity to log in the winter months. (Long term economic benefits also mentioned.) (AFRC)	Noted. Addressed.
37	Why don't we try selling some timber before the counties go broke. (CL – an individual)	Noted.
Project 2		
38	We fully support the road closure and culvert removal near the Crabtree ACEC. (Cascadia Wildlands)	Noted.
Carbon/Climate, Alternative Land Uses – EA Section 1.8.3		
39	No comments received.	
Other Issues		
40	…address the WOPR in its planning documents… (AFRC)	Noted.

Chapter 9: Literature Cited

9.1 BLM and Joint USFS/BLM Documents

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USDI Bureau of Land Management. Salem District Cultural Resource maps and files, aerial photos, USGS topographical maps.

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