United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Salem District Office
1717 Fabry Road S.E.
Salem, Oregon 97306
http://www.or.blm.gov/salem/

TAKE PRIDE IN AMERICA

In Reply To:
5410 (ORS040)
Gordon Creek Thinning
EA No OR-080-07-05

November 25, 2009

Dear Reader:

The Cascades Resource Area completed the March 2009 Gordon Creek Thinning Revised EA on March 17, 2009. A Decision Rationale for the Gordon Creek Thinning I timber sale was completed on April 28, 2009. The decision was administratively protested. In response to protest points concerning Carbon Sequestration and Climate Change, I decided to update the March 2009 Gordon Creek Thinning Revised EA to include a site specific analysis on Carbon Storage, Carbon Emissions and Climate Change. The updated EA is named December 2009 Gordon Creek Thinning Revised EA.

With the exception of new sections on Carbon Storage, Carbon Emissions and Climate Change, there are no changes in content from the March 2009 Revised EA. Therefore the only portions of the December 2009 Revised EA open to public comment during this EA comment period are the new sections on Carbon Storage, Carbon Emissions and Climate Change.

I will be accepting comments on the carbon analysis sections of the December 2009 Gordon Creek Thinning Revised EA until December 19, 2009. Please send written comments to Cindy Enstrom, Cascades Resource Area Field Manager, Salem District, Bureau of Land Management, 1717 Fabry Road SE, Salem, Oregon 97306. Comments may also be faxed to (503) 375-5622. If you have any questions, please call Rudy Hefter at (503) 375-5671.

Sincerely,

Cindy Enstrom

Cindy Enstrom
Cascades Resource Area Field Manager

Note: Comments, including names and addresses of respondents, will be available for public review at the same time as the EA during regular business hours (7:45 a.m. to 4:30 p.m.), Monday through Friday, except holidays. Individual respondents may request confidentiality. If you wish to withhold your name or street address from public review or from disclosure under the Freedom of Information Act, you must state this prominently at the beginning of your written comment. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for inspection in their entirety.

December 2009 Gordon Creek Thinning

Revised Environmental Assessment and
Finding of No Additional Significant Impact

Environmental Assessment Number OR080-07-05

December 2009

Salem District
Multnomah County, Oregon

T.1 S., R. 5 E. sections 1, 3, 9, 11, 13, 15; W.M.

Responsible Agency:	USDI - Bureau of Land Management
Responsible Official:	Cindy Enstrom, Field Manager Cascades Resource Area 1717 Fabry Road SE Salem, OR 97306 (503) 315-5969
For further information, contact:	Keith Walton, Project Leader Cascades Resource Area 1717 Fabry Road SE Salem, OR 97306 (503) 375-5676

BLM Salem District

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.

Table of Contents

List of Tables

FINDING OF NO ADDITIONAL SIGNIFICANT IMPACT

The Bureau of Land Management (BLM) published the *Gordon Creek Thinning Environmental Assessment (*EA) (EA# OR080-07-05) in September of 2007. Comments received on the EA were reviewed and as a result, the BLM revised the Gordon Creek Thinning EA. The *Gordon Creek Thinning Revised EA* is attached to and incorporated by reference in this Finding of No Additional Significant Impact determination (FONASI). The analysis in this revised 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*).

The project is located on BLM lands T.1 S., R. 5 E., sections 1, 3, 9, 11, 13 and 15; W.M. in Multnomah County, Oregon. The proposed action is to thin approximately 1724 acres including: 1514 acres of 55 to 74 year-old timber stands; and 210 acres of 52 year old two storied stands. Approximately 1324 of these acres are in the Matrix land use allocation (LUA), and 400 in the Riparian Reserve LUA.

December 2009 EA Update: The December 2009 edition of the revised EA and FONASI will be made available for public review from December 2, 2009 to December 19, 2009. The notice for public comment will be published in a legal notice in the *Sandy Post* newspaper. Written comments should be addressed to Cindy Enstrom, Field Manager, Cascades Resource Area, 1717 Fabry Road S., Salem, Oregon 97306. Emailed comments may be sent to OR_Salem_Mail@blm.gov. Attention: Cindy Enstrom

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Finding of No Additional Significant Impact

Based upon review of the *Gordon Creek Thinning Revised EA* and supporting documents, I have determined that the Proposed Action is not a major federal action 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 a new environmental impact statement is not needed. This finding is based on the following discussion:

Context: Potential effects resulting from the implementation of the Proposed Action have been analyzed within the context of the project area boundaries, and the Gordon Creek 6th field watershed. This project would affect approximately 24% of the 11,159 acre Gordon Creek 6th field watershed. (*EA section 1.1.1*) [40 CFR 1508.27(a)]:

Intensity:

1. The resources potentially affected by the proposed thinning activities are: air quality, fire hazard/risk, fish species/habitat (except ESA listed species/habitat), invasive, non-native plant species, migratory birds, other special status species / habitat – wildlife, recreation, public safety, rural interface areas, soils, threatened or endangered species – northern spotted owl, visual resources, water quality, and wildlife habitat components, carbon storage, carbon emissions, and climate change.

The effects of commercial thinning are unlikely to have significant adverse impacts on these resources [40 CFR 1508.27(b) (1)] for the following reasons:

- *Project design features* described in *(EA section 2.3.4)* 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 3.3.1):* 1/ No special status vascular plant species or bryophytes would be affected. 2/ Noxious Weeds - While the number of plants may increase in the short term, any increase that does occur should be short lived because all areas with ground disturbing activities be revegetated with native species (*EA section 2.3.4 – 3b*); and enough light as a result of thinning treatments would reach the forest floor to allow establishment of native ground cover species, and brush understory with some conifer regeneration (*EA section 3.3.1.1*). No significant increase in populations of the noxious weed (invasive/non-native) species identified during the field surveys is expected to occur. 3/ Stands proposed for thinning are not presently functioning as late-successional old growth habitat.

- *Hydrology; Beneficial Uses, Fisheries and Aquatic Habitat; and Soils (EA sections 3.3.2-3.3.4)*: Road construction would occur on gentle slopes with stable, vegetated surfaces. Gentle to moderate slope gradients in this project area provide little opportunity for surface water to flow. Stream protection zones (60 feet on perennial streams, 25 feet on intermittent streams) would maintain current stream temperatures by retaining the current vegetation in the primary shade zone and most of the current levels of shading in the secondary shade zone. Stream protection zones are also expected to prevent sediment as a result of overland flow or surface erosion in logging units from reaching streams during storms of less than a 10 year return interval (*EA section 3.3.2*). In addition, project design features (*EA section 2.3.4*) would prevent increasing turbidity at Corbett municipal water intakes as a result of the proposed action. The proposed action will abide by and meet State of Oregon water quality standards. Removal of the failing fish barrier culvert in the NE¼ of Section 1 would allow for unobstructed upstream movement of resident cutthroat trout and any other resident fish species that may be present, as well as aquatic amphibians such as Pacific giant salamanders. Populations of sensitive mollusks in spring heads in the area would be protected by untreated buffers that are generally one site-potential tree height (220 feet) wide.

- *Soils*: Soil Compaction is limited to no more than 10% of each unit's acreage. Timber haul and road maintenance project design features would prevent sedimentation delivery to streams in quantities that would exceed Oregon DEQ requirements. In-stream work (culvert/log fill removal, temporary stream crossings) would take place during the dry season/in-water work period to prevent water quality degradation at municipal water intakes.

- *Special Status Species:* The proposed action would not result in adverse effects to 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.

- *Wildlife* (*EA section 3.3.5*): 1/ Existing snags, remnant old growth trees and coarse woody debris (CWD) would be retained. The few large (≥ 15 inches diameter and ≥ 15 feet tall) snags that would be felled for safety or knocked over by falling and yarding operations would be retained as CWD. 2/ No suitable habitat for any former "Survey and Manage" and BLM Special Status species known or likely to be present would be lost. Therefore, the project would not contribute to the need to list any BLM Special Status species. 3/ 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, though some less common species would be likely to enter thinned stands immediately in response to reduced canopy closure and tree density. 4/ See # 2, for effects to northern spotted owl. No suitable or dispersal habitat for northern spotted owls would be lost or downgraded.

- *Air Quality and Fire Hazard/Risk (EA section 3.3.6):* The thinning would result in short term increased surface fire hazard risk from the slash but the risk of human caused ignition would be reduced to very low levels by treating slash along open roads within the season of harvest where the opportunities for ignition are greatest . The risk is also limited because most of the area is closed to public access due to private land closures. After 3 to 5 years the fine fuels 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 project would make control of fire on BLM land safer for fire fighters because thinning and fuel treatments would reduce the intensity and rate of spread of any fire and road maintenance in association with the project would ensure access for firefighting resources. The proposed action would comply with State of Oregon Air Quality Standards by strict adherence to smoke management regulations. For example, slash burning would take place when wind and air movement patterns would dissipate smoke within 12 hours, reducing the effect on air quality.

- *Visual Resources, Recreation, and Rural Interface (EA section 3.3.7*): Changes to the landscape character would be low and would comply with Visual Resource Management guidelines because the project would maintain a forested setting. Some disturbance to vegetation would be observable after thinning activities and would be expected to develop an undisturbed appearance within five years. Recreation and visual resources would be minimally affected because most of the road system is gated and closed to public vehicular traffic, minimizing recreational opportunities in the area. There is little potential effect to the Rural Interface Area since it is only adjacent to 40 acres of the project area in Section 9. Access to the City of Portland communications site may be affected because service personnel may be delayed up to 30 minutes when logging operations block the access road.

- *Public health or safety* [40 CFR 1508.27(b)(2)]: The project's effects to public health and safety would not be significant because:
  - *Corbett Municipal Water Supply:* Project design features would prevent sediment that would affect water quality at the intakes, and would protect infrastructure (intakes, service roads, pipelines and water treatment plant) from damage (*EA sections 2.3.4, 3.3.2*);
  - *City Of Portland Communications Site:* Project design features would protect infrastructure (access road, gates, electric power supply line) from damage (*EA sections 2.3.4, 3.3.7*);

- § *Bull Run Watershed Management Unit:* Project design features would not increase public access, and would reduce potential for catastrophic fire in the vicinity (*EA sections 2.3.4, 3.3.6, 3.3.7*);
- § Public safety along haul routes would be minimally affected because log truck traffic from forest management activities on both private and public land is common and because project design features such as speed limits and warning signs near logging activities would provide for public safety.
- § Hauling through the Larch Mountain Education Site would be done primarily during low use periods and project design features such as speed limits and warning signs would provide for safety (*EA sections 2.3.4*).

- *Carbon Storage, Carbon Emissions and Climate Change (EA section 3.3.9):*
  - § *Carbon Storage and Carbon Emissions:* Table 16 of the EA shows that during the 30 year analysis period the effects of the proposed thinning would be a net increase in carbon storage of 55,820 tonnes of carbon (C). BLM carbon calculations show that 10 years after treatment, the live tree carbon in the thinned stands (49,950 tonnes C) exceeds the carbon emissions resulting from the proposed thinning (17,080 tonnes C). Carbon calculations also show that 30 years after treatment, the live tree carbon in the thinned stands (304,340 tonnes C) exceeds the carbon storage before thinning (269,300 tonnes C).
  - § Climate Change: The U.S. Geological Survey, in a May 14, 2008 memorandum to the U.S. Fish and Wildlife Service, summarized the latest science on greenhouse gases and concluded that it is currently beyond the scope of existing science to identify a specific source of greenhouse gas emissions or sequestration and designate it as the cause of specific climate impacts at a specific location.

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2. The proposed thinning activities:
   a. Would not affect
   (1) unique characteristics of the geographic area [40 CFR 1508.27(b)(3)] - There are no parklands, prime farmlands, wild and scenic rivers, wilderness, or ecologically critical areas located within the project area (*EA Section 3.1, Table 6);*
   (2) districts, sites, highways, structures, or other objects listed in or eligible for listing in the National Register of Historic Places, nor would the Proposed Action cause loss or destruction of significant scientific, cultural, or historical resources [40 CFR 1508.27(b)(8)] (*EA Section 3.1, Table 6).*
   b. *Are not unique or unusual.* The BLM has experience implementing similar actions in similar areas without highly controversial [40 CFR 1508.27(b) (4)], highly uncertain, or unique or unknown risks [40 CFR 1508.27(b) (5)].
   c. *Do not set a precedent* for future actions that may have significant effects, nor does it represent a decision in principle about a future consideration [40 CFR 1508.27(b) (6)].
   d. *Are not expected to adversely affect Endangered or Threatened Species* listed under the Endangered Species Act (ESA) of 1973 [40 CFR 1508.27(b) (9)].
   (1) *ESA Wildlife - Northern spotted owl (EA Section 3.3.5):* Effects to the species are not significant because: The project maintains dispersal 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.

Except for the removal of hazard trees to protect public safety, a seasonal restriction on timber harvest and road construction (habitat modifying activities) would be applied from March 1st through July 15th within disruption distance of two known spotted owl sites (*EA section 2.3.4*). In addition, a seasonal restriction for spotted owls on helicopter yarding (Alternatives 2 and 3) would be required. ESA Consultation is described in *EA section 5.1.1.1*.

(2) *ESA Fish – LCR Chinook salmon, LCR coho salmon, and LCR steelhead trout (EA Sections 3.3.2, 3.3.3):* Effects to ESA fish are not significant because thinning is not expected to affect these species for the reasons stated in the Hydrology section, above. The increased turbidity from the culvert removals is unlikely to be visible or measurable beyond 0.5 mile downstream of project sites. The closest ESA listed fish are at least 0.75 mile downstream (see Table 7), thus unlikely to be affected by turbidity produced from project actions. 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 5.1.1.2*.

e. *Do not violate any known Federal, State, or local law* or requirement imposed for the protection of the environment [40 CFR 1508.27(b) (10)] (*EA Section 1.3*).

3. The Interdisciplinary Team (IDT) evaluated the project area in context of past, present and reasonably foreseeable actions [40 CFR 1508.27(b) (7)] and determined that there is a potential for cumulative effects on water quality and fisheries, and carbon storage and carbon emissions. These effects are not expected to be significant for the following reasons:

a. Water Quality and Fisheries: The proposed action would be expected to temporarily increase stream sediment and turbidity as a result of culvert replacement, road renovation, road maintenance, road use and log fill removal. There is a theoretical potential for increases in stream sediment and turbidity as a result of thinning and logging operations (*EA Sections 3.3.2 -3.3.4*).

- Increases in sediment yield from temporary culvert installation and removal, road renovation, road maintenance, road use and log fill removal would be local (less than ½ mile/800 meters downstream) and short-lived (primarily in the first winter following the activity). The North Fork intake for the Corbett water system is more than ¾ mile downstream.
- 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).
- The limited magnitude (less than 0.1 percent of the total sixth field watershed sediment supply) and duration (primarily major storm events during the first year following disturbance) 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 sixth or seventh field watershed scale and would be unlikely to have any effect on any designated beneficial uses, including fisheries.

b. Carbon storage and carbon emissions: The proposed thinning would contribute to cumulative effects to carbon storage and carbon emissions. The effects are not significant for the following reasons.

Table 16 of the EA shows that carbon emissions resulting from the proposed thinning over the next 10 years would total 13,990 tonnes of carbon or 51,340 tonnes of carbon dioxide (tonnes C*3.67) (0.00005 billion tonnes or giga-tonnes - GT). Current annual global emissions of carbon dioxide total 25 billion tonnes (25 GT) of carbon dioxide, (IPCC 2007, p. 513), and current annual U.S. emissions of carbon dioxide total 6 billion tonnes (6 GT) (EPA 2007, p 2-3). Global emissions over 10 years total 250 billion tonnes of carbon dioxide and U.S. emissions of carbon dioxide total 60 billion tonnes. Therefore, the short-term emissions from the proposed thinning would constitute 0.0000002% of current global emissions and 0.0000009% of current U.S. emissions for the 10 year period. This emission would be so small that its incremental contribution to global and national emissions would be not be measurable at the level of precision of the global and national emissions.

In addition, the net carbon emissions would be of short duration. Within 10 years, the remaining trees in the harvest units would sequester 49,950 tonnes of carbon, restoring the carbon loss from fuel burning, harvested wood, and harvest operations emissions (Table 16, EA section 3.3.9). Over the thirty years following the proposed thinning, the increase of 35,040 tonnes of live tree carbon would contribute to an annual average of 1,170 tonnes (0.001 million tonnes), or 0.000006% of the U.S. annual accumulation of carbon from forest management of 191 million tonnes; or 0.0007% of the annual accumulation of 1.69 million tonnes of carbon as a result of current implementation on BLM-managed lands in western Oregon. (2008 FEIS, p. 4-537). *(EA section 3.3.9)*

Approved by: Cindy Enstrom 11/25/2009

Cindy Enstrom, Cascades Resource Area Field Manager Date

1.0 INTRODUCTION

December 2009 EA Update: This December 2009 edition of the EA has new sections on Carbon Storage, Carbon Emissions and Climate Change. Changes to the EA in the context of this topic can be found in the Finding of No Significant Impact, EA sections 1.4.2 (Relevant Issues), 2.8.2 (Alternatives Considered, but not analyzed in Detail), 3.3.9 (Carbon Storage, Carbon Emissions, Climate Change), and 9.0 (Carbon and Climate References).

This Environmental Assessment (EA) is a revision of the Gordon Creek Thinning EA (original EA) that was published and made available for public review from September 26, 2007 to October 26, 2007. The original Gordon Creek EA is incorporated by reference.

The purpose of the revised EA, hereafter referred to as this EA, is to incorporate changes to the proposed action, and update the description of the alternatives, affected environment, and environmental effects as a result of further field work and in response to the comments received on the original EA. The thinning acreage proposed in the Gordon Creek thinning project will be divided into multiple timber sales.

This EA will analyze the impacts of proposed commercial thinning operations and connected actions on the human environment in the Gordon Creek sixth field watershed. The EA will provide the decision-maker, the Cascade Resource Area Field Manager, with current information to aid in the decision-making process. It will also determine if there are significant impacts not already analyzed in the Environmental Impact Statement for the Salem District's Resource Management Plan and whether a supplement to that Environmental Impact Statement is needed or if a Finding of No Additional Significant Impact is appropriate.

Section 1 of this EA for the proposed Gordon Creek Thinning project provides a context for what will be analyzed in the EA, describes the kinds of action we will be 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 this proposal.

1.1 Proposed Action

The Cascade Resource Area, Salem District Bureau of Land Management (BLM), proposes to implement forest management activities within the Gordon Creek sixth field watershed. Proposed forest management activities are commercial thinning to maintain the health and growth of existing dense stands. Connected actions include such restoration activities as: fuels management; removal of a failing culvert; mulching, seeding, and fertilizing for roadway stability; and blocking, and improving roads (*EA Sections 2.0 and 3.0).*

1.1.1 Project Area[1] Location and Vicinity

The Gordon Creek Thinning Project area is within the Gordon Creek 6th field watershed, near the City of Corbett in Multnomah County, Oregon. The Gordon Creek watershed contains 11,159 acres; the BLM administers 2,735 of those acres, and this project would thin approximately 1,724 acres. BLM-administered land is intermixed with privately-owned land, creating an assortment of ownership patterns. The project is located within Township 1 South, Range 5 East, sections 1, 3, 9, 11, 13, 15. The project area is adjacent to the Bull Run Watershed to the South and South East of Section 13 but does not drain into the Bull Run system. See *EA Section 7.2.1 - Vicinity and Fish Distribution Map*.

1.2 Purpose of and Need for Action

1.2.1 Need for the Action

Data analysis and field examinations by BLM staff have identified specific stands in which growth rates will soon decline or have already started to decline, and/or in which structural diversity is limited due to overstocking—that is, the stands contain more trees than the sites have water, nutrients, and growing space to sustain. These overstocked stands in the project area need immediate forest management activities to reduce the number of trees per site to allow remaining trees to have sufficient water, nutrients and space for additional growth. Overstocked stands, with their declining growth rates, have resulted in reduced volume yield from these Matrix lands designated for the sustained production of timber. The proposed forest management activities are needed in the project area stands immediately to reverse these trends so the stands will persist and contribute to future forest production and other goals of the NWFP.

1.2.2 Purpose (Objectives) of the Project

Any action alternative to be given serious consideration as a reasonable alternative must meet the objectives provided in the *Salem District Record of Decision and Resource Management Plan,* May 1995 (RMP) and the *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 (NWFP) for projects to be implemented in the planning area. The Gordon Creek project area is within the Matrix and Riparian land use allocations (RMP p. 5; NWFP p. A-4, A-5; *EA section 1.3*). The following RMP and NWFP objectives would be applied to achieve the purpose of this project.

Within the Matrix (General Forest Management Area or GFMA) land use allocation

1. Manage developing stands on available lands to promote tree survival and growth and to achieve a balance between wood volume production, quality of wood, and timber value at harvest; (RMP p. 46) and increase the proportion of merchantable volume in the stand,

[1] Project Area is defined as that area that is directly affected by project operations (e.g. thinning units, area cleared for landings, roads and rights-of-way).

to produce larger, more valuable logs, to anticipate mortality of small trees as the stand develops, to maintain good crown ratios and stable, wind-firm trees (RMP p. D-2) by applying commercial thinning treatments.

2. Supply a sustainable source of forest commodities from the Matrix land use allocation to provide jobs and contribute to community stability (RMP pp. 1, 46-48); and select logging systems based on the suitability and economic efficiency of each system for the successful implementation of the silvicultural prescription, for protection of soil and water quality, and for meeting other land use objectives (RMP P. 47) by developing timber sales that can be successfully offered to the market place.

Within the Riparian Reserve land use allocation:

3. Maintain water quality standards (RMP p.2) and improve stream conditions by
- Removing decaying log fill stream crossings that restrict stream flows, accumulate sediment and pose a threat of future failure.
- Maintaining effective shade for streams pursuant to BLM's TMDL agreement with the State of Oregon.
- Cooperating with affected communities (with regard to municipal watersheds) in the development and application of specific constraints and management actions. (RMP p. C-11)

4. Develop large conifers and future large coarse woody debris, large snag habitat, in-stream large wood, as well as long-term structural and spatial diversity, and other elements of late-successional forest habitat within the Riparian Reserve LUA while removing merchantable material consistent with the purposes for which the Riparian Reserves were established; and to control stocking (stand density), reestablish and manage stands, acquire desired vegetation characteristics, and improve diversity of species composition (RMP p. 9-15, D-6, NWFP p. B-31) by applying commercial thinning treatments within the Riparian Reserve LUA.

Within Both Land Use Allocations

5. 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).

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 vehicles needed to meet the objectives above;
- Perform proper road maintenance to prevent road deterioration or failure and to prevent road generated sedimentation that exceeds ODEQ standards.

7. Increase protection for the public, facilities and high-value resources from large, intense wildfires in the rural/urban interface (RMP, pp. 39, 43) in accordance with the National Fire Plan's Healthy Forest Initiative and Restoration Act by:
- Reducing natural and activity-based fuel hazards on BLM-administered lands in rural interface areas,
- Protecting resources on BLM-administered land from potential wildfires originating on adjacent private land by reducing fuel hazards,
- Controlling access to limit potential human sources of wildfire ignition.

1.2.3 Decision Factors

In choosing the alternative that best meets the purpose and need, the Cascade Resource Area Field Manager will consider the extent to which each alternative would:

a. Provide timber resources and revenue to the government from the sale of those resources (objectives 1 and 2);
b. Reduce the costs both short-term and long-term of managing the lands in the project area objectives 1 and 2);
c. Provide safe, cost-effective access for logging operations, fuels management and fire suppression (objectives 2, 6, and 7) ;
d. Reduce competition-related mortality and wildfire risk, and increase tree vigor and growth (objective 1 and 7);
e. Protect the City of Corbett's water supply (objective 3);
f. Reduce erosion and subsequent sedimentation from roads(objectives 3 and 6);
g. Provide for the establishment and growth of conifer species while retaining structural and habitat components, such as large trees, snags, and coarse woody debris (objectives 4 and 5);
h. Promote the development of healthy late-successional characteristics in the Riparian Reserve land use allocation (objective 4);
i. Establish a defensible area for use during extended fire suppression activities and possibly reduce the overall size of a wildfire (objective 7).
j. Reduce potential human sources of wildfire ignition by controlling access (objective 7).

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

On July 16, 2009 the U.S. Department of the Interior, withdrew the Records of Decision (2008 ROD) for the Western Oregon Plan Revision and directed the BLM to implement actions in conformance with the resource management plans for western Oregon that were in place prior to December 30, 2008. Since project planning and preparation of National Environmental Policy Act documentation for this project began prior to the effective date of the 2008 ROD, this project had been designed to comply to the land use allocations, management direction, and objectives of the 1995 Salem District resource management plan (1995 RMP), as amended.

The proposed commercial thinning activities in the project area have been designed to conform to the following documents, which direct and provide the legal framework for management of BLM lands within the Salem District:

1. *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 (e.g. complies with management goals, objectives, direction, standards and guidelines) as required by 43 CFR 1610.5 (BLM Handbook H1790-1). Implementing the RMP is the reason for doing these activities (RMP p.1-3);
2. *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);

Land Use Allocations: The area proposed for treatment falls within the following Land Use Allocations (LUA) as defined in the previously described (***1***) Northwest Forest Plan (NWFP) and (***2***) the Salem District RMP:

- **General Forest Management Area (GFMA LUA).** This is a component of the lands commonly referred to as Matrix in the NWFP. The terms "Matrix" and "GFMA" may be used interchangeably in this document. The primary objectives are to manage for sustainable forest production while providing for long term site productivity, forest health, cavity nester habitat and biological legacies. Developing stands are to be managed to promote tree survival and growth and to achieve a balance between wood volume production, quality of wood, and timber value at harvest. GFMA lands have a regeneration harvest scheduled at the Culmination of Mean Annual Increment (CMAI).

- **Riparian Reserves (Riparian Reserve LUA).** The primary management focus for the Riparian Reserve LUA is to meet the Aquatic Conservation Strategy Objectives described in the RMP (pp. 5-6) "to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands." This includes terrestrial habitat, water quality and quantity, and aquatic habitat.

  These objectives include: restoring the complexity of watersheds; maintaining and restoring riparian habitat; maintaining and restoring the species composition and structural diversity of plant communities; and providing a supply of coarse woody debris to stream channels (NWFP/ROD p. B-11, RMP 5-6). For the Gordon Creek Thinning Project, the Riparian Reserve LUA includes the stream and the area extending from the edges of the stream channel (each side) to a distance equal to the height of:

  - For fish-bearing streams – a slope distance equal to the height of two site potential trees. For this project this is 440 feet each side of the stream channel.
  - For non-fish-bearing streams - a slope distance equal to the height of one site potential tree. For this project this is 220 feet each side of the stream channel.

  The ACS also states that "Active silvicultural programs will be necessary to restore large conifers in Riparian Reserves." Silvicultural practices are to be applied to control stocking, to promote development of large conifers, and to improve diversity of species composition and stand density (RMP pp. 11, D-6; see also NWFP/ROD p. B-31). Merchantable logs may be removed "where such action would not be detrimental to the purposes for which the Riparian Reserves were established" (RMP D-6).

3. *Record of Decision to Remove the Survey and Manage Mitigation Measure Standards and Guidelines from Forest Service National Forests and Bureau of Land Management Districts Within the Range of the Northern Spotted Owl* (2007 SM ROD), July 2007.

4. *National Fire Plan (NFP), August 2000,* is an interagency plan between the US Forest Service and the US Department of the Interior that was designed to ensure sufficient firefighting resources for wildland fires; restore landscapes and rebuild communities damaged by wildland fire; reduce hazardous fuels in forests; work with local residents to reduce fire risk and improve fire protection; and ensure accountability.

The analysis in the Gordon Creek Thinning Revised EA is site-specific, and supplements and tiers to analyses found in the *Salem District Proposed Resource Management Plan/Final Environmental Impact Statement*, September 1994 (RMP/FEIS).

The RMP/FEIS includes the analysis from the *Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl*, February 1994 (NWFP/FSEIS). The RMP/FEIS is amended by the *Final Supplement to the 2004 Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines*, June 2007.

1.3.1 Watershed Analysis

Information from the *Gordon Creek Watershed Analysis* (July 2006) has been incorporated into the development of the proposed thinning activities, and into the description of the Gordon Creek EA's affected environment and environmental effects (*EA section 3.0*) and is incorporated here by reference. The *Gordon Creek Watershed Analysis* (May 1999) (GCWA) covers the great majority of the project area, except for the very NW corner of S. 1, and a few acres in the SW portion of BLM-managed lands in S. 15. WA Chapter 11 contains management findings and recommendations. "This section describes the types of actions or activities that the BLM could implement in the Gordon Creek Watershed to improve conditions and positively influence trends (GCWA p. 11-1)."

The following are some of the findings and recommendations from the GCWA that are particularly relevant for the development of silvicultural prescriptions, and are excerpted and described in more detail in the *Gordon Creek Silvicultural Prescriptions Commercial Thinning, 2008* (Silviculture Report), pp. 2-3.

- The watershed is dominated by closed mid-seral stands 41- to 80-years of age, which lack structure and characteristics of late-successional stands (GCWA p. 11-1).
- Silvicultural treatments (density management, including commercial thinning) should
- develop late seral forest stand characteristics (GCWA p. 11-3) and would be prescribed primarily in mid-seral stands in the stem exclusion stage to encourage the development of late seral conditions. Desirable stand characteristics include larger trees for a large green tree component and recruitment of large standing dead and down coarse woody debris in future stands, multi-layered stands with well developed understories, and multiple species that include hardwoods and other minor species.
- The BLM should plan and implement riparian silvicultural projects designed to accelerate growth of riparian conifers to improve potential for LWD (large woody debris) on federal lands (GCWA p. 11-8).
- The GCWA finds that "…timber harvest activities will continue…in compliance with the Salem District [RMP] guidelines relative to the land use allocations in the Gordon Creek Watershed." (GCWA p. 11-9) It recommends that the BLM "…apply silvicultural treatments…in the Matrix LUA to meet RMP timber management objectives…" (GCWA p. 11-10).

1.3.2 Former Survey and Manage Species Review

Surveys for former Survey and Manage species and protection for known sites are no longer required because the Secretary of Interior removed the Survey & Manage Mitigation Measure Standards and Guidelines from the BLM's Resource Management Plans in the area of the Northwest Forest Plan (2007 SM ROD).

The Gordon Creek Thinning was proposed prior to the signing of the 2007 SM ROD, when the BLM was under the August 1, 2005, U.S. District Court order in Northwest Ecosystem Alliance et al. v. Rey et al. which found portions of the January *2004 Final Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines* (2004 SEIS) inadequate. Subsequently in that case on January 9, 2006, the Court ordered BLM to set aside the 2004 SEIS and reinstate the January *2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines* (2001 ROD), including any amendments or modifications in effect as of March 21, 2004.

On October 11, 2006, the U.S. District Court provided for certain exemptions from the Survey and Manage requirements including thinning projects in stands less than 80 years old. When the Gordon Creek EA was first published in September 2007, there was one proposed unit which was over 80 years of age that has since been dropped (unit 3A) from the proposed thinning project. Accordingly, all of the proposed units are under 80 years of age and fall within the October 11, 2006 exemptions from the Survey and Manage requirements.

The above documents are available for review in the Salem District Office. Additional information about the proposed activities is available in the *Gordon Creek Thinning EA* Analysis File (GDNAF), also available at the Salem District Office.

1.3.3 Northern Spotted Owl (NSO) Status Review

The following information was considered in the analysis of the Gordon Creek proposed activities: a/ *Scientific Evaluation of the Status of the Northern Spotted Owl* (Sustainable Ecosystems Institute, Courtney et al. 2004); b/Status and Trends in Demography of Northern *Spotted Owls, 1985-2003* (Anthony *et al.* 2004); c/ *Northern Spotted Owl Five Year Review:* Summary and Evaluation (USFWS, November 2004); and Northwest Forest Plan – The *First Ten Years (1994-2003):* d/ *Status and trend of northern spotted owl populations and habitat, PNW Station Edit Draft* (Lint, Technical Coordinator, 2005). Although the agencies anticipated a decline of NSO populations under land and resource management plans during the past decade, the reports identified greater than expected NSO population declines in Washington and northern portions of Oregon, and more stationary populations in southern Oregon and northern California.

The reports did not find a direct correlation between habitat conditions and changes in NSO populations, and they were inconclusive as to the cause of the declines. Lag effects from prior harvest of suitable habitat, competition with barred owls, and habitat loss due to wildfire were identified as current threats. West Nile Virus and Sudden Oak Death were identified as potential new threats. Complex interactions are likely among the various factors. This information has not been found to be in conflict with the NWFP or the RMP (*Evaluation of the Salem District Resource Management Plan Relative to Four Northern Spotted Owl Reports, September 6, 2005).*

1.3.4 Aquatic Conservation Strategy Update

On March 30, 2007, the District Court, Western District of Washington, ruled adverse to the US Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration (NOAA-Fisheries) and USFS and BLM (Agencies) in *Pacific Coast Fed. of Fishermen's Assn. et al v. Natl. Marine Fisheries Service, et al and American Forest Resource Council,* Civ. No. 04-1299RSM (W.D. Wash)((PCFFA IV). Based on violations of the Endangered Species Act (ESA) and the National Environmental Policy Act (NEPA), the Court set aside:

- the USFWS Biological Opinion (March 18, 2004),
- the NOAA-Fisheries Biological Opinion for the ACS Amendment (March 19, 2004),
- the ACS Amendment Final Supplemental Environmental Impact Statement (FSEIS) (October 2003), and the
- ACS Amendment adopted by the Record of Decision dated March 22, 2004.

Previously, in *Pacific Coast Fed. Of Fishermen's Assn. v. Natl. Marine Fisheries Service,* 265 F.3d 1028 (9th Cir. 2001)*(PCFFA II),* the United States Court of Appeals for the Ninth Circuit ruled that because the evaluation of a project's consistency with the long-term, watershed level ACS objectives could overlook short-term, site-scale effects that could have serious consequences to a listed species, these short-term, site-scale effects must be considered. *EA sections 3.1 - 3.4* show how the Gordon Creek thinning project meets the Aquatic Conservation Strategy in the context of the PCFFA cases.

1.3.5 Relevant Statutes/Authorities

This section is a summary of the relevant statutes/authorities that apply to this project. Additional statutes/authorities that apply to this project are shown in *Table 6* (*EA section 3.1*).

- **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 environmental impact statements for Federal projects which may have a significant effect on the 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.

1.4 Scoping and Identification of Relevant Issues

1.4.1 Scoping

Gordon Creek (along with the Beeline and McDowell project areas) was included in the 2007 Timber Sale thinning scoping letter sent out to federal, state and municipal government agencies, nearby landowners, tribal authorities, and interested parties on the Cascades Resource Area mailing list on September 29, 2006. Twenty-six (26) comment letters/emails/postcards were received during the scoping period.

In addition, the original EA and FONSI document was made available for public review between September 26, 2007 and October 26, 2007. One hundred eighty-two (182) comment letters/emails/postcards were received during the original EA comment period. The scoping and EA comment letters/emails/postcards are available for review at the Salem District BLM Office, 1717 Fabry Rd SE, Salem, Oregon. *EA sections 1.4.2 and 1.4.3* address the topics raised in the comments.

1.4.2 Relevant Issues

Based on input from the public and the Interdisciplinary Team plus information contained in the ROD/RMP, the following issues were identified. These issues provide a basis for comparing the environmental effects of the alternatives and aid in the decision-making process. The major issues brought forward were used to formulate alternatives, identify appropriate design features, or analyze environmental effects. The following major issues were identified:

1.4.2.1 Issue 1: Protection of the domestic water sources (City of Corbett, Bull Run Watershed - City of Portland) and protection of ESA (endangered species act) listed fish

Commenters have doubts that the proposed project design will protect domestic water sources and ESA listed fish. Concerns include the potential sediment generation from different logging methods, especially in the Riparian Reserve. They also believe the project would have adverse effects on:

- Public health and safety (especially to Corbett drinking water as a result of affecting the water intake)
- Fire risk to the Corbett intake and the Bull Run Watershed as a result of:
  - increased access due to road construction and renovation, and
  - thinning generated fuels
  - windthrow as a result of thinning activities
- Unauthorized use and trespass of City of Corbett and City of Portland facilities, and the Bull Run watershed as a result of increased access.
- ESA-listed Fish, including the delineation of ESA-listed fish habitat

This issue is addressed in the following sections of this EA: 1.4.2; 1.4.2.1; 1.4.2.6; 2.1; 2.2.3; 2.2.3; 2.3.3; 2.3.4; 3.2; 3.3.2; 3.3.2.1; 3.3.2.2; 3.3.2.3; 3.3.6; 3.3.6.1; 3.3.6.2; 3.3.6.3; 3.3.7; 3.3.7.1; and 3.3.7.2.

1.4.2.2 Issue 2: Cumulative effects analysis

Commenters have expressed a concern about the adequacy of the cumulative effects analysis.

This issue is addressed in the following sections of this EA: 3.3.1.3; 3.3.2.4; 3.3.3.3; 3.3.4.3; 3.3.5.3; 3.3.6.3; and 3.3.7.3.

1.4.2.3 Issue 3: Riparian management and Aquatic Conservation Strategy

Commenters have voiced doubts as to whether thinning in the Riparian Reserve Land Use allocation will support the attainment of Aquatic Conservation Strategy objectives.
This issue is addressed in the following sections of this EA: 1.4.2.1; 2.1; 2.3.1; 2.3.4; 3.2; 3.3.1; 3.3.2; 3.3.2.1; 3.3.2.2; 3.3.2.3; 3.3.3; 3.3.3.1; 3.3.3.2; 3.3.3.4; 3.3.5; 3.3.5.1; 3.3.5.2; 3.3.5.3; 3.3.5.4; 3.3.6; 3.3.7; 3.3.7.1; 3.4; and 5.1.1.2.

1.4.2.4 Issue 4: Potential impacts to Special Status Species (includes ESA threatened/ endangered species

Concerns have been raised that the proposed project would have an adverse effect on Special Status Species. The following types of species are sub-categories of Special Status Species: ESA- listed; Bureau sensitive, Bureau tracking, and other species listed in the 2007 SSS ROD. Some of the species brought up in comments were northern spotted owl, *Gymnopilus punctifolius*, and bats. This issue is addressed in the following sections of this EA: 1.3.1; 1.3.2; 1.4.2.3; 2.3.1; 2.3.1.3; 2.3.4; 2.9; 3.3.1; 3.3.1.1; 3.3.1.4; 3.3.3; 3.3.3.1; 3.3.5; 3.3.5.1; 3.3.5.2; 3.3.5.3; and 3.3.5.4. Comments with regard to ESA listed fish are addressed under Issue 1.

1.4.2.5 Issue 5: Economic viability of timber sale

Concerns have been raised that too many restrictions on the project would have an adverse effect on the economic viability of the timber sale. This issue is addressed in the following sections of this EA: 1.2.3; 1.3; 1.4.2; 2.3.2; 2.3.4; 2.3.3; 2.3.4; 2.6; 3.3.4; and 3.3.4.1.

1.4.2.6 Issue 6: Invasive Non-Native Plants

Commenters raised concerns about logging activities spreading invasive non-native plants. This issue is addressed in the following sections of this EA: 2.3.4; 3.3.1; and 3.3.1.1.

1.4.2.7 Issue 7: Larch Mtn. Educational Area

Commenters raised concerns about the effect of thinning on recreational and educational opportunities within the Large Mtn. Education Area and adjacent areas where recreation takes place. They also believe the project would have adverse effects on:

- collecting mushrooms /fungi (recreational opportunity)
- visual resources

This issue is addressed in the following sections of this EA: 2.3.4; 3.3.3.1; 3.3.6.1, 3.3.7; and 3.3.7.1.

1.4.2.8 Issue 8: Carbon Sequestration (Storage) and Climate Change

The Gordon Creek Revised EA (OR-080-07-05 (EA) is tiered to the PRMP FEIS (1994) which concluded that all alternatives analyzed in the FEIS, in their entirety including all timber harvest, would have only slight (context indicates that the effect would be too small to calculate) effect on carbon. Responsive to public comment, the BLM has added a project level analysis. Commenters (including protest points on the Gordon Creek I Decision) raised concerns about the effect of thinning on Carbon Sequestration and Climate Change.
This issue is addressed in the following sections of this EA: 1.1, 1.4, 2.8.2, 3.2, 3.3.6, 3.3.9 and the FONSI.

1.4.3 Issues Considered But Eliminated From Further Analysis

The following issues, received during the original scoping and EA comment period, were reviewed by the Interdisciplinary Team, and it was determined these issues were beyond the scope of this project or would be discussed in other sections of this EA (See *Table 1*).

Table : Issues Considered but Eliminated from Further Analysis

Project's Effect On:	***Remarks***
Fog Drip	Addressed in Text (*EA sections 3.3.2)*
Late Successional Forest/Trees (>80 years old) Old Growth Forest Stands and Late Successional Old Growth (LSOG))	Late Successional Stands have been dropped from the thinning proposal (*EA section 2.9*). There are no old growth or LSOG stands in the proposed action.
Patch cuts	Addressed in Text (*EA sections 2.3.1, 2.9, 3.3.1, 3.3.1.1, 3.3.5.1, 3.4*)
Snag Retention	Addressed in Text (*EA sections 2.3.1, 2.3.4, 2.9,3.1, 3.3.1.1, 3.3.5, 3.3.5.1-3.3.5.3*)
Wildlife - protection from disturbance	Addressed in Text *(EA sections 2.3.4 and 3.3.5*)

1.5 Decisions to be Made

The following decisions will be made through this analysis:

- To determine if a Supplemental Environmental Impact Statement (SEIS) should be prepared based on whether the proposed action would result in significant impacts to the human environment not already analyzed in the EIS prepared for the Salem District RMP and its amendments.
- If there are any such additional impacts that are significant, we will determine whether the project proposals could be modified to mitigate the impacts so an SEIS would not be necessary. If we determine there is no need to prepare a SEIS, we will document this determination in a Finding of No Additional Significant Impacts (FONASI).
- To determine at what level, where, and how to harvest trees on BLM-administered lands allocated to the programmed timber harvest base within the project area.
- To implement or not implement proposed restoration projects (fuels management, replacing culverts for unimpaired fish passage, and decommissioning roads) on BLM-administered lands within the project area and, if so, which projects, at what level, and where.

2.0 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."

In the Gordon Creek watershed land ownership patterns, some aspects of the road system, and special uses in the area strongly influence the development of the alternatives and effects analysis. O&C lands managed by the BLM are intermixed with private industrial forest lands, typically alternating sections so that the BLM does not manage contiguous blocks of more than one square mile. The US Forest Service (USFS) manages a large block of land adjacent to the east of the Gordon Creek Thinning project area.

Other special uses within and immediately adjacent to the project area include:

- Corbett Water District's water treatment facility and water intake on BLM land which are authorized under a BLM Recreation and Public Purpose (R&PP) lease. In addition there is a Corbett water intake on private land adjacent to BLM land, as well as delivery pipes under roads.
- The Bull Run watershed (Portland Water Bureau) is adjacent to the south boundary of the project area in Section 13.
- A communication site in Section 13 (outside of the Gordon Creek watershed boundary, owned and operated by the City of Portland) including underground power lines and associated controls (green utility boxes) immediately adjacent to the existing road.
- A major power line (Bonneville Power Administration) and service road that pass through Section 13.
- The Larch Mountain Education Site (BLM) in Section 3.

Most of the haul roads in and near the project area are private roads, with the following features that influence alternative development:

- Most of the roads accessing the project area are gated and are customarily locked. All access to BLM lands in Sections 1, 3, 11, 13 and 15 requires crossing private land and/or use of private roads and legal access is by permission only.
- The BLM does not have rights to use the road system that crosses Gordon Creek.

Some of the roads are not designed, constructed or maintained to BLM standards. The amount of road construction and renovation, including temporary stream crossing and removal of an existing log fill stream crossing, is an unresolved resource conflict that led to development of multiple action alternatives.

Protection of the Corbett water source and potential sediment generation from different logging methods, especially in the Riparian Reserve, was also a consideration in developing the action alternatives. Three action alternatives were identified by the Interdisciplinary Team (IDT) that would meet the purpose and need of the project and have meaningful differences in effects from the Proposed Action. Therefore, this EA will analyze the effects of the current "Proposed Action"(including changes from the Original Proposed Action), "Alternative 2," "Alternative 3," and the required "No Action Alternative".

2.2 Planning and Implementation Process

The BLM would require the timber sale operator to accomplish the following actions as required in the timber sale contract written by the BLM.

The BLM would develop the timber sale contract to implement the actions described below and the project design features (PDF) that follow (*EA Section 2.3.4*). These actions and the PDF, taken together, form the best management practices (BMP) that the IDT developed based on the principles of the BMP described in Appendix G of the RMP/FEIS and Appendix C of the RMP which the IDT adapted to the site specific conditions of the proposed Gordon Creek Thinning project.

2.3 Alternative 1 (Proposed Action)

The Proposed Action has been revised since the original Gordon Creek EA was published in September 2007. The original proposed action is described in the original Gordon Creek EA (original EA section 2.2). Sections 2.6 (*Tables 4 and 5*), and 2.9 of this EA show the changes in the proposed action. The current proposed action, hereafter referred to as the Proposed Action, is to thin approximately 1724 acres including (See *EA Section 7.2.2* for maps of the Proposed Action):

- 1514 acres of 55 to 74 year-old timber stands and
- 210 acres of a multiple aged two-storied stand (52and 34 years old) *(Table 19)*.

2.3.1 Proposed Treatments

Matrix LUA

The BLM proposes to commercially thin[2] 1324 acres of overstocked 52-74 year old forest stands within the General Forest Management (GFMA) portion of the Matrix Land Use Allocation (LUA). The objective of this treatment is to: promote timber volume growth and quality; develop a healthy forest that can resist windthrow, disease and wildfire; and provide habitat for a variety of wildlife species.

The commercial thinning implements a "thin from below" prescription that generally designates trees to be retained based on a combination of tree size, crown position[3], spacing, species mix, vigor and potential future log quality (see the Silvicultural Prescription for Gordon Creek, 2008). Specifically, the prescription proposes to:

- Retain trees that are larger than the average diameter for the stand, emphasizing the largest, healthiest and best formed dominant and co-dominant trees;
- Cut and remove suppressed and intermediate trees, and co-dominant trees directly competing with the trees selected for retention 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 stocking (number of trees per acre to be retained in each stand, see *Table 19*);
- Allow up to 25 percent deviation from the prescribed average spacing to select the best trees for retention and provide for variation in final tree spacing and canopy closure;
- Maintain an average canopy closure of retained dominant and co-dominant trees ranging from 55 to 70 percent following thinning;
- Maintain a mix of the species present in the stand;

[2] In commercial thinning material from cut trees is used for wood products.

[3] Crown position indicates the relative position of the live crown (branches) of a tree relative to the crowns of other trees in the forest canopy. Dominant and co-dominant trees are generally the tallest trees, most exposed to sunlight – also called "overstory trees" or "the overstory". Intermediate tree crowns reach into the canopy enough to get some light from above but not from the sides and are generally small and crowded. Suppressed trees are shaded by all of the other crowns and have low growth rates and low vigor as a result of competition with overtopping trees.

- Retain trees that appear healthy and vigorous; and retain trees with good form for potential future log quality.

To retain wildlife habitat elements, the BLM would:

- Retain all old growth trees[4] and protect them from logging damage that would potentially affect the health or function of the trees.
- Maintain intact and standing snags larger than 15 inches diameter and taller than 15 feet (IDT BMP based on Wildlife Report) during logging activities, with rare exceptions 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);
- Consider snags when planning 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.
- Retain Coarse Woody Debris (CWD) meeting RMP standards of at least 20 inches diameter and 20 feet long wherever feasible (RMP p. 21) and protect them from logging damage.
- Retain some (number varies according to local abundance) trees that have desirable characteristics for wildlife habitat, such as multiple tops, broken tops, large limbs, disease, dead areas being used by cavity excavators, deep crevices and cavities.

BLM wildlife biologists located two stands of hemlock that are heavily infested with hemlock dwarf mistletoe and have characteristics that could provide habitat for Johnson's hairstreak, a Bureau Sensitive butterfly. The BLM has modified the proposed project area boundary in the northeast quarter of section 1 to exclude approximately 10 acres of this habitat type from treatment. The BLM has also excluded approximately four (4) acres of this habitat in the southwest quarter of section 13 from treatment to provide potential habitat for this species.

Riparian Reserve LUA

The BLM proposes to commercially thin 400 acres of overstocked 52-74 year old forest stands as one part of a variable density management prescription within the Riparian Reserve LUA. This prescription would: contribute to Aquatic Conservation Strategy (ACS) objectives; develop a healthy forest that can resist windthrow, disease and wildfire in order to protect watershed and aquatic resources; and provide habitat for a variety of wildlife species.
The prescription creates a complex, variable density stand structure, ("clumpy – gappy"), in the Riparian Reserve. Specifically the prescription proposes to apply the following treatments:

- Reserve (do not treat) approximately 58 percent of the Riparian Reserve within the project area, allowing these areas to develop naturally and provide the "clumpy" element of complex stand structure. These no-treatment buffers in the Riparian Reserve include:
    - Stream protection zones (SPZ) - minimum width of 60 feet slope distance on each side of perennial streams[5] and 25 feet slope distance on each side of intermittent streams[6]. These SPZ are also designed to prevent sediment generated by logging operations

[4] Trees older than 200 years – RMP/FEIS, Table 3-16, p. 3-28 and glossary.
[5] Streams that flow all year.
[6] Streams that dry up at least part of the year.

from reaching the streams and prevent loss of shading on those streams to avoid increasing water temperature;
  - SPZ around spring heads with populations of potentially sensitive mollusks or amphibians - one site potential tree height (220 feet) slope distance from the main spring head except where a topographic feature such as a ridge or a man-made feature such as a road cut or trail forms a logical SPZ boundary.
  - Designated buffers – On the North Fork of Gordon Creek within section 1, an additional 40 feet were added to the 60 feet SPZ for a total stream protection zone of 100 feet on each side of the stream.
  - Potentially unstable slopes;
  - Areas with high water table in sections 13 and 15;
  - A two acre stand with large remnant trees near the east ¼ corner of section 11;
  - Areas where hardwood trees and brush species already provide elements of structural complexity; and
  - Areas where logging is not feasible in conjunction with operations in the adjacent Matrix thinning.

- Create five low-density canopy gaps within the thinned portion of the Riparian Reserve in the western portion of section 13, providing the "gappy" element of complex stand structure. Four of these canopy gaps would be approximately one-half acre each and the remaining one would be approximately one acre, for a total of three acres of this habitat feature. The BLM would retain twelve trees per acre (six trees in each of the small gaps, twelve in the large gap) to be the dominant trees in these patches for the remainder of their natural life cycle. Selection criteria for these retained trees includes:
  - Large size;
  - Firm rooting in mineral soil;
  - Species mix - Douglas-fir is preferred for its strength and longevity; and
  - Distribution throughout the gap area, though some clustering would be expected to achieve the above objectives.

- These canopy gaps would be allowed to regenerate naturally to provide patches of mixed brush and conifer seedling/sapling with scattered large trees for the next two to three decades. Exposed mineral soil is necessary for natural conifer regeneration so logging slash and debris would be removed or treated to expose mineral soil on at least 50 percent of the ground in these canopy gaps. Slash may be removed by logging techniques such as directional falling so that the tops fall outside of the gap area or by yarding intact tops out of the gaps. If less than 50 percent of the area has exposed mineral soil, slash may be piled to provide niche habitat for forest floor vertebrates and to break up fuel continuity to reduce the ability of a ground fire to spread.

- Commercially thin, in conjunction with the adjacent Matrix thinning, other portions of the Riparian Reserve to accelerate development of late successional forest characteristics by reducing stocking and creating gaps in the canopy (the 25 percent variation in spacing result in scattered, irregular gaps of up to 1/6 acre) that allow light to reach the forest floor so that understory vegetation will grow. The thinning prescription and marking guides would be essentially the same as for the adjacent Matrix thinning.

- The BLM would retain additional trees with desirable characteristics for wildlife habitat in Riparian Reserves, including reserving some large hemlock trees infected with mistletoe. See *EA Section 7.1, Table 19* for a unit-specific summary of tree densities before and after thinning.

2.3.2 Logging Systems

The *Gordon Creek Logging Systems Report* (2008) (Logging Report) and associated financial analysis worksheets and summaries (2007) are incorporated by reference. The BLM designed the project for basic logging systems to accomplish the proposed thinning project using Best Management *Practices (BMP). The elem*ents of this plan are described below:

- Approximately 86 percent of the project area would be harvested using conventional ground-based logging equipment such as skidders that drag logs to a landing[7], track mounted harvesters that cut and process trees into logs, or a track mounted loader that picks logs up and places them closer to a skid trail or landing (called "shovel swing"). In ground based logging, the BLM requires the logging operators to propose a plan that best uses their particular combination of equipment and operating techniques to accomplish the project within the requirements of the contract, including stipulations to implement the proposed action and project design features described in this EA (*EA section 2.3.4*). Authorized BLM personnel review the written plan and examine skid trail and landing locations prior to approving the plan. The plan then becomes an enforceable part of the contract which is administered by trained and authorized BLM personnel.
- Approximately 14 percent of the project area would be harvested using a skyline yarding system that pulls logs to a landing with cables suspended above the ground, or using low-impact ground-based yarding systems designed for use on slopes no greater than 45% on this project area. The process for approving and administering a logging plan for skyline yarding is similar to the one described above, designating the location of yarding corridors, landings, and trees to be used for attaching cables.
- Included in the portion of the project area that would be harvested using a skyline yarding system (see the paragraph above) are areas where a mobile skyline yarder would set up between 100 and 1000 feet away from the nearest log haul road. A skidder would then skid logs to a landing at the road for sorting and loading on log trucks.
- A loader may or may not work with the skyline yarder to lift logs from under the skyline and place them on the skid trail for skidding. The specific plans for using this system would be included in the logging plan as described above.
- Old railroad grades, skid trails and roads used for logging prior to 1950 are evident throughout the project area and would be re-used for harvest operations where they are suitable for use under current BMP. The BLM determines "suitable for use" based on evaluation of a combination of several factors including: it visibly exists, it is in a useful location and it goes the right direction to be used in the approved logging plan, it is in a stable location, it does not impact a wet area or other fragile site, and it does not prevent attainment of ACS objectives.

[7] A landing is an area that has been cleared of trees where machinery (skidder, loader, skyline yarder, helicopter, etc.) brings logs and sets them down, or "lands" them. At landings on log haul roads, a loader (also called a "shovel") then sorts the logs and loads them on trucks to be hauled to a mill.

2.3.3 Connected Actions

1. Road Work (*EA Section 2.6- Table 4; EA Section 7.2-Maps*):

- ***New Road Construction:*** **"**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 large (dominant and co-dominant) trees growing in the road bed. The BLM would design and construct approximately six and one half (6 ½) miles of new road to provide access to the proposed thinning project area for logging and hauling. All of the new roads are needed to manage Matrix land under the Proposed Action.

  Approximately five and one half (5 ½) miles of these new roads would be within the Matrix and approximately one (1) mile would be in the upland portion of the Riparian Reserve (see Logging and Transportation Systems/Riparian Reserve Land Use Allocation map). The BLM may rock new roads on Matrix or use them natural surface, depending on conditions and needs during operations. New roads in the Riparian Reserve LUA would not be rocked and we would only allow them to be used in the dry season (typically July through October) and with dry conditions.

- ***Road Improvement*****:** "Road Improvement" upgrades an existing road to a higher design standard than the original design. Upgrades may include widening the subgrade, changing the alignment so it can be used by modern trucks, upgrading from natural surface to rock surface, and removing substantial vegetation and some trees from the roadbed. Additional activities include the actions described in the *Maintenance Renovation* paragraph, below. The BLM would improve approximately 4 miles of unmaintained, existing roads so timber yarding and hauling can take place**.**
- ***Road Renovation:*** "Road Renovation" restores an existing, unmaintained or decommissioned road to its original design standards. Actions include removing vegetation from the roadbed and subgrade; and include the actions described in the *Maintenance Renovation* paragraph, below. The BLM would renovate approximately 5 miles of existing old railroad grades and other existing roadbeds so timber yarding and hauling can take place**.**
- ***Maintenance Renovation:*** "Maintenance Renovation" is the normal, periodic work done to maintain existing, open roads in a useable, safe and environmentally sound condition. Actions include: blading and shaping the roadbed and ditches; repairing small slides and slumps; cutting brush adjacent to the road; maintaining, repairing, adding and replacing culverts; and adding rock to replace depleted rock surfaces. The BLM would maintain approximately 18 miles of existing road to be used as the haul route in the Gordon Creek project area as part of the proposal.
- ***Culvert Installation:*** The BLM would install three new cross-drain (not in a stream channel) culverts: one culvert would be installed on an existing road and one on a road to be constructed.

- ***Log Fill Removal and Temporary Stream Crossing:*** The BLM would remove an existing log fill stream crossing on the unnamed fish bearing stream in the southwest quarter of section 1, install a temporary culvert so the road can be used during logging operations, then remove the culvert and restore the stream channel to its original (pre-log fill) grade.
- ***Temporary Stream Crossing:*** The BLM would install a temporary culvert and clean rock fill to cross North Fork Gordon Creek at the old bridge location on private land north of the northeast quarter of section 1. The BLM would require that the crossing be installed, used for harvest operations in the northeast quarter of section 1, removed, and the stream channel restored to its original grade within the same operating season during the designated in-stream work period.

2. Landings

The BLM would require the timber sale operator to construct ground based and skyline landings according to the approved logging plan (see *EA section 2.3.2,* bullet 1, above).

3. Fuels Treatments (*EA Sections 7.2.2,* Harvest Units/Fuel Treatment Areas map)

The BLM would require the operator to reduce forest fuel accumulations after thinning operations have been completed on approximately 682 acres in order to reduce the potential for human caused ignition, and to reduce the rate of spread and intensity and facilitate wildfire control if a fire does start.

The BLM would assess each area designated for fuels treatment (see Harvest Units/Fuel Treatments Map) during logging operations and after they are completed to determine the most appropriate method or combination of methods of fuels treatment to implement. Methods include:

- Hand pile and burn – Work crews with chainsaws pile small to medium size logging slash and debris (all limbs plus boles and chunks ≤8 inches diameter and ≤6 feet long), cover the piles (with plastic sheeting) and burn the piles after fall rains begin and fire season ends (as determined by Oregon Department of Forestry).

- Hand pile without burning – Pile fuels as described above, but without covering or burning the piles.

- Machine pile and burn – Pile all logging slash that is not suitable for CWD using an excavator or loader equipped to pick up debris without picking up soil, cover the piles and burn them as described for hand pile and burn.

- Lop and scatter – Work crews with chainsaws cut logging slash into short lengths (generally <6 feet long) that can be moved by hand, then scatter the debris evenly over the forest floor so that there are no concentrations more than 12 inches deep.

- Machine treatment/mastication of logging slash on site – Use a track mounted machine to masticate ("chew" by chopping/grinding/breaking) logging slash and debris into pieces generally six inches long or less and spread it over the forest floor.

- Biomass removal and hauling off site – Accumulate small to medium size fuel, grind it at landings, and haul it off site for utilization.

The BLM fuels management specialist has prepared the following preliminary fuels treatment recommendations, which is shown on *Table 2*:

Table : Preliminary Fuels Treatment Recommendations

Section	***Treatment***	***Total Treatment Acres***
1	61 acres hand piled and burned in the skyline logging areas. 333 acres either machine mastication or machine pile and burn in the ground based logging areas.	394
3	26 acres machine pile and burn.	26
9	Entire 40 acre unit machine mastication or machine pile and burn.	40
11	11 acres in northern end off road 1-5E-3 to have biomass removal and hauling to treatment plant if funding is available[8]. If funding is not available, machine pile and burn along with other treated acres.	37
13	57 acres machine mastication, 113 acres lop and scatter	170
13	In the low-density canopy gap openings, a combination of no treatment and hand or machine pile, with and without burning based on post-logging assessment by wildlife biologist, silviculturist and fuels specialist.	3 acres, Included in above acres
15	40 acres machine pile and burn in ground based logging area.	40
Total Acres of Fuels Treatment to be Accomplished with the Proposed Timber Sale		710

The final selection of fuel treatment method would be made after logging, based on the BLM Fuel Specialist's evaluation of the amount and characteristics of the fuels and the availability and effectiveness of equipment that is available at the time. In addition to the fuels treatments to be accomplished as part of the proposed timber sale, approximately 29 acres adjoining the Bull Run watershed in Section 13 would be managed for long term fuel reduction through pruning to remove ladder fuels[9], cutting (slashing) brush and conifer regeneration to remove ladder fuels, and clean up the resulting slash and debris by chipping, masticating or biomass removal.

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

- Existing gates that currently limit OHV use to low intensity would be maintained and kept closed according to requirements of the road owners during operations and when the project operations are completed. The operator would take appropriate measures to prevent public access (including OHV) when logging and hauling operations are active.

[8] Transporting biomass to a cogeneration plant or other utilization facility is not economically feasible for a timber sale purchaser/operator at this time. The BLM is pursuing a variety of potential sources of funding to subsidize this treatment and market changes may make the treatment economically feasible for a purchaser by the time the project is completed.

[9] Ladder fuels are limbs, brush and understory trees that can provide a way for a surface fire to climb into the forest canopy and ignite tree crowns.

- Where existing physical barriers currently block OHV access, the logging operator would prevent unauthorized access during operations as part of their normal security measures. The BLM would require that physical barriers be replaced at the end of operations, as well as other measures described under Design Features (*EA section 2.3.4).*
- The BLM authorized contract administrator would ensure that operators make skid trails impassible for OHV as required by the timber sale contract, as described under Design Features (*EA section 2.3.4).*
- The BLM would require that the operator block and otherwise close roads according to design criteria developed by BLM civil engineering staff that would 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 to avoid causing erosion and avoid damaging retained trees. See Design Features (*EA section 2.3.4).*

5. 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. Special Forest products are products that can be found in the forest and can include: edible mushrooms, firewood, posts and poles, and transplants of native plants.

2.3.4 Project Design Features

The IDT reviewed and analyzed the management guidance, 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). Based on its combined experience, professional judgment, familiarity with published research, and field analysis of this project area, the BLM Interdisciplinary Team of Resource Specialists (IDT) then refined them into the proposed action and project design features (PDF) described in this EA. The Proposed Action and project design features (PDF) form the site-specific best management practices (BMP) for this project (RMP C-1, ¶4). The BMP and project design features, and the background analysis that the IDT used to develop them are described in the specialist reports cited throughout this document.

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 Section 3*. Many of the design features require the operator (hired by the timber sale purchaser or a BLM contract) to propose a specific operating plan that effectively uses his combination of equipment, personnel and operating techniques to implement the contract requirements developed from these best management practices. BLM personnel authorized by the BLM Contracting Officer review the operator's proposed operating plan for compliance. When approved, the operating plan would become part of the contract. Performance would be 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 analyzed in this EA. 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 preventive and restorative requirements of the contract. Project design features described in this section would be implemented in all action alternatives unless otherwise specified.

The Project design features listed below are organized by resource management objectives. Many project design features contribute to achieving multiple objectives. The *Logging Systems Report for Gordon Creek* (2008) is incorporated by reference. The design features tied to logging are summarized throughout the following project design features. Ground based and skyline logging is also described on pages 11-16 of the logging systems report. The BLM would require the operator to implement each of the following project design features, unless otherwise stated.

1. Soil Productivity:

a. *In All Timber Harvest Operations*:

The BLM would require the operator to design and implement a plan for logging operations in accordance with the timber sale contract to:

- Limit the area compacted by those logging operations to less than ten (10) percent of the harvest area, calculated for each timber sale contract unit ("unit") (RMP, C-2). The logging operations plan would include: length, width and location of skid trails; length, location and design of skyline corridors; size and locations of landings; and other equipment and operating techniques to be used.
- 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.
- 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 and creating a channel for erosion. This would apply to both ground-based skidding and skyline yarding.
- Limit landing size to the minimum area needed for safe and efficient operations. This size varies with terrain, equipment size and log size. For the Gordon Creek project, the BLM anticipates that landing size for ground based logging would be approximately 60 feet by 80 feet and that skyline landing size would be approximately 60 feet by 40 feet on and adjacent to log haul roads. Compaction caused by landing construction and operations which is outside of road rights-of-way would be included in the 10 percent maximum allowable compacted area.
- Retain a slash mat (consisting of logging slash and debris) on the forest floor to return nutrients and organic matter to the soil. The depth of the slash mat needed is site specific and dependent upon the amount of pre-existing organic material on the ground.
- Implement erosion control measures to prevent rill or gully erosion that would displace soil more than a short distance.

Typical measures include: shaping to modify drainage (water bars, sloping, etc.); tilling; placing logging slash and debris on bare, compacted or disturbed soil such as skid trails or in skyline yarding corridors; and seeding with native species.

- Block roads, skid trails and any other access points and obstruct them with logging slash and debris to prevent use by Off Highway Vehicles (OHV)
- Seed and mulch disturbed soil associated with roads and landings, using native species and sterile mulch as described in PDF for vegetation later in EA section 2.3.4, #3.

b. *In Ground-based Skidding And Other Ground Based Logging Operations*:

- The BLM would allow skidding (dragging logs behind a skidder) operations only during dry soil conditions, typically mid-June through October, when soils have the most resistance to compaction. (Note: other seasonal restrictions described later in this document use other dates, resulting in overlapping restrictions in a timber sale contract.)
- Authorized BLM personnel would examine the operator's proposed skid trail locations and approve them for use only when they comply with the approved logging operations plan and meet the following conditions:
  - Use existing skid trails whenever they are feasible for use in logging (lead toward an approved landing, on stable ground, located where they are needed), are properly spaced to stay within the 10 percent compacted area, do not cross wet or fragile areas, and are aligned on the slope to avoid channeling water and causing erosion.
  - Locate new skid trails only on slopes not greater than 35 percent to avoid gouging, soil displacement, and erosion with effects exceeding those analyzed in the FEIS (pp. 4-11 through 4-13).
  - Generally limit uphill skidding to slopes of 20 percent or less to avoid soil displacement from skidders breaking traction.[10]
- The BLM would only approve operation of mechanized falling/processing and log handling machinery on slopes not greater than 45 percent. The BLM would require these machines operate only on approved skid trails or on top of a slash and brush mat that is sufficiently thick (as determined onsite by the BLM) to avoid displacing soil and to dissipate ground pressure and avoid deep compaction.

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

c. *In Skyline Yarding Operations*:[11]

- Design the skyline yarding so that corridors are no closer than 150 feet apart on at least one end of the corridors and to laterally yard logs up to 75 feet to the skyline. This reduces the number of skyline corridors needed in order to reduce the amount of ground disturbed by dragging logs and the resulting potential for erosion.

d. *In Skyline Yarding-Ground Based Swing Skidding*[12]

- Use only approved skid trails (see above) to move skyline yarders, loaders and any other equipment to the swing landings.
- Use only approved skid trails (see above) to skid logs to landings where log trucks are loaded.

e. *In Other Operations:*

- Pile logging slash and debris to be burned on the compacted area of the landings to affect the minimum area necessary for safe operations. The BLM would require that the piles be tightly constructed with and designed to create a small "footprint" of soil where heat could reduce soil productivity.
- Cover the piles with plastic sheeting during the dry season and conduct burning operations after a consistent pattern of fall rains begin and the soil is wet to the touch at least six inches deep into the surrounding soil profile in order to reduce the amount of heat potentially imparted to the soil. The BLM expects the combination of wet soils that can resist heat and covered piles that are still dry enough to burn to occur in November in the Gordon Creek area.

2. Water Quality and Aquatic Habitat/Fisheries: The objectives are to: protect water quality (RMP 5-6, 22-23, C-1, C-11) and aquatic habitat/fisheries (RMP 5-6, 27-28). The standard for water quality is the Water Quality Standards set by the Oregon Department of Environmental Quality (Oregon DEQ). Also see *Hydrology/Channels/Water Quality: Specialist Report for the Gordon Creek Project* (the *Hydrology Report*)(2008), pp. 19-29

a. *In All Logging and Road Operations:*

The logging system PDF that prevent or reduce potential erosion also contribute to achieving the objectives to protect water quality and aquatic habitat/fisheries by preventing sediment transport to streams, wetlands[13] and riparian zones[14].

[11] 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).

[12] "Swing" refers to a logging operation where one type of equipment moves logs to an intermediate point, then a second type moves those logs to a landing for loading onto trucks. In this case, a skyline yarder brings logs to a small landing, the swing landing, then a skidder skids the logs to the main landing.

[13] Wetlands are areas with enough surface or ground water to support vegetation adapted to saturated soil conditions. Generally includes swamps, marshes, bogs and similar areas. See FEIS 6-17 for a more detailed definition. Also see RMP 10.

[14] Riparian zones are biologically associated with streams, ponds and wetlands and are not equivalent to Riparian Reserves, which are a Land Use Allocation. See FEIS 6-12 for definitions. Also see RMP 10 and 24-25.

The BLM would also implement the following requirements and practices to protect water quality and aquatic habitat/fisheries:

- New roads would be constructed to not increase the size of the stream network (Wemple et al. 1996). New, improved and renovated road surfaces would be designed to drain surface water to adjacent slopes where it would infiltrate into the soil and groundwater.
- To ensure ongoing compliance with Oregon Department of Environmental Quality (ODEQ) water quality standards, the BLM timber sale administrator and the BLM harvest inspectors would visually monitor turbidity (a visible reduction in water clarity (Hydrology Report p. 23)[15] caused by road-generated sediment entering the stream at stream crossings on the haul route. The ODEQ standard is less than ten percent increase in turbidity.
    - BLM personnel would frequently monitor for turbidity during normal timber sale contract administration and do additional checks during wet weather patterns.
    - If turbidity is visible in the stream at the crossing, the BLM would check for turbidity beyond the mixing zone downstream (about 100 meters).
    - If water clarity is visibly altered, the BLM employee would collect water samples immediately above and 100 feet below the stream crossing to measure NTU[16] and determine actual turbidity increase.
    - If water clarity is visibly altered beyond the mixing zone, the BLM would suspend hauling and other operations immediately and require the operator to immediately reduce fine sediment runoff into the stream by one or more of the techniques described in the following paragraphs. The BLM would allow operations to resume when weather and road conditions combined with measures taken to reduce sediment are deemed sufficient to comply with State of Oregon turbidity standards.
- Prevent sediment runoff from entering streams that would cause a visible increase in turbidity in those streams by using one or more of the following methods: maintain vegetation in the ditch; create small settling basins; or install straw bales, wattles or other artificial filters.
- Shape road surfaces and/or add rock to the road surface as directed by the BLM to prevent sediment runoff from entering streams and increasing turbidity in those streams.
- Haul logs only during times and road conditions that would not generate sediment that would enter streams and cause a visible increase in stream turbidity.

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[15] Turbidity is a measurement of water clarity and is not convertible into a volume measurement of sediment yield unless correlated to suspended sediment data. For a description of sediment supply and transport processes in forested watersheds and the effects of forest management on these processes the reader is referred to **Suspended Sediment Dynamics in Small Forest Streams of the Pacific Northwest** (Takashi *et al*, 2005).

[16] NTU (nephelolometric turbidity unit). The EPA allows turbidity in *treated* water to be up to 1 NTU. NTU values below 5 are generally not visible to the unaided eye (Hydro Report p. 14). See also http://www.watersystemscouncil.org/VAiWebDocs/WSCDocs/6808471TURBIDITY.PDF

- On natural surface roads – The BLM would allow the operator to haul and conduct other operations on these roads only during the dry season (typically June through October) and dry conditions when there is no surface mud and the surface supports traffic without creating ruts that damage the subgrade.
- On rock surface roads, not otherwise restricted – The BLM would allow the operator to haul and conduct other operations on these roads only when traffic and other activities would not "pump" fines (sand, silt and clay size particles) to the surface where they could be washed into streams by runoff.

o Stabilize or decommission all new roads and some existing roads after use to prevent erosion and reduce changes to natural drainage patterns.

- For roads that are expected to be used in approximately the next two decades, stabilize them with water bars or other surface shaping to drain runoff water to vegetated slopes, surface tilling, seeding with native species, sediment traps, and/or other techniques to promote infiltration and prevent erosion, sediment transport to streams that would cause a visible increase in turbidity, and increases in peak flows. Culverts and the subgrade would be left intact so that the road can be renovated for future use or fire control with minimal disturbance and expense.
- For roads that are not expected to be used within approximately the next twenty years, decommission these roads by removing culverts (or other stream crossing structures such as log fill), constructing water bars or other surface shaping to drain runoff water to vegetated slopes, re-establishing natural drainage patterns, deep tilling, seeding with native species, and/or other techniques to promote infiltration and prevent erosion, sediment transport to streams that would cause a visible increase in turbidity, and increases in peak flows. The material and basic structure of the subgrade would be left in place so that the road can be reconstructed for future use.

o When natural surface roads would be kept intact over winter for use on this project the next year, the BLM would require the operator to 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.

o The BLM would restrict road construction, stabilizing and decommissioning operations to the dry season (typically June through October) and dry conditions when no surface mud or sediment laden runoff would be generated.

o Construct, use and remove a temporary stream crossing on the North Fork of Gordon Creek on private land north of the NE quarter of section 1. To accomplish this without causing turbidity that would exceed the State of Oregon turbidity standard or be detectable at Corbett's North Fork intake, the BLM would require the operator to:

- Install and remove the temporary crossing during the same "in-water work period", the driest part of the year – July 15 – August 31 in Gordon Creek - and use work methods such as dewatering techniques and sediment traps as directed by the BLM to reduce potential sediment generation that would increase turbidity.
- Install a temporary culvert according to BLM design specifications, including: install road fabric over the existing streambed to reduce sediment generation and reduce direct impacts to the stream channel when removing the fill; install a culvert; and use coarse rock (with very little fine material that could create sediment) for all fill material to reduce the amount of fine sediment introduced into the stream channel.
- Remove the culvert, fill and road fabric and to restore the channel width, bank angle, cross sectional area and grade of the stream to pre-disturbance conditions.
- Avoid moving or removing the existing log supports on the banks in order to avoid changing the current stream bank figuration.

o Remove the existing log fill and construct, use and remove a temporary stream crossing on an unnamed tributary to Gordon Creek on BLM land in the SW quarter of section 1. To accomplish this without causing turbidity that would exceed turbidity standards, the BLM would require the operator to:

- Excavate and remove the existing log fill materials (mostly large, deeply embedded logs and woody debris) from the stream channel at the road crossing to enable installation and use of a temporary stream crossing that would support log haul and equipment crossing.
- Install and remove the temporary crossing (culvert and fill) during the same "in-water work period", the driest part of the year – July 15 – August 31 - and use work methods such as dewatering and sediment traps as directed by the BLM to reduce potential sediment generation that would increase turbidity
- Install a temporary culvert according to BLM design specifications.
- Remove the culvert and fill, and restore the channel width, bank angle, cross sectional area and grade of the stream to match channel dimensions upstream and to provide for passage of water and sediment without causing the channel to either aggrade (fill in) or degrade (incise).
- Place the removed logs in and adjacent to the stream channel as directed by the BLM hydrologist and/or fisheries biologist to provide continued presence of the large woody debris (LWD) element of stream structure.

o Remove the blocked and failing stream crossing structure (culvert and fill) on an unnamed tributary to the North Fork of Gordon Creek in the NE quarter of Section 1. To accomplish this without causing turbidity that would exceed turbidity standards, the BLM would require the operator to:

- Restore channel width, bank angle, cross sectional area, and grade to match channel dimensions upstream as directed by the authorized BLM engineer, hydrologist and/or fisheries biologist in order to: improve stream flow, improve passage of sediment and organic materials, provide unrestricted passage for fish and other aquatic organisms, and eliminate the chronic erosion and turbidity that are currently occurring at this site.
- The BLM would require the operator to do this work during the "in-water work period", the driest part of the year – July 15 – August 31 - and use work methods and sediment traps as directed by the BLM to reduce potential sediment generation that would increase turbidity.

o 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).

b. *Other Components of Hydrologic Functions, Aquatic Habitat and Fisheries (Channel, Bank, Temperature, Etc.):*

o Directionally fall trees[17] in the harvest units so that they do not enter the SPZ, to avoid impacts to the SPZ.

o 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 in order to create CWD habitat.

o BLM engineers would locate and design roads to be constructed 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.

3. Stand Structure, Wildlife Habitat and Other Vegetation:

a. *To protect old growth, wildlife habitat, and other retained trees:*

o The BLM would designate all old growth trees as "Reserved" and contractually prohibit the operator from cutting them.

o The BLM marking guidelines would direct the marking contractor to make a conscious effort to protect large standing snags (at least 15 inches diameter, Wildlife Report, pp. 7-8) by marking some of the prescribed number of leave trees per acre as close to these snags as possible.

o The BLM would require the operator's approved logging plan to include operational methods to:

- Leave large (≥ 15 inches diameter) snags standing to the greatest extent possible under legal safety requirements such as Federal and Oregon Occupational Safety and Health Administrations (OSHA and OR-OSHA) requirements (RMP p D-2), best management practices. The BLM would require the operator to leave any snags which are cut for safety or knocked down incidental to operations on site as CWD.

[17] Directional felling means to cut trees so that they fall in a specific, desired direction to achieve objectives. In this case the objective is to avoid impacts to the SPZ.

- Leave existing CWD in place whenever feasible. The required logging operations plan would include a design for skid trail location and operating techniques that require minimal movement of CWD to protect its physical integrity. If decay class 1 or 2 CWD, 20 inches diameter large end by 20 feet long or larger, (RMP p. 21) needs to be moved to facilitate logging operations, the BLM would allow the operator to cut a section of the log to allow access instead of moving the entire log.
- Avoid damaging more than two retained trees (those marked for retention by the BLM) per acre, in order to maintain stand productivity. The standard for "damage" is bark damage on more than 50 percent of the tree's circumference. Operational methods to protect the forest stand from damage, include techniques such as:
  - seasonal restrictions on falling and yarding during the spring growing season when bark is easily damaged (typically March through June);
  - directional falling to lead[18] 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;
  - using protective bumpers on retained trees used as rub trees; and
  - locating burn piles to avoid heat damage to trees.

b. *To reduce the spread of invasive/non-native plant species:*

- 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.
- 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. The BLM would require the operator to make that equipment available for BLM inspection before moving it onto the project area.
- If the BLM determines that there are high priority (species that are not yet widespread in this region and which have the potential to spread to new areas) weed species in the project area that could be transported to new sites outside of this area, clean all ground-disturbing logging and road construction equipment to be free of soil, plant parts and seed at a BLM approved site prior to leaving the project area, or at an approved industrial wash facility immediately after leaving the project area, in order to prevent transporting soil, seed and plant parts from the project area to another area if known sites of BLM Manual 9015 Class A and B or ODA List T and A species were identified in the proposed harvest area or on lands immediately adjacent to the proposed harvest area.

[18] "To lead" means that logs on the ground are oriented in a direction that allows them to be pulled smoothly with gradual turns into the skid trail or skyline corridor. Turning sharp corners damages retained trees.

4. Threatened, Endangered or Other Special Status Plant and Animal Species:

The BLM would require the operator to operate under the following seasonal restrictions:

a. *To minimize disturbance to the northern spotted owl (NSO) as follows:*

- As required by the Letter of Concurrence (LOC), Definitions and General Standards (pp.11-12), no operations within disruption distance (0.25 mile for most activities) of known spotted owl sites during the NSO critical nesting season, March 1 – July 15.
- No type I helicopter activity within disruption distance (0.5 mile) of known spotted owl sites during the NSO nesting season, March 1 – September 30. Applies to alternatives 2 and 3.
- No blasting operations within disruption distance (1 mile) of known spotted owl sites during the NSO nesting season, March 1 – September 30.

These seasonal restrictions would affect the Northeast quarter of T.1S., R.5E., section 1 and the Southeast quarter of section 13, with the exception of blasting operations, which would affect most of sections 1 and 13. Seasonal restrictions could be waived if protocol surveys indicate no presence of nesting spotted owls within disruption distance (0.25 to 1 mile).

b. The BLM would restrict or suspend operations at any time if plant or animal populations that need protection are found during ongoing surveys or are found incidental to operations or other activity in the area.

c. The BLM would modify project boundaries at any time to buffer plant or animal species/populations that require protection (protocol specific to each species) that are found during ongoing surveys or are found incidental to operations or other activity in the area.

5. Fire and Air Quality:

a. *To reduce the risk of fire and risks to air quality:*

- The BLM would conduct all burning operations in compliance with the Oregon Smoke Management Plan to maintain air quality and visibility in a manner consistent with the Clean Air Act.
- The BLM would require the operator to construct slash and debris piles for burning according to the following requirements to achieve clean burning, to protect retained trees and to prevent burning anything outside of the piles:
  - construct piles with compact fuel arrangement to promote efficient burning;
  - place landing piles on soil already compacted by landing operations;
  - place piles to avoid heat damage to crowns and boles of retained trees; and
  - cover piles with plastic sheeting to keep fuels dry so they would burn efficiently during the wet season.
- The BLM would prepare a Burn Plan after piles are created by the operator that would define specific parameters for burning operations.

These parameters include acceptable ranges for weather conditions (temperature, relative humidity, wind direction and wind speed ranges), forecasted weather conditions, fuel moisture in the pile, and fuel moisture in adjacent fuels. The Burn Plan would also specify personnel needs, equipment needs, and escape fire prevention plans in order to conduct safe, efficient and effective burning operations.

- The BLM would only require the operator to pile woody debris smaller than eight inches diameter to retain larger material on site for nutrient cycling and woody debris habitat.
- Where the BLM selects piling with a machine as part of the fuels treatment method (along with subsequent pile burning), the BLM would require the operator to operate the machine on top of the existing slash and debris mat and make only a single pass over any spot to avoid compacting soil in the project area..
- Where the BLM selects mastication as the fuels treatment method, the BLM would require the operator to use a mulching machine that breaks/chops forest fuels up to eight inches in diameter into pieces smaller than one foot long and leaves a mat of masticated fuel no more than one foot deep so that fire control can be done with hand crews if a fire enters the fuel treatment area. The machine would operate on top of untreated slash or on the treated debris mat to avoid disturbing or compacting the soil surface.
- The BLM would require the operator to meet or exceed ODF fire prevention and fire suppression equipment standards.

6. Public Safety, Rural Interface and Recreation:

a. Oregon Occupational Safety and Health Administration (OR OSHA) and the BLM would require the operator to place signs, temporarily block roads with vehicles or moveable barricades, and/or use flaggers to ensure public safety while logging, hauling and fuel treatment operations are active.

b. The BLM would require the operator to observe a ten miles per hour (10 MPH) speed limit for all vehicles across BLM land in section 3 between 200 feet east of the Corbett Water Treatment Plant and 200 feet west of the Larch Mountain Education Site trailhead to provide for public safety in this area where pedestrian traffic, including school children, is common.

c. The BLM would require that the operator not use the Larch Mountain Education Site parking and bus turn-around area for logging operations or as a parking area for vehicles or equipment, except that the area may be used for loading or unloading equipment if it is not being used by the public at that time.

d. The BLM would allow the operator to cross the trail in Section 3 with logging equipment, including skidding, but would not allow the operator to not use the walking trail as a skid trail. The BLM would require the operator to repair the trail walking surface wherever it was damaged by logging operations.

e. The BLM would allow log hauling operations on Road 1-5E-3 east of section 3 only when the subgrade is firm, typically May through November, to avoid damage to the Corbett intake water pipeline.

f. The BLM would prohibit log hauling operations on Road 1-5E-3 east of the junction with Road 1-5E-02.3 at all times to avoid potential impacts to the North Fork water intake facility and pipeline.

g. The BLM would require the operator to develop and implement a dust abatement plan, to be reviewed and approved by the BLM prior to operations, to prevent dust from logging and log hauling operations from impacting the Corbett water treatment plant and the Larch Mountain Environmental Education Site trailhead.

h. The BLM would post notices that BLM land in section 3 east of the Larch Mountain Education Site trailhead (the area containing the "Big Tree Trail") is closed to public entry from the time logging operations begin until the trail restoration is approved by the BLM to provide for public safety by preventing public access.

7. Cultural Resources: The BLM would restrict or suspend ground disturbing activities immediately if prehistoric cultural resources are encountered during project implementation. The BLM would conduct a professional evaluation of the resource site and develop appropriate management practices to protect it.

8. Seasonal Restrictions and Operational Periods: The Seasonal Restrictions and Operating Periods are summarized in *Table 3*.

Table : 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 helicopter operations	Northern spotted owl nesting season			■	■	■	■	■					
Falling and yarding	Bark slippage			▒	▒	■	■	▒					
Hauling	Water quality and sedimentation	▒	▒	▒	▒	▒						▒	▒
Hauling on Road 1-5E-3 east of section 3.	Protect Corbett Water District intake pipeline.	■	■	■	■	▒						▒	■
Skidding operations	Soil compaction	■	■	■	■	■				▒	▒	▒	■
Road Construction / Decommissioning	Soil damage/erosion control	■	■	■	■	▒				▒	▒	▒	■
In-water work, roads[1]	Protect fish and aquatic habitat	■	■	■	■	■	▒	▒		▒	■	■	■
Logging operations	Fire season, ODF regulated use						▒	▒	▒	▒	▒		

Key	Operations allowed.	Operations restricted, modified or allowed depending on conditions.	Operations restricted

1 Includes log fill removal, temporary culvert installation/removal, and removal of failing culvert.

2.4 Alternative 2

See *EA Section 7.2.4* for maps of Alternative 2. The silvicultural prescription is the same as for the Proposed Action and Alternative 3, but considers helicopter logging instead of skyline and ground based logging on approximately 575 acres to minimize road construction and renovation compared to the Proposed Action. (See *Table 4* for a comparison of road construction and renovation for the three action alternatives.)

- **Changes to Project Design Features:**
  - The BLM would require the operator to limit helicopter landing size to the minimum area needed for safe and efficient operations.

    This size varies with terrain, height of the trees surrounding the landing area, helicopter size and log size. For the Gordon Creek project, the BLM anticipates that helicopter log landing size would be approximately 80 feet by 250 feet (½ acre) on and adjacent to log haul roads and that approximately 6 of these landings would be constructed. In addition the BLM anticipates that service landing size would be approximately 150 by 200 feet (¾ acre) and that approximately 3 service landings would be constructed.
  - The BLM would allow the operator to surface up to half of each landing area with rock.
  - The BLM would require the operator to provide and use spill containment devices sufficient to contain all fuel and other petroleum products present on service landings.
  - The BLM would require the operator to treat logging slash and debris in the landing areas as directed by the BLM after on-site evaluation of specific needs. The same slash treatment options described for the Proposed Action would apply to this Alternative.
  - The temporary stream crossing on private land north of section 1 would not be installed.
  - The log fill would not be removed and the temporary stream crossing would not be installed in the SW ¼ of section 1.

2.5 Alternative 3

See *EA Section 7.2.5* for maps of Alternative 3. The silvicultural prescription is the same as for the Proposed Action and Alternative 2, but considers helicopter logging instead of skyline and ground based logging on approximately 200 acres to reduce road construction and renovation compared to the Proposed Action.

- **Changes to Project Design Features:**
  - See Alternative 2, above, for project design features for helicopter logging landings. Approximately 4 log landings and 2 service landings would be required.
  - The temporary stream crossings and log fill removal would not be done, as described for Alternative 2, above.

2.6 Comparison of Action Alternatives

Table 4 shows a summary of the road work by Action Alternatives.

Table : Summary of Proposed Road by Action Alternatives

Alternative	*Road Work (Distances in miles, approximate) **						
	New Construction	*Road Improvement*	*Road Renovation*	*Total*	*Natural Surface*	*Rocked*	*Maintenance Renovation*
Proposed Action **	6.5	4	5	15.5	7[#]	8.5[#]	18
Original Proposed Action***	6	4	4	14	14	0	18
Alternative 2 ***	<1	<1	2	3	1	2	18
Alternative 3 ***	3	2	4	9	7	2	18

* For road work type definitions see *EA section 2.3.3* item 1. ** Described in *EA section 2.3.3,* item 1. *** Unchanged from Original EA (published 09/2007) [#] Rock is optional depending on site specific needs and operating schedule.

Table 5 shows a summary of the thinning treatments by land use allocation, the logging systems and the economic values by action alternative.

Table : Summary of Thinning Treatment and Economic Analysis by Action Alternatives

Alternative	*Land Use Allocation (Approximate Acres)*			*Logging System (Approximate Acres)*			*Approximate Number of Helicopter Landings*	*Total Net Value****
	Matrix GFMA	*Riparian*	*Total*	*Ground-based*	*Skyline*	*Helicopter*		
Net Value/Acre***				$4,050	$3,700	(-$1,600)		
Proposed Action *	1324	400	1724	1483	241	0	0	$7,097,000
Original Proposed Action**	1305	500	1805	1505	300	0	0	$7,097,000
Alternative 2 **	1305	475	1780	1180	25	575	9	$4,095,000
Alternative 3 **	1305	500	1805	1455	150	200	6	$6,048,000

* Described in this EA, section 2.3

** Unchanged from Original EA (published September 2007). The comparison between alternatives is based on the original acreage estimates, log values and fuel costs. Updating acreage would not be significantly different (less than 70 acres total) and updating log values and fuel costs would not change the relative values of the alternatives. The primary purpose of this comparison is to show ***proportional*** differences between alternatives rather than precise acreages and values, which would be updated for each decision to implement projects under this EA.

*** Net Value is the value of the logs delivered to the mill (pond value) less logging and hauling costs (calculated in 2007). Total Net Value is rounded to the nearest thousand dollars. Net value per acre is a rounded average for each logging system where there is a 2 – 5 percent difference between high and low values because of infrastructure (e.g. roads, landings) and fixed costs (e.g. move-in). More detail is given in the Gordon Creek Logging Systems Report and Gordon Creek Financial Analysis Report, both of which are incorporated by reference.

Additional Note: Acres for the original proposal were estimated from existing GIS mapping data. Approximately 40 percent of the area has GPS data in the revised proposal, the remainder is estimated from existing GIS mapping. Actual proposed project has been reduced in both LUA, increase in RR acres is a result of adding previously unmapped streams and more precise mapping.

2.7 No Action Alternative

The No Action Alternative describes the baseline against which the effects of the action alternatives 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 any of the proposed actions. 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 or connected actions would occur. If this alternative were to be selected, the following items would not be done in the project area at this time:

- Silviculture treatments
- Timber harvest
- Road construction, renovation, improvement or closure
- Stream crossing restoration projects such as culvert upgrades, log fill removal, or removal of failing culverts
- Fuel reduction projects

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. 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.

2.8 Alternatives Considered But Not Analyzed In Detail

2.8.1 During the Preparation of the Original (2007) and Revised (March 2009) EAs

Regeneration Harvest

Generally, the RMP provides for regeneration harvest at Culmination of Mean Annual Increment (CMAI), at an approximate stand age between 70 and 110 years of age (RMP p. 48, D-1). The Resource Area has determined that these stands are approximately 15 years short of CMAI, therefore they are not ready for regeneration harvest at this time and regeneration harvest was not analyzed in detail.

Reduced Road Construction/Renovation by Skyline Yarding Across Perennial Streams

Project planning indicated that skyline yarding across Gordon Creek with full suspension would be feasible in approximately 4 locations in Section 1, and approximately 5 locations in Section 11. This would reduce road renovation/ construction since roads and landings would only be needed on one side of the stream in these locations.

It would be technically feasible to fully suspend logs above the ground within the stream protection zone in these areas; however movement of the suspended logs in skyline corridors would unavoidably break enough branches to reduce shading slightly. Calculations by the BLM's logging systems specialist indicate that shading could be

reduced by as much as four percent using this logging method, reducing shade levels from the current 92 percent to 88 percent.

The BLM Hydrologist for this project determined that 88 percent provides effective shade to prevent increasing stream temperature, an agreement between the State of Oregon and the BLM requires that there be no human caused reduction in effective stream shading on land managed by the BLM (see Hydrology Report). The BLM considered this alternative, but because the BLM could not guarantee zero reduction in effective shading, this alternative was dropped from detailed analysis.

Variable Density Thinning in Matrix

Under the RMP, the primary function of the Matrix LUA is to produce a sustainable supply of timber and other commodities, and then to provide connectivity to support dispersal between reserves, provide habitat and provide for other ecological functions (RMP p. 20). Variable density thinning (VDT) of forest stands takes many forms, but its application in dense, managed forest stands using methods proposed in external scoping comments involves thinning densities that deviate from the range of residual densities that the IDT determined would be most suited to achieving timber production goals. The IDT considered this alternative but did not analyze it in detail because the Proposed Action for Riparian Reserves (RR) implements a form of variable density management designated to provide greater ecological diversity, owl nesting, foraging, and roosting habitat to meet habitat diversity objectives.

Prohibit Winter Haul on Private Roads in Section 12

The IDT considered prohibiting winter hauling on the private road in section 12 that provides access to portions of the project area in sections 1 and 11. The BLM could not legally enforce a restriction on the use of this private road because private use of these private roads is protected from government interference by the Fifth Amendment of the U.S. Constitution as well as Reciprocal Rights-of-Way agreements between BLM and the private landowner which does not authorize the BLM to restrict private use of the private roads, including private log hauling during the winter months. Given BLM's inability to restrict private use of these private roads during winter month, BLM analyzed the effects of including winter haul on this road.

2.8.2 As a Result of the Protest of Decision for the March 2009 Revised EA as it Relates to Carbon Sequestration (Storage) and Climate Change

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".

2.9 Changes Made in Response to Comments Received on the Original Gordon Creek Thinning EA # OR080-07-05

Low Density Canopy Gaps Dropped from Proposed Action

The BLM has modified the Proposed Action in the original Gordon Creek EA as follows in response to public comments received by the BLM (note: these were called low density patches in the original EA):

- Drop all of the proposed Low Density Canopy Gaps in the Riparian Reserve in Section 1 adjacent to North Fork Gordon Creek
- Drop all of the 2½ acre Low Density Canopy Gaps in the Matrix in Section 13
- Drop all but four ½ acre and one 1 acre Low Density Canopy Gaps in the Riparian Reserve in Section 13.

The comments received expressed concerns that erosion and windthrow would impact water quality in the Corbett municipal watershed, that the proposed canopy gaps were incompatible with management direction for the Riparian Reserve LUA, and that the openings in Matrix were unnecessary because of the large open areas created by private industrial timber management in the area. The BLM determined that:

- ACS Objectives for habitat and complex stand structure (ACS Objectives 1 and 9, RMP pp. 5-6) in Section 1 would be met at the "maintain" level without the increased complexity introduced by the proposed canopy gaps. Therefore, the proposed canopy gaps in this area could be dropped in response to public comment and still meet ACS Objectives. Thinned stands in the Riparian Reserve would develop similar to other thinned stands in the project area; see the Environmental Effects for the Proposed Action, *EA sections 3.3.1, 3.3.5.* Untreated stands in the Riparian Reserve would continue to develop as described in *EA sections 3.3.1, 3.3.5* Environmental Effects for the No Action alternative. The opportunity to increase stand complexity and provide habitat for species that prefer brushy openings with scattered large trees and piles of woody debris would be foregone at this time.
- Canopy gaps in the Matrix LUA in Section 13 were not essential to provide sufficient variety of habitat on a landscape level to provide for the connectivity, habitat and ecological functions objectives in the RMP (p. 20), and that the presence of small canopy gaps would somewhat reduce the sustainable supply of timber (RMP p. 20) produced from Matrix land in Section 13. Therefore, the proposed canopy gaps could be dropped in response to public comment and still meet RMP objectives. The habitat for species that prefer this size of brushy openings with scattered large trees and piles of woody debris would not be created within the extensive uniform conifer stands present in Section 13.
- Introducing elements of complex stand structure in the Riparian Reserve is important to achieving the habitat objectives of ACS Objectives 1 and 9 in the western part of Section 13, but that the ACS Objectives could be minimally met with fewer and smaller low density canopy gaps. Therefore, the number and size of these openings could be scaled back in response to public comment.

Some habitat for species that prefer small brushy openings with scattered large trees and piles of woody debris would be created within the uniform conifer stands in the Riparian Reserves in this part of Section 13.

Expanded Stream Protection Zone in Section 1

EA Comments expressed concerns that the stream protection zones (SPZ) were not wide enough to protect water quality in the Corbett municipal watershed and downstream aquatic habitat. The BLM hydrologist determined that the current 60 ft. stream protection zone together with all other elements of the Proposed Action and Project Design Features, would be adequate to meet all ACS Objectives at the maintain or restore levels. Therefore, the additional buffers would not be necessary to protect water quality in the Corbett municipal watershed and downstream aquatic habitat. However, in light of the sensitivity of having management activities take place near the section 1 water intake, 40 feet were added to the current 60 ft. SPZ resulting in a 100 feet no treatment buffer on each side of the North Fork of Gordon Creek within section 1.

The BLM also determined that ACS Objectives for habitat and complex stand structure (ACS Objectives 1 and 9, RMP pp. 5-6) in Riparian Reserves in this area would be met at the "maintain" level without the increased complexity introduced by the proposed thinning. Therefore additional buffer could be added to the proposal and still meet ACS objectives. The differences in effects between the original proposal and the current Proposed Action are essentially that where dense, uniform conifer stands are found between 60 feet (SPZ) and 100 feet (total width of the revised no treatment buffer):

- The understory would develop as described in the Environmental Effects for the No Action alternative, rather than developing as described for the Proposed Action (*EA section 3.3.1*).
- Growth rates for the dominant and co-dominant trees would be as described in Environmental Effects for the No Action alternative rather than the increased growth rates described for the Proposed Action. This means that the trees within the 60 to 100 feet range from the stream that could fall and contribute large wood to the stream would not have gained the additional size in the next two decades that would have been expected as a result of thinning. It also means that the trees that do increase growth rates and would be larger in the next two decades are further from the stream, so the potential large wood contribution would be from the smaller tops of the trees.
- Any soil disturbance caused by windthrown trees in the thinned area would be farther from the stream, increasing the assurance that sediment would not reach the stream.

Treatment of 117 Year Old Stand Dropped from the Proposed Action

The BLM drop the proposal to thin five acres of a 117 year old timber stand on Matrix in Section 3, effectively implementing the "No Action" alternative for this stand, as a result of public comment.

The differences in effects from this change are slight, due to the small size of this stand and the adjacent Riparian Reserve portion of the same stand type. The current growth rates would continue, some potential increase in growth rates on dominant and codominant trees to be retained in a thinning would not occur, and some of the intermediate and suppressed trees in the unthinned stand would be expected to die and become snags. Some of these snags may be larger than 15 inches diameter.

The decision to drop management of this stand in this proposed action does not constitute a decision to change the land use allocation under the RMP or any future management plans. Management of this stand for the next ten to twenty years will be directed by the management plan in place at the time.

Extend the Logging Operating Season

The BLM modified the original proposed action to enable extension of the logging operating season in response to public comment. The BLM determined that these changes are necessary to improve the economic efficiency of the planned thinning (RMP, D-1), thereby improving the timber value at harvest (RMP p. 46, D-1) and increasing the probability that the proposed timber sale can be successfully offered to the marketplace (Purpose and Need, *EA section 1.2*).

The specific changes the BLM made to the original proposal to achieve these objectives are:

- Allowing (not requiring) new construction, renovated and improved natural surface roads to be rocked if needed to extend the operating season into the fall and winter by making it feasible to haul logs on those roads. See Connected Actions, *EA section 2.3.3*. The rock surface and operational restrictions described in the Proposed Action and Connected Actions would prevent erosion and sediment transport to streams.
- Add rock, shape road surfaces, add sediment traps and implement operational restrictions to allow for winter log haul on the private road in Section 12 and across stream crossings in Section 15 that were not planned for winter haul in the original proposed action. These measures would prevent sediment transport to streams in excess of Oregon DEQ water quality standards.
- Allow limited ground based logging operations during the winter (from the beginning of fall rains in about October until the beginning of NSO and migratory bird nesting seasons March 01). The operations described in the Proposed Action and the best management practices to be implemented as Project Design Features would prevent soil disturbance that could cause erosion and sediment transport to streams and would limit compaction (and resulting productivity loss) to a maximum of 10 percent of the area logged using these methods.

Provide Options for Fuel Treatment Methods

The BLM modified the original proposed action for fuels treatments partly in response to public comment and partly in response to additional BLM review. The original proposal required specific fuel treatment methods for specific sites in the project area. The modified proposal lists several methods that the BLM may choose to implement based on BLM's assessment of the amount and character of slash left after logging, other site conditions such as slope and access, and the availability of resources to accomplish the work. This change increases the BLM's ability to achieve fuel management objectives and may also increase the probability that the proposed timber sale can be successfully offered to the marketplace (Purpose and Need, EA section 1.2) because flexibility in selection of methods and equipment often allows an operator to achieve BLM objectives at a lower cost.

Drop Two Culvert Replacements on Thompson Creek and tributary in Section 14

The culvert on the main Thompson Creek was replaced by the BLM (through the Secure Rural Schools and Community Self-Determination Act of 2000) in 2008 with an adequately sized (for 100 year flood standards) culvert that allows fish passage. The cooperators on the culvert replacement project chose to not replace the culvert on the tributary since engineering analysis of the watershed upstream of the culvert showed that the culvert was of adequate size to meet 100 year flood requirements.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

3.1 Identification of Affected Elements of the Environment

The interdisciplinary team of resource specialists (IDT) reviewed the elements of the human environment, required by law, regulation, Executive Order and policy, to determine if they would be affected by the action alternatives (formerly BLM H-1790-1, Appendix 5, BLM Handbook H-1790-1: p. 137), [40 CFR 1508.27(b)(3)], [40 CFR 1508.27(b)(8)].
Table 6 summarizes the results of that review. Affected elements are **bold**. All entries apply to the action alternatives, unless otherwise noted.

Table : Review of the Elements of the Environment

Elements Of The Environment [Statute/Authority/CFR]	***Status***[19]	***Cumulative Effects***[20]	***Remarks***
Air Quality [Clean Air Act as amended (42 USC 7401 et seq.)]	Affected	No	Addressed in Text (*EA section 3.3.6*)
Cultural Resources [National Historic Preservation Act (NHPA), as amended (16 USC 470), 40 CFR 1508.27(b)(3)], 40 CFR 1508.27 (b)(8)]	Not Affected	No	Historic cultural sites and features are present. This project is in compliance with the NHPA because these resources have been determined not eligible for listing on the National Register of Historic Places (NRHP). Addressed in Text (*EA section 3.3.8*)
Ecologically critical areas [40 CFR 1508.27(b)(3)])	Not Present	No	
Energy Policy [Executive Order (E.O.) 13212]	Not Affected	No	
Environmental Justice [E.O. 12898, 2/ 11/1994]	Not Affected	No	
Fire Hazard/Risk (Healthy Forests Restoration Act of 2003 (P.L. 108-148)	Affected	No	Addressed in Text (*EA section 3.3.6*)

[19] *Not present* = not present within the project area, *Not affected* = not affected by the project, *Affected* = affected by the project yet in compliance with listed authority
[20] Do the action alternatives contribute to cumulative effects to this element? Yes/No

Elements Of The Environment [Statute/Authority/CFR]		***Status[19]***	***Cumulative Effects[20]***	***Remarks***
Essential Fish Habitat [Magnuson-Stevens Act Provision: Essential Fish Habitat (EFH): Final Rule (50 CFR Part 600; 67 FR 2376, 2/17/ 2002]		Not Present	No	
Fish Species/Habitat (except Endangered Species Act (ESA) listed species/habitat)		Affected	Yes	Addressed in text (*EA sections 3.3.3, 3.3.2* – cumulative effects)
Floodplains [E.O. 11988, as amended, 5/24/1977)		Not Affected	No	The project is small in scale and would not change the character of the river floodplain, change floodplain elevations, or affect overbank flooding.
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)]		Not Affected	No	
Invasive, Nonnative Species (plants) (Federal Noxious Weed Control Act and E.O. 13112)		Affected	No	Addressed in text (*EA Section 3.3.1*)
Land Uses (right-of-ways, permits, etc)		Not Affected	No	
Late Successional and Old Growth Stands		Not Present	No	The 5 acre 117 year old stand has been dropped from the Proposed Action.
Migratory Birds [Migratory Bird Treaty Act of 1918, as amended (16 USC 703 et seq.), E.O. 131186]		Affected	No	Addressed in text (*EA Section 3.3.5*)
Native American Religious Concerns [American Indian Religious Freedom Act of 1978 (AIRFA) (42 USC 1996)]		Not Affected	No	This project is in compliance with the AIRFA because there no known Native American religious sites are in the project area and no concerns from any Tribes were received during the scoping period. Addressed in text (*EA Section 5.1.2*)
Public Health and Safety [40 CFR 1508.27(b)(2)]		Not Affected		Addressed in text *(EA sections 2.3.4, 3.3.7)*
Recreation		Affected	No	Addressed in text (*EA Section 3.3.7*)
Rural Interface Areas		Affected	No	Addressed in text (*EA Section 3.3.7*)
Soils		Affected	No	Addressed in text (*EA Section 3.3.4*)
Other Special Status Species / Habitat	Plants	Not Present	No	
	Wildlife	Affected	No	Addressed in text (*EA Section 3.3.5*)

Elements Of The Environment [Statute/Authority/CFR]		***Status[19]***	***Cumulative Effects[20]***	***Remarks***
Threatened or Endangered (T/E) Species or Habitat [Endangered Species Act of 1983, as amended (16 USC 1531) (ESA)]	Fish	Not Affected	No	Addressed in text (*EA Sections 3.3.3, 5.1.1*)
	Plant	Not Present	No	
	Wildlife	Affected	No	The only T/E species affected by this project is the northern spotted owl. The proposed project would not affect Designated northern spotted owl Critical Habitat. Addressed in text ((*EA Section 3.3.5*)
Visual Resources		Affected	No	Addressed in text (*EA Section 3.3.7*)
Water Quality [Clean Water Act of 1977 (33 USC 1251 et seq.) (CWA)]		Affected	Yes	May affect quality of water (component - sediment/turbidity) in the channel drawn by the Corbett water district. The risks of these effects are reduced by the implementation of project design features to limit the detectable effects that are discernable from background levels to no more than 0.5 mile downstream .The Corbett water intake is more than 0.5 miles downstream from the stream crossing work that would add sediment into Gordon Creek. The BLM will be in contact with the Corbett water district during harvest operations to further reduce the risks to the water intake. In addition, all water drawn by the water intake will be treated so this project will not affect the quality of drinking water delivered by the Corbett water district to its customers. Addressed in text (*EA Section 2.3.4, 3.3.2*)
Water Resources – Other		Not Affected	No	Addressed in text (*EA Section 3.3.2*)
Wetlands (E.O. 11990 , 5/24/1977), 40 CFR 1508.27(b)(3)]		Not Affected	No	No effects to wetlands are expected because all proposed activities would occur outside of known wetlands.
Wild and Scenic Rivers [Wild and Scenic Rivers Act, as amended (16 USC 1271), 40 CFR 1508.27(b)(3)]		Not Present	No	
Wildlife Habitat Components (snags, CWD, remnant old growth trees)		Affected	No	Addressed in text (*EA Section 3.3.5*)
Wilderness (Federal Land Policy and Management Act of 1976 (43 USC 1701 et seq.); Wilderness Act of 1964 (16 USC 1131 et seq.)		Not Present	No	

The elements of the environment affected by the proposed thinning activities are: air quality, fire hazard/risk, fish species/habitat (except ESA listed species/habitat), invasive, non-native plant species, migratory birds, other special status species / habitat – wildlife, recreation, public safety, rural interface areas, soils, threatened or endangered species – northern spotted owl, visual resources, water quality, and wildlife habitat components and carbon storage, carbon emissions and climate change. *EA Section 3.2* describes the assumptions, methodology and general setting. *EA section 3.3* describes the current condition and trend of the affected resources and the environmental effects of the alternatives on those resources.

3.2 Analysis Assumptions and Methodology/ General Setting

Sources Incorporated by Reference: *Gordon Creek Watershed Analysis (GWCA)*

General Assumptions

- 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 LUA on BLM-administered lands will be managed for protection of watershed values such as drinking water, water quality and aquatic habitat and for terrestrial wildlife habitat on both a local and landscape level. Under the RMP, the width of the Riparian Reserve LUA is one site-potential tree height (220 feet for the Gordon Creek Thinning project) slope distance on each side of non-fish bearing streams and two such tree heights for fish bearing streams.
- If the proposed action, or one of the action alternatives, is implemented, no further silvicultural treatments would be done for approximately the next 20 years in these stands, both Matrix and Riparian Reserve.
- Potential warming and drying trends predicted by 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 (GCWA p. 5-1). Warming and drying could theoretically increase stresses in overcrowded stands, but the BLM cannot reliably quantify this effect with current modeling tools.
- Most private forest lands in the Gordon Creek watershed will be intensively managed with regeneration harvests scheduled on commercial economic rotations occurring at 50-60 year intervals (PRMP/FEIS 1994, p. 4-3). BLM observations of recent trends in industrial forest management indicate that this interval may be reduced to 30-40 years for some landowners.
- Unless otherwise noted, there is no measurable difference between the effects of the Proposed Action and the original proposed action.
- One objective of this EA is to clarify the effects of the original action alternatives as well as describing the effects of the current proposed action.

General Methodology

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 Gordon Creek project).
- GIS data, aerial photographs and satellite imagery, 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.
- Aerial photographs from the last 50 years, satellite imagery, GIS data and field reconnaissance by BLM personnel at various times from 2005-2008 were used to assess changes and to determine present forest conditions (species, structure, canopy cover, size classes) on all land ownerships within the Gordon Creek 6th field watershed.
- Economic analysis assumptions are summarized in the footnotes to *Table 5, EA section 2.6.* Details of the economic analysis methods are found in the logging methods cost analysis worksheets which together form the logging financial analysis which is incorporated by reference.

General Setting/Affected Environment

Existing Watershed Condition

The Gordon Creek 6th Field watershed is located in the lower Sandy River basin, approximately 20 miles east of Portland, Oregon and six (6) miles east of Corbett, Oregon. The Gordon Creek watershed covers approximately 11,159 acres, draining the southwest side of Larch Mountain (Gordon Creek Watershed Analysis (GCWA) p. 1-2).
This watershed is not a key watershed as defined in the Northwest Forest Plan (NWFP), (NWFP p. A-5; RMP p. 6; GCWA p. 2-1). The Environmental Assessment project area covers approximately 1,700 acres within the Gordon Creek 6th Field watershed and less than 40 acres split between two adjacent watersheds. See Maps, EA section 7.2.

Approximately 24% of the Gordon Creek watershed is managed by BLM, 47% is private, 28% is Forest Service (USFS), and 1% is local government. USFS lands are concentrated in the upper quarter of the watershed, while BLM lands are intermingled in a checkerboard pattern with private lands in the middle portion (GCWA p. 1-5).

Historical human use in the watershed focused on logging (GCWA 10-1) (*EA section 3.2.2*). Today, a major land use in the watershed is industrial forestry (GCWA p. 1-5).

Two water intakes for the Corbett Water District municipal water supply are within this watershed (GCWA p. 1-8). The North Fork intake is on BLM managed land in the south-center part of Section 1, which authorized under a R&PP lease. The South Fork intake (the primary intake) is on private land in the north-center part of Section 12.

Corbett's water treatment facility is located on BLM land in the SE ¼ of Section 3. The pipeline from the intakes to the treatment facility runs under and adjacent to the access road between the North Fork intake and the treatment facility (field tour with Zachary Bertz, Corbett Water District). See Logging & Transportation Systems/Riparian and Water Resources Map.

There are approximately 65 miles of mapped road in the Gordon Creek Watershed, most of which are closed to the public. 28 miles of these roads are on federal (BLM and USFS) lands (43 percent). Roads are closed to the public primarily as a result of the intermingled private and public ownership pattern.

Average total road density across all ownerships is estimated at 3.7 miles per square mile (miles/mile^2), 3.0 miles/mile^2 on federal lands. Approximately 25 percent of the roads are within 200 feet of a stream, but only a small fraction of those are on steep slopes (GCWA only refers to "steep" slopes, field observations by the IDT indicate that very few roads are on slopes steeper than 35 percent). (GCWA pp. 1-8, 3-8, 11-1)

Slope gradients for nearly two thirds (63%) of the watershed are less than 20 percent and 30 percent of the watershed has slopes of 20-50 percent. Only seven percent of the watershed has slopes greater than 50 percent and the vast majority of those slopes are downstream of the project area (GWCA Map 3-4, p. 3-9; text pp. 3-6 through 3-8.).

Approximately eighty (80) percent of Gordon Creek Watershed as a whole is dominated by closed-canopy conifer forests; 20 percent of the watershed area is covered by mixed conifer-broadleaf forests (GCWA p. 5-2, based on Interagency Vegetation Mapping Program satellite imagery and mapping). These stands are predominantly closed, mid-seral stands 41- to 80-years of age, which lack structure and characteristics of late-successional stands (GCWA p. 11-1).

On BLM land within the Gordon Creek watershed approximately 80 percent of the forest stands are in this mid-seral stage, 6 percent are in early-seral stage, 6 percent are in open-sapling condition and 8 percent are in mature and older forest seral stages. These older stands are typically small (less than 40 acres), isolated patches scattered across BLM forestlands. The oldest BLM stands in the water shed are 150-170 years old (BLM Forest Operations Inventory data as cited in GCWA p. 5-4), none of which are proposed for harvest in the Gordon Creek thinning project. BLM land is within the General Forest Management Area (GFMA) portion of the Matrix land use allocation (LUA) and the Riparian Reserve LUA described in the Salem District Resource Management Plan (RMP p.5), (NWFP p. A-5; GCWA p. 1-5). For additional description of stands and vegetation, see *EA Section 3.3.1*, Vegetation and Forest Stand Characteristics.

The following acreage summaries provide additional context for the project:

- There are 2735 acres of BLM managed land in the general project area vicinity (GIS data base). This excludes lands in the Bull Run Management Unit in the SE ¼ of section 13. These acres include:
  - 1789 acres within the Matrix (General Forest Management Area (GFMA)) land use allocation (LUA), 65 percent of the BLM's 2735 acres.
    - 1324 acres of thinning is proposed within the Matrix LUA for the Gordon Creek project, 48 percent of the BLM's 2735 total acres and 74 percent of the BLM's 1789 Matrix acres.

        - § 465 acres of Matrix would remain unthinned after the implementation of the Gordon Creek project, 26 percent of the BLM's 1789 Matrix acres.
    - o 946 acres within the Riparian Reserve LUA, 35 percent of the BLM's 2735 acres.
        - § 400 acres of thinning is proposed within the Riparian Reserve LUA for the Gordon Creek project, 15 percent of the BLM's 2735 acres, and 42 percent of the BLM's 946 Riparian Reserve acres.
        - § 546 acres of Riparian Reserve would remain unthinned after the implementation of the Gordon Creek project, 58 percent of the BLM's 946 Riparian Reserve acres.
- 1724 acres is proposed for thinning in the Gordon Creek thinning project, 65 percent of the BLM's 2735 acres.
- 1011 acres of BLM managed land in the general project area vicinity would remain unthinned after the implementation of the Gordon Creek thinning project, 37 percent of the BLM's 2735 acres.

Historical Influences on Forest Development in the Gordon Creek Watershed

The following historical information was compiled from BLM archival records of timber sales, land surveys, and reforestation records; the *Cultural Resources Report* (incorporated by reference); *A History of the Bridal Veil Lumbering* Company, Bill Carr, USFS 1983; Bridal Veil, Oregon – Wikipedia; www.bridalveiloregon.com; www.ghosttowns.com/states/or/bridalveil.html.

The following historical information applies to all BLM, Forest Service, and private industrial forest lands.

The original forest stands throughout the project area were clearcut logged in the 1920s and 30s. The logging patterns are clearly visible on 1956 aerial photos in BLM archival records. Other parts of Larch Mountain area were logged beginning in the 1800s when Bridal Veil Lumber Company built their mills and started logging operations.

Timber sale dates on BLM managed land in the Gordon Creek area ranged from 1924 to 1936, almost exclusively to Bridal Veil Timber Company, formerly the Bridal Veil Lumbering Company. Over 600 cords of cordwood, plus miscellaneous salvage and cedar shingle bolts are recorded as having been sold from 1943-45, indicating that slash and debris loading on the site was high. Site preparation was largely neglected, or incidental to fires in the area. The rails were salvaged for steel during World War II, ending any possible rail traffic. The record keeping system changed after this time period and there is a gap in the narrative until the commercial thinning in section 11, see the Vegetation section of this EA.

Some augmentation with planting or broadcast seeding may also have been done, as was done on adjacent USFS land that was obtained from the Bridal Veil Lumber Company, but much of the regeneration was very likely from seed produced by the smaller, more poorly formed or diseased trees that survived logging of the merchantable timber, rather than the larger, healthier and straighter trees.

Railroad logging was a very common logging method in the northwest in that era, and was used extensively in the Gordon Creek area. The logging methods used shaped the terrain, access and forest stands in the project area today.

There are railroad grades throughout the project area, many with extensive benched (cut-and fill) roadbeds and throughcuts[21], often 15-20 feet deep. Some of these were mainlines, such as the north-south Brower Mill Road, while many of them are simply spurs used entirely for logging specific areas.

There are also numerous other roadbeds and trails throughout the stands in the area that were likely a combination of railroad spurs, truck roads and skid trails used by oxen and/or bulldozers. Where railroad trestles crossed streams in gentle curves, truck roads often continued upstream with steeper slopes and sharper curves to a suitable truck road crossing.

Yarding on most slopes was done with steam donkeys and hi-lead cable systems that often provided no suspension while dragging logs up or across the hillside. In relatively flat areas or where gentle slopes led downhill to loading areas, skidding with oxen, bulldozers, and hi-lead yarding were used. Many of these railroad grades, truck roads and skid trails are still evident today in various stages of recovering to natural forest floor conditions. See the Soils section of this EA for additional descriptions.

3.3 Resource Specific Affected Environment and Environmental Effects

3.3.1 Vegetation and Forest Stand Characteristics

Sources Incorporated by Reference: *Gordon Creek Silvicultural Prescriptions Commercial Thinning, Thompson, 2008 (Silviculture Report); Cascade Resource Area Botanical Report Proposed Gordon Creek Timber Sale, Fennell 2008 (Botany Report); Cascade Resource Area Wildlife Report Gordon Creek Project, England and Murphy 2009 (Wildlife Report); Gordon Creek Thinning Project Air Quality and Fire Hazard/Risk Specialist Report, Raible 2009 (Fuels Report). Additional sources: Stand Exam data and analysis, botanical surveys, field reconnaissance by BLM personnel, Gordon Creek Watershed Analysis (GWCA), Salem District Forest Operations Inventory (FOI) data, Salem District Timber Production Capability Class (TPCC), Salem District Geographic Information System (GIS) data, Salem District archival records.*

Additional Resource Specific Assumptions

As relative density[22] (RD) 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.

There is a considerable body of research on thinning pure Douglas-fir stands, but a limited amount concerning thinning mixed conifer stands. The recommendation for timber production in pure Douglas-fir is to thin down to a RD of 35 to 40, then thin again when the stand RD reaches 55. Western hemlock is more shade tolerant than Douglas-fir and stand models indicate that mixed conifer stands where western hemlock approaches or exceeds 50 percent of the stand can support more stems per acre. The silviculturist for the Gordon Creek project has determined that using a target RD of no less than 40-45 % residual RD for mixed conifer stands found in the Gordon Creek area is a reasonable approach to ensure that the sites remain fully occupied and productive.

[21] Benched roads are a notch cut in the hill (‾‾\------\ ). Throughcuts are a trench through a hill (‾‾__/‾‾).
[22] Relative density (RD, using Curtis' system) 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.

Resource Specific Methodology

- For stand structure information, Stand Exams were conducted under BLM administered contracts in 1999 and 2005 and additional stand information was gathered by BLM personnel.
- The BLM analyzed the data using BLM's EcoSurvey 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. See the Silviculture Report for additional stand exam summary data.
- For Threatened/Endangered/Special Status/Special Attention botanical species and former Survey & Manage 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).

  *Known Site Survey***:** Prior to field surveys, the botanist reviewed data bases for the presence of known Threatened or Endangered (T/E), Special Status Species (SSS), former Survey and Manage (S&M) and Invasive/Non-native plant species in or near the project area; evaluated habitat requirements for T/E, SSS and S&M species; and evaluated the known habitat in the proposed harvest area(s) for habitat suitability for T/E, SSS and S&M species.

  Field Surveys: The botanist conducted botanical inventories of the proposed harvest areas for T/E, SSS and S&M species on 04/20/05, 05/16/05, 05/17/05, 06/16/05, 06/21/05, 07/07/05, 07/11/05, 07/12/05, 08/30/05, 07/19/06 and 07/27/06. The botanist surveyed the entire project area using the Intuitive-controlled method which focuses survey efforts in the areas most likely to contain these species. Intuitive-controlled surveys are performed by traversing through and around the proposed project area, visiting specific areas identified on topographic maps, aerial photos, and as a result of the known site inventory (described in the previous paragraph) as having potential habitat for T&E, SSS and S&M species. The botanist also surveyed all road corridors on both public and private lands.

  BLM's botanist conducted surveys for invasive and non-native plant species concurrent with the field surveys for other plants as described above. The botanist also conducted additional surveys for invasive/non-native species inhabiting the road system connected to the proposed project area on 9/4/08 (BLM experience has shown that road rights-of-way are the most likely place for these species to have become established). These surveys were conducted to determine what, if any, noxious/invasive species are present, their distribution and population size, and to assess potential effects of habitat modifying activities on existing invasive/non-native species.

Affected Environment

Stand Structure and Development

Matrix (GFMA) LUA

Prior to the beginning of extensive railroad logging in the Larch Mountain area (including the Gordon Creek watershed) in the 1920s the forest was shaped by fire, wind, insects and disease. Fire and wind patterns were influenced by topography (slope steepness and aspect). These forces created a mosaic pattern of forest stands of different ages at scales ranging from as small as a fraction of an acre to many thousands of acres following large scale fires or wind events. For more detailed information see the Fire, Fuels and Air Quality section of this EA.

In 1993 the Regional Ecological Assessment Project estimated the historical range of natural variability of forest seral stages for the Sandy River basin, which includes the Gordon Creek watershed, to have naturally been 47-59 percent late-seral forest and 8-28 percent early-seral forest. (GCWA p. 5-6)

The forest stands on BLM lands throughout the Gordon Creek project area are currently second-growth, managed conifer forest regenerated after virtually all BLM land in the project area was clearcut in the decade before World War II.[23] The stands range from 52-74 years old and, except as described in the following paragraphs, are dense, single storied stands of mixed western hemlock and Douglas-fir with 74-93 percent crown closure. Douglas-fir is more common at the lower elevations in the proposal, and western hemlock is more common at the higher elevations.

The RD throughout the project area (except in Section 3) ranges from 51-72 and stocking typically ranges from 120 – 224 trees per acre (TPA). These densities and stocking levels are associated with overstocked stands where competition for site resources (water, nutrients and light) results in moderately to severely reduced growth rates and stand vigor with increased susceptibility to damage from insects, disease, fire and windthrow.

There are some (estimated as less than 20) trees in the SE¼SE¼ Section 15 that have developed old growth characteristics, as determined by BLM personnel based on observations of size and appearance, that are being reserved as old growth trees. There are also some (estimated as less than 50) large snags in the same area. The actual age of the trees is not known. There are no other known old growth trees in the project area. All other known old growth trees in the vicinity have been excluded from the project area.

When lands in the area were originally logged, common practice was to leave approximately two trees per acre as a seed source for reforestation, then to log those trees after the area seeded in. Additional seed would often come from cull trees (trees with unmerchantable volume and log grade), often understory hemlock, that survived logging.

[23] BLM archival records show that the typical ten-year timber sale (or patent) in the Gordon Creek project area was typically sold in large blocks, usually in multiples of 40 acres. Almost all of the timber was sold to Bridal Veil Timber Company between November, 1924 and September, 1936. The mill at Bridal Veil burned in November 1936. The last of these were terminated 12/30/41. The overlapping contract periods resulted in logging almost the entire project area within a single decade.

It often took many years for conifer stands to become established with this reforestation method. The BLM has not found specific documentation that these practices were followed at that time in the Gordon Creek area, but the characteristics described for these stands are what we would expect to see as a result of these practices.

The USFS planted conifer seedlings in 1928 (8 ft. by 8 ft. spacing) on lands that they obtained from Bridal Veil Timber Company, but BLM does not have records available that indicate whether tree planting was done on the lands that are now under BLM ownership.

In general, the stands in Sections 3, 9, 11 and 15 are Douglas-fir dominated. In Sections 1 and 13 most of the stands are mixed conifer where nearly half to nearly all of the trees are western hemlock, a more shade tolerant species.
Detailed species composition for each stand is derived from stand exam results which are available for examination at the Salem District office.

The RD in stands prescribed for thinning, both Matrix and Riparian Reserve, ranges from 51-72 percent, except in Section 3 where it is 46 percent. Trees per acre (TPA) count only conifer trees that are 7.0 inches DBH or larger. The stands prescribed for thinning generally range from 120-224 TPA. See the Silviculture Report for stand specific summaries. One 210 acre stand in Section 15 is a two-storied stand that developed as a result of management practices. The original reforestation effort after logging left a stand of scattered clumps and individual conifers with dense brush in between.

In 1975 the BLM scarified (uprooted and piled brush and debris using a bulldozer with a brush blade) between conifer clumps, burned the piles and planted the bare ground with Douglas-fir seedlings. The overstory is now composed of clumps of trees that are now 52 years old, and primarily Douglas-fir. The trees in these clumps have wide, deep crowns and have generally retained their lower limbs. The understory is now 34 years old and was pre-commercially thinned in 1990. The diameter[24] of the understory varies greatly, from 5-11 inches; the smaller trees are usually stems that have grown in the shade of a nearby overstory tree.

One 24-acre second-growth stand in the SE corner of Sec. 15 has a remnant overstory of approximately 150-year-old[25] Douglas-fir and western hemlock, about 0.7 TPA and ranging from 35-81 inches DBH. These are probably seed trees that were intended for harvest at some later date, but were left alone for some unknown reason. Two areas in the project area have had a previous commercial thinning: about 200 acres in Sec. 13, (1980) and about 25 acres in Sec. 11 (1985). Both areas show increased diameter growth compared to adjacent unthinned areas, and the stand in Sec. 11 has a sometimes-dense layer of conifer regeneration that is about 10 feet tall.

[24] Tree diameter is measured at 4.5 feet above the ground (uphill side), known as "Diameter Breast Height", or DBH. Unless a different method is specified, diameter is measured as circumference in inches (outside of the bark) divided by π (~3.14).

[25] Age of these residual trees is uncertain. The estimate of age 150 was derived from archival records, but some of the trees may be over 200 years old. All of these trees are reserved from cutting and are being treated as if they are older than 200 years.

Ground cover (primarily sword fern, salal and Oregon grape) and brush understory (primarily vine maple) is sparse in these stands, typically with less than 10 percent of the forest floor covered by these species.

Hemlock dwarf mistletoe (*Arceuthobium tsugense*) is endemic in parts the project area, particularly in some areas of Sections 1 and 13; and will remain after harvest regardless of this action. Trees infected with this parasitic plant disease exhibit reduced growth and vigor, and develop increasingly gnarled and misshapen limbs and boles over time. The disease typically spreads slowly, as spores rupture and infect neighboring trees. Spores are spread by the wind and gravity to nearby trees.

Riparian Reserve LUA

The Riparian Reserve stands proposed for thinning are similar to and contiguous with the Matrix stands proposed for thinning. When BLM lands in the Gordon Creek area were logged and reforested, there was no distinction made between forest stands in what is now classified as Riparian Reserve and those in Matrix. Stands in the Riparian Reserve that are naturally developing structural complexity are not proposed for treatment; therefore they are not "in the project area". Forest stands that are associated with ecological riparian zones where the water table largely defines site conditions typically developed more species and structural diversity with hardwood trees, brush species and western redcedar providing greater variety than is found in the adjacent uniform conifer stands.

Analysis in Support of the Thinning Prescription

The silviculture[26] expert (silviculturist) for the Gordon Creek project has special expertise in forest stand density management based on his nine years of experience as the western Oregon coordinator for the BLM Density Management Study (DMS), including seven sites on four BLM Districts, in cooperation with Oregon State University and the Pacific Northwest Research Station. This ongoing study provides the basis for some of the most current science available on the effects of different thinning densities and the development and effects of created canopy gaps.

Matrix (GFMA) LUA: The stands in the project area vary widely in species composition and relative density. None of the stands in the Gordon Creek project area have reached CMAI. At an approximate current median age of 60 years, these stands could have been commercially thinned for the first time about 20 years ago (about age 40), to maximize volume production from these lands.

Two areas in the proposal were commercially thinned at about that time. The rest of the acreage has essentially seen one commercial thinning entry foregone. If management objectives remain similar to the current RMP, the silviculturist for the Gordon Creek project anticipates one more commercial thinning on most of these stands in about 20 years, then a regeneration harvest about 20-30 years after that.

[26] Silviculture is the science and art of cultivating a forest - the theory and practice of controlling the establishment, composition and growth of forests to meet defined management objectives (drawn from the Society of American Foresters definition and application narratives). The silvicultural prescription is a planned series of treatments (or decision to not treat) to change current stand structure to one that meets management goals.

Additional reasons for commercial thinning include:

- immediate return of volume, development of larger residual trees, fire hazard reduction, increasing growth and diversity of understory vegetation,
- accelerating the development of spotted owl habitat (see *EA section 3.3.5*, Wildlife),
- maintaining the health and vigor of the stand, providing options for future management (such as uneven-aged management), and
- sanitation harvest[27] of western hemlock stems infected with hemlock dwarf mistletoe. The proposed thinning treatment is designed to meet all of these objectives.

Riparian Reserve LUA: The BLM silviculture and wildlife specialists for the Gordon Creek project made a joint field evaluation of all RR's in the project area. They determined from this effort that selected Riparian Reserves in Sections 1 and 13 are lacking vertical canopy structure in terms of tree regeneration or tall shrubs. Within these sections, there are other areas where understory trees and/or shrubs are present, but their growth is severely hindered by the shade of the dense overstory canopy.

The wildlife specialist determined that habitat development could be facilitated through the creation of low-density canopy gaps in these areas. The silviculturist and wildlife biologist developed a proposal that included the number, size, location, overstory tree retention plan, natural regeneration plan, slash treatment plan, and analysis of how habitat characteristics in these canopy gaps would be expected to develop over the next two to three decades. In about 20 years the stands would need to be evaluated for further silvicultural treatment to meet management objectives.

Survey Results for Threatened or Endangered /Special Status/Former Survey and Manage Plant Species

The botanist's known site search determined that suitable habitat for twenty special status fungi species exists within the boundaries of the project area (Botany Report, Table 1). All of these species are seasonal fungi that appear in the spring or fall when conditions are favorable. Due to the unpredictable nature of seasonal fruiting fungi, surveys for these species are not considered practical and are not required at this time.

The botanist's known site search determined that there are no known sites for any Threatened or Endangered (T/E) or currently listed Special Status (SSS) vascular plant, lichen, bryophytes or fungi species within or adjacent to the project area; and no known habitat for T/E, SSS or S&M vascular plant, lichen, bryophyte species within or adjacent to the project area.

Surveys identified *Gymnopilus punctifolius*, formerly S&M but currently a non-listed fungi species, within the boundaries of proposed harvest unit 1-5-3A in Sec.3, T1S, R5E, W.M. The area where this species was located has been dropped from all action alternatives.

An October 1995 study conducted by the Oregon State University Department of Botany & Plant Pathology found *Codriophorus ryszardii* (previously referred to as *Codriophorus aquaticum* and *Racomitrium aquaticum*) on five sites within section 13, T1S, R3E, W.M.

[27] Sanitation harvest is cutting and removing diseased trees. In this case, designating healthy trees to be retained in the commercial thinning and designating mistletoe infected hemlock to be cut and logged.

This species, formerly a Bureau Tracking/Survey & Manage category E species, is currently a non-listed moss species. All North American records for *Codriophorus aquaticum* (= *Racomitrium aquaticum*) have been renamed *Codriophorus ryszardii* (= *Racomitrium ryszardii*), and *Codriophorus aquaticum* has been determined to not exist in North America (Benarek-Ochyra 2000; Ochyra and Benarek-Ochyra 2004). The BLM botanist resurveyed for *Codriophorus ryszardii* on 07/19/06 and 07/27/06 and did not find this species within the proposed project boundaries.

Survey Results for Invasive / Non-native Plant Species

Based on observations of the location and abundance of invasive species made during field surveys, invasive species are present along roads in and adjacent to the proposed Gordon Creek Thinning area, but they are not strong competitors with native species. Areas of past ground disturbance (e.g. old roads) within and adjacent to the proposed project areas were absent of invasive species (Botany Report pp. 3-4) likely due to their inability to compete with native vegetation and the lack of available sunlight.

BLM field surveys found the following BLM Manual 9015 Class C and/or Oregon Department of Agriculture (ODA) List B invasive/non-native species in the road corridors within and adjacent to the proposed harvest areas; himalayan blackberry (*Rubus discolor*), tansy ragwort (*Senecio jacobaea*), bull thistle (*Cirsium vulgare*), Canadian thistle (*Cirsium arvense*), St. John's wort (*Hypericum perforatum*), and scotch broom (*Cytisus scoparius*) (Botany Report pp. 3-4).

Survey results show that all of the invasive/non-native species identified were found to inhabit road corridors (areas of high light and soil disturbance) in both Matrix and Riparian Reserves and none were found within the proposed harvest areas outside of road corridors. These invasive/non-native species are regionally abundant and well distributed throughout northwest Oregon and eradication is not practical due to the widespread ubiquitous nature of their infestations (Oregon State Department of Agriculture Weed Mapper). Class C species receive the lowest priority (BLM Manual 9015) and management emphasis is to contain populations to their present size or decrease population to a manageable size.

The BLM botanist conducted a Noxious Weed Risk Assessment of the project area and determined that the area has a risk rating of "moderate" (*Botany Report*). A moderate rating indicates the proposed project could proceed as planned with measures in place to control and/or prevent the establishment of invasive/non-native plant species in areas of ground disturbance (See *EA section 2.3.4*).

Environmental Effects

3.3.1.1 All Action Alternatives

Within the Matrix (GFMA) LUA

Stand Structure and Development

Observed Characteristics and Direct Effects Immediately after Thinning:

Immediately following a thinning the stands should appear healthy with minimal logging damage[28] to the residual trees. Most of the stand should appear more uniform in spacing and tree size than it currently does. Average stand diameter would be increased, since the bulk of the harvested trees would be in the smaller diameter classes.

In some areas dominated by western hemlock, the proportion of stocking that is Douglas-fir should increase, compared to current stand composition. The amount of hemlock dwarf mistletoe infection would be reduced, since many infected trees will have been removed.

Fewer trees and lower relative density would result in less competition for site resources (light, nutrients and water). The canopy would be more open than it is currently so that the crowns of retained trees would receive sunlight from the sides as well as above, and lower limbs would be less shaded. Enough light would reach the forest floor to allow establishment of native ground cover species, and brush understory with some conifer regeneration.

Observed Characteristics and Trends in the Long Term:

In the next 20 years, growth on the retained trees should continue at a steady rate, which would be greater than the growth rate if the area remained unthinned. The crowns should expand and fill the spaces created by the thinning and the site should be fully occupied so that growth is slowing down by the end of the second decade after thinning. The understory vegetation should become less vigorous as the site resources become concentrated in the trees and less light reaches the forest floor. The effect of the thinning on total net yield in the GFMA should be positive since available site resources would be redistributed and utilized by fewer stems. For subsequent rotations the productivity of this site should be maintained. It should produce a sustainable supply of timber and still meet all of the other resource objectives outlined in the ROD and RMP.

Indirect Effects:

As site resources are concentrated on fewer trees, the growth rates of the retained trees increases and the trees are more vigorous and healthy compared to what they would be in a crowded stand[29].

[28] We consider a logging-damaged tree as one that has had its cambium removed from more than 50% of the circumference of its bole, and a minimal amount of damage would typically be not more than two trees per acre (2 TPA) having that amount of damage.

[29] This is the same concept as thinning carrots in a vegetable garden. So many seeds typically sprout that the crowded carrots would be small and unhealthy if not thinned. The first thinning is usually done when the carrots are too small to be eaten (precommercial thinning). When some of the carrots are harvested during the growing season they may be

With faster growth rates, it is reasonable to assume that more trees would get larger faster, with proportionate increases in average log volume and timber value for the remainder of the rotation (the planned cycle of a forest stand from establishment to regeneration harvest). The faster growth rates after thinning would also provide trees of suitable size for snags (15+ inches diameter) and CWD (20+ inches diameter) as needed for management plans sooner than would be available without thinning.

In the Pacific Northwest, many studies have been done which document the differential growth rates and structural development of thinned versus unthinned forests. Two of the most recent studies are: Emmingham *et al*, 2007; and Davis *et al*, 2007. All such studies include an unthinned "control" treatment for comparison purposes. In a research context, the controls test the scientific "null hypothesis," that is, whether or not the treated stands would have shown the same growth and development with no treatment whatsoever. Roberts, et al (2007) looked at wind damage following the implementation of variable-density thinning prescriptions. They found no significant difference in wind damage following thinning, between thinned and unthinned areas. Further, internal edges created by gaps, skid trails, and unthinned patches did not inherently increase wind damage risk. The paper also recommends that care be taken to locate gaps and skid trails away from topographically vulnerable positions.

BLM experience with similar thinning projects has shown that thinning as prescribed in the proposed action retains sufficient strength in the stand to resist windthrow of more than scattered individual trees. As trees in the stand become more vigorous, increased root mass) as the roots spread into areas previously occupied by competing trees) and limb-to-limb contact that further dampens swaying, wind-firmness will continue to increase.

There is a theoretical, unquantifiable risk that an unusually intense windstorm in the first year to three years would result in more extensive windthrow than would occur in the untreated stands. Observations of stands within the general project area that were thinned approximately 20 years ago support the BLM's conclusion that we would not expect increased windthrow.

Trees damaged by logging would either survive to be logged in future timber harvest, develop decay pockets that could be used by cavity excavating/nesting wildlife species, or die and become snags or woody debris.

Thinning in the Matrix LUA would have the indirect effect of reducing the hemlock dwarf mistletoe infestation which would result in higher average quality hemlock logs as the thinned stand continues to grow and develop. This would contribute to Matrix LUA objectives for developing timber quantity, quality and value in the long term.

Hemlock Dwarf Mistletoe:
Areas infected with hemlock dwarf mistletoe would experience the growth and spread cycle associated with this parasitic plant. In general, the rate of infection would decrease dramatically in the thinned areas, as the most-infected overstory stems are harvested.

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large enough to eat (commercial thinning) and the ones left in the ground will grow larger until harvested in the fall (regeneration harvest).

However, new infection of healthy hemlock trees would begin to occur over time, as the disease spreads out from infected trees that were left. Infected trees will be left in infection centers where the least-infected trees are retained, or when trees that appear to be disease free, but are actually infected, are retained.

The infection rate would also decrease in the understory at first, but then also slowly increase over time. The primary spread mechanism here is simple gravity, when spores from infected trees drift downward and infect susceptible smaller hemlock trees in the understory.

Preserving the western hemlock dwarf mistletoe infection center in Sec. 13 (approximately 4 acres), and other infection centers adjacent to thinning area boundaries, would keep these trees with large, gnarly limbs in the stand. They provide some desirable habitat features for wildlife (see *EA Section 3.3.5*), but also pose the threat of ready re-infection of adjacent hemlock leave trees.

Threatened, Endangered and Special Status Plant Species

No Suitable habitat to support any T/E species was identified within or adjacent to the proposed project area. Although suitable habitat to support some Special Status Species (SSS) was identified within the proposed project area, no SSS were found. Suitable habitat will remain in both the thinned area and reserves, and no adverse impact to suitable habitat, or any undiscovered SSS is anticipated. The proposed project would not contribute to the need to list any SSS.

Invasive/Non-native Plant Species

It is unlikely that this project would result in the spread of any of the invasive species populations present within and adjacent to the proposed thinning units , along roads accessing these units or along roads where log haul would take place for the following reasons.

A slight increase in the number of individual invasive/non-native plants is likely to occur as a result of project activities. In the professional opinion of the BLM botanist, the increase in the number of plants would be so small as to be difficult to quantify because of the widespread and ubiquitous nature of the invasive species populations identified in the proposed project area (see affected environment). For example, if 10 new scotch broom were to start growing as a result of the proposed action, the increase would be undetectable compared to the current the regional scotch broom population of many millions of plants.

In the short term (1-5 years) some areas of soil disturbed by logging and road construction/stabilization operations may become infested with species already present in the area. The BLM anticipates that the infestations would be short lived due to competition with native species. This conclusion is based on the BLM's general observations throughout the Cascades Resource Area and specific observations of forest stands within and adjacent to the Gordon Creek Thinning project that have been commercially thinned in the last 25 years and show little or no difference in their invasive/non-native species population composition compared to untreated stands.

In addition, BLM's experience shows that the seeding it would conduct on disturbed soil in exposed areas (non-forested areas such as roads) with native grass species would prevent establishment of invasive/non-native species populations in these areas.

Based on more than a decade of BLM experience with washing equipment, visual inspection of that equipment by BLM personnel, and monitoring invasive species after logging, washing of earth moving and logging equipment before entering BLM land has proven to be an effective method to reduce the risk of spreading invasive species. In addition, if known invasive species are identified in or adjacent to the proposed harvest area, washing of earth moving and logging equipment before they leave BLM land would reduce the risk of spreading these invasive species to other areas.

Fungi, Including Recreationally/Commercially Harvested Fungi (e.g. mushrooms)

Fungi rely on many environmental factors that induce fruiting. A forest is dynamic not static, and as the forest changes over time, whether it changes by natural processes or human intervention, different environmental factors are introduced. As the forest environment changes, both the fungi species mix within a forest and the amount of fruiting may also change over time. One study indicates that some fungi species were induced to fruit by forest thinning operations (Colgan et al 1999).

Regardless of the alternative chosen, change will occur in the forest environment and it is reasonable to assume that fungi species abundance and distribution will change with it. Although an unquantifiable shift in annual productivity for some fungi species may occur, commercial thinning such as proposed for the Gordon Creek Thinning had the least impact on recreationally and commercially harvested forest fungi compared to harvest prescriptions that remove more trees (Pacific Northwest Research Station, USDA Forest Service, 2000). This type of commercial thinning also tends to accommodate both commercial timber harvest and mushroom resources (Kranabetter et al 2001).

Within the Riparian Reserve LUA:

Stand Structure and Development

The thinning prescription and logging methods are essentially the same in the Riparian Reserves as they are in the adjacent Matrix portions of the treatment area. Therefore, the environmental effects are essentially the same as described above for thinning on Matrix. The focus of the description of environmental effects to vegetation and stand structure on Matrix ground emphasized the effects important to timber production. The following description of environmental effects to vegetation and stand structure in the Riparian Reserve emphasizes the effects important to ACS objectives.

Observed Characteristics and Direct Effects Immediately after Thinning:

Immediately following a thinning the stands should appear healthy with minimal logging damage to the residual trees. Average stand diameter would be increased, since the bulk of the harvested trees would be in the smaller diameter classes.

In some areas dominated by western hemlock, the proportion of stocking that is Douglas-fir should increase compared to current stand composition. The amount of hemlock dwarf mistletoe infection would be reduced, since many infected trees will have been removed.

Fewer trees and lower relative density would result in less competition for site resources (light, nutrients and water). The canopy would be more open than it is currently so that the crowns of retained trees would receive sunlight from the sides as well as above, and lower limbs would be less shaded. The 25 percent variation in spacing (marking guides) would effectively create small clumps and gaps up to 1/6 acre. Enough light would reach the forest floor to allow establishment of native ground cover species, and brush understory with some conifer tree regeneration within three to five years. The small clumps and gaps created by spacing variation would also introduce variation in the density, distribution and species mix of ground cover plants and brush and conifer understory.

Where the low-density canopy gaps are created, the 12 leave trees per acre and understory vegetation would grow at a faster rate than adjacent thinned or unthinned areas. The crowns of the leave trees would quit receding from the forest floor as the lowest live limbs would tend to retain healthy foliage rather than slowly die.

Hardwood trees and conifer species having low local abundance to be retained in the stand would have less competition for site resources and should have higher survival and growth rates than would be expected if the stands were not thinned.

Skyline corridors would create linear openings in the canopy oriented up and down slopes (rather than across slopes). These openings would not change the character of the stand at ground level because the width of the corridor (12 ft.) is less than the average leave tree spacing (average 21-25 feet, ± 25 percent). The skyline cable and carriage would break limbs to create an opening in the canopy, which would allow additional light to reach the forest floor for understory growth. As limbs grow together in the canopy, this gap should close over the next 20 years.

Skid trails should not create linear canopy gaps since the 12 ft. width is also less than the average leave tree spacing and there are no cables in the canopy, but the compacted trail would be visible on the ground and take one to two decades longer to grow ground cover and understory than the 90 percent of the ground based yarding area in the Riparian Reserve that is not compacted by skid trails.

Observed Characteristics and Trends in the Long Term:

In the next 20 years, growth on the retained trees should continue at a steady rate, which would be greater than the growth rate if the area remained unthinned. The crowns would expand and fill the spaces created by the thinning and the site should be fully occupied so that growth is slowing down by the end of the second decade after thinning. The understory vegetation in the thinned area should be well established and vigorous by year five, but start to become less vigorous after about 15 years as the site resources become concentrated in the trees and less light reaches the forest floor.

In the low-density canopy gaps, the brush understory should continue to thrive in the open conditions. Conifer seedlings should begin to grow through the brush layer and start to grow more rapidly as the crowns spread above the brush understory. The crowns of the retained trees should continue to grow larger and deeper, with larger lower limbs, and begin developing other late-successional characteristics related to large size such as thick, rough bark and deep bark fissures. Eventually they would become old-growth trees.

Indirect Effects:

As site resources are concentrated on fewer trees, the growth rates of the retained trees increases and the trees are more vigorous and healthy compared to what they would be in a crowded stand. With faster growth rates, it is reasonable to assume that more trees would get larger faster. The faster growth rates after thinning would provide trees of suitable size for snags (15+ inches diameter) and CWD (20+ inches diameter) sooner than would be available without thinning. Thus, accelerated growth would help meet Terrestrial Recommendation 1 of the GCWA (p. 11-3) to "… develop and maintain later seral forest stand characteristics. Desirable stand characteristics include larger trees for a large green tree component and recruitment of large standing dead and down coarse woody debris in future stands…"

Retaining minor conifer species and hardwoods and the development of understory vegetation would also help meet Terrestrial Recommendation 1, which continues: "…multi-layered stands with well developed understories, and multiple species that include hardwoods and other minor species."

Since Riparian Reserve stands tend to be more on stream canyon slopes rather than on exposed upland ridges, they tend to be more sheltered from high winds than Matrix stands on exposed ridges. The BLM expects, based on experience with similar projects, even less windthrow in Riparian Reserves than in Matrix stands. Individual windthrown trees and small windthrown patches of trees contribute to structural complexity as natural openings with "debris pile" habitat that develops into a brush patch and eventually, again, conifers. Trees damaged by logging would either survive and perhaps develop decay pockets that could be used by cavity excavating/nesting wildlife species, or die and become snags or woody debris.

Dominant and codominant hemlock trees infected with dwarf mistletoe would continue to grow deformed limbs, misshapen boles and witch's broom (an abnormal growth of a clump of numerous small, often deformed limbs). New infection of healthy hemlock trees would begin to occur over time, as the disease spreads out from infected trees to uninfected dominant and codominant trees and to understory hemlock regeneration.

Long Term Management Objectives:

To continue accelerated development of late seral characteristics beyond two to three decades after thinning, a second treatment would be needed approximately 20 years after this proposed thinning. At that time, the expected abundance of trees larger than 20 inches diameter with healthy crowns and understory of ground cover species, brush and conifer seedlings/saplings would provide opportunities to enhance and accelerate the late seral characteristics that would be developing.

Variable Density and Horizontal Complexity:

Immediately after thinning the Gordon Creek project area would have a higher degree of complexity on a landscape level than it currently has due to the 25 percent spacing variation within thinned stands, treatments that vary between stands, the untreated areas within and adjacent to the thinned stands, and the low-density canopy gaps.

The untreated areas include stands of almost pure hardwoods and brush, mixed conifers and hardwoods, and high-density conifer stands. As each of these stands continue to mature and be influenced by natural forces over the next 20 years and beyond, the different niche habitats provided by each stand type should continue to develop increasing complexity and diversity. Future silvicultural treatments may be done in about 20 years to further develop this variation and complexity.

The following photos indicate the visual differences in stand characteristics that typically result from thinning prescriptions proposed in the Matrix LUA.

Photo : *Current dense stand proposed for treatment. Note lack of ground cover vegetation and understory. Photo point is NE1/4 section 1.* K. Walton 2007

Photo : *Anticipated result after treatment (photo is on private land in SE1/4 section 12), approximately five years after thinning. Note typical understory development and snag.* K. Walton 2006

Photo 3: *Dense canopy in stand proposed for thinning treatment. Note lack of vigorous understory. Photo point is NE1/4 Section 1.* K. Walton 2007

Photo 4: Canopy view approximately 5 years after thinning treatment (photo point is on private land in SE1/4 section 12), example of tree crown spacing and developing understory. K. Walton 2006

Differences in Effects between the Original and Current Proposed Action

The changes in the proposed action, including changes in effects, are described in *EA section 2.9*.

3.3.1.2 Alternatives 2 and 3

Effects to vegetation under Alternatives 2 and 3 would be similar to the Proposed Action since the basic stand treatment is identical under all three action alternatives. The following text shows the differences between Alternatives 2 and 3 and the proposed action.

Alternatives 2 and 3: Fewer roads would be constructed compared to the Proposed Action, resulting in proportionally less forest land being converted to road than in the Proposed Action. No skid trails or skyline corridors would be used in helicopter logging areas, so those linear openings would not be created through the vegetation.

Alternative 3: Many of the same locations that would have been used for roads under the Proposed Action would be used as skid trails rather than roads.

3.3.1.3 Cumulative Effects

No cumulative effects are 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. In addition, no cumulative effects are expected with regard to invasive non-native plants because the project would not contribute to the spread of invasive species populations or to the introduction of new species with the implementation of project design features.

3.3.1.4 No Action Alternative

Stand Structure and Development (all land use allocations)

The stands would continue to grow but at a reduced rate. Crowns would close and there would be more suppression mortality resulting in more snags and down wood, especially in the smaller (less than 15" DBH) size classes. Understory vegetation would be reduced in quantity and diversity because of the ever-reduced light reaching the forest floor. In the Matrix LUA, at rotation age there would be smaller trees of lower quality to harvest and total net yield would be reduced below the potential for the site.

Within the Riparian Reserve LUA especially, there would be slower development of the 20+ " DBH trees desirable for future snag and coarse woody debris recruitment and fewer of them would reach this size within the next 20 years.

The dense stands would not increase in vigor and may decline in vigor, making them more susceptible to disease, insects, windthrow and fire. This condition would not meet O&C Act, or RMP objectives and would not fulfill the Purpose and Need for this project. The live crown ratio (live crown height/total height of the tree, expressed as percent) would continue to decline as lower limbs die from shading. The unfavorable height-to-diameter ratios that develop in high-density stands would continue to develop, increasing the risk of extensive windthrow (GCWA p. 11-3). Hemlock dwarf mistletoe would continue to spread unimpeded to uninfected trees, and infected trees would experience greater reductions in growth and vitality.

Threatened/Endangered/Special Status/Special Attention/Former Survey & Manage Plant Species

With no human caused changes and excluding natural disturbances to the habitat that currently exists at the proposed project sites, no impact to any known or undiscovered Threatened, Endangered, Special Status, Special Attention, and former Survey and Manage botanical species would be expected to occur. However, as the habitat in the proposed project area naturally changes over time, species composition for the different botanical groups would both increase and decrease during different stages of succession as suitable environmental conditions and substrates become available.

Invasive / Non-native Plant Species (including Noxious Weeds)

Over time existing populations of invasive/non-native species would decline in number of plants and vigor as native vegetation (including trees) displaces the non-natives species. These species would likely maintain a small population along roads and in natural openings and population size may increase in areas where natural disturbances occur. Management activities on land not managed by the BLM and public access into the area (as described in section 3.3.7 of this EA) may result in introducing additional species, or increasing populations of species that are currently in the area.

3.3.2 Hydrology

Sources Incorporated by Reference: *2008 Hydrology/Channels/Water Quality: Specialist Report for the Gordon Creek Project, Hawe, (Hydro Report), WEPP (Water Erosion Prediction Project) Report for Gordon Creek*

Resource Specific Methodology

- Field reconnaissance by Hydrologist
- The Water Erosion Prediction Project (WEPP) soil erosion model was used to predict potential changes in erosion and sediment yield from actions proposed in this EA. Documentation of the WEPP model is available at the following web site: http://fsweb.moscow.rmrs.fs.fed.us/fswepp.
- The WEPP model is a physically-based soil erosion model developed by an interagency group of scientists from the U.S.D.A. Agricultural Research Service, Forest Service, and Natural Resources Conservation Service and the U.S.D.I. Bureau of Land Management, and Geological Survey.
- For WEPP calculations of erosion and sediment generation only skyline logging acres on slopes greater than 35 percent in the Riparian Reserve were calculated. Skyline logging areas outside of Riparian Reserves are at least 220 feet from any stream and, as is evident from calculations and discussion below, it is reasonable to assume that no sediment would reach streams from these areas.
- Since skidding is limited to slopes less than 35 percent and skid trail treatments (see design features), it is reasonable to assume that runoff water would not develop the velocities that would potentially erode soil and transport sediment through undisturbed vegetation to a stream.

Affected Environment

Project Area Setting

The project area is located east of Portland in the Western Cascades at elevations ranging from 1,500 – 2,500 feet[30]. Most of the project area lies 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 assumed to lie between 1,500 - 3,000 feet in elevation. The project area receives approximately 85-100 inches of rain annually and has an approximate mean 2-year precipitation event of 3.9 inches in a 24-hour period (estimated at: http://www.nws.noaa.gov/ohd/hdsc/noaaatlas2.htm).

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

The project area is located in six 7th field watersheds within the Gordon Creek sixth field watershed (11,159 acres). All proposed units ultimately drain to the same fourth field watershed: Lower Columbia-Sandy cataloging unit (#17080001). The City of Corbett utilizes portions of the North and South Forks of Gordon Creek as a source for drinking water. None of the project area streams are designated as Wild and Scenic. There are no key watersheds in the project area.

Channel and Wetland Morphology (ACS Objective 3)

Project Area Stream Channels

Most of the project area is situated on the ridgelines and adjacent slopes in the headwaters of the Gordon Creek watershed. Stream channels here formed in response to climate, surface lithology, slope, aspect and soils31. Gordon Creek has incised into the western slope of a volcanic cinder cone centered near the current Larch Mountain peak. The terrain is composed of pyroclastic rocks of basalt and andesite from the last 1-4 million years (Walker, 1991). Hillsides here alternate between flats and benches (20-40% grade, silty-clay loam soils) on the tops of lava flows to steeper side-slopes (40-60% grade, gravelly loam soil textures) between flows and along incised stream channels.

The main Gordon Creek channel passes through Sections 1 and 11 and was field reviewed by the area hydrologist in 2005/06.

Based on criteria provided in the BLM publication Riparian Area Management. A User Guide to Assessing Proper Functional Condition and the Supporting Science for Lotic Areas (U.S.D.I., 1998)[32] and comparing conditions here to similar channels in Western Cascades, the Gordon Creek channel reaches observed in the project area on BLM are currently in *proper functioning condition* (PFC) for the following reasons.

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. 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.).

Roads and Stream Channels in the Project Area

There are numerous places where existing roads cross streams in and near the project area. All of the culverts on BLM controlled roads on haul routes for the project are adequate to meet 100 year flood standards. In some other locations the culverts are either damaged or under-sized (are not large enough to handle calculated 100 year flood event flows) and may lead to road failure if they overflow.

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[31] For a more detailed description of stream channel formation and geomorphology the reader is referred to ***Geomorphology of Steepland Headwaters: The Transition From Hillslopes to Channels*** (Benda *et al*., 2005)

[32] See the Hydro Report, page 5, paragraph 1 for the definition of proper functioning condition.

At some culverts outflows have eroded or otherwise changed the nature of the stream, generally for less than 100 feet downstream of the culvert on the small streams in the project area. See page 5 of the hydrology report for more detail.

Throughout the Gordon Creek watershed stream crossings were at one time constructed from large logs placed across the channel. Many of these are quite old and date back to railroad logging in the area. Naturally, all of these structures have deteriorated under exposure to the elements. The channel morphology at these locations has adjusted and as the wood structures have deteriorated through the years, stream-flows have carved channels around and through the wood, additional organic material has accumulated and banks have been stabilized by vegetation. The large wood in the channel at these locations may be providing nutrients, shade and cover for aquatic species.

Project Area Wetlands

The BLM GIS Lakes theme, for smaller wetlands, ponds and lakes identifies two wetland\pond complexes in the project area are identified on National Wetlands Inventory maps. It also identified additional areas adjacent to local streams as wetlands. All of the identified wetlands are outside of the proposed treatment units.

Project Area Hydrology (ACS Objective 6)

There are no stream gages on Gordon Creek and none of the small headwater tributary channels in the project area have been gaged. The Sandy River is gaged several miles downstream of the project area near Troutdale, Oregon. Gordon Creek is similar to other Western Cascades streams where highest discharge takes place during winter storm events.

Base Flow

Summer base-flow (when mean stream discharge drops below 20% of the mean winter flow) normally begins in perennial channels sometime in July and continues from August-October. Many small headwater channels (intermittent or ephemeral) dry up completely during this period.

Peak Flow

Peak flow refers to the instantaneous maximum discharge associated with individual storm or snowmelt events (U.S.E.P.A., 1991). In the Western Cascades**,** peak flows are often associated with rapid and substantial depletion of the snow-pack during prolonged rain-on-snow (ROS) periods. The two largest peak flow events in the last century took place in 1964 and in February of 1996.

Both were estimated at or above a 100 year flood return interval and both were in response to substantial snow pack melt-off. Smaller peak flows are associated with snow pack melting during the spring. The State of Oregon has estimated peak flows for most watersheds in Western Oregon, including project area watersheds. These estimates may be viewed at the following web site http://map.wrd.state.or.us/apps/wr/wr_mapping/. Additional details about how peak flow was analyzed for the Gordon Creek project is found in the Hydro Report pp. 6-10

Potential For Peak Flow Augmentation Due To Forest Harvest: Current Condition

A preliminary analysis for the risk of increases in peak flow as a result of forest harvest was conducted using the Oregon Watershed Assessment Manual watershed analysis methods for forest hydrology (OWEB, 1997 located at http://www.oweb.state.or.us/publications/wa_manual99.shtml).

The proportion of the seventh field watersheds in the project area within ROS elevation varies from a high of 90% in Thompson Creek to a low of 0% in Lower Gordon Creek. According to the OWEB methodology, the risk of peak flow enhancement within each seventh field will vary with the proportion of this area that has been recently harvested (see Hydro Report). The proportion of ROS area with current crown closure ≤ 35% ranged from a high of 15% in Cat Creek to a low of 5% in the South Fork of Gordon Creek. This analysis indicates that, in all of the project seventh field watersheds, the risk is low that peak-flows have been increased as a result of openings in the forest canopy because the proportion of TSZ with crown closure ≤ 35 percent is too low to affect them.

Peak Flow/Water Quality Effects from Roads

Road surfaces have also been implicated as important contributors to increased peak flows in the Western Cascades. Based on the analysis described in the Hydro Report (p.9) the estimated increase in stream length in Gordon Creek range from a low of 8% in Middle Gordon to as high as 22% in Thompson Creek.

Based on this analysis of road proximity to streams, Thompson Creek (23%) and Upper Gordon Creek (20%) are at risk for augmentation of peak flows due to the road network in the watershed.

In addition these two watersheds, relative to the other seventh field watersheds, appear to have the higher risk for water quality degradation due to proximity of the road network to streams. The primary risk to water quality posed by roads in the project area is increased turbidity from fine sediments washed off forest roads or eroded from fills at stream intersections.

Project Area Ground Water

The Water Resources Department (OWRD), together with the Oregon Department of Environmental Quality (DEQ), is responsible for the regulation and protection of ground water quality and quantity. DEQ has reported that nitrate is the most commonly detected contaminate of ground water in the State of Oregon followed by pesticides, volatile organic compounds, and bacteria (see http://www.deq.state.or.us/wq/groundwa/wqgw.htm). The DEQ has not identified any groundwater pollution problems within project watersheds.

Water Quality and Beneficial Uses (ACS Objectives 4, 5)

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, Chapter 340, Division 41.

In addition, updated water quality standards have recently been approved by the USEPA. These standards may be reviewed at http://www.deq.state.or.us/wq/standards/Temperature/FinalRules340-041.pdf.

Designated Beneficial Uses

The State of Oregon designates the beneficial uses for which all waters of the state are utilized. Water quality standards are ultimately meant to protect these uses. The City of Corbett withdraws water from both the North and South Forks of Gordon Creek in Sections 1 and 12, respectively. Both resident and anadromous fish are downstream from several of the proposed units.

Sandy TMDL: Effective Shade and Stream Temperature

The ODEQ's 2002 303d List of Water Quality Limited Streams is a compilation of streams which do not meet the state's water quality standards (http://www.deq.state.or.us/wq/WQLData).

Gordon Creek is listed for not meeting summer stream temperature standards up to river mile 10.5 (approximate extent of anadromous fish). As a result, the Sandy River Basin Total Maximum Daily Load assessment (TMDL)[33] was issued by the ODEQ in 2005. The TMDL targets the recovery or maintenance of ***effective shade*** (as measured by a solar pathfinder or similar instrument) along all perennial streams in the Sandy basin.

According to the TMDL, effective shade is a surrogate measure for the heat load a stream receives when it is exposed to direct sunlight and thus, maintaining or recovering site potential levels of effective shade should result in reductions in stream temperatures to levels that achieve state standards. In the project area, the site potential for effective shade is estimated by use of effective shade curves and varies from 80-95% depending on stream channel orientation with a "near stream disturbance zone" of 25-50 feet (see Figure 3.44. in the TMDL: Effective Shade Curve – Western Hemlock Potential Vegetation Zone).
A 2006 solar pathfinder survey along the main channel of North Gordon Creek in section 1 by the area hydrologist determined average effective shade to be 92% (Hawe, 2006). This is at the upper end of the range of *potential* effective shade (80-95%) for this reach.

Based on field surveys such as this, together with review of aerial photographs and satellite data of forest cover, the area hydrologist concluded that effective shade is near to full potential along the perennial streams on public lands in the project area with effective shade in the range of 80-95% along stream reaches viewed in the field. It is precisely because of the high stand density, and hence high effective shade in this area, that some riparian forest stands are proposed for thinning.

These data support the conclusion that the existing riparian vegetation in the project area is adequate to maintain perennial streams in the temperature range required by the ODEQ under the Clean Water Act because the shade produced does not allow sufficient light to penetrate to the water surface and increase summer stream temperatures above standards.

[33] http://www.deq.state.or.us/wq/TMDLs/sandy.htm

Stream temperature data from upper Gordon Creek in 2001, as reported by the ODEQ for the Sandy River TMDL, supports this conclusion. Seven-day average stream temperatures at the upper site (NF Gordon in Section 1) were at no time over the standard of 18C. See the Hydro Report, pp. 12-13.

Sediment Supply, Transport and Turbidity

The ODEQ has completed a Source Water Assessment (SWA) for the Corbett municipal watershed (http://www.deq.state.or.us/wq/dwp/SWAReports/PWS00359_Corbett.pdf). The SWA identifies "potential contaminant sources" within "sensitive areas," defined as areas with high runoff potential, high soil erosion potential ***or any area*** within 1,000 feet of creeks that are upstream of the CWD water intakes on the South and North Forks of Gordon Creek. Portions of proposed units GDN01A, 01B and 01C are within the mapped sensitive area above the water intake on North Fork Gordon Creek in T.01S., R.05E., Section 1.

In addition, potential haul route roads pass within 1,000 feet of the South Fork Gordon Creek water intake in Section 12 on private land. The SWA identified a single potential impact from forestry activities: "cutting and yarding of trees may contribute to increased erosion, resulting in ***turbidity*** and chemical changes in drinking water supply."

According to Zachary Bertz, the Corbett Water District (CWD) has been monitoring intake water (at a point just before it enters the treatment plant) for turbidity[34] since 2005.

The CWD also installed a warning system which indicates when turbidity in receiving water exceeds 1 NTU (nephelolometric turbidity unit). The EPA allows turbidity in *treated* water to be up to 1 NTU. Meanwhile, NTU values below 5 are generally not visible to the unaided eye[35]. The only instance to date in which the water diversion was stopped for turbidity exceeding 1 NTU was during the November 7, 2006 storm event while withdrawing water from the South Fork Gordon Creek intake (located on private land in Section 12).

According to Zachary Bertz, turbidity data from the CWD is available for public review. The data was not reviewed for this report because NTU values over the previous three years have only resulted in one shutdown of intake water, indicating that turbidity remains below 1 NTU the majority of the time. In addition, during winter field reviews of project streams by the area hydrologist, water clarity was excellent and turbidity was visually estimated at below 5 NTUs (i.e., no cloudiness visible). Therefore, it is reasonable to conclude that stream clarity in both the North and South Fork of Gordon Creek is generally high, meets the State of Oregon's water quality standards and protects the designated beneficial uses.

The expected background erosion rate (existing condition and No Action Alternative) in Gordon Creek is estimated at 0.004 tons/acre/year (8 pounds, or about ½ gallon of dry soil) (calculated as a 30 year average).

[34] Email from Zachary Bertz of Field Services for CWD, dated 4/15/08
[35] http://www.watersystemscouncil.org/VAiWebDocs/WSCDocs/6808471TURBIDITY.PDF

Environmental Effects

3.3.2.1 Proposed Action

Channel and Wetland Morphology (ACS Objective 3)
See Hydro Report pp. 15-16

Direct and Indirect Effects - Channel and Wetland Morphology

In general, there would be no direct alteration of the physical features of the project area stream channels or wetlands under this proposal. Stream banks, channel beds and wetlands are protected from direct physical alteration or disturbance by harvesting equipment. With the exception of the proposed disturbance at three stream crossings (discussed below) direct disturbances by equipment or yarding are kept a minimum of 60 feet from all wetlands and perennial stream channels (25 feet from intermittent channels).

New road construction would not cross stream channels or wetlands, however, work at three stream crossings on roads that have not been maintained is proposed. The temporary stream crossing on private land proposed in the North Fork of Gordon Creek (north of Section 1 on private land) would compact the bed surface in the channel as the existing materials were excavated and removed and the temporary fill and culverts were placed. Compacted area would be limited to the width and length of the crossing (approximately 250 cubic yards (yd^3). After removal of the culverts and fill, channel width, bank angle, cross sectional area, and grade would be restored to pre-disturbance conditions so that there would be no net effect on the channels physical dimensions. The stream banks would remain in their current condition as the existing log supports on the bank are not proposed for removal.

The temporary stream crossing (SW ¼ section of section 1) would disturb the bed surface and banks of the channel as the existing materials (mostly large, deeply embedded logs and woody debris) were excavated and removed and the temporary fill and culverts were placed. The compacted area would be limited to the width and length of the crossing (approximately 150 yd^3). After removal of the temporary culverts and fill, channel width, bank angle, cross sectional area, and grade would be restored to match channel dimensions upstream and to provide for passage of water and sediment without causing the channel to either aggrade or degrade. Wood would be replaced in the channel.

After the proposed action removes the blocked and failing stream crossing structure in NE Section 1, channel width, bank angle, cross sectional area, and grade would be restored to match channel dimensions upstream. This change would provide improved stream flow and passage of sediment, organic materials and aquatic organisms and will eliminate the chronic erosion and turbidity at this site and result in unrestricted stream-flow and fish passage at this location. In all three cases, some slight channel adjustment to grade or width may occur within the first year (varies with the timing and magnitude of storm events) following disturbance as the channel reaches equilibrium with flow and sediment transport.

Based on previous experience with these type of channel crossings (i.e., judgment of the field hydrologist) long term effects to channel function or morphology from disturbance at these three stream crossings would be unlikely because the channels are resilient (i.e., they resist change) and would adjust to accommodate the new structures 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.

Project Area Hydrology (ACS Objective 6)

Hydro Report pp. 16-19

Direct and Indirect Effects – Watershed Hydrology Base Flow and Fog-Drip

It is unlikely the proposed action would have a detectable effect on fog drip or a detectable effect on the base flow in Gordon Creek for the following reasons. The proposed thinning retains approximately 50% canopy closure and affects no more than12% of the watershed. The BLM hydrologist conducted a literature search and could find no studies showing adverse effects of thinning, with the above characteristics, on fog drip or base flow. The conclusions of the studies found in the literature search apply to harvest where the forest cover is removed (clear cut). The following is a summary of those studies.

Outside of fog-drip zones, total removal of the forest cover usually results in an immediate increase in summer base flow (i.e., low-flow), presumably due to the reduction in evapo-transpiration and interception, followed by a slow recovery to pre-treatment flows after several years (Harr et al., 1979).

Similarly, small watershed studies in the Pacific Northwest have shown that forest harvest typically increases summer low flows[36]. However, based on research in the Bull Run watershed, in areas where fog drip is a major source of precipitation, *clear cut* harvesting resulted in a decline in low flow.

The Mount Hood National Forest completed an assessment of fog drip effects on low flows in the Upper Sandy Watershed Assessment of 1996 (page 4-162). They note that reductions in low flows in the Bull Run watershed study were attributed to reductions in fog drip in Fox Creek after 25% of the watershed was clear cut in the 1970s. However, recovery of fog drip and the expected increase in low flow due to reduced evapo-transpiration was later observed after a few years of vegetation re-growth.

Peak Flow

Approximately 1,240 acres of proposed treatment units lay in a zone subject to transient snow accumulations (TSZ) in the winter. It can be assumed that the reduction in stand density may result in some increase in snow accumulation on the ground in these areas because there would be less canopy interception and sublimation[37]. However, it's unclear how or if partial stand removal (i.e., thinning) affects peak flows because it has not been well researched (Moore et al., 2005).

[36] MacDonald, Lee H. 1991. Monitoring Guidelines to Evaluate Effects of Forestry Activities on Streams in the Pacific Northwest and Alaska. Page 95. EPA/910/9-91-001.

[37] Montesi et al, 2004. As much as 30% of the snow-pack may return to the atmosphere in the sublimation process alone.

If all 1,240 acres were thinned under this proposal, it would increase openings (areas <35% canopy closure) within the TSZ in Gordon Creek by sixteen acres as a result of new road surfaces. 455 acres out of 6,386 acres or 7% of the TSZ would be in an open condition.

In the most recent review specific to the Pacific Northwest, Grant et al. indicates that having as much as 12% of the TSZ in an open condition is below the level reported by any study for hydrologic change in this region (Grant et.al., 2008). Therefore, based on the previous discussion, it is unlikely that the proposed thinning would have any effect on peak flows in any of the watersheds in the project area.

Peak Flow Effects from Roads

Existing Roads - Since this proposal will not alter the existing road network, there is no mechanism of change from current conditions (i.e., current conditions would be maintained) except through new construction.

New Road Construction - All the proposed new road construction is on slopes generally under 30% and would not require full bench or cut and fill construction. Roads constructed on these surfaces result in little or no sub-surface disturbance. These roads would have no effect on sub-surface or groundwater flow and thus have no effect on the timing or volume of stream flow in the watershed (Wemple et al, 2003). Since no additional permanent stream crossings are proposed, there would be no additional routes for water intercepted by road surfaces to reach streams.

Intercepted rainfall on these roads would be drained to the adjacent undisturbed forest floor where, because of the high permeability of forest soils, it quickly infiltrates into the ground. Under these circumstances, road construction has a low risk of altering watershed hydrology or peak flows because intercepted water does not reach stream channels any faster than precipitation which falls on the forest floor.

Ground Water

The proposed project would have no potential effect on ground water quality because no BLM action would affect nitrate, pesticide, volatile organic compounds or bacteria levels analyzed by DEQ. The proposed project would not affect ground water quantity because it would not affect the total infiltration capability of the project area, nor would it displace infiltration in any area by more than a few feet (half the width of skid trails, roads or landings).

Water Quality (ACS Objectives 4 and 5)

Direct and Indirect Effects - Water Quality

Sandy TMDL: Effective Shade and Stream Temperature

In a 2006 survey along the main channel of Gordon Creek in Section 1 the Cascades Resource Area Hydrologist estimated existing average effective shade (solar pathfinder measurements) to be 92% (Hawe, 2006). This proposal would maintain effective shade in the SPZ (stream protection zone) at current levels and within the range required under the TMDL (http://www.deq.state.or.us/WQ/TMDLs/SandyBasin/Sandy/SandyTMDL.pdf).

To ensure that any harvesting adjacent to stream protection zones (SPZ) will not increase summer temperature maximums, the BLM has agreed to follow the ***Northwest Forest Plan Temperature TMDL Implementation Strategies*** (U.S. Forest Service and Bureau of Land Management. 2005): no shade producing vegetation within the "primary shade zone" (estimated to be no more than 60 feet from the active stream channel in all cases) of perennial streams would be cut or removed.

Where riparian thinning is proposed beyond the 60 foot SPZ, average canopy closure in the secondary shade zone (the area beyond the primary shade zone that contributes to effective shade) would be maintained above 50%. Retaining 50% of the secondary shade zone canopy closure was determined by the ***Northwest Forest Plan Temperature TMDL Implementation Strategies*** to provide adequate shade for the prevention of any increase in stream temperature because it does not allow enough light to strike the water surface to increase the heat load. A recent article (Wilkerson et al, 2005) provides additional evidence in support of this conclusion: Wilkerson found no temperature effect on streams with a reduction in basal area to 60% of current conditions in the ***primary shade zone***.

Therefore, this proposal is unlikely to result in any detectable change in stream temperature, would maintain stream temperatures in their current range and would protect beneficial uses because there is no harvest in the primary shade zone and 50% of the shade in the secondary shade zone would be retained.

Sediment Supply, Transport and Turbidity

Forest Management Practices

In most cases, management practices with the potential to accelerate erosion fall into three categories: road construction/maintenance and hauling, timber harvest or "yarding," and site preparation for reforestation (particularly prescribed burning). BMPs and mitigation measures are proposed to eliminate and/or limit acceleration of sediment delivery to streams in the project area beyond background levels.

Road construction and maintenance:

New roads would not be connected to the stream system and therefore no pathway would exist for delivery of any sediment to streams generated by their construction or use. All new road construction would occur on low to moderate slopes emanating from the existing road network, on stable surfaces (i.e., surfaces that are not contributing to landsliding or mass wasting) and therefore road related landslides in these locations are also unlikely.

All road construction would utilize the BMPs required by the Federal Clean Water Act (as amended by the Water Quality Act of 1987) to reduce non-point source pollution to the maximum extent practicable[38].

[38] See http://www.epa.gov/owow/nps/forestrymgmt/ for a review of applicable BMPs.

Since road construction would occur on stable surfaces well away (generally more than 220 feet, minimum of 150 feet) from streams and incorporate appropriate BMPs, the only opportunity for these roads to deliver sediment to the stream system would be at the proposed two temporary crossings and the crossing repair proposed in Section 1 (discussed below).

Maintenance and improvements of existing roads (i.e., added rock and blading of road surfaces), construction of the two temporary stream crossings and removal of the blocked and eroding culvert in Section 1 would occur during the driest period of the year, the "in-water work period," to avoid increasing turbidity of local streams during periods of higher flow.

Nevertheless, there may be increased turbidity (i.e., a visible reduction in water clarity) relative to background or upstream water clarity during this activity and/or it may also increase slightly in the first winter following the project if storm events wash some of the fines off disturbed surfaces and deliver them to the stream.

Based on research (see Foltz and Yanosek, 2005) conducted at culvert replacement projects in forested watersheds, turbidity levels at the three sites of disturbance in Section 1 would be unlikely to exceed the State of Oregon WQ standards (>10% increase relative to background levels) beyond the mixing zone downstream (about 100 meters) and would decrease as disturbed surfaces (and the channel bed) become "armored" (i.e., fines are removed). A turbidity plume downstream from the disturbance may be visible during the actual project (such as the installation and removal of the temporary crossings) and would likely decrease by an order of magnitude within two hours after disturbance ceases. In-stream disturbance at these sites would probably be completed during one work day at installation and another during removal and so any increase in turbidity would be unlikely to exceed eight hours.

Corbett Water District would be notified prior to project implementation on the two projects upstream of the intake in Section 1 (the temporary crossing in the southwest is downstream of the water intake). Stream flow at both sites is <1 ft^3/sec at base flow and would be captured upstream of and piped around the work site. BLM staff would monitor turbidity as required by the State of Oregon, both visually and with a portable turbidity meter, 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.

Any increased turbidity would be unlikely to be visible or detectable beyond 800 meters below the site of the disturbance (see Foltz and Yanosek, 2005), would not likely exceed the standards set by the State of Oregon.

The proposed temporary stream crossings (described on the previous page) are 1,300 meters upstream of the Corbett water intake. Since the distance between these actions and the intake are greater than 800 meters, it is highly unlikely increased turbidity would reach the intake or have any effect on the quality or quantity of water withdrawn for treatment. Therefore, water quality standards would be maintained and beneficial uses protected.

Hauling:

Timber hauling would be done primarily in the summer since most of the logging operations would be done with skidders. Some hauling would extend into the wetter periods of the year (October – February).

Based on BLM's previous field experience with winter haul on forest roads, the BMPs described in the Proposed Action, Connected Actions and Project Design Features of this EA[39] would effectively eliminate fine sediment delivery to streams during and after timber haul. Therefore, any increases in turbidity attributable to hauling would be unlikely to exceed the State of Oregon Water Quality standards (>10% increase relative to background levels) and would decrease as soon as hauling was discontinued and road surface drainage improved. Increased turbidity as a result of hauling is unlikely to be visible or detectable beyond ½ mile (800 meters) below the site of the disturbance (see Foltz and Yanosek, 2005), would not exceed the State of Oregon's Water Quality standards and would therefore protect beneficial uses.

Tree Harvest and Yarding:

It is unlikely that this proposal will increase bank erosion or channel cutting by altering channel roughness, redirecting flows or altering bank-stabilizing vegetation. Tree falling and yarding into or through streams is not proposed under this proposal and the SPZ around all streams will eliminate most disturbance of stream-side vegetation. The potential for increases in stream energy due to alterations of peak flows is low, as was discussed previously.

Areas with potential for slope instability and mass wasting were identified and verified by BLM personnel during work for the project proposal. All proposed treatment units are outside of any areas mapped as unstable or prone to mass wasting in the TPCC. Tree removal is not proposed on steep, unstable slopes where the potential for mass wasting adjacent to stream reaches is high as defined by the TPCC. Therefore, increases in sediment delivery to streams due to mass wasting induced by loss of root strength and increases in soil pore pressure are unlikely to result.

[39] Includes regular monitoring by BLM personnel (timber sale administrator and harvest inspectors) authorized to stop hauling if turbidity approaches limits set by the Oregon Department of Environmental Quality.

Surface Erosion Potential: WEPP (Water Erosion Prediction Project)

Hydro Report pp. 24-28

The "Disturbed WEPP" module was utilized to predict runoff, surface erosion and sediment yield due to timber harvest and ground-based yarding for the proposed action and alternatives, in one unit adjacent to the Gordon Creek main channel. Predicted erosion and sediment values are estimated to be accurate within plus or minus 50 percent of the true value (Elliot et. al., 1997). Sediment yields from road construction, reconstruction, use, or decommissioning and from mass wasting were discussed earlier in this document and were not evaluated by the model.

Recent research indicates that WEPP over-predicts sediment yields on a watershed basis in Western Oregon (Geren, 2006). This is likely a result of an over-prediction by the WEPP model (which was calibrated in drier landscapes with far less vegetative cover) of overland flow and sediment yield on the heavily vegetated slopes of the Western Cascades. Therefore, estimates of surface erosion and sediment delivery to streams reported below are higher than what is likely to occur and should be viewed as a tool for the comparison of alternatives.

A 100 acre unit in Section 1 adjacent to Gordon Creek and upstream of the Corbett water intake was analyzed for potential sediment delivery to the stream. This unit is considered to be a "representative" riparian logging unit: conditions here are assumed to be similar to conditions in other treatment units based on the judgment of the field hydrologist.

The cable yarding alternative increases the probability that sediment would be delivered in the first winter after treatment from 77% to 97%. It increases the annual average quantity of sediment delivery from the sample unit from 0.004 tons/acre (no action alternative) to 0.04 tons/acre (helicopter yarding) and to 0.09 tons/acre (proposed alternative). With a storm event large enough to saturate soils and cause overland flow, the quantity of sediment eroded and delivered down slope would likely increase (mean annual average would increase to 0.09 t/ac/yr. Only a small portion of this sediment would travel across 25 feet (minimum SPZ for intermittent streams) of undisturbed, rough textured, vegetated ground to reach a stream channel.

To put these annual sediment yields into a visual context: the quantity of sediment (from surface erosion alone) predicted to be delivered to the stream under the Proposed Action is approximately three and a half buckets of soil[40] for each acre[41] treated in skyline yarding areas with slopes generally greater than 35 percent that drain directly into a stream. Alternative 2, due to the reduced surface disturbance assumed in the model, would produce about half the sediment of the Proposed Action, or less than two buckets of sediment per treated acre.

[40] One cubic foot ($ft.^3$) of dry soil weighs approximately 75 pounds. 1 $ft.^3$ = 7.34 gallons = approximately $1^1/_2$ common 5 gallon plastic buckets. Since 0.09 tons =180 lbs, it is equal to 2.4 $ft.^3$, or 3½ buckets of soil.

[41] A football field is almost exactly one acre.

Total sediment production predicted by the WEPP model would be approximately 15½ tons[42] from 173 acres of skyline yarding in the Riparian Reserve. This would be distributed over two to six years depending on potential operating schedules.

For a number of reasons discussed below, the modeled surface erosion sediment yields from all the alternatives are not detectable relative to background sediment transport in the main channel of Gordon Creek. Based on a summary of sediment yield research on forested watersheds in the United States, (Patric et. al., 1984), total sediment yields from all sources (i.e., mass wasting, surface erosion, bank erosion, etc.) reported for 26 small forested watersheds (< 2mi2) in Northern California and Oregon range from 0.02-19.43 with a mean of 1.752 tons/acre/year (Table 3, page 102).

By comparison, surface erosion on croplands averages 44.5 tons/acre/year in the United States. Since surface erosion alone is such a small component of sediment in transport in these watersheds, the Proposed Action only delivers about 5% and Alternative 2 about 2.5% of mean background sediment yields in the watershed. Alternative 3 would be somewhere in the middle between the Proposed Action and Alternative 2. Given the inherent variability and error in sediment yield measurements[43], an increase of such small magnitude is not measurable using current field grade technology.

In addition, sediment transport in headwater streams takes place primarily during infrequent storm events (return periods of one year or more) so that an observer would be unlikely to see any sediment from the treated units entering the channel unless they were at the site during an unusual precipitation event (i.e., greater than an annual event). Even during larger storm events, overland flow with surface erosion and sediment delivery is infrequent in forested landscapes of Western Oregon.

Field reviews (Hawe, 2007) of units logged with a skyline yarding system on BLM land during a November 2007 rainstorm (>2 inches in three days) found no evidence of overland flow or sediment transport on cable yarding corridors where WEPP had predicted sediment transport under similar conditions.

Finally, the transport of sediment already in the stream system during large events (prolonged, heavy rain) would reduce the clarity of the background water (i.e., increase turbidity) so that sediment supplied by either alternative, because it is such a small quantity relative to background, would be unlikely to be detectable by a turbidity measurement from the sediment already in transport. Therefore, any incremental increase in turbidity that resulted from the proposal would be unlikely to exceed levels (1 NTU) that would cause additional treatment expense by causing shut down of the intake for the Corbett Water provider.

[42] 0.09 ton/ac. x 173 ac. = 15.57 tons. This is approximately one 15 cubic yard dump truck.

[43] Field measurements of sediment yield, especially in small mountain streams, are notoriously difficult and both temporal and spatial variability is high (Robert B. Thomas, 1985).

Therefore, although WEPP analysis predicts a small increase in surface erosion and sediment delivery to streams as a result of harvest and yarding disturbance, relative to background levels it would be undetectable.
Finally, based on several factors listed below, it is unlikely that this quantity of sediment would actually reach streams:

1. WEPP has been demonstrated to over-estimate actual sediment yields in research in the Pacific Northwest (see Geren above),
2. This was a "worst case scenario" analysis which looked at the conditions on the unit most likely to result in sediment delivery and applied them to the entire area,
3. The WEPP model *assumes no mitigation*. Several factors that WEPP cannot model mitigate the potential for sediment delivery:
4. even when compacted, large quantities of residual slash (i.e., brush, limbs and branches) on yarding corridors (both ground-based and cable) would contribute to reducing the accumulation of runoff by deflecting and redistributing overland flow laterally to areas where it will infiltrate into the soil,
5. gentle to moderate slopes in much of the project area provide little opportunity for surface water to flow,
6. the no-treatment zones in riparian areas have high surface roughness which functions to trap any overland flow and sediment before reaching streams,
7. the small size of trees being yarded would limit surface disturbance to minimal levels.

Differences In Effects Between The Original And Current Proposed Actions

- Winter haul – originally analyzed under Alts. 2 and 3. A longer period of log hauling would be allowed provided operational restrictions prevent sediment transport to streams during fall and winter hauling (see Project Design Features). Impacts to aquatic habitat and fish populations would be similar between the original and current proposed action, as under both actions log hauling would cease if sediment is transported to streams. There is no discernable difference in effects from winter haul between the analysis of Alternatives 2 and 3in the original EA and the three action alternatives in this EA.
- Option to rock some new/renovated/improved roads to extend operating season. The original EA analysis showed that no erosion or sedimentation would be expected on the roads to be constructed/renovated/improved. Since rock reduces erosion and sediment generation, there would be no change in effects. Since rocked roads would be closed, as would natural surface roads, there would be no change to open roads remaining at the close of the project. Vegetation would be slower to establish in the roadbed, but since these roads would be used for future logging, this would not constitute a change in effects from those analyzed in the original EA.
- Option for winter ground based logging, limited methods. BLM analysis of the project design features for such logging shows that the extent of compaction would be the same as analyzed in the original EA.
- Expanded "No Treatment Buffers" would not result in a change in effects from the original to the current Proposed Action. See *EA section 2.9* for additional discussion.
- Minor changes to total acres. Minor acreage differences do not change analysis or effects.

- Of the two culverts originally proposed for replacement in section 14, one has already been replaced by the BLM through the Secure Rural Schools and Community Self-Determination Act of 2000 in a separate action from the Gordon Creek Thinning project. Therefore, the effects have already taken place and are no longer part of this analysis. The second culvert would not be replaced under this proposal, so there would be no effects. See *EA section 2.9.*

3.3.2.2 Alternative 2

This alternative differs primarily in the quantity and location of road construction and yarding methods. Watershed hydrology is unlikely to be effected in a detectable way by either alternative. Therefore, all environmental effects would be the same as disclosed in the previous discussion with the exception to those discussed below as pertain to road construction/channel morphology and yarding methods/surface erosion.

Under this alternative, combined new openings created by roads and landings (ground based, skyline and helicopter) would be approximately 10 acres less than Proposed Action. In both alternatives openings are unlikely to contribute to changes in base or peak flows or sediment delivery because roads and landings would not be connected to the stream system (i.e., there would be no physical mechanism for surface flow or sediment to reach streams).

Alternative 2 would eliminate the immediate effects on stream channel morphology and water quality by eliminating the two temporary stream crossings proposed in Section 1. In the short term (one year) this would leave the channel in both locations in current functioning condition and would eliminate the short duration turbidity pulses associated with their disturbance. Beyond one year there would be no net difference in either turbidity or channel morphology at these locations relative to the Proposed Action because, under the Proposed Action, channel morphological adjustments and turbidity would essentially return to pre-disturbance state after one year.

Under Alternative 2, over 90 percent of skyline yarding in Riparian Reserve would be replaced by helicopter yarding, thereby reducing surface erosion with sediment delivery to streams on these units by half relative to skyline yarding under the proposed alternative, or 8 tons (see WEPP discussion above). However, neither proposal would likely increase turbidity to a level that would result in a reduction in water quality at the Corbett water intake or contribute in a detectable manner to cumulative sediment yields on the sixth field watershed scale.

While this alternative would theoretically reduce the risk of increases in turbidity in the municipal watershed, and would eliminate the turbidity pulses associated with the temporary stream crossings in Section1, there would not likely be a measurable benefit for drinking water quality or the costs of providing it.

3.3.2.3 Alternative 3

This alternative differs primarily in the quantity and location of road construction and yarding methods. Watershed hydrology is unlikely to be effected in a detectable way by either alternative.

Therefore, all environmental effects would be the same as disclosed in the previous discussion with the exception to those discussed below as pertain to road construction/channel morphology and yarding methods/surface erosion.

Under this alternative, combined new openings created by roads and landings (ground based, skyline and helicopter) would be approximately two (2) acres less than Proposed Action. In both alternatives openings are unlikely to contribute to changes in base or peak flows or sediment delivery because roads and landings would not be connected to the stream system (i.e., there would be no physical mechanism for surface flow or sediment to reach streams).

Alternative 3 would eliminate the immediate effects on stream channel morphology and water quality by eliminating the temporary stream crossings proposed in the south-west of Section 1. In the short term (one year) this would leave the channel in this location in current functioning condition and would eliminate the short duration turbidity pulses associated with its disturbance.

Beyond one year there would be no net difference in either turbidity or channel morphology at this location relative to Proposed Action because, under Proposed Action, channel morphological adjustments and turbidity would essentially return to pre-disturbance state after one year.

Under Alternative 3, approximately 60 percent of skyline yarding in Riparian Reserve would be replaced by helicopter yarding, thereby reducing surface erosion with sediment delivery to streams on these units to less than 4 tons from skyline yarding in the Riparian Reserve under the proposed action (see WEPP discussion above). However, neither proposal would likely increase turbidity to a level that would result in a reduction in water quality at the Corbett water intake or contribute in a detectable manner to cumulative sediment yields on the sixth field watershed scale. While this alternative would theoretically reduce the risk of increases in turbidity in the municipal watershed there would not likely be a measurable benefit for drinking water quality or the costs of providing it.

3.3.2.4 Cumulative Effects

Channel and Wetland Morphology (ACS Objective 3)

With the exception of disturbance at three stream crossings in Section 1, this proposal would not result in any direct effects to channel or wetland morphology and therefore would have no cumulative effect. At the two locations of direct channel disturbance, adjustments would be limited to the site of disturbance (i.e., not extend more than 100 feet downstream or upstream from the disturbance) and unlikely to result in any alterations to channels or floodplains downstream or elsewhere in the watershed.

This project would not contribute to cumulative effects since channels in the project area already have properly functioning dimensions and form (see discussion in Affected Environment). Channel adjustments at the site of disturbance, if they occur at all, would be of relatively low magnitude and short duration (channel adjustment within one year).

Watershed Hydrology (ACS Objective 6)

The proposal is not likely to result in a direct effect to peak or base flow, the proposal is therefore unlikely to contribute to any cumulative effects to peak or base flows in these watersheds. Current condition of the watersheds in the project area indicates low risk for augmentation of peak flows due to forest openings. This proposal would result in a net increase of sixteen acres in forest openings in ROS areas with crown closure <35% and would be unlikely to contribute cumulatively to the augmentation of peak flows even if they were occurring in these watersheds as a result of past forest harvest.

Proposed road use and construction is unlikely to alter surface or subsurface hydrology in a manner that would alter stream-flow patterns or timing or contribute cumulatively to any change from current conditions in the watershed.

Water Quality(ACS Objectives 4 and 5)

There are no cumulative effects to stream temperature because the project would have no effects on stream temperature (See effects section on stream temperatures)

Sediment/Turbidity

The incremental increase in sediment yield and turbidity that could be attributable to the preferred alternative is of such a small magnitude and duration that it is unlikely to be detectable at the seventh field watershed scale. Evidence for this statement is detailed below.

Based on a summary of sediment yield research on forested watersheds in the United States, (Patric et. al., 1984), total sediment yields from all sources (i.e., mass wasting, surface erosion, bank erosion, etc.) reported for 26 small forested watersheds (< $2mi^2$) in Northern California and Oregon range from 0.02-19.43 with a mean of 1.752 tons/acre/year (Patric, Table 3, page 102).

This mean is a result of all the disturbances in the studied watersheds, both natural and human caused, including forest harvest on private land, and is therefore an estimate of the cumulative sediment yield in the watersheds. The authors stated that the data, while limited, "can provide useful approximations of sediment yield from forested areas. Also, the generalized values can be used to check the reasonableness of estimates derived from erosion models" (Patric, page 101, paragraph 1). Therefore, it is assumed that sediment yields reported in the Patric article represent a meaningful average that provides a basis for cumulative effects analysis in the Gordon Creek watershed.
Applying the mean of 1.752 tons/acre/year to the Upper Gordon Creek seventh field watershed (2,400 acres) provides an estimate of the total sediment yield of 4,000 tons/year.

The estimated average increase of 0.09 tons/acre/yr directly attributable to the proposed action is an increase of 30 tons (327 treated acres) in the first year following logging upstream of the water intake in Section 1.

Accounting for the 50% estimated precision of the WEPP model, this represents between approximately 0.4-1.0% of mean annual yield (the background level of sediment) in this watershed. Given the inherent variability and error in sediment yield measurements[44], an increase of such small magnitude is not detectable with current technology.

The second alternative (i.e., helicopter yarding) would be approximately 0.2-0.5% of background (approximately 50% of the proposed alternative) but again, there is no current technology that would be capable of measuring such a small difference in sediment yields. Typically, sediment yields from forest harvest decrease over time as a negative exponential (Dissmeyer, 2000).

Therefore, the quantity of surface erosion with delivery of sediment during large storm events would likely drop back to current levels (0.004 t/ac/yr) within three to five years as the remaining forest stand fills out.

In a similar manner, the risk of short term (during the action and the first winter following) increases in stream turbidity as a result of road repair and hauling may contribute to increased turbidity levels directly below road/stream intersections. These would be maintained below the limits required by the Oregon State DEQ. Cumulatively the limited magnitude (not visible more than 800 meters downstream of the crossing) and duration (primarily in the first winter following road repairs) of this effect would be non-detectable on the scale of the seventh field watershed and would be unlikely to have any effect on any designated beneficial uses. Since the impact to the 7th field is undetectable, then if combined at the larger 5th field scale, there would be no scientifically credible way to say, causally, which portion of the sediment or turbidity came from this activity or a particular 7th field watershed.

Site Preparation: Pile burning would be unlikely to have any influence over water quality, stream channels or watershed hydrology because it would take place on level ground outside of riparian areas on surfaces that were previously compacted (i.e., roads and/or landings)**.** Conducting these activities on level ground outside of the riparian areas on surfaces that were previously compacted means that there is no delivery mechanism by which the pile burning could reach the stream channels.

3.3.2.5 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 timber harvesting and road building).

[44] Accurate estimates of sediment yield are difficult to measure and may vary by two or more orders of magnitude (Gregory L. Morris, Jiahua Fan, 1998).

3.3.3 Fisheries and Aquatic Habitat

Sources Incorporated by Reference: *Gordon Creek Fisheries Specialist Report (Fisheries Report) , Hydrology Report,* ***Additional Sources Referenced:*** *Logging Systems Report*

Resource Specific Methodology

- Resident fish distribution was determined from electro-fishing surveys of project area streams during May 2005 conducted by BLM Fisheries Biologists.
- Springs were surveyed for sensitive aquatic snail and amphibian species during June 2006 and June and July 2007.
- Snail specimens collected by BLM biologists were identified to species by Dr. Terrence Frest.
- Locations and conditions of existing culverts, proposed stream crossings, and log hauling roads were examined during September 2005 and October 2008.
- Anadromous fish species distribution was determined using Streamnet (2006) and ODFW (1993) fish distribution data and from field examinations of a barrier falls on Gordon Creek in Section 10 (T1S, R5E).

Affected Environment

Fish Presence in Project Area

Fish presence/absence survey reports may be found in the individual project files. Following are summaries of the findings of those surveys. Many streams adjacent to proposed thinning units support populations of resident cutthroat trout (*Oncorhynchus clarki clarki*; Behnke 1992). Anadromous fish species are found downstream of the project area. See *Table 7* for approximate distances downstream from proposed project units to potential resident cutthroat trout and anadromous salmonid habitats.

Section 1:

North Fork Gordon Creek supports cutthroat trout populations the length of the stream in section 1. Two tributaries to North Fork Gordon Creek in section 1 also support cutthroat trout populations.

One is an unnamed 4th order stream that enters from the northeast near the center of the section, and is fish-bearing upstream (in both forks where it forks near the section line) beyond the east boundary of the section. The other is an unnamed 2nd order stream that enters from the northeast near the southwest corner of the section. Cutthroat trout use of this stream ends approximately 0.5 mile upstream from the confluence with North Fork Gordon Creek.

Section 3:

Martin Creek which is a 1st order tributary to Gordon Creek in the SW ¼ of section 3 does not support fish populations.

Section 11:

The mainstem of Gordon Creek supports cutthroat trout populations the full length of the stream in Section 11. The North and South Forks of Gordon Creek join in the northwest corner of the section to form Gordon Creek.

Both forks support cutthroat trout populations; the South Fork at least as far upstream as the first road crossing to the east in Section 12; the North Fork throughout its course through Section 1. Two tributaries to Gordon Creek also support cutthroat trout populations: an unnamed 3rd order tributary stream that enters from the south in the northwest corner of the section, and Thompson Creek where it flows northwesterly through the southwest corner of the section.

Section 13:

Two 2nd order streams (tributaries to Thompson Creek) that arise west of Road 1-5E-28 and flow west out of the section support cutthroat trout populations. Both have the upstream end of fish use posted.

Section 15:

Cat Creek (a 2nd order stream), which crosses Road 1-5E-22 near the center of the section, supports cutthroat trout populations up to the confluence of two 1st order streams approximately 200 feet upstream of the road. The upstream end of fish use is posted.

Threatened / Endangered Species

Three fish species listed as 'threatened' under the Endangered Species Act of 1973 (ESA) are found in the Gordon Creek watershed. They are: Lower Columbia River (LCR) coho salmon (*O. kisutch*), LCR winter steelhead trout (*O. mykiss*) and LCR Chinook salmon (*O. tshawytscha*). These species are anadromous, fish that are born and reared in freshwater, move to the ocean to grow and mature, and return to freshwater to reproduce. See *Table 7* for estimated distances downstream from proposed project units to habitat that may be occupied by any or all of the ESA listed fish species. ESA fish distribution in the vicinity of the proposed units is shown on the Vicinity and Fish Distribution map (EA section 7.2.1). Consultation with the National Marine Fisheries Service on the effects of proposed projects is required for projects that "may affect" ESA listed species.

The watershed (Gordon Creek 6th field) containing the Gordon Creek project area has LCR coho salmon, LCR steelhead trout and LCR Chinook salmon present at varying distances downstream of the project area in Gordon Creek, Buck Creek, Cat Creek and the Sandy River. No threatened or endangered anadromous fish populations are present in streams within the proposed harvest units because of a barrier falls (4 m drop over bedrock of 80% slope) located 5.4 miles upstream of the mouth of Gordon Creek in the NW ¼ of Section 10, T1S, R5E, which is thought to be the upstream limit of anadromous fish distribution in Gordon Creek (ODFW 1993).

Of the three ESA listed fish species found in Gordon Creek, only steelhead are known to ascend the stream as far as the barrier, but coho salmon may also ascend Gordon Creek up to that point. Chinook salmon distribution is suspected to end several miles downstream of the falls near the mouth of Cat Creek. Oregon Department of Fish and Wildlife (ODFW) surveyed for coho salmon in a randomly-located sample reach near the North Fork Gordon Creek confluence during 2003-2008; no coho salmon have been found above the falls in Gordon Creek (T. Alsbury, ODFW, personal communication).

Table 7 shows the approximate distances downstream from proposed project units to resident cutthroat trout and potential ESA listed fish habitat[45]. Distances are in miles except where stated in feet (from the perimeter of tree harvest areas to stream banks).

Table : Distance to Fish Habitat

Unit Number	***Distance To Resident Cutthroat Trout / Affected Stream***	***Distance to Endangered Species Act (ESA) Listed Species (in miles) in Gordon Creek***		
		Steelhead	***Coho***	***Chinook***
GDN 1A,C	At least 60 feet on North Fork Gordon Creek and two unnamed tributaries	2.25	2.25	5.75
GDN 1B	At least 60 feet on North Fork Gordon Creek and an unnamed tributary	3.25	3.25	6.75
GDN 3A,B	1.0 mile in Gordon Creek	1.0	1.0	4.0
GDN 9A	No stream channels	NA	NA	NA
GDN 11 A,D	At least 60 feet on Gordon Creek, North Fork and South Fork Gordon Creek, and an unnamed tributary to Gordon Creek	0.75	0.75	4.25
GDN 11B	At least 60 feet on Gordon Creek, South Fork Gordon Creek and an unnamed tributary to Gordon Creek	1.0	1.0	4.5
GDN 11C	Dropped from proposed action			
GDN 11E	At least 60 feet on Thompson Creek	2.5	2.5	4.75
GDN 13A	approximately 400 feet on unnamed tributary to Thompson Creek	3.0	3.0	5.25
GDN 13B	200 feet on unnamed tributary to Thompson Creek	3.25	3.25	5.5
GDN 15A,B	At least 60 feet on Cat Creek	3.0	3.0	3.0

Special Status Species Presence in the Project Area

BLM Sensitive Species – Columbia Duskysnail

The Columbia duskysnail (*Colligyrus* n. sp. 1) is a Columbia Gorge endemic, found on both sides from east and south of Portland to Hood River, Oregon. Most sites are in Gorge tributaries; a few other sites occur in drainages originating from near Mount Hood, Oregon, to Mount St. Helens, Washington. In the Salem BLM District, it is likely to be found only in the Cascades Resource Area, and only in cold, pure, well-oxygenated springs in Clackamas and Multnomah Counties. The Columbia duskysnail is present in spring heads adjacent to Units 3A, 11B, 13B and 15A.

BLM Sensitive Species – Cope's Giant Salamander

Larvae of Cope's giant salamander (*Dicamptodon copei*) are found in streams or occasionally (in Washington) in ponds and lakes, from sea level to 4,400 feet. There are very few known sites in Oregon. On Salem BLM lands larvae have been found only in the upper reaches of the Gordon Creek watershed. The species was found in mainstem Gordon Creek adjacent to Unit 1A.

[45] Upstream limits of anadromous fish distribution are obtained from streamnet.org or ODFW (1993) inventories. Stream distances were measured using ArcGIS software.

Bureau Strategic Species – Pristine Springsnail

The pristine springsnail (*Pristinicola hemphilli*) is found in springheads adjacent to Units 3A, 11B, 13B and 15A. Springsnail species are thought to occur only in cold, pure, well-oxygenated springs and spring-fed streams. Another species of springsnail (*Promenetus umbillicatellus*; common name unknown) is found in one springhead adjacent to Unit 3A.

Former Bureau Assessment Species – Cascade Torrent Salamander

Species in the genus *Rhyacotriton* are nearly always found in cold, clear streams, seepages, or waterfalls from sea level up to about 4,000 feet in elevation.

They are frequently found in intermittent streams and seeps, usually under woody debris, under rocks, or buried in very loose uncompacted gravel. The Cascade torrent salamander (*Rhyacotriton cascadae*) has been found throughout the Cascades Resource Area, and is found in spring heads adjacent to Units 11B and 13B. The Cascade torrent salamander was dropped from BLM's list of special status species in January 2008.

Stream Habitat Conditions

Streams are well shaded by closed canopies provided by coniferous and deciduous trees (see Hydrology Report, p. 13). Third order and larger streams within the project area (Gordon Creek, North Fork Gordon Creek, South Fork Gordon Creek and Thompson Creek) are mostly low gradient (1-4%), confined boulder-cobble channels with stable streambeds and well vegetated banks (>90% of banks vegetated with riparian and streamside vegetation; SRBWC 1999). Instream LWD (large woody debris) levels in Gordon Creek are low (<10 pieces/100 m; Raymond et al. 2006).

Most of the LWD is very old and was probably recruited to the stream channels prior to the logging of the old growth trees in the 1930s and 1940s. Aquatic habitats are simplified and provide little fish cover due to the lack of LWD (SRBWC 1999).
In particular, pool frequency and depth, and LWD density were evaluated as in poor condition relative to stream potential (Raymond et al. 2006). The short-term recruitment potential for future LWD is limited due to the stand age (~60 years) and size (avg. dbh[46] ≤21") of the riparian trees.

Small streams (1st and 2nd order tributaries) within the project area are generally low gradient (0.5-3%), with unconfined channels. Dominant substrates are cobble, gravel, sand and silt. Instream LWD is composed of both very old pieces of large wood that were probably recruited to the stream channels prior to the logging of the old growth trees in the 1930s and 1940s, and of small diameter (avg. dbh ≤21 in.) wood from young trees (~60 years old) currently growing in riparian areas. LWD recruitment potential is adequate because the smaller trees present are capable of fulfilling the functions of LWD in small streams. LWD pieces ≥ 12 inches in diameter were common (44 pieces/100m) on a tributary to North Fork Gordon Creek in the southwest ¼ of Section 1.

[46] Dbh – Diameter breast height, the diameter of a tree 4.5 feet above the ground on the uphill side.

Section 1:

A culvert that is a barrier to fish passage is located in the northeast ¼ of Section 1 on the southern of two forks of the fish-bearing tributary to N.F. Gordon Creek just west of the section boundary along the railroad grade. The culvert is perched, preventing upstream fish passage. Blockage of upstream fish passage results in isolation of the population upstream of the barrier. The barrier would prevent recolonization of the upstream habitat in the case of a natural or human caused event that results in a severe reduction or extirpation of the upstream population. The fill over the culvert is eroding, apparently due to blockage at the culvert inlet. Blockage of the culvert inlet, and the resultant erosion of the fill has the potential to cause culvert failure, which could result in severe adverse effects to downstream aquatic species and habitat from delivery of large amounts of sediment.

An undersized culvert (does not meet 100 year flood criteria) for the Gordon Creek Road is located on a perennial tributary to Gordon Creek in the southwest corner of Section 1. The culvert does not likely impede fish passage because the steep gradient of the stream channel itself between the culvert and Gordon Creek, appears to impede fish passage and isolate the resident cutthroat trout population upstream of the road. This culvert is outside of the project area on a road not planned for use as a haul route. A log fill stream crossing (*circa* 1930) is located in the SW ¼ of Section 1 in the unnamed perennial tributary to N. F. Gordon Creek near the SW section corner.

Section 11:

Second order streams on BLM land in Section 11 have the potential to receive sediment from the road system on private land in Section 12. An inadequate amount of rock is on the roads in Section 12 to prevent the road surface from becoming muddy (fines worked to the surface by tire action) when used as a haul route by logging trucks during rainy periods. Approaches to stream crossings are confined in through-cuts with no ditches and few opportunities to divert flows onto stable, vegetated slopes. Rain water carrying sediment off the road surface would enter first and second order streams in Section 12, with sediment potentially being carried downstream to BLM stream segments in section 11.

Section 12:

The private road in section 12 which would be used as a haul route for portions of sections 1 and 11 has an inadequate amount of rock to prevent pumping mud to the road surface (fines worked to the surface by tire action) if used for log haul during rainy periods. Approaches to stream crossings are confined in though-cuts with no ditches and few opportunities to divert water flows from the road surface onto stable, vegetated slopes so that sediment-laden water could infiltrate into the soil before reaching stream channels.

Section 13 (West side):

In Section 13, west of Road 1-5E-28 and north of Road 1-5E-13.2, two streams (headwater tributaries to Thompson Creek) originate at springs near Road 1-5E-28 and flow westward for approximately 0.5 mile before exiting Section 13. Both streams are fish-bearing for some portion of their course within Section 13. At the spring origin and for an unknown distance downstream the southernmost stream is known to provide habitat for the Columbia duskysnail, pristine springsnail and the Cascade torrent salamander, and the other stream is suspected to also provide this habitat.

Both streams flow in unconfined channels over cobble, gravel, sand and silty substrates. The age, size and density of the trees in the RR of both streams are similar to those of the surrounding areas, as is the understory vegetation, although near the streams understory vegetation is composed of species more typical of streamside and wet areas.

Both streams are well shaded and contain abundant LWD. Most of the instream LWD is very old, probably recruited to the stream channels prior to the logging of old growth trees in the area in the 1930s and 1940s. Some smaller woody debris is present as a result of more recent mortality of trees from the current stands. Due to the small size of the streams, conifers of the sizes found in the current stands (avg. dbh $\leq$21**"**) are capable of fulfilling the functions of instream LWD. The spring-fed origins of both streams is presumed to be what makes them capable of supporting populations of Columbia duskysnail, pristine springsnail and Cascade torrent salamander, all of which are species dependent on a perennial supply of cold, clear water.

Section 14:

In 2006, two culverts located along Road 1-5E-28 on Thompson Creek and a perennial 3rd order tributary to Thompson Creek, both of which originate in Section 13 were assessed for replacement. During 2007-2008, the county replaced the culvert on Thompson Creek. Previously, both culverts were barriers to upstream migration for resident fish and potentially for aquatic amphibians. The culvert on the Thompson Creek tributary was originally reported to be under-sized to accommodate water and sediment associated with a 100 year flow event. Engineering assessment of the stream network upstream of this culvert determined that the culvert is of adequate size for 100 year flood events (personal communication with BLM Engineering staff). Because of the small amount of resident cutthroat trout habitat (about 0.5 mile of stream) upstream of the culvert, the culvert has a low priority for replacement relative to other existing fish barrier culverts in the Cascades Resource Area.

Section 15:

In Section 15 where Road 1-5E-22 crosses Cat Creek the crossing is in a depression where water puddles and mud accumulates, creating a high risk source of sediment input to the stream if the road is used as a haul route by logging trucks during rainy periods.

Environmental Effects

3.3.3.1 Proposed Action

Fish and Aquatic Habitat

Proposed tree thinning in and adjacent to riparian reserves (RR) on perennial streams would not impact fish habitat or aquatic species and habitat in springheads due to SPZs (Stream Protection Zones; minimum no-harvest buffers) of 60 ft on perennial streams, and 200-220 ft on springheads (Olson and Rugger 2007). Thinning in riparian reserves would be conducted as to not reduce stream shade per Aquatic Conservation Strategy (ACS) Objective 8: Maintain …adequate summer and winter thermal regulation… (USBLM 1995, p. 6), and thus stream and springhead temperatures would not increase (Johnson 2004).

SPZs would intercept and infiltrate water carrying sediment preventing its delivery to streams and springs (CH2MHILL et al. 1999, and Hydrology Report).

Reducing the density of trees within the RR is expected to have a long-term beneficial effect on aquatic habitat as a result of accelerating growth of the trees left in the stands. Accelerated growth of trees within the RR is expected to improve LWD recruitment potential to aquatic habitats. Aquatic habitat would improve over the long term (20 years) with increased LWD recruitment because LWD stabilizes stream channels, and increases pool frequency, complexity and depth, and provides high quality cover for fish (Hicks et al. 1991).

Removal of the fish barrier culvert in the northeast ¼ of Section 1 would allow for unobstructed upstream movement of cutthroat trout, and aquatic amphibians such as the Pacific giant salamander, and would reconnect an isolated cutthroat trout population inhabiting ≥0.3 mile of tributary stream with other populations in the Gordon Creek basin. Removal of the culvert would benefit cutthroat trout in the long-term as populations that are not isolated by barriers have greater genetic diversity, greater life history diversity, and greater population persistence (Fausch et al. 2006, Wofford et al. 2005). Sediment transport and turbidity would increase short term during the culvert removal. The increased turbidity is unlikely to be visible or measurable beyond 0.5 mile downstream (Foltz and Yanosek 2005).

Cutthroat trout would likely either be displaced from a portion of the 0.5 mile long reach with elevated turbidity (and have to compete with greater numbers of fish for food) or their feeding would be disrupted (unable to see prey items) by short term increases in turbidity (Bjornn and Reiser 1991). No long-term adverse effects of the culvert removal on aquatic species or habitat are expected.

Cutthroat trout would be impacted by a short-term input of sediment and elevated turbidity from temporary culvert installations in North Fork Gordon Creek on Longview Fibre land just north of Section 1, and on a tributary to North Fork Gordon Creek in the southwest ¼ of Section 1, and again during the removal of these culverts. Sediment delivery would be minimized by using rock fill over erosion fabric laid over the streambeds. Turbidity levels would be unlikely to exceed State of Oregon standards beyond 0.5 mi below the crossing (Foltz and Yanosek 2005).

Cutthroat trout would likely either be displaced from the reach with elevated turbidity (and have to compete with greater numbers of fish for food) or their feeding would be disrupted (unable to see prey items) for several hours by short-term increases in turbidity (Bjornn and Reiser 1991). No long-term adverse effects of the culvert placement and removal on fish and aquatic species or habitats are expected.

The stream culvert in Section 14 along Road 1-5E-28 on a Thompson Creek tributary would not be replaced, and the culvert would still be a barrier to upstream fish passage for cutthroat trout and possibly aquatic amphibians, if present. Over the long-term, loss in stream connections among cutthroat trout populations results in loss of genetic and life history diversity, and lower population persistence (Fausch et al. 2006, Wofford, et al. 2005).

Up to 6.5 miles of new road proposed for construction would have minimal negative impacts to aquatic habitat (little to no increase in sediment delivery) as all new roads would be constructed on stable ground near or above slope breaks to riparian reserves and stream channels, and would be constructed as to not increase the size of the stream network (Wemple et al. 1996, and Hydrology Report).

Most haul route roads are paved or well-rocked or graveled such that no sediment would move off these roads, and thus fish populations and aquatic habitat would not be impacted by timber hauling on these roads. Roads with inadequate or no rock on their surfaces could potentially deliver sediment to streams, particularly during rainy periods. Increased turbidity resulting from sediment delivery from roads negatively impacts fish by displacing fish from stream reaches with elevated turbidity, and decreasing feeding ability (unable to see prey items; Bjornn and Reiser 1991). To minimize short-term impacts to fish populations, natural surface roads (lacking surface rock) in the project area would only be used for hauling during the dry season.

Sediment input to fish habitat from use of rocked roads would be minimized by restricting hauling on some routes to periods of dry road conditions, or monitoring for sediment movement. Several haul routes associated with thinning may be used for hauling of logs during the rainy season. Log hauling on Road 1-5E-22 during the rainy season poses a high risk of movement of sediment from the road surface to Cat Creek at the stream crossing in Section 15.

Sediment delivery exceeding ODEQ standards from wet season and wet condition hauling across the stream crossing in Section 15 would be prevented by implementing Project Design Features, and impacts to fish would be minimized by the use of site specific monitoring to suspend hauling whenever conditions would potentially introduce sediment into streams that would exceed State of Oregon turbidity standards.

Because the new and renovated roads that may be used for log hauling during the rainy season are located on stable ground at distances of >150 feet from streams, and are designed to not increase the size of the stream network (Wemple et al. 1996), runoff from the roads would infiltrate into the soil before reaching stream channels. Thus, no sediment would reach streams and there would be no impact to fish populations or aquatic habitats from wet season hauling on these roads.

Special Status Species – Aquatic

The proposed action would not result in adverse effects to 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.

Threatened/Endangered Species

Short-term sediment inputs into several Gordon Creek tributary streams associated with culvert (temporary) placement and removal, and timber hauling may temporarily displace juvenile coho salmon and steelhead trout, or impair their feeding (unable to detect prey items because of turbidity, Bjornn and Reiser 1991). Short-term sediment delivery and turbidity effects would be localized to haul road crossings of streams, and location of culvert repairs and temporary stream crossings, and would likely extend <0.5 mile (800 meters) downstream (Foltz and Yanosek 2005).

The nearest steelhead trout and coho salmon habitat is 0.75 to 1.0 mile downstream of the project area (*Table 7*), thus these species may but are unlikely to be affected by the project. The upstream limit of LCR Chinook salmon is at least three miles downstream of project areas (Streamnet 2006). Thus, LCR Chinook salmon would not be affected because sediment and turbidity effects would not extend that far downstream of the project area.

Bureau Sensitive and Strategic Aquatic Mollusks - Columbia duskysnail and Pristine springsnail

No adverse effects to the Columbia duskysnail and pristine springsnail are expected to result from thinning. No harvest buffers of 200-220' (one site potential tree height) radius around the springheads adjacent to Units 3A, 11B, 13B and 15A, would prevent sediment delivery to springs. Any water moving sediment from thinned areas would be intercepted by the no harvest buffers and would infiltrate into the soil before reaching springs (Olson and Rugger 2007, CH2MHILL et al. 1999, and Hydrology Report). Additionally, shade levels would not decrease in the no harvest buffers, and consequently water temperatures would not increase in the springs and streams formed by spring outflows (Johnson 2004).

Bureau Sensitive Species – Cope's Giant Salamander and former Bureau Assessment Species – Cascade Torrent Salamander

Olson and Rugger (2007) found no adverse impacts to torrent salamanders or stream habitats from tree thinning projects at 11 sites in western Oregon where thinning was conducted adjacent to headwater Riparian Reserves inhabited by the salamanders. In this project, no harvest buffer of 200 to 220' (one site potential tree height) radius around springheads and SPZs with a minimum width of 60 feet in the streams downstream would prevent sediment delivery to springs and streams inhabited by Cascade torrent and Cope's giant salamanders. Any water moving sediment from thinned areas would be intercepted by the no harvest buffers and would infiltrate into the soil before reaching springs and stream channels (Olson and Rugger 2007, CH2MHILL et al. 1999, and Hydrology Report).

Additionally, shade levels would not decrease in the no harvest buffers and riparian reserves, and consequently water temperatures would not increase in the springs and streams formed by spring outflows (Johnson 2004). Thus, aquatic habitat and the Cascades torrent salamander and Cope's giant salamander would not be impacted by the proposed tree thinning.

Differences In Effects Between The Original And Current Proposed Actions

The stream culvert in Section 14 along Road 1-5E-28 on a Thompson Creek tributary would not be replaced, and the culvert would still be a barrier to upstream fish passage for cutthroat trout and possibly aquatic amphibians. Potential impacts of leaving the current culvert in place are described above under *EA Section 3.3.3.1*.

Within the expanded (100 feet wide vs. 60 feet wide) SPZ's in sections 1 and 11, growth rates of conifer trees would be similar to that of the No Action alternative.
Thus, trees that fall and contribute LWD to streams from these expanded buffers would not gain the additional size expected if the trees had been thinned to accelerate their growth.

A longer period of log hauling would be allowed provided operational restrictions prevent sediment transport to streams during fall and winter hauling (see Project Design Features). Impacts to aquatic habitat and fish populations would be similar between the original and current proposed action, as under both actions log hauling would cease if sediment is transported to streams.

3.3.3.2 Alternatives 2 and 3

Impacts to aquatic habitats and fish and aquatic species populations would be the same as in Proposed Action. The differences between the Proposed Action and Alternatives 2 and 3 are primarily logging some acres with helicopters instead of conventional skyline and ground based logging methods, eliminating two temporary culverts in section 1, and constructing/improving/renovating fewer miles of road as described in EA Chapter 2. Otherwise all alternatives are identical.

With any of the three logging methods (ground based, skyline and helicopter), SPZs would intercept and infiltrate water carrying sediment from areas of ground disturbance preventing its delivery to streams and springs (CH2MHILL et al. 1999, and Hydrology Report). Thus, aquatic habitats and fish and aquatic species would not be impacted.

Effects would be the same as under the Proposed Action except for the following. See Fisheries Report pp. 14-16 for additional details.

Helicopter logging would be expected to result in approximately half of the sediment production per acre than was modeled for the Proposed Action, so total potential sediment production would be lower than for the Proposed Action, roughly proportional to the number of acres helicopter logged in Riparian Reserves. See EA section *3.3.2*.

Because no impacts to aquatic habitat or fish populations would be expected under the Proposed Action, no impacts would be expected from either Alternative 2 or Alternative 3. In these alternatives, temporary culverts would not be installed in North Fork Gordon Creek on Longview Fibre land just north of Section 1, and on a tributary to North Fork Gordon Creek in the southwest ¼ of Section 1. Thus, short-term impacts to cutthroat trout associated with the elevated turbidity from the culvert installation and removal would be avoided.

Less road construction, and improvement and renovation of roads, would occur under these alternatives compared to the Proposed Action because more areas would be thinned by helicopter logging. Similar, to the Proposed Action, no sediment is expected to be delivered to streams from roads (see Hydrology Report). Hence aquatic habitats and fish populations also would not be impacted by road construction under Alternative 2 or Alternative 3.

While BLM logging plans would provide for helicopter landings on broad ridge tops with short haul distances to paved roads, it is reasonably foreseeable that an operator would negotiate with adjacent private landowners and use private roads in section 12 for winter haul that would be likely to produce more sediment than roads built to BLM standards.

This is foreseeable because most helicopter logging in the Pacific northwest is done in the winter months when there is less competition for helicopters than there is during the summer wildfire season. Also, the cool, humid air in the winter months provides better lift, resulting in larger payloads and reduced fuel consumption which provides greater economic efficiency. Helicopter log landings on private land, especially in section 12, would shorten flight distances, thus using less fuel and being more economically efficient for the operator.

Hauling of logs on roads in Section 12 would result in sediment being transported by rain water off the road surface and into first and second order streams, with sediment potentially being carried 0.3 mile downstream to BLM stream segments in Section 11. Turbidity levels would be highest immediately downstream of stream crossings, but would likely meet State of Oregon standards by 0.5 mi below the crossings (Foltz and Yanosek 2005).

Cutthroat trout would likely either be displaced from reaches with elevated turbidity (and have to compete with greater numbers of fish for food) or their feeding would be disrupted (unable to see prey items, Bjornn and Reiser 1991) during increased levels of turbidity resulting from log hauling. Salmonids are unlikely to suffer gill abrasion from stream turbidities (suspended sediment concentrations) associated with timber harvest activities (Hicks et al. 1991).

3.3.3.3 Cumulative Effects

The Proposed Action is expected to have no cumulative effects on fish and aquatic species populations and their habitats. Because there is no tree harvest in the primary shade zone and at least 50 percent crown closure in the secondary shade zone would be retained to provide shade, stream temperatures would be maintained in their current range and beneficial uses would be protected (see Hydrology section). With no direct effects to stream temperature, there would be no cumulative effects to stream temperature.

With the exception of disturbance at three stream crossings in Section 1, the proposed action would not result in any direct effects to channel morphology and therefore would have no cumulative effect because channels in the project area already have properly functioning dimensions and form (see discussion in Affected Environment - Hydrology). At the three locations of direct channel disturbance, adjustments would be limited to the site of disturbance (i.e., not extend more than 100 feet downstream or upstream from the disturbance) and unlikely to result in any alterations to channels or floodplains downstream or elsewhere in the watershed (Gordon Creek Hydrology Report, pp. 15-16).

With no cumulative impacts to channel morphology, in-stream fish habitat (i.e. pool habitat, in-stream cover, stream depth, etc.) also would not have cumulative impacts.

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 downstream of the two temporary stream crossings and the eroding culvert that would be removed in Section 1.

Short-term increases in sediment and turbidity associated with fill and culvert removals are expected to have less impact on fish populations than if the culverts and road fills are not removed (under the No Action Alternative) and eventually fail resulting in much higher levels of fine sediment delivery to downstream cutthroat trout habitat.

Cumulative effects of the proposed action and other expected timber harvest activities on adjacent State and private lands on peak flows, and sediment supply and turbidity were analyzed in the Hydrology Report (See Gordon Creek Hydrology Specialist Report, pp. 16-19, 28-29). No direct or cumulative impacts to peak flows are expected (Hydrology Report, p. 19). The incremental increase in sediment yield and turbidity attributed to the proposed action (including the direct impacts discussed above) is of such small magnitude and duration that it is unlikely to be detectable at the seventh field watershed scale (Hydrology Specialist Report, p. 29).

Cumulatively the limited magnitude and duration of sediment effects would be unlikely to have any effect on designated beneficial uses (Hydrology Specialist Report, p. 29), including spawning and rearing success of fish populations.

Similar to that of the Proposed Action, no cumulative effects from either Alternatives 2 or 3 are expected to the following habitat components: stream shading, stream sediment levels, peak stream flows, and channel morphology (in-stream habitat conditions; see cumulative effects section under the Proposed Action). Thus, these alternatives would not contribute to cumulative impacts to aquatic habitats or fish populations.

3.3.3.4 No Action Alternative

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 from snow or ice break, wind storms, and wildfire. Stream temperatures would follow changes in stream shading (Johnson 2004).

Dense stands of riparian trees would self-thin over time, contributing LWD to stream channels, and windthrow from storms would also contribute LWD to streams. Natural sediment inputs to streams would vary as sediment contributing events (flooding) occur within the RR.

Populations of aquatic species would be expected undergo natural increases and declines related to sediment delivery events and changes in stream shade. Salmonid populations would decline during periods when riparian canopy is lost (due to fire, windthrow, etc.) and stream temperatures are elevated. Higher stream temperatures increase metabolic costs of trout (Li et al. 2004), resulting in lower survival and recruitment.

Additionally, during periods of accelerated sediment delivery recruitment success would be lower because of fine sediment reducing intragravel oxygen levels resulting in higher embryo mortality (Bjornn and Reiser 1991).

No short term increases in stream sedimentation and turbidity would occur as a result of culvert replacements or installation of a temporary stream crossings. However, the culvert in the NE ¼ of Section 1 would continue to block upstream passage of cutthroat trout, and potentially amphibians. Isolated cutthroat trout populations, such as the one above the culvert barrier in Section 1, have lower probability of persisting through time due to genetic drift, and loss of life history diversity (Fausch et al. 2006).

Failure of any culvert would introduce a large amount of sediment into the stream, and cause extensive lateral scour and deposition, and additional erosion downstream of the culvert (Furniss et al. 1991). High sediment levels would decrease fish numbers due to lower reproductive success and feeding efficiency, and less living space for fish (Bjornn and Reiser 1991, Hicks et al. 1991).

3.3.4 Soils

Source Incorporated by Reference: *2008 Soils Environmental Assessment for the Proposed Gordon Creek Project (Soils Report)*

Additional Resource Specific Assumptions

- All lands on BLM are classified as either, *Suitable* for timber production, *Suitable but fragile* for a variety of reasons (e.g., nutrient status, compacted surfaces, slope gradient, etc.) or *Non-suitable*. BLM practice is to locate proposed timber harvest unit boundaries to avoid areas that are *Non-suitable*.
- If less than ten percent of the ground surface is compacted (≥10 percent increase in density) by logging operations (e.g. ground based equipment, landings, and skyline yarding), then impacts and potential reductions in growth and yield are within the standards analyzed in the FEIS/RMP.
- See the Hydrology section of this EA for discussion of assumption for WEPP modeling of soil erosion.

Resource Specific Methodology

- 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[47].
- From the TPCC preface: "The purpose of the TPCC is to interpret soil and land characteristics to assist in timber management planning and in the application of practices which will maintain or enhance production over a long period of time".
- The WEPP (Water Erosion Prediction Project) soil erosion model was used to predict potential changes in erosion and sediment yield.

[47] Power, W.E., Tausch, W.A.. 1987. ***Timber Production Capability Classification. TPCC Technical Guide***. U.S.D.I. BLM Salem District. OR.

- 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.

Affected Environment

Typical soils in the project area 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). Soils in the project area range from clay loams to silty clay loams to silt loams to cobbly loams with different density of gravels or cobbles. Project soils are well-drained to moderately well-drained and moderately deep to very deep on the western low foothills and foot slopes of the Cascade Mountains. Project area soils are suited for growing Douglas fir and western hemlock.

All of the proposed treatments are within areas classified as Suitable. The only Non-suitable lands in the area are wet areas, mapped as FWNW (Fragile Wet Non-Woodland) and are adjacent to streams and wetlands, all of which are within stream protection zones (SPZ) and would not be treated. The TPCC does not identify compaction as a problem in the project area. Furthermore, based on field review by area specialists, soil surfaces generally appear to be in a non-compacted state and are covered with a deep layer of surface "duff" (partially decomposed organic material, mostly needles, bark and wood) that protects the mineral soil surface. Some slight compaction (increase in bulk density of less than 10% relative to un-compacted soils) may persist in the area outside of the visible skid trails and roads as a result of previous logging with heavy ground based equipment.

However, it is difficult to assess how much if any of this disturbance remains because it is obscured by tree growth and the surface duff layer. Random small pits dug by area specialists did not reveal any compacted soil surfaces beneath the duff and thus it is reasonable to conclude that compaction outside of road and skid trail surfaces, if it remains at all, is discontinuous and is not apparently impacting site productivity.

A few moderate (i.e., bulk density of the soil has been increased by 10-20% relative to un-compacted soils) and some highly compacted soils (i.e., bulk density of the soil has been increased by 20-50%) have visibly persisted in some of the skid trails and along railroad grades. Moderately compacted soils are primarily located along skid trails and are generally less than 10 feet in width and discontinuous since large portions of former skid trails have been obscured by the growth of trees and development of the duff layer. Highly compacted soils are associated with the railroad logging roads and they range from 20-30 feet in width and are generally continuous along the entire surface of the road since the topsoil in these locations was scraped off and compacted during construction.

Based on the proceeding observations, a conservative estimate is that approximately 4% of the soils in the project area are slightly to moderately compacted and 1% highly compacted.

Existing skid trails, roads and railroad grades in the project area are frequently bordered by rows of conifers within 1-3 feet of the apparently compacted surface on both sides of the skid trails and roadbeds.

These trees are often noticeably larger in diameter than trees further away from the skid trails and roadbeds. Sometimes a precise row of trees, also frequently larger than the surrounding stand, are observed growing down the centerline of the skid trail or roadbed.

Based on GIS mapping of slope classes in the project area, *Table 8* shows the majority of the project proposal is on ***low*** slope gradient (i.e., 0-35%). The remaining areas proposed for treatment are on ***moderate*** slopes (i.e., 35-65%).

A few steeper areas (i.e., 65-80%) are primarily located on slopes adjacent to the main Gordon Creek channel along the inner canyon (i.e., the geomorphic feature created over thousands of years as the stream incised into the surrounding bedrock).

Table : Slopes in the Gordon Creek Project Area

% Slope	*Project Acres by Percent Slope**
0-35% slope	63%
35-60% slope	30%
60+ Slope	7%

** Estimate from slope classification of DEM (Digital Elevation Model) Acres are rounded*

There are approximately 65 miles of mapped roads in the Gordon Creek watershed with an average road density across all ownerships estimated at 3.7 miles per square mile (mi./mi.^{2}). Twenty-eight (28) miles of these roads are on federal lands (43 percent) with an estimated road density of 3.0 mi./mi.^{2}.

Open road densities are low, especially in the upper portion of the watershed, due to numerous locked gates and USFS closures that prohibit motor vehicle use (GWCA pp. 1-8; 3-10; 11-1,2). All road access in the Gordon Creek project area is closed by locked gates except for the paved Larch Mountain road that approaches within about 100 feet of BLM land north of section one, and a small part of section 13 adjacent to the powerline road in the northwest ¼ of section 13.

The condition of these road surfaces varies widely from paved highways (e.g. the Larch Mountain Road) to rocked logging roads, to obvious but unmaintained natural surface roads and barely discernible natural surface roads. There are several miles of old railroad grades, some of which appear to be included in the mapped roads. The primary difference in existing effects between the railroad grades and truck roads is that the railroad grades often had more excavation of benched roads and through-cuts.

The unmaintained, natural surface roads proposed for use in the Gordon Creek thinning are truck roads and railroad grades that were utilized between 1900 and 1940 to log the area and haul logs to market. Many of these roads and railroad grades remain in a highly disturbed state (compacted, evidence of surface erosion, impermeability that results in ponding of water in the roadbed, little vegetation growing in the subgrade).

Other road surfaces are partially to almost fully recovered (compaction has lessened to near pre-disturbance bulk density. Rates of water percolation and movement have recovered to pre-disturbance rates, cut slopes have collapsed to a natural angle of repose, the subgrade has been revegetated with ground-cover plants, brush and sometimes trees).

The expected background erosion rate (existing condition and No Action Alternative) in Gordon Creek is estimated at 0.004 tons/acre/year (8 pounds, or about ½ gallon of dry soil) (30 year average). Typical erosion from small, forested watersheds in the Pacific Northwest range from 0.02-19.43 with a mean of 1.752 t/ac/yr (Patric, 1984). Typical renewal rates for topsoil range from 0.12-0.8 t/ac/yr. (Pimentel, 1987). By comparison, surface erosion on croplands averages 44.5 tons/acre/year in the United States.

Environmental Effects

3.3.4.1 Proposed Action

Following completion of the proposed action, the majority of vegetation and root systems would remain, along with surface soil litter and slash from thinned trees. The expected amounts of surface soil displacement and soil compaction from commercial thinning operations would not exceed 10% of each project area, consistent with RMP standards and guidelines (p.C-1-2) because less than 10% of surface soils would be subject to operations that could result in compaction or soil displacement. The estimated rate of surface erosion, under the worst case scenario, is discussed below (see Surface Erosion Potential).

In addition, the proposed action would maintain sufficient mycorrhizae populations because the root systems of most trees would remain undisturbed and there is no evidence that past disturbance of the area has effected mycorrhizae populations. For the Proposed Action, the total area of disturbed and compacted surfaces would range from a low of 138 acres to a high of 172 acres representing 8-10% of the 1,724 treatment acres.
Therefore, the Proposed Action would be expected to maintain compaction at or below the district guidelines (RMP C-2) to not compact more than 10% of ground-based logging units with skid trails and landings.

Soil Compaction and Disturbance/Displacement – Direct Effects

Skidding and Yarding

Compaction, displacement and disturbance of surface soils from ground based yarding varies with soil moisture, the quantity and type of organic material on the surface (i.e., duff and slash layer), slope gradient, the type of equipment used and the operator of the equipment.

If yarding is done using crawler tractors for all the proposed ground-based units (1500 acres), the percentage of total tractor unit area impacted by surface disturbance and soil compaction as a result of skid roads would be approximately 6%-8% (between 90 to 120 acres). On the soils disturbed by crawler tractor skid trails, a moderate amount of top soil displacement and moderate to heavy soil compaction would be expected to occur.

Since most of the compaction (increase in soil density) occurs in the first pass when soils are wet and after the first three to five passes when soils are relatively dry (RMP/FEIS p. S-1) it is reasonable to assume that single pass on a slash mat "shovel logging" in the winter would have impacts to soil compaction and productivity that are equivalent to multi-pass skidding operations in the dry season.

BLM Personnel have observed winter shovel logging on Oregon Department of Forestry Lands, conducted on a slash mat with generally single round-trip passes by the equipment. Loggers for Frank Lumber Company informed the BLM that the thinning in sections 2 and 12 adjacent to the project area were shovel logged in the winter (personal communication).

Informal examination of these sites shows little evidence of compaction in limited "feel and crumble" tests and no apparent difference in tree or understory growth (personal observations). Although it was not a study point, one of the sites studied by Miller, et al (2007) (Toledo South, see p. 4) was logged in April (wet season).

No unusual compaction or rutting was described by the researchers and trees immediately adjacent to the forwarder trail showed increased growth rates over seven years compared to trees further from the trail. It is reasonable to assume, from these observations, that with careful operating techniques some ground based logging operations can be done in the wet season without damaging site productivity. For example:

- Dry season skidding or single pass "shovel logging" in the winter would be expected to result in moderate to heavy, fairly continuous compaction within the main 12 foot wide skid roads which would cover no more than 10% of the project area. Impacts would be light to moderate and less continuous on less-traveled portions of skid roads and where slash is deeper on shovel logging trails.
- Mechanized harvester systems operating on slash, soil impacts between skid roads are expected to result in light to moderate compaction in two discontinuous, narrow strips less than three feet in width.

Some of the potentially impacted acreage listed above for ground-based yarding systems includes existing skid roads from previous logging. Where practical, portions of these existing skid roads would be used for skid roads for this project. As a result, the amount of acreage for new or additional harvest impacts would be less than the totals listed above.

In skyline yarding areas, impacts usually consist of intermittent (because of slash distributing the weight of the dragging end of the logs) light compaction of a narrow strip less than four feet wide (the skyline road). This is especially true for thinning of second growth stands where logs are relatively small. The area affected would be a maximum of three percent of the area skyline-yarded (300 acres) or approximately 9 acres.

Road Construction and Maintenance

Constructing up to 6.5 miles of new roads would displace topsoil and compact subsoil on 16 acres, essentially converting it into non-forest land. The roads to be constructed would be predominantly on moderate topography (slopes of approximately 3% to 10%, maximum slopes of approximately 30 percent for skyline yarding areas), so the average total width of the clearing would be expected to be around 22 feet. This narrow clearing would have a minimal effect on overall tree spacing and stocking.

Placing slash debris over exposed natural road surfaces would decrease any potential surface erosion and runoff and provide a source of organic material to the disturbed soil. Using water bars and other shaping of the natural road surface would divert runoff onto stable, vegetated slopes and prevent the water from attaining velocities that would cause surface erosion.

Blocking vehicle access would prevent creating ruts and repeated disturbance of the surface that typically contribute to erosion when vehicles continue to use a natural surface road after operations are done. Surface rock (locations and length of road segments to be rocked would be determined during the project) would prevent soil erosion on rocked road segments.

In addition to new road constructed on previously undisturbed surfaces, approximately four miles of roads would be improved under this proposal. Since the proportion of these existing "roads" that is disturbed varies across the project area the BLM estimates that this renovation would be the equivalent of new disturbance to a maximum of 50% of the affected area, approximately 5 acres.

Maintenance Renovation of existing, rocked roads would result in no change in the amount of current non-forest land. Some encroaching vegetation along these roads would be removed and surface rock would be added where needed. Drainage structure (e.g. culverts, catch basins, ditches, sediment traps, diversions from ditches to stable slopes) maintenance and improvements would improve drainage and road surface conditions, resulting in less road surface erosion into the surrounding area and streams. This drainage structure maintenance and improvement work would be expected to result in some minor short term roadside erosion when the established vegetation in the ditch and culvert catchment areas would be removed while cleaning or reshaping ditches and catchment basins. Litter-fall accumulations and the growth of vegetation generally re-establish within one-two seasons and erosion rates would be expected to return to very low levels thereafter.

Landing Construction

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 (18 acres). Portions of ground based landings where skidders return multiple times would be heavily compacted and would persist for several years. Soil disturbance from landings would be local to the landing area and would not affect soil resources on a watershed or landscape scale.

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 – one to three years).

Surface Erosion Potential

WEPP modeling predicts 15.57 tons of soil loss through erosion, roughly 15½ cubic yards of dry soil, from 173 acres of skyline yarding in Riparian Reserves. See the Hydrology section of this EA for details of the calculation.

Two hundred and forty-one (241) total acres of Skyline yarding would result in 21.7 tons, or approximately 22 cubic yards of eroded soil from all skyline areas, or about two medium size ("10 yard") dump trucks from 241 acres, less than 1/1000 inch of soil[48]. See the Hydrology section of this EA for the discussion that leads the BLM to reasonably conclude that the amount of soil eroded and deposited outside of the thinning area is too miniscule to calculate productivity loss based on soil erosion. Erosion from ground based logging areas is expected to be less than from skyline yarded areas, see assumptions section for Hydrology for discussion of this rationale.

Site Productivity due to Soil Compaction, Disturbance/Displacement and Surface Erosion - Indirect Effects

Less than one percent reduction in site productivity would be expected from compaction and disturbance by logging operations. A recent study by the Pacific Northwest Research Station (Miller, et al 2007, PNW-RP-574) found that growth of the trees immediately adjacent to skid/forwarder trails showed 3-18 percent greater growth than trees unaffected by logging trails over 7 to 11 years. It also indicated that the "rate of apparent recovery [of compacted soil in logging trails] is underestimated (Mill and others 2004)", and that the "[e]ffects of logging traffic on soil properties and tree growth are complex and depend on several factors, including…subsequent rate and effectiveness of natural remediation (freezing-thawing, wetting-drying, soil organisms, and vegetation)."

It is reasonable to assume, based on current research, that site productivity reduction would be less than the one percent analyzed in the RMP/FEIS (p. 4-12) that was based on an estimated 15-30 percent reduction in growth rates for trees adjacent to skid trails. The RMP concluded that "[t]his is considered an insignificant adverse growth impact." The light compaction from mechanized harvester operations and from skyline yarding is not likely to measurably effect the reestablishment or growth of vegetation and is expected to have no measurable reduction in overall yield for the project area. As trees age and become established, any potential negative effect on growth from soil compaction and displacement becomes less pronounced and growth rates may approach that of trees on similar, undisturbed sites. This is especially true where the area of compaction/displacement tends to be in narrow strips, as is the case with skid trails, skyline roads and small landings.

[48] A typical sheet of printer paper is 0.004 inch thick. Calculations of soil amounts: 1 cubic yard (cy) = 27 cubic feet (cf or $ft^{3)}$ = 324 square feet (sf or $ft^{2)}$ @ 1 in. deep. Predicted erosion is 0.09 tons/acre = 0.09 cy/ac. 1 Ac. = 43560 ft^2. 0.09 cy/ac. x27 cf/cy = 2.43 cf. 2.34 cf x 12 sf @ 1" deep/cf = 29.16 sf of soil 1 inch deep. 29.16 sf ÷ 43560 sf/ac. = 0.00067 inch of soil per square foot. WEPP predicts soil loss through erosion to be approximately 1/6 of a sheet of paper in depth.

Road surfaces and log landing areas may remain far below potential site productivity levels for many decades. It is anticipated that these roads would be used for future logging operations so that, while they may become revegetated between timber harvest entries, they would not be converted to productive forest land in the foreseeable future.

3.3.4.2 Alternatives 2 and 3

- These proposals would reduce ground based and skyline yarding, road construction and renovation while adding helicopter yarding. Helicopter yarding would require additional acres disturbed for the construction of landings and additional rocking of roads.

  The total acres of soil compaction and displacement would be reduced to 5-7 percent of the treatment area under Alternative 2 and to 6-9 percent under Alternative 3.

- Permanently compacted surfaces due to new road construction would be reduced from 21 acres in the Proposed Action to approximately 12 acres under Alternative 2 and to approximately 13 acres under Alternative 3.

- Soil productivity losses would be reduced under both alternatives primarily due to the reduction in permanently compacted surfaces with less road construction.

- Soil erosion (not including road surfaces) would be reduced from an estimated total for the project area as a whole of 272 tons in the first year for the proposed action to 39 tons with Alternative 2 (reduction by 85%), primarily as a result of helicopter yarding in place of skyline yarding and ground based logging in some areas. Surface erosion for Alternative 3 was not computed but would be approximately mid-way between the proposed alternative and Alternative 2 because some steeper areas closer to riparian reserves and streams would be helicopter yarded as opposed to skyline yarded.

3.3.4.3 Cumulative Effects

There are no cumulative effects to soil because the project would utilize already impacted ground (existing skid trails) when-ever possible. BLM's experience with other thinning projects shows that compacted surfaces revegetate over time and in the case of many of the old skid roads in Gordon Creek have gone back to forest and the old road beds are not recognizable to the casual eye. Effects would be contained within or adjacent to the project units, and there would be no other uses affecting this resource.

3.3.4.4 No Action Alternative

Existing, maintained rocked roads would continue to be part of the transportation system and be maintained according to the Salem District transportation management plan, and would remain as non-forest land and provide access for management activities.

Historic unmaintained roads and landings would be left in their current condition, which range from virtually no evidence of recovery to advanced recovery where understory vegetation is similar to adjacent areas. Vegetation and other natural processes would continue to slowly break up compaction and continue the process of recovering productive capability over time.

3.3.5 Wildlife

Sources incorporated by reference: *Cascades Resource Area EA Wildlife Report, Gordon Creek Project, England and Murphy, 2008 (Wildlife Report)); Biological Assessment of Not Likely to Adversely Affect (NLAA) Projects with the Potential to Modify the Habitat of Northern Spotted Owls Willamette Planning Province - FY 2009-2010 (BA); Letter of Concurrence Regarding the Effects of Habitat Modification Activities within the Willamette Province, FY2009-2010, 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 #13420-2008-I-0140 (LOC). Gordon Creek Watershed Assessment, July 2006 (GWCA)*

Resource Specific Methodology

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

- For Special Status/species of concern: They compiled a list of species in the Cascades Resource Area using BLM wildlife databases, BLM Special Status Species lists(BLM IM OR-2008-038), Oregon Natural Heritage Information Center lists (ONHIC 2007), various wildlife field guides, literature, and texts.

  The biologists visited the project area during the 2005, 2006, 2007, and 2008 field seasons and examined habitats in and adjacent to proposed Gordon Creek 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 Gordon Creek 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 Gordon Creek Project Area and their habitat preferences is included in *Table 20*.

- For Bureau Strategic species (a new category identified in Instruction Memorandum BLM IM OR-2007-072, July 25, 2007): Biologists looked for the species incidental to other surveys. No additional surveys are required.

- For migratory and resident birds: The 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. To develop this list they identified bird species which are documented or suspected to nest on BLM lands in the Cascades Resource area, then identified which of those species have at least a low probability of nesting in the Gordon Creek Project Area.

  They consulted a variety of sources and criteria to identify a list of priority species, sources and species priority determination are listed in Appendices A and B of the Wildlife Report.

- For amphibians: Wildlife biologists conducted optional surveys for amphibians in spring 2005, fall 2006 and spring 2007. Additional surveys may be conducted in the future.

- For northern spotted owl (NSO): Surveyors under contract with the BLM surveyed for owls during the 2006 and 2007 nesting seasons in the Gordon Creek area, including the vicinity of two known spotted owl sites on adjacent USFS and Portland Water Bureau lands. Additional surveys may be conducted in the future.

- Additional surveys: The BLM conducted surveys for red tree voles in Section 3 in July 2007. The BLM conducted surveys for mollusks in Section 3 during the fall of 2000. The BLM also conducted breeding bird surveys in section 13 in 1994.

Affected Environment

Introduction

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). Certain structural and compositional aspects that have been found to be important contributors to habitat diversity and species richness include: dead wood in the form of snags and down logs, remnant live trees (trees that are older and larger than most of the trees in the stand), and vertical and horizontal variation in tree and understory canopies. 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, both Matrix and Riparian Reserves. They are also features that would make the stands habitable by a broader range of forest-associated animal species.

General Stand Condition

The stands proposed for thinning in the Gordon Creek area originated between the mid-1930s to the late 1950s after the mature/old growth forest was logged. Little evidence of the previous stands are now visible, except for scattered concentrations of large CWD that represents "cull" material that was not considered valuable enough at the time to haul-away, and very few remnant live trees. Canopy closures range from approximately 70-95 percent, and understory shrub development has generally been retarded and ground cover is sparse (less than 10 percent).

Young managed stands with simple structure and limited diversity such as those proposed for thinning currently constitute a large portion of the Gordon Creek Watershed (GCWA, pp.5-4 to 5-5). Forest management during the period when these stands were established was designed and intended to maximize timber production.

Wildlife habitat conditions were given secondary, if any, consideration during stand initiation and management. Researchers have recognized that stands initiated and managed in such a way 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).

Residual Old-Growth Trees, Coarse Woody Debris (CWD), and Special Habitats

Table 9 summarizes the presence of residual old growth trees, special habitats, and the amount of CWD present in the units prior to thinning. The presence of CWD, residual old growth trees and special habitats is based on stand exam data, aerial photos, and field review by specialists. CWD must be at least 20" in diameter at the large end, 20 feet in length, and in decay classes 1 and 2, to satisfy management direction as described in the Salem Resource

Management Plan (RMP, p. 21). Material of this size that is in more advanced stages of decay is summarized as well, since this material is valuable habitat for such species as Oregon slender salamander, and will contribute to forest floor wildlife habitat conditions for some decades. Throughout the project areas, CWD in a less decayed condition (class 1 and 2) is primarily limited to smaller diameter material than would be considered adequate to meet RMP management direction. CWD in more advanced stages of decay (classes 3-5) are usually remnants of old-growth "cull" trees that were not removed after harvest, and are often in larger diameter classes.

These logs provide valuable habitat for a whole host of 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. The less-decayed logs in smaller size classes are mostly the result of recent self-thinning in crowded overstocked stands. These small logs are much less useful to forest floor-associated animal species for cover because they have less volume, and persist for shorter time spans (usually less than two decades) than the larger material.

Residual old-growth trees are present in low numbers in the Gordon Creek area, primarily in T.1S., R.5E., sections 3 and 15. CWD that would meet RMP management direction (240+ linear feet per acre of material in decay classes 1 or 2, at least 20" in diameter at the large end, and 20 feet in length) is currently lacking in all of the units proposed for thinning (RMP, p. 21). CWD in decay classes 3-5 is generally abundant (240 to 500+ linear feet/acre) throughout the project area, and is large enough to last for at least several decades. *Table 9* shows a summary of special habitats, remnants, and coarse woody debris (cwd) present by project unit.

Table : Special Habitats, Remnants, and Coarse Woody Debris (CWD)

Unit#	*Location*	*Seral Stage*	*Remnant Old Growth*	*Special Habitats **	*CWD*
1A	1S-5E-1	Mid to late Mid	No	No	0 Linear ft/acre >19" diameter & >20' long, hard (decay classes 1-2) / 500'+ soft (decay classes 3-5) logs
3B	1S-5E-3	Late Mid	Yes	No	<60 Linear ft/acre >19" diameter & >20' long, hard (decay classes 1-2) / 240' soft (decay classes 3-5) logs
9A	1S-5E-9	Late Mid	No	No	0+ Linear ft/acre >19" diameter & >20' long, hard (decay classes 1-2) / 240' soft (decay classes 3-5) logs
11A-D	1S-5E-11	Late Mid	No	No	<60 Linear ft/acre >19" diameter & >20' long, hard (decay classes 1-2) / 500'+ soft (decay classes 3-5) logs
13A	1S-5E-13	Mid to Late Mid	No	No	0 Linear ft/acre >19" diameter & >20' long, hard (decay classes 1-2) / 500'+ soft (decay classes 3-5) logs
15A	1S-5E-15	Mid to Late Mid	Yes	No	0 + Linear ft/acre >19" diameter & >20' long, hard (decay classes 1-2) / 240'+ soft (decay classes 3-5) logs

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+

* Special habitats within the units include: wet and dry meadows, talus, cliffs & rock outcrops.

Snags and Snag-Associated and Cavity Nesting Species

Table 10 summarizes the number of snags necessary to meet management direction in the RMP (p. 21) for five cavity-excavating woodpecker species which are referred to in Neitro et al (1985). *Table 11* summarizes the snags present prior to thinning. A diameter of 15+ inches was used because most wildlife species that utilize snags are associated with snags greater than 14.2 inches (Rose et. al., 2001). The presence of snags and standing dead material is based on stand exam data and field review by specialists.

Stand exam data is based on a statistical sample from plots. Low numbers of snags may be present, but the sampling may not have picked up any on the plots. The use of 0+ in the table denotes when there are trace numbers of snags present that may not have shown up on the plots.

The hairy woodpecker, red-breasted sapsucker and pileated woodpecker are species associated with conifer stands in the western Cascade Mountains, and are present in the Gordon Creek Project Area. Northern Flicker and Downy woodpecker are not typically associated with closed-canopy conifer-dominated stands in the western Cascades, though both species are found in or around the project area.

Snag habitat does not meet the 40 percent of maximum population densities requirement for the five woodpecker species throughout most of the project areas (RMP, p.21). Most of the snags and CWD material that are present are small (less than 20" diameter) and/or highly decayed. Trees that could have developed into large snags and down logs were removed by past timber management treatments. In general stands throughout the project areas are in a condition in which there is a near-term (less than three decades) snag deficit (RMP, p. 21).

Table 10 shows the minimum number of snags necessary to support species of cavity nesting birds at 40 percent of potential population levels shown in parentheses (RMP p. 21, as per Neitro et al, 1985) *Table 11* shows a summary of snags currently available by project unit.

Table : Snags to Support Cavity Nesting Birds

Diameter class (inches dbh)	***Snag Decay Stage***		***Total by diameter class (per 100 acres)***
	Hard 2-3	***Soft 4-5***	
11+		Downy woodpecker (6)	6
15+	Red-breasted sapsucker (18)	Hairy woodpecker (77)	95
17+		Northern flicker (19)	19
25+	Pileated woodpecker (2)		2
Total – all diameter and decay classes			122

Table : Snags Currently Available By Project Unit

Snags at least 15' tall/100 acres						
Section (all units)	***Hard snags 15-25"***	***Soft snags 15-25"***	***Hard snags 25"+***	***Soft snags 25"+***	***Total hard snags 15"+***	***Total soft snags 15"+***
1S-5E-1	60	0	25	40	85	40
1S-5E-3	100	100	0	25	100	125
1S-5E-9	25	25	0	30	25	55

Snags at least 15' tall/100 acres						
Section (all units)	***Hard snags 15-25"***	***Soft snags 15-25"***	***Hard snags 25"+***	***Soft snags 25"+***	***Total hard snags 15"+***	***Total soft snags 15"+***
1S-5E-11	50	20	0	150	50	170
1S-5E-13	175	0	0	50	175	50
1S-5E-15	110	40	30	130	140	170

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

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 CWD, snags, 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.

Federally Listed Species (Endangered Species Act (ESA)) - Northern Spotted Owl

The proposed thinning units provide 1,724 acres of dispersal habitat in the Lower Sandy River. There are two known spotted owl sites in the Gordon Creek Watershed, located to the northeast and the southeast of the Gordon Creek Project Area on adjacent Forest Service and Portland Water Bureau lands. These sites were located during the late 1980s, and had not been surveyed since the early 1990s, when they were both occupied by pairs. Surveys for northern spotted owls were conducted during 2006 and 2007 in the Gordon Creek area, including in the vicinity of these two known spotted owl sites and there were no spotted owl responses and no spotted owls were found. Portions of T.1S., R.5E., sections 1 and 13 are located within the provincial home range radius (1.2 miles) of these known spotted owl sites.

No suitable nesting, foraging and roosting habitat is proposed for thinning inside or outside the provincial home range of any known spotted owl sites. None of the units are located in Critical Habitat and there are no unmapped LSRs (100 acre core areas of known spotted owls as of January 1994) in the vicinity of the proposed units.

Bureau Sensitive - Johnson's Hairstreak

Johnson's hairstreak *(Callophrys johnsoni)* is a small butterfly which is found in older coniferous forests that contain mistletoes (*Arceuthobium* species), primarily of western hemlock and true firs. It is a forest canopy species, which may account for the rarity of sightings. Late successional and old-growth forests are important to the survival of Johnson's hairstreak. It has been called the only old-growth obligate butterfly (Pyle 2002). However, younger forests that contain dwarf mistletoe may have the potential to support populations of the Johnson's hairstreak (Hoffman and Lauvray 2005). There are no old-growth or late successional stands in the proposed Gordon Creek units, however, western hemlock dwarf mistletoe is present in the Gordon Creek area, particularly in the Northeast quarter of T.1S., R.5E., section 1, and the Southwest quarter of section 13.
Most of the Johnson's hairstreak records in Oregon are from elevations over 2,000 feet. BLM lands in Gordon Creek vary in elevation from about 1,300 to 2,400 feet, with most of sections 1 and 13 above 2,000 feet. Johnson's hairstreak has been found in old-growth hemlock near Larch Mountain, located 2 to 4 miles northeast of the project area.

Bureau Sensitive – Oregon Slender Salamander

Oregon slender salamander, a Bureau Sensitive Species, is expected to occur in portions of the project areas where CWD of adequate size (RMP requirements >20" diameter at the large end, >20' in length) occurs. Oregon slender salamander has been found throughout the Cascades Resource Area in stands across the full range of seral stages.
Its distribution on BLM lands within the Cascades Resource Area appears to be limited by dry conditions at low elevations along the Willamette Valley floor, and by cold conditions at higher elevations (Dowlan, unpublished 2006).

Habitat is generally described as conifer stands dominated by Douglas-fir with large amounts of large rotten (decay class 3 to 5) Douglas-fir down logs. Old logs, stumps and large woody material piles around stumps, and exfoliated tree bark on the ground are used for cover, feeding and breeding. Larger material that can hold moisture through summer drought is generally considered to be most important in maintaining moderate subsurface microclimate conditions. Optimal habitat for these animals is generally described as late-successional forest conditions with cool, moist microclimates and large down wood. The species has been found in Sections 3, 9 and 15 of the Gordon Creek Project Area and is highly likely and assumed to be present in all other sections of the project area due to the relative abundance of CWD in the advanced stages of decay.

Bureau Sensitive/Former Survey and Manage – Larch Mountain salamander

The Gordon Creek Project Area is about two to four miles southwest of the closest known site on Forest Service lands near Larch Mountain. Larch Mountain salamander is associated with rocky, talus areas on steep slopes and coarse woody debris in older forests. On the Oregon side of its range, it is found on slopes that descend into the Columbia River Gorge.

There are no known sites on Salem BLM lands. Habitat for Larch Mountain Salamander is not present in the Gordon Creek Project Area because it steep slopes with talus, and older forest or significant retention of pre-disturbance components which would be impacted by this proposal. In 2006, purposive surveys were conducted in the Cascades Resource Area, and Larch Mountain Salamanders were one of the target species searched for (Dowlan and Price 2007). Survey areas searched represent the best BLM-managed Larch Mountain salamander habitat available in northern Clackamas and Multnomah Counties. No Larch Mountain salamanders were found, and Larch Mountain salamanders are not suspected to occur on BLM lands in the Salem District. Therefore, proposed ground-disturbing activities would not have "deleterious effects" as described in the LMS protocol, and no effects to Larch Mountain salamander are anticipated (Crisafulli, 1999).

Former Survey and Manage – Red Tree Vole

Surveys for former Survey and Manage species and protection for known sites are no longer required because the Secretary of Interior removed the Survey & Manage Mitigation Measure Standards and Guidelines from the BLM's Resource Management Plans in the area of the Northwest Forest Plan (ROD 2007).
Prior to the signing of this ROD, red tree vole surveys were conducted in section 3. Although no red tree vole nest structures were found, some resin ducts from feeding red tree voles were found on the ground in unit 3B.

The red tree vole is an arboreal vole associated with conifer forests west of the Cascades summit, below about 3,500 to 4,500 feet in elevation. The project area is within the "Northern Mesic Zone" of the range identified for the species. Prior to the 2007 ROD, surveys were required within the Northern Mesic Zone when (Biswell et al 2002) where the:

- canopy of the stand that would be removed or disturbed has an estimated quadratic mean diameter (QMD) > 16 inches or an average mean diameter (AMD) > 15 inches, and;
- canopy that would be disturbed consists of stands that are:
  - in a mature or old-growth condition, or are older mixed-age conifer forests containing Douglas-fir, grand fir, Sitka spruce, western hemlock, or white fir with multi-layered canopies and large branches capable of supporting nests and providing travel routes, or:
  - conifer stands with a canopy closure of 60% or greater of the intermediate, co-dominant and dominant trees and with two or more predominant conifer trees per acre. Predominant trees should have one or more of the following characteristics: large limbs, well developed crowns, cavities, broken tops, or mistletoe, that may provide structure for suitable platforms for red tree vole nests.
  - Predominant trees are overstory trees remaining from an earlier cohort, which should have a portion of their crowns above the dominant canopy; and
- proposed activities are likely to have a significant negative impact on the species' habitat, its life cycle, microclimate, or life support requirements.

None of the stands currently proposed for thinning meet the stand-level criteria as described above.

Bats

Four bat species of concern are suspected to occur in the Gordon Creek Area (silver-haired bat, long-eared myotis, long-legged myotis, and Yuma myotis).

These species are associated with caves and mines, bridges, buildings, cliff habitat, or decadent live trees and large snags with sloughing bark. Decadent live trees and large snags, particularly ones with bark attached that extend above the tree canopy, are used variously as solitary roosts, maternity roosts, and hibernacula by these species, and other bat species associated with Douglas-fir forests (Christy and West 1993, Weller and Zabel 2001, Waldien et.al. 2000). Although roost sites are poorly characterized in Pacific Northwest forests, existing information indicates that old-growth forests provide higher quality roost sites than younger forests and that many species prefer older forests (Thomas and West 1991, Perkins and Cross 1988). Old-growth and tall snags with sloughing bark are rare in the project areas (Tables 1 and 3), and these species are likely to be present in low numbers. In addition, the fringed bat, a Bureau Sensitive species, could occur in the Gordon Creek Area. This species is more closely associated caves, cliffs, rock outcrops, buildings and abandoned mines; habitat features not present in the project area. However, fringed bats have been known to use snags to a lesser extent, as described above.

Migratory and Resident Bird Species

About 125 bird species are known or suspected to breed in the Cascades Resource Area (Appendix A based on Altman and Hagar 2007, Altman 2008, Marshall et.al. 2003). Of these species, 80 have at least a low probability of breeding in the Gordon Creek Action Area. There are 54 bird species that nest in the Cascades Resource Area that are priority bird species of conservation concern identified by bird conservation partners (Appendix B of the Wildlife Report). Of these species, 33 have at least a low probability of breeding in the Gordon Creek Action Area. The proposed thinning is located in the Western Oregon Cascades Physiographic region. The Partners in Flight (PIF) conservation plan which addresses the Western Oregon Cascades is the *Conservation Strategy for Landbirds in Coniferous Forest of Western Oregon and Washington* (Altman 2008).

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, however, these species are also common or more abundant in mature conifer stands as well (Hansen et.al., 1995).

The proposed thinning areas are in mid seral stands in the 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.

Big Game

Big game species that are found in the project areas include Roosevelt elk (*Cervus elaphus roosevelti*) and black-tailed deer (*Odocoileus hemionus*). The project areas are in mid seral stands which provide hiding and low quality thermal cover. Early seral communities and mid seral stands are abundant on adjacent private lands surrounding the project areas. The Salem District Record of Decision and Resource Management Plan (RMP) approved May 1995, identifies no critical winter or summer range in the project areas (RMP p.26).

Environmental Effects

3.3.5.1 Proposed Action

General Habitat

Overall, short term (less than 5 years) canopy cover reduction, disturbance, and reduction or removal of ground vegetation would occur due to thinning. The long term (more than 5 years) effects would be to increase structural complexity and improve habitat quality for wildlife. If management objectives remain similar to the current RMP, regeneration harvest could occur in the Matrix in about 40-50 years, and Riparian Reserves would be allowed to develop late successional conditions and would not be subject to regeneration harvest. 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 wildlife habitat by providing more opportunities for foraging; nesting/breeding activities; 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 structure habitats in the vicinity of the project areas (GCWA, pp.5-4 to 5-5).

Proposed road construction and renovation, skid trails and skyline corridors under the various alternatives 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 five years) ground vegetation would become re-established due to increased light to the forest floor and the breaks in the canopy would close.

Riparian Reserves, Canopy Gaps and associated Wildlife Species

The age classes proposed for thinning provide the greatest opportunities for acceleration of tree diameter growth and understory development through thinning and density management (GCWA, p. 11-4). It is anticipated that thinning would improve habitat conditions in the Riparian 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 (GCWA, 11-3).

Four ½ acre and one 1 acre low-density canopy gaps are proposed according to the variable density management criteria in the Gordon Creek Watershed Analysis (GCWA, p. 11-4). These openings would result in more vertical understory layering and ground cover, adding complexity to the Riparian Reserve. At the landscape level, connectivity for species such as the spotted owl is expected to improve as late successional conditions develop in the Riparian Reserves (GCWA, p. 11-6).

Other species which would benefit from the development of older forests in the Riparian 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. Species which are expected to benefit from canopy gaps in the Riparian Reserve are ruffed grouse, Wilson's warbler, warbling vireo, song sparrow and big game species. Leaving slash piles unburned is expected to provide habitat for winter wrens and small mammals.

Residual Old Growth Trees, Snags and Coarse Woody Debris (CWD)

Within thinning units, most existing snags in all sizes over 15 inches diameter would be retained. It is anticipated that 90+ percent of these snags would remain standing after treatment. This would effectively reserve the best existing habitat features for primary excavators (woodpeckers), and secondary cavity users, such as songbirds, bats and small mammals. The remaining 10 percent or less of these snags may need to be felled for safety, road construction, skid roads, skyline corridors or would fall incidental to logging operations. More of the smaller diameter/taller snags (<12 inches diameter and >25 feet tall), would be felled for safety reasons, or fall incidental to thinning operations. These snags are less important for wildlife species than the larger material over 15 inches (Rose et. al., 2001).

Any snag that falls for any reason as a result of thinning operations would remain on-site as CWD, providing important habitat for a different, but also, key group of dead-wood associated species, including the Oregon slender salamander, a Bureau Sensitive species. All dead wood that is on-site would remain on-site, either in the form or standing snags or as down logs, after thinning.

Management direction for the Matrix LUA is to provide a renewable supply of snags and down logs well-distributed across the landscape (RMP p. 21). Most units throughout the project areas are expected to remain in a snag deficit condition (RMP, p. 21) for one to three decades, until live trees become large enough (at least 20" diameter) to provide for recruitment of large snags and CWD which will meet RMP requirements.

As a result of thinning, growth of residual live trees would be accelerated, so that larger trees would be available sooner than without thinning to contribute additional large snags and CWD in the future stand. The RMP guidelines for snags (40 percent maximum population densities) and CWD (240+ linear feet per acre of material in decay classes 1 or 2, at least 20" in diameter at the large end, and 20 feet in length), could be met in one to three decades. Large diameter CWD 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 CWD would be directly impacted by logging. Less than ten percent of the thinning area would be directly impacted by skidding, which is the operation with the highest potential impact to existing CWD. BLM oversight of skid trail locations would ensure that skid trails were located to avoid impact to high value CWD whenever feasible, reducing the anticipated impacts below the ten percent level that would be expected from locating skid trails without concern for CWD. The same principles generally apply to snag retention.

Special Status and Former Survey and Manage Species

Federally Listed Species - Northern Spotted Owl

Refer to *Table 12* for a summary of the Gordon Creek project and its effects on spotted owl habitat. In the short term, 1,724 acres of dispersal habitat in the Sandy River Watershed would be altered as a result of thinning. Available scientific literature provides support for the finding that 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 2007c). Examples of silvicultural activities that may fall into this category are light to moderate thinning, down salvage, individual tree removal, and prescribed burning.

In the short-term, seasonal restrictions on habitat modification activities (felling, yarding, burning, and road building) would minimize the risk of disturbance to any unknown northern spotted owls during the critical nesting season and delay habitat modification activities later into the nesting season when spotted owls are less sensitive to disturbance. 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.

In the long term, thinning would accelerate the development of suitable habitat characteristics, especially in Riparian Reserves. As thinned stands mature, habitat conditions are expected to improve. Canopy closures would increase and these stands would attain suitable habitat conditions within 10 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 CWD for prey species and nesting opportunities for spotted owls. No habitat would be downgraded to a lower classification as a result of thinning. No suitable habitat would be altered or downgraded within the provincial home range radius of any known spotted owl sites. Overall habitat conditions with the provincial home range of two spotted owl sites would not change as a result of thinning. None of the proposed units are located in LSR or Critical Habitat for the Northern spotted owl.

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.

As a result, 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. Such treatments can have long-term benefits to spotted owls by encouraging late-successional characteristics to occur more rapidly (BA p. 9, LOC p. 15). A summary of the above information is shown in *Table 12*.

Table : Spotted Owl Habitat Modification

5th Field Watershed	*6th Field Watershed*	*Township-Range-Section#*	*Proposed Treatment* [1]	*Acres*	*Land Use Allocation* [2]	*Pre/Post Treatment Habitat Type* [3]	*Habitat Modification* [4]	*Effect* [5]
Lower Sandy	Gordon Creek	1S-5E-3, 9, 11, 13, 15	Light to moderate thin	1324	GFMA	Dispersal/ Dispersal	Maintain	NLAA
Lower Sandy	Gordon Creek	1S-5E-3, 11, 12, 15	Light to moderate thin	400	RR	Dispersal/ Dispersal	Maintain	NLAA
			TOTAL	1724				

Notes and definitions for Table 12 come from the BA, pp. 3, 4-5; and the LOC, pp. 10-11.

[1] Treatment Type: Light to moderate thinning 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 thinning maintains a minimum of 40 percent average canopy cover. Light to moderate thinning 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.

[3] Habitat Types: 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: NLAA=May affect but not likely to adversely affect

Bureau Sensitive - Johnson's Hairstreak Butterfly

The project is not expected to have a measurable adverse effect this species for the following reasons. Peak conditions for the Johnson's hairstreak butterfly are old-growth and late successional second growth forests which contain hemlockdwarf mistletoe (Lasen et.al., 1995). It is considered to be an old-growth olbligate species (Pyle 2002). No old-growth or late successional habitat is proposed for thinning. There are approximately 1,800 acres of old-growth and late successional forests in the Gordon Creek Watershed that would not be affected by this proposal, 90 percent of which is located at higher elevations where the majority of the known sites occur (over 2,000 feet in elevation).

Younger stands with hemlock dwarf mistletoe are thought to have the potential to support populations of Johnson's hairstreak (Hoffman and Lauvray 2005). There is hemlock dwarf mistletoe within the stands proposed for thinning, especially in T.1S., R.5E., sections 1 and 13. The areas with the highest concentrations of dwarf mistletoe in the Northeast quarter of section 1 and the Southwest quarter of section 13 have been dropped from the proposal. This thinning proposal would adversely affect dwarf mistletoe hemlock and therefore may have effects on Johnson's hairstreak, but the impacts would be limited to individual trees in sub-optimal habitat mostly below 2,000 feet, with the two known infection centers reserved from harvest. Hemlock dwarf mistletoe is known to be very persistent and virtually impossible to eliminate without aggressive clearcutting (Hawksworth pp. 135-139), and would persist after treatment.

Bureau Sensitive – Oregon Slender Salamander

It is not expected that thinning these stands would result in significant effects to Oregon slender salamanders or their habitat. 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 (RMP requirements >20" diameter at the large end, >20' in length) currently exists.

The CWD currently on-site prior to thinning would continue to provide refuge for terrestrial salamanders many years after treatment (Table 1). These results are consistent with survey results elsewhere in Cascades Resource Area from stands that had been subjected to timber harvest in the past (Dowlan, unpublished 2006). Stands in similar age classes had been subjected to regeneration harvest with no green tree retention, similar to the proposed thinning units. Logging practices of the time resulted in heavy concentrations of large logs, or "culls" which were cut, but not removed from the site.
This large woody material lasts for many decades, and provides moderating microclimates in which terrestrial salamanders can persist.

In the short term, direct effects (disruption or mortality) to Oregon slender salamanders may occur during logging operations. Ground based logging would result in the most impact due to higher ground disturbance.

Skyline logging would have fewer impacts due to less ground disturbance, and helicopter yarding would have the least impact of the various logging methods. Design features common to all projects would minimize disturbance to existing CWD. Ground disturbance from tractor skidding trails and other ground-based logging equipment would be limited to ten percent of project unit areas, and therefore, no more than ten percent of potential Oregon slender salamander habitat within any unit.

Former Survey and Manage – Red Tree Vole

In the short-term, undetected nests within marginal habitat (habitat less than 80 years of age) could be destroyed or disturbed during thinning. 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.

Bats

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). No older forests are proposed for thinning. Bat species which use snags would be affected due to a loss of 10 percent or less of the standing dead material within the thinning units. Most existing snags in all sizes over 15 inches diameter would be retained. It is anticipated that 90+ percent of these snags would remain standing after treatment.

The remaining 10 percent or less of these snags may need to be felled for safety, road construction, skid roads, skyline corridors or would fall incidental to logging operations. Bat activity appears to be higher in thinned versus unthinned stands. Structural changes in thinned 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). The fringed bat, is more closely associated with buildings, bridges, mines, cliff crevices and caves than snag habitat. None of these features are present in the Gordon Creek Project Area.

Migratory and Resident Birds

The effects of thinning on priority bird species with at least a low probability of nesting in the Gordon Creek Project Area are shown in the Wildlife Report, Table 7. The following is a summary of the project's effects on migratory and resident birds. Disturbance of nests, eggs, nestlings and nesting failure would be highly likely if harvest operations occur during active nesting periods. However, the impacts would be short term (during one nesting season), and would not reduce the persistence of any bird species in the watershed or populations at the regional scale. 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).

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 et.al., 1995). The thinning would have no effects or even positive long term effects on this same set of species. In the short term, individuals of some species 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 help minimize short term disturbance.

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.

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 (0 to10 years) 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.

In the long term (10+ 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.

Differences In Effects Between The Original And Current Proposed Actions

Low Density Canopy Gaps Dropped from the Proposed Action

The number of low density canopy gaps originally proposed has been reduced to four ½ acre and one 1 acre low density canopy gaps. Canopy gaps are not essential to provide variety of habitat on a landscape level in the RMP (p. 20). The smaller number of low density canopy gaps now proposed would result less diversity in understory layering and complexity, thus fewer canopy gaps in the vicinity of the openings formerly proposed. There would be fewer benefits to species which are expected to benefit from canopy gaps, such as the ruffed grouse, Wilson's warbler, warbling vireo, song sparrow and big game species.

Treatment of 117 Year Old Stand Dropped From the Proposed Action

Treatment of the older forest stand originally proposed for thinning in T.1S., R.5E., Section 3 has been dropped from the Proposed Action. The No Action Alternative was adopted for this stand which would result in fewer impacts to late successional species such as the spotted owl and the red tree vole. As a result of dropping of treatment of this stand, there is no longer any late successional stand proposed for treatment in this proposal.

3.3.5.2 Alternatives 2 and 3

Gordon Creek Alternative 2 and 3 involve less road construction, less skyline and ground based yarding, and more helicopter yarding as described in *EA section 2.6*. The environmental effects of these Alternatives are similar to the Proposed Action, except that less road construction and ground based logging under Alternatives 2 and 3 would result in proportionately less ground disturbance and thus fewer canopy breaks and less access to stands by larger mammals and avian predators.

Snags and Coarse Woody Debris (CWD)

Impacts to CWD and duff/litter layers would be less under Alternatives 2 and 3. As a result of less road construction, renovation and ground based logging, Alternatives 2 and 3 would result in proportionately less ground disturbance and thus fewer impacts to CWD and duff/litter layers than the Proposed Action.

Impacts to snags would be slightly less under Alternatives 2 and 3. Impacts to snags associated with skyline yarding are expected in and adjacent to skyline yarding corridors. Alternative 2 has about 90% less planned skyline yarding than the Proposed Action, and Alternative 3 has about 50% less skyline yarding than the Proposed Action, with corresponding reductions in potential impacts to snags in general. Where larger snag numbers are the greatest in Section 15, no skyline is planned under any alternative. Neither is any skyline yarding proposed in Sections 3 or 9. Impacts from skyline yarding are expected to be insignificant due to the numbers and distribution of snags in relation to where skyline yarding is proposed.

Also, required clearing for road construction would result in higher impacts to snags under The Proposed Action. However, Alternatives 2 and 3 would require more clearing for helicopter landings not required under The Proposed Action. Helicopter yarding is expected to have increased impacts on taller snags, of which there are few in the project area where helicopter yarding is proposed.

Special Status and Former Survey and Manage Species

Federally Listed Species: Northern Spotted Owl

Impacts to canopy closure would be less under Alternatives 2 and 3 due to less road construction and fewer skyline corridors. However, Alternatives 2 and 3 would require clearing for helicopter landings not required under the Proposed Action. Any differences in impacts would be insignificant because the habitat would not be downgraded, and would remain primarily dispersal habitat under all alternatives both before and after treatment.

Other Special Status and Former Survey and Manage Species

- Impacts to Special Status Species whose primary habitat is CWD and duff/litter layers would be less under Alternatives 2 and 3 for reasons explained above.
- Impacts to species whose primary habitat is snags would be slightly less under Alternatives 2 and 3 for reasons explained above.

- Impacts to canopy dwelling species such as the red tree vole and Johnson's hairstreak would be slightly less under Alternatives 2 and 3 due to less road construction and fewer skyline corridors. However, these impacts would be balanced out by increased canopy damage due to helicopter logging under Alternatives 2 and 3.

3.3.5.3 Cumulative Effects

Residual Old Growth Trees, Snags and CWD

Regardless of the scale for assessing cumulative effects, design features would retain existing CWD, residual old growth trees, and snags 15+ inches diameter. It is expected that 90+ percent of these snags would remain standing after treatment. Some snags, especially smaller diameter/taller snags (<12 inches diameter and >25 feet tall), would be felled for safety reasons, or fall incidental to thinning operations. Any snag that falls for any reason as a result of thinning operations would remain on-site to become CWD, 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), including the Oregon slender salamander, a Bureau Sensitive species.

Beneficial cumulative effects to CWD, snag habitat and associated species may 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.

Northern Spotted Owl

The scale for cumulative effects for the northern spotted owl is the provincial home range of known spotted owl sites, which is 1.2 miles for the Cascades of Western Oregon (BA, p. 3; LOC, p. 11) and the location of the project in relationship to adjacent known spotted owl sites and Late Successional Reserves (LSRs) The scale was chosen because the Northwest Forest Plan (NWFP) goal for conservation and recovery for the spotted owl is to maintain suitable owl habitat within LSRs and 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 (BA pp.11-20), and Cumulative Habitat Effects Summary (BA pp. 38). Unit Specific Data, including the environmental baseline and effects of proposed projects that are not likely to adversely affect spotted owls, are summarized by Administrative Units in the Willamette Province (BA pp. 43-105), including the Cascades Resource Area where the Gordon Creek Project is located (BA pp. 51-59).

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 Gordon Creek Project) would not be significant because they would not reduce the landscape's ability to function as dispersal habitat for spotted owls (LOC p. 29), and would not likely diminish the effectiveness of the conservation program established under the NWFP (LOC p. 29-31).

The proposed project would not contribute to cumulative effects to spotted owls because dispersal habitat would be maintained, and no suitable habitat would be affected within and between known owl sites. Overall habitat conditions within the provincial home range of two spotted owl sites would not change as a result of thinning. Silvicultural prescriptions that promote multi-aged and multi-storied stands may increase the quality of spotted owl habitat over time (LOC pp. 19).

Other BLM Special Status Species and Former Survey and Manage

The proposed action alternative would not contribute to cumulative effects to the Oregon slender salamander and other CWD associated species. Suitable habitat conditions would be maintained in the short term in the project areas, providing refugia for low-mobility amphibians and invertebrates. In the long term, larger trees would be available sooner than without thinning to contribute additional large CWD in future stands. Implementation of the project would not eliminate connectivity between proposed units or adjacent untreated stands under BLM management.

Cumulative effects to Johnson's hairstreak butterfly would be limited to individual trees in sub-optimal habitat mostly below 2,000 feet, with the areas of greatest dwarf mistletoe reserved from harvest.

No adverse cumulative effects to red tree vole habitat are expected because:

- Red tree vole is considered to be a late successional associate. No late successional habitat over 80 years of age would be lost or altered;
- The thinned stands would attain older forest conditions sooner as a result of the thinning, particularly in Riparian Reserve.
- Undisturbed habitat in the same or similar age class with connectivity to the thinning units exists within the project area, elsewhere within the affected sections.

Thinning in the project areas, either individually or collectively, 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 areas 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 migratory birds are expected. 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.

Big Game

No 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.

3.3.5.4 No Action Alternative

Habitat Structure, Residual Old Growth Trees, Snags and Coarse Woody Debris

Overcrowded stands with low vigor and small crowns would grow more slowly compared to thinned stands. Self thinning would occur, but diameter growth would not accelerate as fast as in thinned stands. Snags and CWD created by self thinning mortality would not be large enough to meet RMP standards until later in the life of the stand (approximately 20 to 50 years) when suppressed co-dominates achieve these diameters before dying. Without management intervention, stands would take longer to develop late successional habitat conditions and remain less diverse for a longer period of time.

BLM Special Status Species and Former Survey and Manage

Federally Listed Species: Northern Spotted Owl

There would be no immediate change in spotted owl habitat and no effect to spotted owls caused by 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, it would take approximately 20 to 50 years to develop suitable habitat conditions if left untreated.

Other Special Status and Former Survey and Manage Species

In the short term, there would be no immediate change in current habitat conditions for former Survey and Manage and BLM Special Status Species. In the long term (20 to 50 years):

- Trees will grow more slowly, and material available for CWD recruitment would average smaller in diameter than if thinning were to occur. Development of Oregon slender salamander habitat conditions would likely be delayed without the addition of new large woody material to replace existing well-decayed material that will eventually disappear.
- Since no new disturbance to the conifer canopy would occur, no undetected red tree vole nests would be affected. Optimal red tree vole habitat conditions, presumed to be older forest conditions, would develop more slowly without thinning.
- There would be no canopy disturbance, thus no impacts to Johnson's hairstreak.

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 in the Matrix that may be subject to regeneration harvest may not noticeably increase prior to harvest, and legacy features in the future stand would likely be smaller and less long-lasting, especially those that provide habitat for cavity-nesting species.

Big Game

In the short term (0 to 10 years), 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 (10+ years), 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.

3.3.6 Air Quality and Fire Hazard/Risk

Source Incorporated by Reference: *Gordon Creek Thinning Project Air Quality and Fire Hazard/Risk Specialist Report. 2008, Raible (Fuels Report)*

Resource Specific Assumptions

- The Oregon Smoke Management Plan of December 2007 would not have major revisions that would affect operations during the Gordon Creek Thinning Project.
- Access would continue to be controlled by locked gates on BLM, water district and private industrial lands.
- Climate change may increase the duration and severity of wildfire season to an unknown extent during the project period, but that any such overall increase would not exceed the conditions used to model fire potential for this time period.

Resource Specific Methodology

- Discussed vegetation modeling and interpretation to fire regimes and condition class with Jane Kertis of the NW Ecology Group to incorporate compiled data from the Ecoshare website.
- Contacted Northwest Coordination Center Predictive Services for past fire occurrences.

Affected Environment

Air Quality

Air quality in the Gordon Creek Thinning project area is good. The Columbia River Gorge is frequently windy, so polluted air does not stagnate in the area. The project area is located approximately 15 miles east of the Portland metropolitan area and two miles south of the Columbia Gorge National Scenic Area, both of which are “smoke sensitive receptor areas” (SSRA).

The project area is 12 miles west of the Mark O. Hatfield Wilderness Area, a Class 1 area for smoke management. The Oregon Smoke Management Plan requires landowners to prevent smoke intrusion into SSRAs and to prevent smoke from reducing visibility in the wilderness area.

Fire History

Continuing fire history research shows that fire has occurred more often than earlier believed, and that it has not been as severe on the landscape as previously thought. The research has shown that old growth stands have multiple age classes that were not easily discerned, leading to the understanding that there were more disturbance events (such as fire) than were previously thought.

The fires that burned through the Gordon Creek area in 1890 were apparently mixed severity and information from the State of Oregon confirms that the Gordon Creek area was also burned in 1900. In September of 1902 a train started a fire near Dodson that was swept by east winds and destroyed the towns of Palmer and Brower. In three days, fires were burning at Rocky Butte, Gresham, Molalla, Multnomah, Springwater and Bridal Veil. By the time the smoke cleared, "some of the communities reporting large fire losses in their vicinity were Troutdale, Dodge, Highland, Springwater, Lents, Salmon river, Gresham, Orient, Damascus, Viola, Logan and Eagle Creek Valley. The summer of 1902 would become the most disastrous on record in Western Oregon, as well as Washington, in terms of lives and farms lost for forest fires." (Carr 1983, p. 18)

Recent fires in the area include: 2008 escaped slash burn southeast of Corbett water treatment plant; 2008 Gnarl Fire in the Mt. Hood Wilderness; 2006 complex of lightening fires in salmon-Huckleberry wilderness; 2006 Blister Fire 20+ miles south of Gordon Creek, 800 acres; 1991 Multnomah Falls Gorge Fire;

Landscape Vegetation Patterns

Using existing data (fire history, vegetation, etc) and mapping processes modeling has been completed for Northwestern Oregon to measure the overall landscape vegetation pattern changes due to fire (fire frequency/severity) and the effects for the disturbance (succession class or vegetation/fuel condition class (CC)) prior to the first white settlers. The national fire regimes condition class (FRCC) are designed at a landscape analysis since fire operates at that scale. This interpretation of the modeling from the larger database on the website (http://www.reo.gov/ecoshare/news-issues/index-issues.asp) is done at the watershed level (Lower Sandy) which encompass the project area. For this area the Rapid Assessment Reference Condition Models percentages were:

- Douglas-fir Hemlock – wet mesic 33%
- Douglas-fir Hemlock – dry mesic 23%
- Pacific silver fir – high elevation 2%
- Douglas-fir Willamette Valley 4%
- No vegetation classification (developments, fields, roads, etc.)37%
- Other minor vegetation models 1%

Douglas-fir Hemlock – wet mesic (*Table 13*): Fire plays a major role in infrequently resetting landscapes within this vegetation model with intervals ranging roughly from 300 to 800 years. Mixed severity fires occur less frequently than in the Douglas-fir Hemlock dry regime. Insects, pathogens and windthrow occur in this type at variable intervals creating fine scale variability on the landscape.

Table : Historic Vegetation Class Representation in the Sandy River Watershed, Douglas-fir Hemlock – wet mesic

Vegetation Class	*Historic watershed representation*	*Present vegetation class comparison to historical amounts*
A- Early Post-stand replacement with shrubs, herbs and seedlings	5%	Abundant
B – Closed canopy young stands with trees up to 20" dbh.	15%	Similar
C – Young forest stands opened up by mixed severity fire with trees up to 20" dbh.	1%	Abundant
D – Mature to old-growth forest stands that have been opened by mixed-severity fire with trees greater than 20" dbh.	4%	Over represented
E – mature to old growth forest stand stands dominated by large tress with an understory of western hemlock	75%	Under represented
Fire Regime is Group 5 – 71% of all fires are high severity stand replacement at 400 year intervals and 28 % are mixed severity at 1000 year intervals		

Douglas-fir Hemlock – dry mesic: Fire is the major disturbance process. Mixed Severity fires are more common than stand replacing events, occurring at 50-150 year frequencies. Stand replacement fires that reset large landscapes occur at 250-500 year frequencies. This fire regime is largely responsible for the dominance of Douglas-fire in these landscapes. Insects, pathogens and windthrow also occur in this type at variable intervals, often interacting with drought and other extreme weather conditions. These disturbances affect smaller areas than fire.

Table : Historic Vegetation Class Representation in the Sandy River Watershed, Douglas-fir Hemlock – dry mesic

Vegetation Class	*Historic watershed representation*	*Present vegetation class comparison to historical amounts*
A- Early Post-stand replacement with shrubs, herbs, and seedlings	5%	Abundant
B – Closed canopy young stands with trees up to 20" dbh.	15%	Over represented
C – Young forest stands opened up by mixed severity fire with trees up to 20" dbh.	5%	Similar
D – Mature to old-growth forest stands that have been opened by mixed-severity fire with trees greater than 20" dbh.	15%	Under represented
E – mature to old growth forest stand stands dominated by large tress with an understory of western hemlock	60%	Under represented
Fire Regime is Group 3 – 25% of all fires are high severity stand replacement at 250-500 year intervals and 75 % are mixed severity at 50-150 year intervals		

What this means is that on the watershed scale for both the wet mesic and dry mesic Douglas-fir Hemlock vegetation class E and for the dry mesic class D are underrepresented (*Table 14*). Thinning the class B lands would move these stands on a successional trajectory towards filling this vegetation class.

Class A types which are abundant now would grow and fill the class B and C lands that are thinned. (http://www.reo.gov/ecoshare/news-issues/index-issues.asp) This data is used to predict the basic fire regimes for the project area.

Table : Fire Regimes

Project Name	*Reference Condition Model*	*Terrain features*	*Fire Return Interval*	*Severity*
Gordon Creek	Douglas-fir Hemlock Wet Mesic	North facing slopes	300 + years	High Stand replacement
	Douglas-fir Hemlock Dry Mesic	South, west facing slopes, flats	50-150 years	Mixed

Fire Hazard Rating, Fire Risk and Values at Risk

Fire hazard ratings provide an index of resistance to control a wildfire and are based on vegetation, fuel arrangement and volume, condition and location. All are determinants of the potential for spread of a fire and difficulty of suppression. The fuel model in the vicinity of the project area is now typically Fuel Model 8 / 10 (closed timber litter / timber litter and understory based on the 13 fuel model system) or a TL3(183) Moderate Load Conifer Litter (based on the 40 fuel model system).

Fire risk reflects the probability of ignition in a given area. There are two primary sources of fire ignition: lightning and humans. Lightning ignitions are unpredictable and uncontrollable, while we can reduce the potential for human caused fires with management practices. The locked gates on the road systems in most of the project area reduce the number of people in the area and thus limit the potential for human caused ignitions. Values at risk provide an index of resources and human values that could be affected by wildfire. The Corbett municipal watershed in section 1 and the Bull Run watershed adjacent to BLM lands in section 13 are high value. Lands in sections 3 and 9 are also high value due to their proximity to the Corbett water treatment plant, trails, residences and other structures.

Wildland / Urban Interface

Wildland / Urban Interface (WUI) is a term used to describe the area where developed lands meet undeveloped lands. The developed lands can be homes, businesses or agricultural lands. Under the Healthy Forest Restoration Act of 2003 the term “at risk community” means either the interface community or a group of homes and other structures with basic infrastructure and service (such as utilities and collectively maintained transportation routes). The unit in section 3 fits this definition because of the Corbett water treatment facility (infrastructure).

Fire Behavior

The physical setting for the Cascades, including the Gordon Creek thinning project area, has major west-east lying mountain drainages. This allows for the creation of strong up-canyon winds in the afternoon during the late spring, summer and early fall. The west to east oriented drainages also provide funneling to strong, dry East winds that can occur unpredictably.

During the summer and fall seasons, these dry, warm winds reach velocities of 30 to 40 miles per hour, with stronger gusts over the higher ridges and down east-to-west oriented drainages. East winds are important because they often occur when fuel moistures are at critically low levels. Large wildland fires igniting on the lower and middle thirds of slopes may spread to ridgelines before safe suppression action can be taken. (NWOR FMP, p.41)

In temperate ecosystems like the Pacific Northwest, biomass accumulates faster than it decomposes. New studies have linked occurrence of wildfire with global weather changes such as El Niño/La Niña and global warming. Virtually all climate-model projections indicate that warmer springs and summers will occur over the region in coming decades. The trends will reinforce the tendency toward early spring snowmelt and longer fire seasons which will accentuate conditions favorable to the occurrence of large wildfires (Westerling, et al, 2006, Swetnam, 2002). After fall rains begin and potential for east wind events is past, fire does not spread through conifer logging slash because fuel moisture is high, temperatures are cool and humidity is high.

Environmental Effects

3.3.6.1 Proposed Action

Air Quality

Locally within ¼ - ½ mile of the piles there may be some very short term (a few hours) increase in smoke after piles are ignited resulting from drift smoke. Transport winds affecting the area would keep the air shed scoured out preventing a buildup of particulate matter and provide atmospheric mixing to prevent any intrusions or visibility.

The total amount of slash debris expected to be piled for burning is estimated to be between 2000 and 4500 tons over an extended period of 3 to 6 years. Burning between 500 and 1500 tons of dry, cured, piled fuels under favorable atmospheric conditions each year in the project area is not expected to result in any long term negative effects to air quality in the air shed.

Generally, once covered dry piles have been ignited, the fire intensity builds rapidly to a point where the fuels burn cleanly and very little smoke is produced. The strong convection column produced carries the smoke and gases well up into the atmosphere where it is diluted and carried away in the air mass. After a few hours, as the piles burn down and the intensity subsides, additional smoke may be produced due to lower temperatures and less efficient combustion. Depending on size, arrangement, type and moisture content of the remaining fuel, the smoke will diminish over several hours or days as the piles cool and burn out (sooner if rain develops).

Generally this smoke only affects the immediate area (¼- ½ mile or less) around the pile. If a temperature inversion develops over the area during the night time hours, smoke may be trapped under the inversion and accumulate, resulting in a short term impact to the local air quality. The accumulated smoke generally clears out by mid-morning as the inversion lifts. Due to the location of this project (over 2000' elevation) it is unlikely that inversions will present a problem.

Burning of slash will always be coordinated with ODF and conducted in accordance with the Oregon State Smoke Management Plan. This serves to coordinate all forest burning activities on a regional scale to prevent negative impacts to local and regional air sheds.

Fire Hazard Rating, Fire Risk and Values at Risk

Slash created from timber harvest would add an estimated 10-15 tons per acre of dead fuel to the thinned areas, most of which would be smaller than 100 hour fuel size class (3 inches diameter) (PNW-105 series: 1-DF-2, 2-DF-2-PC and PNW-GTR -258 series: 1-DFWH-PRE-01-03). The fuel arrangement would tend to be continuous with patches of low fuels. The fuel model would shift from fuel model TL3 (183) Moderate Load Conifer Litter to a fuel model SB2 (202) Moderate Load Activity Fuel (RMRS-GTR-153). These models predict the spread rate changing from very low (132-400 ft/hr) to moderate (3300 to 9240 ft/hr) and the flame length changing from low (1-2 ft) to moderate (10-17 ft) with the project (Scott and Burgan, RMRS-GTR-153, 2005, pp 59,68).

All thinning projects result in increased fire risk potential for 1 to 3 years because of the increased dead fine fuels (1 and 10 hour fuels)[49].
The relatively low amounts of larger 100 to 1000 hour fuels persist much longer and remain a factor contributing to resistance to control because they contribute to fire intensity and duration.

As previously stated, fuel treatments (38% of the area) are based on the need to reduce the potential risk from fire starts or high intensity fires. The thinning from below itself reduces fire risk by removing ladder fuels which can move ground fire into the tree canopy and removing small diameter trees which can ignite easier. Reducing surface fuel loads also results in more efficient and quicker fire suppression, less risk for fire fighters and less resource damage. Machine treatment would reduce the risk by turning logging slash into all 10 hour fuels which will decay more rapidly, take on moisture more quickly with humidity changes and make accomplishment of any fire suppression more successful.

As noted previously, portions of the project area would receive some slash reduction treatment to reduce fire risk, while the rest of the project (62%) would have no surface treatment of the thinning slash. Fuel loading, risk of a fire start and the resistance to control a fire, would all increase at the untreated sites as a result of this action.

Risk of a fire start in the untreated slash would be greatest during the first season following cutting, - the period when needles dry out but remain attached. These highly flammable “red needles” generally fall off within one year and risk of a fire start greatly diminishes.

[49] Forest fuels are classified according to how long it takes their moisture content to equalize with the surrounding air, also referred to as timelag classes. Timelag is the midpoint of this response time, i.e. 1-hour fuels respond in less than 2 hours, 10-hour fuels respond in 2 to 20 hours, etc. Grass and straw are one hour fuels (<¼ in. diameter). Twigs and small branches (¼ - 1 in.) are 10 hour fuels. Dead limbs (1-3 in.) are 100 hour fuels. Small logs (3-8 in.) are 1000 hour fuels. Different time-lag classes burn differently: 1-hour fuels (needle litter, hardwood leaves) ignite quickly and combust at rapid rates. Progressively larger particles (10-, 100-, 1000-hour and larger fuels) require more heat for ignition and combustion. Fires usually start and spread in dead fine fuels (< ¼ in. diameter), which ignite increasingly larger size classes of fuels. If fine fuels are reduced or missing, a fire may not ignite or spread.

A study of precommercial thinning effects on fine fuels (<1" in diameter) showed a decrease by 50 percent in loading (tons/ac) and in fuelbed depth in less than two years. This study also looked at blowdown (windthrown trees) which typically has high levels of fuel at the start. Fine fuels essentially fall to background levels in two to four years. Larger branch fuels and 1000-hour fuels persist for longer periods with the conversion of sound 1000-hr fuels to rotten 1000-hr fuels is a gradual process of about 80 years (Christiansen, 1991).

Fire risk would continue to diminish as the area "greens up" with under story vegetation, and as the fine twigs and branches in the slash begin to break off and collect on the soil surface. Past experience in the geographic area of this proposed action has shown that, in approximately 15 years, untreated slash would generally decompose to the point where it no longer contributes significantly to increased fire risk. Depending on the amount of large, down wood left on site from logging, the resistance to control would also decrease over time but more slowly. This is what is expected to occur for the areas considered in this proposed action where the slash created would be left in place, untreated.

The resulting total residual dead fuel loading would vary throughout the site ranging from 5-30 tons per acre. It is expected that about half of the dead fuel tonnage to be left on site following treatment would be in the form of down logs and pieces in the 10 inch and larger size class. The decision to leave the slash untreated under this proposed action is based on a number of factors:

- Historically, the number of fires that have occurred in this area has been very low and it is unlikely that this additional slash would result in a fire occurring in the area.
- The cost to treat all the slash would be fairly high (>$500 per acre) with limited benefit.
- Most of the roads leading into the units would be blocked or have limited access that controls entry to much of the site by the public.
- The continued existence of a tree canopy to shade the fuels would maintain cooler temperatures and higher humidity on the site reducing the risk of a fire start.

Differences in Effects Between the Original and Current Proposed Actions

The current Proposed Action treats 682 acres instead of 137 acres. Increasing the acres treated is expected to reduce risk of wildland fire ignition, reduce the intensity and rate of spread of any fire that does start, and increase ease of control commensurate with the increase in area treated.

3.3.6.2 Alternative 2 and 3

The amount of fuel left behind after helicopter yarding is expected to be higher than the proposed action. Delimbing in the unit and leaving small diameter treetops with limbs attached in the unit would create an arrangement of fuels that is more vertical than conventional ground-based or cable logging systems. The resulting fuel load would make the areas that are untreated more difficult to contain if a wildfire was to start because of the size and arrangement of the fuels. Helicopter yarding would create larger slash piles at landing areas.

3.3.6.3 Cumulative Effects

Current trends in human activity and related potential for fire starts would be expected to remain the same because access control (gates) reduces the potential for human caused fires. The cumulative potential for wildfire start and growth would increase in the short term (1-3 years) as a result of the proposed action because fuel loading on the ground would increase as a result of harvest. Cumulative potential for wildfire start and growth would decrease in the longer term (1-2 decades) as the logging slash decays and because the natural heavy fuel loading from suppression mortality (trees dying) would not be present after treatment.

Adjacent to the project area is the Bull Run watershed. Vegetation and fuels in this area are unmanaged and it poses a potential fire hazard to BLM lands. The primary sources of fire ignitions are lightning and humans. We have no control over lightening; however treatment and access control can reduce the potential for human caused fires and reduce fire intensities. There is currently no public access allowed in the proposed area and would remain under these conditions during and following treatment.

3.3.6.4 No Action Alternative

Air Quality

For air quality the no action alternative means no effect on air quality from burning, although the potential risk from more intensive wildfires would produce a large quantity of smoke in a short period of time. Since wildfires often occur under east wind conditions, the Portland metro area would be in the path of the smoke.

Fire Risk

Current trends in human activity and related potential for fire starts would be expected to remain the same because access control (gates) reduces the potential for human caused fires. Severity and the potential for a crown fire will be higher for dense stands with accumulating surface fuels in the long term (one to several decades) because of suppression mortality. Fuel loading would likely change to TL5 High Load Conifer Litter or TL7 Large Down Logs with similar fire behavior characteristics for rate of spread or flame length as the current conditions.

The major change would be that surface fires would be long duration due to more down wood and the potential for a crown fire to occur would increase due to increased ladder fuels and canopy closure.

The potential risk can change annually with weather conditions and possibly increase faster in the long term with predicted climate change. If a wildfire were to occur the effects may include: 1) total tree mortality, 2) elimination of the duff and litter layers, 3) reduction of the downed woody component, especially logs in later stages of decay, 4) increased erosion and sedimentation of water courses, and 5) formation of snags.

Consequently, without treatment potential fire hazards are greater to the neighboring communities, adjacent high value lands, Bull Run watershed, Corbett water source and private property.

3.3.7 Recreation, Visual Resources and Rural Interface (including Public Safety)

Source incorporated by reference: *Recreation, Visual and Rural Interface Resources Report*

Resource Specific Assumptions

- Access to the project area will continue to be controlled by gates and road owner policy as it now is.

Resource Specific Methodology

- The extent of Rural Interface was determined by BLM RUI maps, aerial photography and personal observations.
- Recreational uses and RUI concerns were derived from personal observations and conversations with area residents at an open house and on the phone.
- Corbett Water Board issues and concerns were derived from multiple conversations (on site in the project area, open house, at the CWB office, and telephone) in addition to their written input.
- Information on the Big Tree Trail was derived from personal observations and oral history of the undocumented creation of the trail.

Affected Environment

Recreation

The entire project area is characterized by a forest setting and is accessed by gravel forest roads. Evidence of manmade modifications such as roads, timber harvest, municipal water system improvements and old railroad grades are common on both private and public land within the general area. Recreational use of the proposed project area and vicinity appears to be low to moderate, with most of the use concentrated around the Larch Mountain environmental education site and within walking distance of public roads and the powerline access road that is usually open for public use. Local residents access the area from private land away from public access roads. The most common recreational uses appear to be hiking, bicycling, horseback riding, big-game hunting and harvesting edible mushrooms.
The private landowners commonly open their gates during at least part of the big game hunting season in the fall, which sometimes coincides with mushroom harvest season.

The Larch Mountain Environmental Education Site is located in T.1S, R.5E. Section 3. One of the proposed thinning units is located across the gravel forest road to the south. The education site consists of a trailhead with parking area, toilets and information kiosk; a trail through multiple age classes of forest and riparian area; and two picnic shelters. Approximately 500 students visit the environmental education site per year, with high numbers of visitation occurring from September through June.

The Big Tree trail, located southeast of the education site within the proposed thinning unit in section 3, is approximately a half mile long with improved trail tread (crushed rock over filter cloth). The Big Tree Trail is an unauthorized, user-created trail that is not officially a part of the Larch Mountain Environmental Education Site and there are no documented proposals to include it in the education site. However, the BLM recognizes that this trail has become popular with visitors and offers students and other visitors the opportunity to view some remnant old-growth trees adjacent to the proposed thinning unit. The "Big Tree" has died and broken off so that it is now a large diameter snag with large CWD adjacent to the trail.

Visual Resources

All of the proposed units (1724 acres) fall within Visual Resource Management (VRM) class 4. VRM class 4 areas allow for management activities that may dominate the view and be the major focus of viewer attention.

Rural Interface Areas (RIAs)

Proposed units in sections 3, 9 and 15 have residences within ½ mile. The unit in Section 9 is in a Rural Urban Interface Area according to the Salem District Resource Management Plan (RMP p. 39).

In general, the concerns of property owners near timber harvest units include: effects to the Corbett municipal water system; noise, traffic and dust from logging and hauling activities; effects to scenic (visual), recreation, water quality/aquatic habitat and wildlife values; increased public access that may lead to problems with fire hazard, garbage dumping and vandalism. Roads surrounding these proposed units have historically experienced log truck traffic.

City of Portland Communications Site Right-of-Way and Portland Water Bureau, Bull Run Watershed

The City of Portland, Oregon has been granted a right-of-way for a communications site in SE¼NE¼ section 13 adjacent to the Gordon Creek Thinning project area. The access road and buried powerline (with surface mounted utility boxes) run through the project area in section 13, and provides the closest access point (about 1000 feet) to the Bull Run Watershed within the project area. The access road is closed by a locked gate installed and maintained by the City of Portland.

There is a second gate, controlled by the City of Portland, at the BRWMU boundary in the center-east part of section 13 and the communication site is enclosed by a security fence with a third locked gate.

The Bull Run Watershed Management Unit (BRWMU) provides the major portion of the Portland municipal water supply and is a Congressionally Designated withdrawal on BLM and USFS lands. The watershed boundary traverses the SE ¼ of section 13 adjacent to the project area. The proposed thinning does not include any lands in the BRWMU (*EA section 7.2.2.1 – Logging and Transportation Maps*)

Corbett Water District Municipal Water Treatment Plant, Two Intakes, and Pipeline

The City of Corbett, Oregon, maintains a slow sand filter water treatment plant in south-central section 3, their secondary municipal water intake is on BLM land on the North Fork of Gordon Creek in south-central section 1, which is authorized under a R&PP lease. The primary municipal water intake is on private land in section 12 on South Fork Gordon Creek). Intake pipelines cross BLM land in and adjacent to the project area. Parts of the pipeline and controls are under and adjacent to haul route roads. This pipeline has been damaged in the past by winter season log hauling from operations on private land.

Environmental Effects

3.3.7.1 All Action Alternatives

Recreation, Public Safety and Visual Resources

Recreation opportunities would be locally restricted in the short term because public use of the proposed thinning units for hiking, biking, horse riding, and mushroom harvesting and unidentified dispersed activities would be restricted for weeks to months during active thinning activities. Recreation in the general area would be only minimally impacted because similar recreational opportunities are available on other nearby public and private lands.

The BLM has designed the project to avoid impacts to the Larch Mountain Environmental Education Site from logging and fuel reduction operations except for machinery noise during operations in section 3 and log truck traffic adjacent to the trailhead and parking lot, and on the logging road between the site and the Larch Mountain county road during logging operations in parts of sections 1, 3 and 11. The BLM has designed the project to provide for public safety by including speed limits and warning signs for log truck and school bus traffic that would provide a safe operating environment to prevent accidents.

Machinery noise would lessen with distance from the trailhead and should be nearly or completely inaudible at the picnic shelters. Logging and fuel reduction operations would be completed in section 3 (where the education site is located) within a few weeks between June 1 and October 31 (subject to restrictions for specific resources as described in EA chapter 2). Log truck traffic from all logging operations in those areas would occur for weeks to months between June 1 and October 31, possibly during more than one year within a 3-6 year period.

The BLM has designed the project to close The Big Tree Trail for up to one year to provide for public safety. The trail would be closed during logging and site preparation operations in section 3. The trail tread would be damaged by logging operations, rendering the trail unusable for up to a year until repairs are completed and all safety hazards mitigated. None of the old growth trees in the stand adjacent to the trail would be cut or damaged by operations, so the original apparent purpose of the trail (to view the old growth trees) would not be altered when the trail is re-opened. Observing forest stand development over the next 10-20 years after commercial thinning may also provide additional educational opportunities.

Mushroom crops for recreational harvest would be affected to an unknown extent, but some edible mushrooms appear to be stimulated by thinning the forest. See the vegetation section of this EA for additional discussion.

Visual Resources

The BLM has designed the project to avoid long term (more than five years) degradation of visual resources. After thinning, a forested setting would still be maintained throughout the project area. Changes to landscape character are expected to be low and primarily associated with disturbance to understory vegetation. Understory vegetation would be expected to exceed current levels within two to five years.

Public Safety / Rural Interface Areas (RIA's)

The BLM has designed the project to provide for public safety. Public safety relative to the Education Site is described above. Warning signs, gate closures, speed limits, flaggers and road blocks would be used to avoid dangerous encounters between members of the public and logging operations. The design features described in *EA section 2.3.4* would prevent damage and sediment from impacting the Corbett water system, BRWMU and City of Portland communications site (see following sections for more detail).

The BLM has designed the project to avoid long term (more than 5 years) impacts to the issues identified as important to the Rural Interface Areas. Effects to scenic, recreation, water quality/aquatic habitat and wildlife habitat that were identified as concerns by nearby residents are addressed under those headings in this EA.

Residents adjacent to the proposed thinning unit in section 9 would be exposed to noise and possibly dust from logging and fuel reduction operations for a (potentially discontinuous) period of two to eight weeks. Operations in other parts of the proposed project area would potentially be heard by residents within the RUI, but distance would mute the noise to background levels. The distance to other residences should prevent any dust created by operations of log hauling from reaching them. Since all haul routes are commonly used by log trucks, no changes to typical traffic patterns would be expected as a result of the proposed action.

There would be no increase in public access to the project area since gates would continue to be locked according to the road control policies of the private road owners except during the hours of active logging and hauling operations and watchmen and/or other security measures would be provided by the operator (a standard practice for security and fire prevention) to prevent unauthorized access. Therefore, there would be no increase in fire hazard, garbage dumping and vandalism associated with public access.

City of Portland Communications Site Right-of-Way and Portland Water Bureau, Bull Run Watershed:

The BLM has designed the project to avoid impact to the communication site except for potential delays of up to 30 minutes for maintenance personnel travelling to and from the site while logging operations make room for the vehicle to pass. The underground power line would be clearly identified and site specific measures taken to avoid damage. The access road would not be blocked by logging equipment overnight. No increased public access would occur because of the locked gates and the logging operator's watchman.

Risk of fire reaching or damaging the site would not be increased because of the fuels treatments to prevent intense fire or rapid spread (see the Air Quality and Fire Hazard section of this EA for additional information) and because access for firefighting forces would be improved by renovating the mid-slope road west of the site.

The BLM has designed the project so that the Bull Run Watershed and Portland municipal water supply would not be affected by the proposed action. Public access to the outer edges of the watershed would not be increased because the locked gate would remain in service, controlled by the City of Portland personnel maintaining the communication site when logging operations are not active, and closed and guarded by the operator when logging operations are active.

The road to be constructed in the SE¼ of section 13 would not increase public access because it would be behind the first of the locked gates described above and it would be blocked and made impassable after logging so that it would not provide closer access to the BRWMU boundary.

The BLM has designed the project so that there would be no increased risk of fire entering the BRWMU from BLM land in the project area. Fuels treatments have been designed to create conditions where the rate of spread and intensity are low enough to be contained by readily available firefighting forces while still outside of the BRWMU.

The thinning and fuel treatments are designed to reduce fire potential and increase control potential for decades, even if planned follow-up treatments are not accomplished, because the forest would be healthier (see the Vegetation section of this EA) and healthier forests are less prone to catastrophic fire; and because ladder fuels would have been removed and lower levels of fuel accumulation would be expected compared to the No Action alternative as described in the Air Quality and Fire Hazard/Risk section of this EA.

Corbett Water District Municipal Water Treatment Plant, Two Intakes, and Pipeline

The BLM has designed the project to avoid negative effects to water quality for the Corbett municipal water supply as described in the Hydrology section of this EA. Municipal water intakes, municipal wells and private wells and water intakes are not close enough to proposed thinning units to be damaged by operations and no evidence of potential indirect impacts (other than the water quality issues discussed under Hydrology) has been found by the BLM.

The BLM has designed the project to avoid impacts to the Corbett pipeline by limiting log hauling on the roads in right-of-way to the dry season when the roads are firm and solid. Therefore, no damage to the pipeline would be expected. The BLM has also designed the project to prevent impacts to the Corbett water treatment plant since speed limits and dust abatement measures adjacent to the treatment plant would prevent road-generated dust from reaching the facility. Detailed measures to prevent damage and procedures for promptly identifying and repairing any accidental damage that may occur would be defined in a Memorandum of Understanding between the BLM and the Corbett Water District.

Differences In Effects Between The Original And Current Proposed Actions

- The BLM has identified additional specific measures to protect the Corbett water supply. Dry season haul on the pipeline road, speed limits, dust abatement and agreements governing prompt repair of any accidental damage would avoid impacts to Corbett water supply facilities.
- See the Hydrology section of this EA for discussion of differences that could affect water quality at the Corbett water intakes.
- See the Air Quality and Fire Hazard/Risk section of this EA for discussion of changes in fuel treatments in the Corbett municipal watershed and adjacent to BRWMU.

3.3.7.2 Alternatives 2 and 3

The effects of Alternatives 2 and 3 would be the same as for the Proposed Action except:

- § Helicopters would be heard and seen. However, because the distances would be over ½ mile from residences, this should only be at or below the level of background noise.
- § While there would be some differences in the appearance of areas logged with a helicopter, the overall visual character of the thinned areas would be similar to the casual observer.
- § Fewer roads would be available for firefighter access in the event of a wildfire, increasing the potential for a fire to become larger in the Corbett municipal watershed or to run uphill toward the communication site. This would not affect the BRWMU because the road to be constructed would be made impassible under the proposed action, so the absence of the road makes no difference to fire control tactics.
- § There would be an unpredictable risk of a helicopter crash that could introduce contaminants into the Corbett municipal watershed or the outer edge of the BRWMU.

3.3.7.3 Cumulative Effects Analysis

Rural Interface Areas (RIAs)

No cumulative to rural interface areas are expected. Public safety along haul routes would be minimally affected because log truck traffic from forest management activities on both private and public land is common and because project design features such as speed limits and warning signs near logging activities would provide for public safety.

3.3.7.4 No Action Alternative

- With the exception of unplanned changes (i.e. wildfire, disease etc.) no modifications to the landscape character of the proposed units would be expected to occur.
- No changes to current recreation opportunities would occur.
- If a wildland fire were to escape initial attack, there would be no fuel breaks to slow the rate of spread before the fire reached the communication site, the BRWMU boundary, or private property. Therefore, there could be increased risk of fire damage to these values.
- There would be no change to current use patterns. Logging and hauling would continue to be frequent activities since much of the surrounding land is private industrial forest land where timber management is a common practice. Use of the Larch Mountain Education Site and the loop trail south of the Site and water treatment plant would continue.

- The Corbett water providers would continue to use the road facilities. Low levels of horse riding, bicycle riding and hiking recreation use would continue.

3.3.8 Cultural Resources

Sources Incorporated by Reference: *Cultural Resource Inventory Reports, Gordon Creek Thinning Timber Sale Pre-project Surveys.* ***Additional Sources Referenced:*** *A History of the Bridal Veil Lumbering Company, Bill Carr, USFS 1983; BLM Archival Records Metsger's Atlas; http://en.wikipedia.org/wiki/Bridal_Veil,_Oregon; http://bridalveiloregon.com/*

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 referenced 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 as having potential to contain cultural resources. In addition they examined other areas noticed during surveys that had potential for human activity (such as flat areas suitable for camping or cabins).

Affected Environment

The cultural resources found in the project area and vicinity are interesting, but they are not unique, do not provide new or significant information about forest use or domestic life in the early to mid 20th century, are too scattered, deteriorated and incomplete to lend themselves to public interpretation, and are not eligible for listing on the National Register of Historic Places. No prehistoric sites have been found. No mitigation, beyond recording and mapping sites and railroad routes, is recommended by the District Archaeologist.

Railroad grades and associated features for logging and transporting logs to the sawmill at Palmer are the most prominent artifact of historical human activity in the project area. The routes have been mapped. While there were several trestles in and near the project area, the only remains of those collapsed trestles are piles of rotting timbers with spikes and bolts. Some old ties are occasionally evident in the railroad grades, often only as moss growing on the last remains of rotted wood. Pieces of rail are rare. No machinery has been found. These routes have been noted and mapped. These railroad logging activities in the Gordon Creek area were carried out by the Bridal Veil Lumbering Company. The history of this company and its logging operations and technology are well documented in several public documents including the 1983 publication by Bill Carr.

Four donkey engine sleds were found, three on BLM and one on private land. One of them is quite large, made of 30-36 inch diameter logs approximately 60 feet long. No machinery remains on any of the sleds. Loading boom logs were found near the largest of these sleds in section 1. These sites have been mapped and described.

The collapsed remains of small structures and some garbage dumps were found in the project area. Trash dumps contain mostly rusted cans, broken glass and bleach bottles. One site had some oyster and clam shells. The sites are recorded, but do not yield information beyond casual interest.

No prehistoric sites have been found, and none were expected because the entire area was so heavily disturbed by logging operations in the 1930s. Most of the ground in the project area is covered by a layer of litter and duff that obscures the ground.

Environmental Effects

3.3.8.1 All Action Alternatives

Some of the old railroad grades and truck roads would be used as truck roads and skid trails, which would preserve their location and general form, but would change the appearance from rustic/overgrown to currently useable roads. Traces of old ties in these locations would be removed. Some decaying piles of collapsed small structures, timbers and rough-cut lumber would be broken up and removed. The trash dumps that are in the treated project area would be logged over, but since the material there is already broken glass and smashed, rusting tin cans, no cultural resources with values exceeding casual interest would be damaged and the existing material would remain on site.

3.3.8.2 No Action Alternative

Cultural resources in the area would continue to deteriorate as wood decays and metal parts rust. Durable materials such as ceramic and glass fragments and metal would continue to be covered by duff and litter accumulation.

3.3.9 Carbon Storage, Carbon Emissions, and Climate Change

Sources Incorporated by Reference: *Gordon Creek Carbon Calculation notes (GC Carbon Notes), 2008 FEIS: Volume I, Pages 220-224; Volume II, Pages 537-543, and Volume III, Appendices, Pages 28-30, USGS May 14 Memo on Carbon Emissions and Climate Change, and Memo on Carbon in Harvested Wood.*

Resource Specific Methodology

On July 16, 2009, the U.S. Department of the Interior withdrew the Records of Decision (2008 ROD) for the Western Oregon Plan Revision. The information contained in the Final Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management (2008 FEIS) is relevant since it examined recent and applicable science regarding climate change and carbon storage. That analysis concluded that effects of forest management on carbon storage could be analyzed by quantifying the change in carbon storage in live trees, storage in forests other than live trees, and storage in harvested wood. The discussion on Volume I, Pages 220-224; Volume II, Pages 537-543, and Volume III, Appendices, Pages 28-30 are relevant to the effects analysis for this project and are incorporated by reference.

Project effects to carbon storage and carbon as greenhouse gases will be applied to all action alternatives. The difference between alternatives with regard to carbon analysis is too small to be discernable because the action alternatives are similar with respect to the features that would affect carbon storage (acres, forest type, emissions from harvest equipment). References cited for this analysis can be found in EA section 9.0 under Carbon Storage, Carbon Emissions, and Climate Change.

Context –Greenhouse Gases, Climate Change and the Spatial Scale for Analysis

Uncertainty about the nature, effects and magnitude of the greenhouse gases and global climate change interrelationship is evident in a wide range of conclusions and recommendations in the literature reviewed. However, Forster et. al. 2007 (pp. 129-234), which is incorporated here by reference, concluded that human-caused increases in greenhouse gases are extremely likely to have exerted a substantial effect on global climate. The U.S. Geological Survey, in a May 14, 2008 memorandum to the U.S. Fish and Wildlife Service, summarized the latest science on greenhouse gases and concluded that it is currently beyond the scope of existing science to identify a specific source of greenhouse gas emissions or sequestration and designate it as the cause of specific climate impacts at a specific location. This defines the spatial scale for analysis as global, not local, regional or continental. That memorandum is incorporated here by reference. Based on the BLM's review of statutes, regulations, policy, plans and literature, the BLM accepts the conclusions above as appropriate context for a reasoned choice among alternatives.

Context – Temporal Scale for Analysis

This analysis will assess short-term and long-term effects on carbon storage and carbon emissions. The BLM has selected 0-10 years as the analysis period for short-term effects on carbon storage and carbon emissions, because this time period would encompass the duration of all of the direct emissions from the proposed thinning.

The BLM has selected 11-30 years as the analysis period for long-term effects on carbon storage and carbon emissions for this project. Within 30 years following the proposed thinning, net carbon storage would equal or exceed the carbon storage prior to thinning, therefore this period would be expected to encompass the duration of the direct and indirect effects on carbon storage and carbon emissions from thinning in the Gordon Creek project area. In addition, 20-30 years following the proposed thinning in the Matrix LUA, BLM staff would assess the stands for regeneration harvest or another partial cut harvest based on how well the trees grew during the 30 year period, and whether the trees would meet the RMP timber management objectives of achieving a balance between wood volume production, quality of wood, and timber value at harvest (RMP p. 46). In 20-30 years, the BLM would also assess portions within the Riparian LUA to determine whether any further density management treatments would increase the development of late successional habitat conditions in line with the Aquatic Conservation Strategy.

Context – Calculations of Carbon Storage and Carbon in Greenhouse Gas Emissions, Project Area Scale

The purpose of the calculation of carbon storage is to provide a basis for evaluating the significance of carbon storage relative to the temporal and spatial scale. The BLM calculated estimates of existing carbon stores, of carbon to be removed by the proposed thinning, of storage of removed carbon, and of future carbon storage in the remaining trees in the stand.

The Gordon Creek Carbon Calculation notes (GC Carbon Notes) are incorporated here by reference.

The BLM used site specific data from stand exams as input to the Oregon Growth Analysis and Project System Growth and Yield Project for Northwest Oregon Forests (Version 8.2 – 2006) (ORGANON) (a forest stand model) to determine stand growth over the analysis period. With the Gordon Creek stand growth data, the BLM calculated carbon in the live trees and other than live tree pools using the methodology described in the 2008 FEIS Appendix C, pp. 28-29.

The analysis of carbon stored in harvested wood in the 2008 FEIS used a factor for converting board feet of harvest wood to mass of carbon from Smith et al. 2006, p. 35. Based on information developed after the 2008 FEIS, this factor has been refined to better account for regionally-specific conditions and the fraction of harvested volume that is typically milled into solid wood products and into processed wood products. Harvest volumes were converted to cubic feet, converted to pounds of biomass, and then to carbon content, yielding an overall conversion factor of 1,000 board feet = 1.326 tonnes of carbon. Of this total amount of carbon in harvested wood, 63.8% of harvest volume is considered as sawlogs and 36.2% as pulpwood (GTR RM-199, Table B-6), for evaluation using the storage rates over time from Smith et al. 2006, p. 27. The improved conversion factor is used in this analysis to evaluate the amount of carbon stored in harvested wood. Information on the development of this conversion factor is on file in the BLM office and is available for review upon request and is incorporated here by reference (R. Hardt, personal communication, 11/6/09, on file in the Salem BLM Office). The effect of the 2008 FEIS alternatives on carbon storage has been reanalyzed based on this improved conversion factor. This re-analysis revealed a slight increase in the amount of carbon storage over time for all alternatives and less difference among the alternatives than described in the 2008 FEIS, pp. 537-543. Overall, this re-analysis revealed no change in the magnitude or trend of effects on carbon storage from that described in the 2008 FEIS.

Carbon emissions from equipment used in harvest operations were calculated based on BLM staff interviews with purchasers who buy timber sales in the local area, fuel consumption specifications from equipment manufacturers' published information, and field observations by BLM personnel. The BLM fuels specialist calculated the carbon associated with the burning of harvest generated fuels.

Affected Environment

Climate Change

The Final Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management (2008) described current information on predicted changes in regional climate (pp. 488-490) and is incorporated here by reference. That description concluded that the regional climate has become warmer and wetter with reduced snowpack, and continued change is likely. That description also concluded that changes in resource impacts as a result of climate change would be highly sensitive to specific changes in the amount and timing of precipitation, but specific changes in the amount and timing of precipitation are too uncertain to predict at this time.

Because of this uncertainty about changes in precipitation, it is not possible to predict changes in vegetation types and condition, wildfire frequency and intensity, streamflow, and wildlife habitat.

In addition, The U.S. Geological Survey, May 14, 2008 memorandum to the U.S. Fish and Wildlife Service (incorporated here by reference), summarized the latest science on greenhouse gases and concluded that it is currently beyond the scope of existing science to identify a specific source of greenhouse gas emissions or sequestration and designate it as the cause of specific climate impacts at a specific location.

Carbon Storage

The following show total quantities of carbon in forest ecosystem vegetation[50] worldwide, in the United States, the Pacific Northwest and in the Gordon Creek project area.

- Total carbon, forest ecosystem vegetation, Worldwide (Matthews et al, 2000, p. 58) = 132-457 Gt[51]
- Total carbon, forest ecosystem vegetation, United States (US EPA, 2009) = 27 Gt
- Total carbon, forest ecosystem vegetation, Pacific Northwest, Cascades Range =1.5-1.7 Gt (Hudiburg, et al., 2009)
- Total carbon, forest ecosystem vegetation, Gordon Creek proposed thinning units = 0.0003 Gt (335,200 tonnes), which consists of live tree carbon (269,300 tonnes) and other than live tree carbon (65,900 tonnes).
- The annual accumulation of carbon from forest management in the United States is 191 million tonnes (.191 Gt), and 1.69 million tonnes (.169 Gt) from current management on BLM-managed lands in western Oregon (2008 FEIS, p. 4-537).

Environmental Effects

3.3.9.1 All Action Alternatives

Total carbon in forest ecosystem vegetation can be divided into three pools: live trees (foliage, branches, stems, bark and live roots of trees), forest carbon other than live trees (dead wood and roots, non-tree vegetation, litter and soil organic matter) and harvested wood products. As a result of thinning, BLM carbon calculations show that the overall on-site forest ecosystem vegetation carbon storage would decrease from 335,200 tonnes C to 228,400 tonnes C. The proposed thinning would cause direct effects on greenhouse gas levels by emitting carbon from harvest operations and fuel treatment.

Short-term Effects (0-10 years after timber harvest):

Harvest Operations

Harvest operations would emit carbon as greenhouse gases.

[50] Carbon contained in both above ground and below ground parts of trees and forest vegetation, and downed wood, litter and duff. It does not include mineral carbon in soil, nor fossil fuels.
[51] Metric tons are referred to in this document as tonnes. A Giga-tonne (Gt) is one billion tonnes (metric tons).

Using the methodology described in the beginning of EA section 3.3.9, BLM staff calculated an average fuel consumption of 2.75 gallons per 1 mbf (timber volume) from standing timber on site to the sawmill. Fuel consumption for harvest operations for all of the Gordon Creek timber sales (Gordon Creek Thinning I, Gordon Creek Thinning II, and Gordon Creek Thinning III timber sales) would total an estimated 110,000 gallons. This represents total emissions of approximately 300 tonnes of carbon (GC Carbon Notes).

Live Trees Pool

Thinning would directly affect the live trees pool because the project would remove live trees. The proposed thinning would remove approximately 106,880 tonnes of carbon from the live trees pool. *Table 16* shows that approximately 164,420 tonnes of carbon would be retained in the live trees pool available for future growth and carbon storage, from the pre-treatment levels of 269,300 tonnes of carbon.

Harvested Wood Products Pool

Some of the carbon in harvested trees is stored in various forms; some is emitted to provide energy; and some is emitted without energy capture. Harvested saw log gross volume at Gordon Creek of 40,000 Mbf would contain 53,040 tonnes (1 Mbf = approximately 1.3 tonnes carbon). Much of the emissions from harvested wood would occur shortly after harvest. In the first 10 years after harvest, approximately 12,090 tonnes of carbon (23 % of the total carbon in sawlogs) would be emitted as a result of the proposed project.

Forest Carbon Other Than Live Trees Pool

The remaining 53,840 tonnes of carbon from the live trees pool would be converted to forest carbon other than live trees - dead material that would remain on-site. Pile burning approximately 3,530 tonnes of biomass from 723 acres would emit a total of approximately 1,600 tonnes of carbon as greenhouse gases (GC Carbon Notes).

The remainder of the on-site dead material would decay over time. In all alternatives, including the no action alternative, the decay of dead material (dead wood and roots, non-tree vegetation and litter) would result in some portion of carbon emitted and some portion of the carbon entering into long-term storage as soil carbon. The rate of emissions from decay of dead material is unknown. Furthermore, it is not known whether the rate of emissions from decay of dead material, or the amount of dead material would differ between the action alternatives and the no action alternative. Therefore, emissions from decay of dead material are not quantified in this analysis.

Long-term Effects (11-30 years after timber harvest):

Live Trees Pool:

Following thinning, approximately 80-120 of the largest trees per acre would remain on site (*Table 19*). These trees would store carbon as they grow. *Table 16* shows, live tree carbon would increase to 304,340 tonnes after 30 years of growth, an increase of 141,920 tonnes from the post harvest of 164,420 tonnes Thirty years after thinning, there would be an overall increase in live tree carbon of 35,040 tonnes from pre-harvest levels (short term change in live tree pool + long term change in live tree pool).

Harvested Wood Products Pool

From 11-30 years after harvest an additional approximately 3,090 tonnes of carbon (6 % of the total carbon in sawlogs) would be emitted from harvested wood. Approximately 37,860 tonnes (71% of the total harvested carbon) of the carbon would remain stored in wood products still in use, in landfills, or emitted with energy capture (2008 FEIS, pp. 540-541; Appendices, p. 30).

Summary of Changes in Carbon Storage

Table : Summary of Carbon Storage and Carbon in Greenhouse Gas Emissions (GC Carbon Notes)

Source	Tonnes Carbon (C)		Notes
	Action Alternatives	No Action Alternative	
#1. C Storage in live trees pool 2010 (current conditions)	269,300	269,300	
Carbon Storage			
#2. C Storage in live trees pool (after thinning) 2010	162,420	269,300	
#3. Increase, C Storage in live trees pool, Growth Period (30 years)	141,920	180,970	#4 - #2
#4. C Storage in live trees pool, 2040	304,340	450,270	#2 + #3
#5. C Storage in harvested wood after 30 years	37,860	0	71% of C in harvested wood products (53,040 tonnes C)
#6. Total Carbon Storage, Analysis Period (2010-2040)	342,200	450,270	#4 + #5
Carbon Emissions			
Short Term Emissions (0-10 years)			
#7. Harvested wood	12,090	0	
#8. Harvest operations	300	0	
#9. Fuel treatment (burning)	1600	0	
#10. Total Short term emissions	13,990	0	
#11. Long term emissions from harvested wood (11-30 years)	3,090	0	
#12. Total Carbon Emissions, Analysis Period (2010-2040)	17,080	0	
#13. Net Carbon Storage, Analysis Period (2010-2040)	325,120	450,270	#6 - #12
#14. Net Increase - Carbon Storage, Analysis Period (2010-2040)	55,820	180,970	#13 - #1
#15. Net Increase - C Storage in live trees pool, Analysis Period (2010-2040)	35,040	180,970	#4 - #1
Increase, C Storage in live trees pool, Growth Period (10 years)	49,950	63,830	Tree growth

Table 16 shows that during the 30 year analysis period the effects of the proposed thinning would be a net increase in carbon storage of 55,820 tonnes C. BLM carbon calculations show that 10 years after treatment, the live tree carbon in the thinned stands (49,950 tonnes C) exceeds the carbon emissions resulting from the proposed thinning (17,080 tonnes C).

Carbon calculations also show that 30 years after treatment, the live tree carbon in the thinned stands (304,340 tonnes C) exceeds the carbon storage before thinning (269,300 tonnes C).

3.3.9.2 Cumulative Effects

The proposed thinning would contribute to cumulative effects to carbon storage and carbon emissions. *Table 16* shows that carbon emissions resulting from the proposed thinning over the next 10 years would total 13,990 tonnes of carbon or 51,340 tonnes of carbon dioxide (tonnes C*3.67) (0.00005 GT). Current annual global emissions of carbon dioxide total 25 billion tonnes (25 GT) of carbon dioxide, (IPCC 2007, p. 513), and current annual U.S. emissions of carbon dioxide total 6 billion tonnes (6 GT) (EPA 2007, p 2-3). Global emissions over 10 years total 250 billion tonnes of carbon dioxide and U.S. emissions of carbon dioxide total 60 billion tonnes. Therefore, the short-term emissions from the proposed thinning would constitute 0.0000002% of current global emissions and 0.0000009% of current U.S. emissions for the 10 year period. This emission would be so small that its incremental contribution to global and national emissions would be not be measurable at the level of precision of the global and national emissions.

In addition, the net carbon emissions would be of short duration. Within 10 years, the remaining trees in the harvest units would sequester 49,950 tonnes of carbon, restoring the carbon loss from fuel burning, harvested wood, and harvest operations emissions (*Table 16*). Over the thirty years following the proposed thinning, the increase of 35,040 tonnes of live tree carbon would contribute to an annual average of 1,170 tonnes (0.001 million tonnes), or 0.000006% of the U.S. annual accumulation of carbon from forest management of 191 million tonnes; or 0.0007% of the annual accumulation of 1.69 million tonnes of carbon as a result of current implementation on BLM-managed lands in western Oregon. (2008 FEIS, p. 4-537).

The 2008 FEIS (p. 4-538), which is incorporated here by reference, states that by 2106, the No Action Alternative (management under the 1995 RMP) would result in a total carbon storage of approximately 628 million tonnes, 9% higher than average historic conditions (576 million tonnes, 2008 FEIS, 3-224, as reanalyzed in November 6, 2009 memo, on file and incorporated by reference, Cascades Resource Area) (See Methodology earlier in this section).

3.3.9.3 No Action Alternative

Under the no action alternative, no carbon as greenhouse gases would be emitted from harvest operations or fuels treatments. Carbon stored in live trees would not be converted to the harvested wood carbon pool, and would be converted to the other than live tree pool through ongoing processes of tree mortality. *Table 16* shows live tree carbon would increase to 450,270 tonnes after 30 years of growth, an increase of 180,970 tonnes from the 2010 levels (269,300 tonnes). The no action alternative would result in greater increase in net carbon over the 30 year analysis period than the proposed action by approximately 125,150 tonnes.

3.3.9.4 Cumulative Effects, No Action Alternative

The increase of 180,970 tonnes of live tree carbon associated with the no action alternative would contribute to an annual average of 6,030 tonnes, or 0.00003% to the U.S. annual accumulation of carbon from forest management of 191 million tonnes; or 0.004% of the annual accumulation of 1.69 million tonnes of carbon as a result of current implementation on BLM-managed lands in western Oregon. (2008 FEIS, p. 4-537).

3.4 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:

1. ***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*)

2. ***ACS Component 2 - Key Watershed***: The project would comply with Component 2 by establishing that the Gordon Creek project is not within a Key watershed. (RMP p. 7).

3. ***ACS Component 3 - Watershed Analysis:*** The project would comply with Component 3 by incorporating the following recommendations from the Gordon Creek Watershed Analysis [July 2006].

- Terrestrial Recommendation 1: Density management and 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 50% average crown closure in Riparian Reserve. Low-density areas enhance spatial variation and provide for development of opening/shrub/edge habitat for 10-20 years. Untreated areas provide additional range of species and density mix.(WA 11-3,4)
- Terrestrial Recommendation 2: Develop standing dead and down LWD by leaving enough trees for future recruitment if needed. Thinning would leave many times the recommended retention to develop large trees for future recruitment. Low-density canopy gaps retain at least the recommended retention levels. This goal would be achieved over time.(WA 11-5,6)
- Terrestrial Recommendation 3: Road densities. Many existing roads in the project area are being decommissioned by natural processes and would continue to do so. Roads to be constructed, improved or renovated for use in this project would be located on ridgetops and stable, gentle slopes to avoid sedimentation impacts. Roads used in the project would be stabilized and closed after use. (WA 11-6)
- Terrestrial Recommendation 4: Noxious weeds. Equipment washing required. Vegetation Management EIS provides further guidance. (WA 11-6,7)

- Aquatic Recommendation 1: Riparian Condition and LWD on Federal Lands, accelerate growth for recruitment of LWD for stream structure. Thinning is designed to accelerate growth. Suitable large trees would be available years to decades sooner than without treatment.
- Aquatic Recommendations 3-7: Stream flows, water quality, ODEQ 303(d), and stream temperatures. The project would not contribute to detectable changes in these elements. (WA 11-8)
- Aquatic Recommendation 7 - Soils, Slope Stability and Mass Wasting: Project design avoids erosion. There are no slides or bare slopes identified in the project area. (WA 11-8)
- Human Uses Recommendation 1 – Timber Management in the Matrix Land Use Allocation. Provide timber sales that are marketable, provide a balance between wood volume/quality/value, and maintain a healthy forest ecosystem. The project was designed so that all action alternatives achieve these objectives.

4. ***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 three Action Alternatives do not retard or prevent the attainment of any of the nine ACS objectives for the following reasons.

1. **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 3.3.1, 3.3.5*). In summary:

   No Action Alternative: The No Action alternative would maintain the development of the existing vegetation and associated stand structure at its present rate. The current distribution, diversity and complexity of watershed and landscape-scale features would be maintained. Faster restoration of distribution, diversity, and complexity of watershed and landscape features would not occur.

   Action Alternatives: The proposed combination of thinning from below, low-density thinning and unthinned areas in the Riparian Reserve Land Use Allocation (RR) 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.

Since Riparian Reserve provides travel corridors and resources for aquatic, riparian dependant and other late-successional associated plants and animals, the increased structural and plant diversity would ensure protection of aquatic systems by maintaining and restoring the distribution, diversity and complexity of watershed and landscape features.

2. **ACSO 2: Maintain and restore spatial and temporal connectivity within and between watersheds.** Addressed in Text *(EA sections 3.3.1, 3.3.5)* In summary:

   No Action Alternative: The No Action alternative would have little effect on connectivity except in the long term within the affected watersheds.

   Action Alternatives: Long term connectivity of terrestrial watershed features would be improved by enhancing conditions for stand structure development. In time, the Riparian Reserve LUA would improve in functioning as refugia for late successional, aquatic and riparian associated and dependent species.

   Both terrestrial and aquatic connectivity would be maintained, and over the long-term, as the Riparian Reserve LUA develops late successional characteristics, lateral, longitudinal and drainage connectivity would be restored.

3. **ACSO 3: Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.** Addressed in Text (*EA sections 2.3.4, 3.3.2, and 3.3.3*). In summary:

   No Action Alternative: It is assumed that the current condition of physical integrity would be maintained.

   Action Alternatives: Maintains: Physical integrity of channels at existing stream crossings would be altered for one to several years following repair/maintenance and installation/removal of temporary stream crossings (2 temporary crossings under Action Alternative 1; 1 temporary crossing under Action Alternative 3; no temporary crossings under Action Alternative 2) 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 when the crossing is removed. Due to the stable nature of channels at these locations, little to no additional disturbance to channel morphology would be expected either upstream or downstream from the crossings.

4. **ACSO 4: Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems.** Addressed in Text (*EA sections 2.3.4, 3.3.2, and 3.3.3*). In summary:

   No Action Alternative: It is assumed that the current condition of the water quality would be maintained.

Action Alternatives: Stream Protection Zones (SPZs) in the Riparian Reserve LUA (RR) would be maintained. The proposed new and improved roads are on ridge top or upper-slope locations with no hydrologic connections or proximity to streams or riparian areas. Overall, these action alternatives would be unlikely to have any measurable effect on stream temperatures, pH, or dissolved oxygen. Sediment transport and turbidity in the affected watersheds is likely to increase over the short term as a direct result of road repair and construction, hauling and yarding in and around the RRs. Sediment increases would not be visible beyond 800 meters (0.5 mile) downstream from road/stream intersections and would not be expected to affect fish, aquatic species or habitat, or human uses. Over the long-term (beyond 3-5 years), current conditions and trends in turbidity and sediment yield would likely be maintained under the action alternatives.

5. **ACSO 5: Maintain and restore the sediment regime under which aquatic ecosystems evolved.** Addressed in Text (*EA sections 2.3.4, 3.3.2, and 3.3.3*). In summary:

   No Action Alternative: It is assumed that the current levels of sediment into streams would be maintained.

   Action Alternatives: Stream protection Zones (SPZs) in RRs would be maintained (minimum of 60 feet on fish bearing streams and 25 feet on non-fish bearing streams in treatment areas). Hauling restrictions and sediment control measures would minimize sediment delivery. Short-term localized increases in stream sediment can be expected during temporary culvert installation and removal, but BMPs and mitigation measures would be implemented to limit acceleration of sediment delivery to streams.

6. **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 2.3.4, 3.3.2, and 3.3.3*). In summary:

   No Action Alternative: No change in in-streams flows would be anticipated.
   Action Alternatives: A preliminary analysis for the risk of increases in peak flow as a result of forest harvest was conducted using the Oregon Watershed Assessment Manual watershed analysis methods for forest hydrology (OWEB, 1997). Because the proposed project would remove less than half the existing forest canopy and only a small fraction of the forest cover (roads and landings), it is unlikely to produce any measurable effect on stream flows. Within the Riparian Reserve, the riparian canopy would be retained intact within the primary shade zone and substantial portions of the canopy would be retained in the secondary shade zone, therefore maintaining riparian microclimate conditions and protecting streams from increases in temperature.

7. **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 2.3.4, 3.1*). 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.

Action Alternatives: There would be no alteration of any stream channel, wetland or pond morphological feature. All operations, equipment and disturbances are kept a minimum of 60 feet from all wetlands and perennial stream channels, and 25 feet from all intermittent stream channels. Thus, the current condition of floodplain inundation and water tables would be maintained.

8. **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 2.3.4, 3.3.2, and 3.3.3*). In summary:

   No Action Alternative: The current species composition and structural diversity of plant communities would continue along the current trajectory. Diversification would occur over a longer period of time.

   Action Alternatives: SPZs would maintain the current species composition and structural diversity of plant communities in riparian areas and wetlands from 25 feet (intermittent streams) to 60 feet (perennial streams) in treatment areas. Additional no treatment buffers would expand this to 100 feet along Gordon Creek in section 1. Thinning and low density canopy gaps (section 13 only) in Riparian Reserve LUA outside of the SPZs would help to restore diversity in species composition by allowing more understory development and help to restore structural diversity by creating horizontal and vertical variations that are currently lacking in the riparian treatment areas.

9. **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 2.3.4, 3.3.1, 3.3.2, 3.3.3 and 3.3.5*). 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.

   Action Alternatives: The action alternatives would have no adverse effect on riparian dependent species. Populations of sensitive mollusks in spring heads in the area would be protected by untreated buffers that are generally one site-potential tree height wide (except where existing features, such as roads, define a logical boundary). Although thinning activities may affect other 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.

3.4.1 Comparison of Alternatives with regard to the Decision Factors

This section compares the alternatives with regard to the Decision Factors described in *EA section 1.2.3* and the project objectives in *EA section 1.2.2*.

a. Provide timber resources and revenue to the government from the sale of those resources (objectives 1 and 2);
b. Reduce the costs both short-term and long-term of managing the lands in the project area objectives 1 and 2); and
c. Provides safe, cost-effective access for logging operations, fuels management and fire suppression (objectives 2, 6, and 7):

   The No Action Alternative would not meet this factor since no timber sale would take place.

   All action alternatives would provide timber resources to the market. However the Proposed Action would be the most cost effective alternative, providing the greatest revenue with the least logging costs. Alternative 2 would the least cost effective, providing the least revenue, with the most logging costs. Alternative 3 would fall between the other action alternatives. The difference between the alternatives is the economic viability of helicopter logging systems compared to skyline and ground based logging systems. Costs differences include the costs of helicopter time, fuel, road construction/improvement, and landing construction (Table 5, *EA section 2.6*).

d. Reduce competition-related mortality and wildfire risk, and increase tree vigor and growth (objectives 1 and 7):

   The No Action Alternative would not meet this decision factor.

   All action alternatives would meet this factor. (*EA sections 3.3.1 and 3.3.6*).

e. Protect the City of Corbett's water supply (objective 3):

   The No Action Alternative meets this factor.

   With the implementation of project design features, all action alternatives meet this factor. At the beginning of the analysis, there was a question as to whether installing a temporary crossing NE ¼ of section 1 in the proposed action would result in sediment that could affect the water quality at the intake. The environmental analysis shows that any sediment produced would settle out before reaching the intake (insert hydrology section); therefore there is no measureable difference in effects between the action alternatives. The analysis also showed that there was no measurable difference in effects to water quality between helicopter logging systems and skyline/ground based logging systems (*EA section 3.3.2*). Project design features protecting water quality, and protecting infrastructure, including intakes, pipelines and the water treatment plant are described in *EA section 2.3.4.*

f. Reduce erosion and subsequent sedimentation from roads (objectives 3 and 6):

   All action alternatives meet this criterion.

Under the No Action Alternative, there is no opportunity to remove and rehabilitate the failing stream crossing adjacent to the project area in the NE1/4 of section 1, which could result in erosion and sedimentation as the culvert fails.

Under the action alternatives, roads would be maintained, reducing the risk of erosion and sedimentation associated with the existing road system. New road construction and improvement would not cause sedimentation. Potential for sedimentation associated with stream crossing and haul routes would be the same under all action alternatives *(EA sections 2.3.4, 3.3.2 and 3.3.3)*

g. Provide for the establishment and growth of conifer species while retaining structural and habitat components, such as large trees, snags, and coarse woody debris (objectives 4 and 5);
h. Promote the development of healthy late-successional characteristics in the Riparian Reserve land use allocation (objective 4);

Under the No action alternative, **s**tand health and tree growth rates would decline if stands are not thinned. Competition would result in mortality of smaller trees and some co-dominant trees in the stands. This alternative retains existing elements, but does not enhance conditions to provide these elements for the future stand. Trees would continue to grow slowly until reaching suitable size for large woody debris, snags and late successional habitat (*EA sections 3.3.1, 3.3.5*)

All Action Alternatives would meet decision factors **g** and **h**. Stand health and tree growth rates would be maintained as trees are released from competition. The alternatives retain the elements described under "no action" on untreated areas of the stands in the project area and encourage development of larger diameter trees and more open stand conditions in treated areas. These conditions add an element of diversity to the landscape not provided on BLM lands not provided under the No Action alternative. (*EA sections 3.3.1, 3.3.5*).

i. Establish a defensible area for use during extended fire suppression activities and possibly reduce the overall size of a wildfire (objective 7).
j. Reduce potential human sources of wildfire ignition by controlling access (objective 7).

All alternatives meet Decision Factors **i** and **j**. See *EA sections 2.3.4, 3.3.6 and 3.3.7*. However, under the No Action Alternative, dense forest stands with high crown densities are more susceptible to a high intensity, stand replacement wildfire that escapes initial attack and could threaten the public and other resources.

Under the Action Alternatives, managed, thinned forest stands are less prone to catastrophic wildfires. Fires that do start tend to be easier to control in managed stands. Maintaining logging roads provides faster access for suppression forces if a fire does start. The road system into the Gordon Creek project area is currently gated, and controlled by land owners, including the City of Portland. These owners control access to their properties. Under the action alternatives, fuels would be treated adjacent to roads, further decreasing the risk of human-caused ignition, where public access is available. See *EA sections 2.3.4, 3.3.6 and 3.3.7*.

4.0 LIST OF PREPARERS

Table : List of Preparers

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Hydrology/ Water Quality	Patrick Hawe
Logging Systems	Michael Barger
Recreation, Visual Resources Management and Rural Interface	Zachary Jarrett
Silviculture	Charley Thompson
Soils	Patrick Hawe
Wildlife	Jim England

5.0 CONTACTS AND CONSULTATION

5.1 Consultation

5.1.1 ESA Section 7 Consultation

5.1.1.1 US Fish and Wildlife Service

The timber sale 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 FY2009/2010 consultation process. The *Biological Assessment of NLAA Projects with the Potential to Modify the Habitat of Northern Spotted Owls Willamette Planning Province - FY 2009-2010* (BA), was submitted in August 2008. Using effect determination guidelines, the BA concluded that the Gordon Creek Thinning may affect, but is not likely to adversely affect the northern spotted owl due to the modification of dispersal habitat (BA, pp. 21-23).

The *Letter of Concurrence Regarding the Effects of Habitat Modification Activities within the Willamette Province, FY2009-2010* (LOC) associated with the Gordon Creek Project was issued in October 2008 (reference # 13420-2008-I-0140). The LOC concurred that the habitat modification activities described in the BA, including the Gordon Creek Thinning, are not likely to adversely affect spotted owls and are not likely to adversely affect spotted owl Critical Habitat (LOC, p. 31).

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. 31).

The proposed thinning and connected actions described in this EA have incorporated the applicable General Standards that were described in the BA (p. 6-7) and LOC (LOC, pp. 12-14).
This includes 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.

5.1.1.2 NOAA Fisheries (NMFS)

Consultation with the National Marine Fisheries Service on the potential effects of the proposed project on LCR coho salmon and LCR steelhead trout has been completed. Consultation has been conducted under the *Biological Assessment for Fiscal Year 2007-2009 Low-Risk Thinning Timber Sales on the Mt. Hood and Willamette National Forests, and portions of the Eugene and Salem Bureau of Land Management Districts.* A Letter of Concurrence from NOAA Fisheries, dated April 12, 2007 was received for this project. Project conformance documentation with this Letter of Concurrence will be completed prior to the Field Manager selecting an alternative.

Endangered Species Act (ESA) Determination of Effect for Listed Fish Species

The project would have an ESA determination of "May Affect, Not Likely to Adversely Affect" on Lower Columbia River (LCR) coho salmon and LCR steelhead trout (*Table 18* and *EA section 3.3.4*). LCR chinook salmon would not be affected because their suspected upstream limit of distribution is at least three miles downstream of the project area (see *Table 7*).

Table : Endangered Species Act (ESA) Determinations of Effect for Lower Columbia River Coho Salmon and Lower Columbia River steelhead trout

Species	*Project Area*	*Effect Call*	*Remarks*
Lower Columbia River (LCR) coho salmon, LCR steelhead trout	Gordon Creek	May Effect, Not Likely to Adversely Affect	See *EA Section 3.3.3*
LCR chinook salmon	Gordon Creek	No Effect	See *EA Section 3.3.3*

The project would have no effect on Critical Habitat for the species listed above, and would have "no adverse effects" on Essential Fish Habitat (EFH) as designated under the Magnuson-Stevens Fishery Conservation Act.

5.1.2 Cultural Resources - Section 106 Consultation with State Historical Preservation Office:

5.1.2.1 Cultural Resources

Cultural resource surveys were conducted throughout the sale area between October 2005 and May, 2006 (CRIR # C0603, C0604, C0605, C0608, C0609, and C0611). As a result of these surveys, historic cultural features dating to between 1924 and 1940 and associated with railroad logging operations by the Bridal Veil Lumber Company were identified in sec. 1, 3, 11, and 15 of the sale. Cultural sites related to historic logging were recorded in section 1 (1-5-1-1SE-h) and in section 11 (1-5-11-1SE-h). A historic dump site dating to 1940-1942 was recorded in section 9 (1-5-9-1SE-h). All three sites were determined not eligible for the National Register of Historic Places and assessed as not having other values requiring conservation in place. The recording conducted as a result of these inventories adequately documents the heritage values of the three sites and multiple individual historic features and a determination of No Effect was made. The Oregon State Historic Preservation Office concurred with this No Effect determination for section 9 in a letter dated Nov. 17, 2006. SHPO did not provide comments on the No Effect determinations for the remainder of the project area and the comment period has expired.

5.2 Public Scoping and Notification - Tribal Governments, Adjacent Landowners, General Public, and State County and local government offices

December 2009 EA Update: The December 2009 edition of the revised EA and FONASI will be made available for public review from December 2, 2009 to December 19, 2009. The notice for public comment will be published in a legal notice in the *Sandy Post* newspaper. Written comments should be addressed to Cindy Enstrom, Field Manager, Cascades Resource Area, 1717 Fabry Road S., Salem, Oregon 97306. Emailed comments may be sent to OR_Salem_Mail@blm.gov. Attention: Cindy Enstrom

For information on project scoping and the original EA comment period, see *EA section 1.4*. The revised EA and FONASI will be made available for public review from March 18, 2009 to April 6, 2009 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 *Sandy Post* newspaper. Written comments should be addressed to Cindy Enstrom, Field Manager, Cascades Resource Area, 1717 Fabry Road S., Salem, Oregon 97306. Emailed comments may be sent to OR_Salem_Mail@blm.gov. Attention: Cindy Enstrom

6.0 LIST OF INTERDISCIPLINARY TEAM REPORTS INCORPORATED BY REFERENCE

Interdisciplinary team reports can be found in the Gordon Creek Thinning EA project file and are available for review at the Salem District Office.

Barger , M., 2008. *Gordon Creek Logging Systems Report* Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Cultural Resource Inventory Reports, Gordon Creek Thinning Timber Sale Pre-project Surveys. Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

England, J., Murphy, C., 2009. *Cascades Resource Area Wildlife Report Gordon Creek Project* (Wildlife Report) Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Fennell, T., 2008. *Cascades Resource Area Botanical Report Proposed Gordon Creek Timber Sale (Botany Report)*, Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Hawe, W. P., 2008. *2008 Hydrology/Channels/Water Quality: Specialist Report for the Gordon Creek Project, Hawe, (Hydro Report),* Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Hawe, W. P., 2008. *WEPP (Water Erosion Prediction Project) Report for Gordon Creek*, Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Hawe, W.P. 2008. *2008 Soils Environmental Assessment for the Proposed Gordon Creek Project* (Soils Report) Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Jarrett, Z., 2007. *Recreation, Visual and Rural Interface Resources Report.* Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Raible, B. 2009. *Gordon Creek Thinning Project Air Quality and Fire Hazard/Risk Specialist Report,* (Fuels Report), Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Thompson, Charley, 2008. *Gordon Creek Silvicultural Prescriptions Commercial Thinning*. [Silvicultural Report] Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Zoellick, B., 2008. *Gordon Creek Fisheries Specialist Report* (Fisheries Report) Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

7.0 ADDITIONAL SUPPORTING DATA AND MAPS OF THE ACTION ALTERNATIVES

7.1 Tables

Table : Gordon Creek Vegetation Summary

T-R-S[1]	*EA Unit(s)*	*Acres*	*Current Stand Age class*	*Trees per acre before treatment*	*Trees per acre after treatment*	*Average Diameter*	*% Canopy closure before treatment*	*% Canopy closure after treatment*
1-5-1	1A-1C	538	55-70	166-224	80-120	15-20	76-92	55-70
1-5-3	3A	24	74	120-170	80-120	17	80	55
1-5-9	9A	40	63-73	120-127	80	16-19	74-80	55
1-5-11	11A-11D	333 343	67	95-184	80-120	19	87	55
	11D	10	63	132	80	19	82	55
1-5-13	13A-13B	462	56-68	142-206	80-120	15-17	80-93	55-70
1-5-15	15A	210 317	52/34	150/302	120	17	80	60
	15A -15B	107	60-64	110-130	80-90	17-20	76-85	55-65
Total Acres		1724						

Table : Special Status Wildlife Species for Gordon Creek, Cascades Resource Area (Bureau Sensitive, USFWS SOC and Federally Listed) (Wildlife Report Table 6)

Occurrence	*Species and Status*	*Habitat Description*
Invertebrates		
S	*Callophrys Johnsoni* **BS** Johnson's Hairstreak	Cool, moist, old-growth conifer forests of the Pacific Northwest, primarily west of the Cascade Mountains. Feeds on dwarf mistletoe associated with Western hemlock and true firs. Known to occur in old-growth hemlock near Larch Mountain east of the Gordon Creek area. *There is hemlock dwarf mistletoe present in the Gordon Creek area (EA section 3.3.5).*
D	*Colligyrus Sp.* **BS** Columbia Duskysnail	A Columbia Gorge endemic, found on both sides from east and south of Portland to Hood River, Oregon. Most sites are in Gorge tributaries; a few other sites occur in drainages originating from near Mount Hood, Oregon, to Mount St. Helens, Washington. In the Salem District, it is likely to be found only in the Cascades Resource Area, and only in cold, pure, well-oxygenated springs within Clackamas and Multnomah Counties. *The Gordon Creek area is located in the species suspected range. Surveys conducted to Protocol for Aquatic Mollusk Species From the Northwest Forest Plan, Version 2.0, have confirmed the presence of colligyrus at several locations in the Gordon Creek area (EA section 3.3.3).*
N	Cryptomastix Devia **BS** Puget Oregonian (snail)	Mature and old growth forests, typically under hardwood logs and leaf litter, rocks and talus, in litter under sword ferns growing under hardwood trees and shrubs, and under moss growing on big leaf maple trunks. *No mature or old-growth forest habitat is proposed for thinning. None were found during purposive surveys conducted in the Cascades Resource area in 2006.*
N	*Derocerus Hesperium* **BS** Evening fieldslug	Occurs in wet meadows in forested situations in a variety of low vegetation, litter, debris and rocks. Search area limited to within 30 meters of perennial wetlands, springs, seeps and riparian areas. *This habitat is not present in the Gordon Creek area.*

Occurrence	*Species and Status*	*Habitat Description*
N	*Gliabates Oregonius* **BS** Salamander slug	Type locality is in leaf litter under bushes in mature conifer forest at elevation of 600' in east side of the Oregon Coast Range. Has been found at 11 sites in the Cascades Resource Area, ranging from unharvested or unthinned late-successional forest, to a 45 year old stand that originated after regeneration harvest. *There are no salamander slug sites in the Gordon Creek area.*
N	*Gonidea Angulata* **BS** Western ridged mussel	Substrates of lakes, streams, and rivers that range in size from gravel to firm mud with the presence of at least some fine material (e.g. sand, silt or clay). Preferred sites generally have constant flow, rather shallow water (typically < 3 m in depth), and well-oxygenated substrates, especially when occurring in finer sediments.
Herpetofauna		
N	*Actinemys Marmorata Marmorata* **BS/SOC/ SC** Northern Pacific pond turtle	Marshes, ponds, lakes, slow rivers and streams, usually with an abundance of aquatic vegetation and emergent logs or boulders for basking. Associated with Willamette Valley. *Gordon Creek is located in the Cascades Mountains and no suitable habitat is present.*
S	*Ascaphus Truei* **SOC/SV** Tailed frog	Cold, fast-flowing permanent springs and streams in forested areas. Has a very narrow temperature tolerance. *Likely to occur in the Gordon Creek area.*
D	*Batrachoseps Wrightorum* **BS/SOC/SU** Oregon slender salamander	West slope of Cascades. Prefers down logs and woody material in more advanced stages of decay. Most common in mature and old-growth conifer forests. *Known to occur in Gordon Creek area (EA section 3.3.5).*
N	*Chrysemys Picta* **BS/SC** Painted turtle	Marshes, ponds, lakes, slow rivers and streams, usually with an abundance of aquatic vegetation and emergent logs or boulders for basking. Associated with the Willamette River and its major tributaries in the Willamette Valley. *Gordon Creek is located in the Cascades Mountains and no suitable habitat is present.*
D	*Dicamptodon Copei* **BS/SU** Cope's giant salamander	Larvae in streams or occasionally (in Washington) in ponds and lakes, sea level to 4,400 feet. Very few sites in Oregon. Possible in Sandy River sub-basins. *Known to occur in the Gordon Creek area (EA section 3.3.5)*
N	*Plethodon Larselii* **BS/SV** Larch Mountain salamander	Associated with rocky, talus areas on steep slopes and coarse woody debris in older forests close to the Columbia River Gorge. There are no known sites on Salem BLM lands. Gordon Creek is two to four miles southwest of the closest known site. *Habitat is not present in Gordon Creek and it is not suspected to occur. None were found during purposive surveys conducted in the Cascades Resource area in 2006.*
D	*Rana Aurora* **SOC/SU** Red-legged frog	Common in marshes, ponds, and streams with little or no flow, from the valley floor to about 2,500 feet in mountain forests. Can occur in seasonal waters if wet until late May or June. *Documented to occur in the Gordon Creek area.*
N	*Rana Boylei* **BS/SOC/SV** Foothill yellow-legged frog	Permanent streams and vicinity, with rocky, gravelly and sandy substrates in the south half of the Resource Area. *Gordon Creek is located in the northern part of the Resource Area and no suitable habitat is present.*
N	*Rana Cascadae* **SOC/SV** Cascades frog	Found in higher elevation bogs, ponds and stream edges associated with moist meadows above 3500 feet. *Gordon Creek is located at lower elevations and no suitable habitat is present.*
Birds		
S	*Accipiter Gentilis* **SOC/SC** Northern goshawk	Rare Summer resident in Cascades. Prefers mature or old-growth forests with dense canopy cover at higher elevations. Winters at lower elevations. Stands in Gordon Creek are young and located at lower elevations. *Low probability of occurrence in the Gordon Creek area* (*EA section 3.3.5 – Migratory Birds, Wildlife Report Table 7).*
S	*Contopus Cooperi* **SOC/SV** Olive-sided flycatcher	Remnant large trees/snags in forest openings/edges and open forests, high contrast old/young edges. Migratory, arrive late May, leave late August. *Suitable habitat is present in Gordon Creek. Area (EA section 3.3.5 –*

Occurrence	*Species and Status*	*Habitat Description*
		Migratory Birds, Wildlife Report Table 7).
S	*Empidonax Traillii Bresteri* **SOC/SV** Little willow flycatcher	Dense shrub and early seral stages, prefers the wet sites/ riparian zones. Migratory, arriving in mid May 15, most leave early September. *Suitable habitat is present in Gordon Creek area* (*EA section 3.3.5 – Migratory Birds, Wildlife Report Table 7).*
N	*Falco Peregrinus Anatum* **BS/SE** American peregrine falcon	Rare during the nesting season. Usually occurs as a transient/migrant and winter visitor. Found in a variety of open habitats near cliffs or mountains. Prefers areas near larger bodies of water and rivers. *No suitable habitat is present in the Gordon Creek area.*
N	*Haliaeetus Leucocephalus* **BS** Bald eagle	Rare summer resident in Cascades. Uncommon winter resident in Willamette Valley. For nesting and perching, prefers large old-growth trees near major bodies of water and rivers. *No suitable habitat is present in the Gordon Creek area.*
N	*Histrionicus Histrionicus* **BS/SOC/SU** Harlequin duck	An uncommon summer resident found in whitewater mountain rivers and streams during nesting season. Winters on rocky coasts. *No suitable habitat is present in the Gordon Creek area.*
N	*Icteria Virens* **SOC/SC** yellow-breasted chat (Willamette Valley)	Formerly common in dense riparian thickets along the Willamette Valley floor. Will use brushy young stands after regeneration harvest, blackberry thickets, and dense scotch broom stands. Possible in any young, brushy valley-edge elevation stand. Migratory. *Gordon Creek is located in the Cascades Mountains and no suitable habitat is present.*
N	*Melanerpes Formicivorus* **SOC** Acorn Woodpecker	Nests in colonies in cavities in mature/old-growth oak groves in the Willamette Valley. Most common to the south in the Umpqua, Rogue Valleys and California. *No suitable habitat is present in the Gordon Creek area.*
N	*Melanerpes Lewis* **BS/SOC/SC** Lewis' woodpecker	Formerly a common summer resident and uncommon winter visitor in Willamette Valley. Oak woodlands and hardwood forests. Transient on Salem District in fall along high divides. *No suitable habitat is present in the Gordon Creek area.*
S	*Patagioenas Fasciata* **SOC** Band-tailed pigeon	Nests in closed-canopy forest; forages in open-canopy forest. Keys in on mineral sites and berry producing plants. Migratory, most arrive in March, leave in October. *Suitable habitat is present in Gordon Creek area* (*EA section 3.3.5 – Migratory Birds, Wildlife Report Table 7).*
N	*Pooecetes Gramineus Affinis* **BS/SOC/SC** Oregon vesper sparrow	Rare and local summer resident in Willamette Valley. Very rare in winter. Dry, grassy areas. Western Oregon interior valley breeding population is of concern. *Gordon Creek is located in the Cascades Mountains and no suitable habitat is present.*
N	*Progne Subis* **BS/SOC/SC** Purple martin	Rare summer resident. Typically occurs along rivers and other water bodies. Nests colonially in cavities in old buildings, abandoned woodpecker holes, and nest boxes. No suitable habitat is present in or adjacent to the Gordon Creek BLM parcels. Very low probability of occurrence in the Gordon Creek area. *EA section 3.3.5 – Migratory Birds, Wildlife Report Table 7).*
D	*Strix Occidentalis Caurina* **LT/ST** Northern spotted owl	Permanent resident. Prefers mature and old-growth conifer forests with large down logs, standing snags in various stages of decay, high canopy closure and a high degree of vertical stand structure. *Known to occur within the provincial home range radius of Gordon Creek area (EA section 3.3.5.*
Mammals		
N	*Antrozus Pallidus* **BS/SOC/SV** Pallid bat	Occurs sporadically in w. Oregon. Associated with arid habitats, generally drier interior valleys of Southwestern Oregon. Found in caves, under bridges, cracks in rocks, hollow trees, old buildings, other secluded and protected places. *No suitable habitat is present in the Gordon Creek area.*

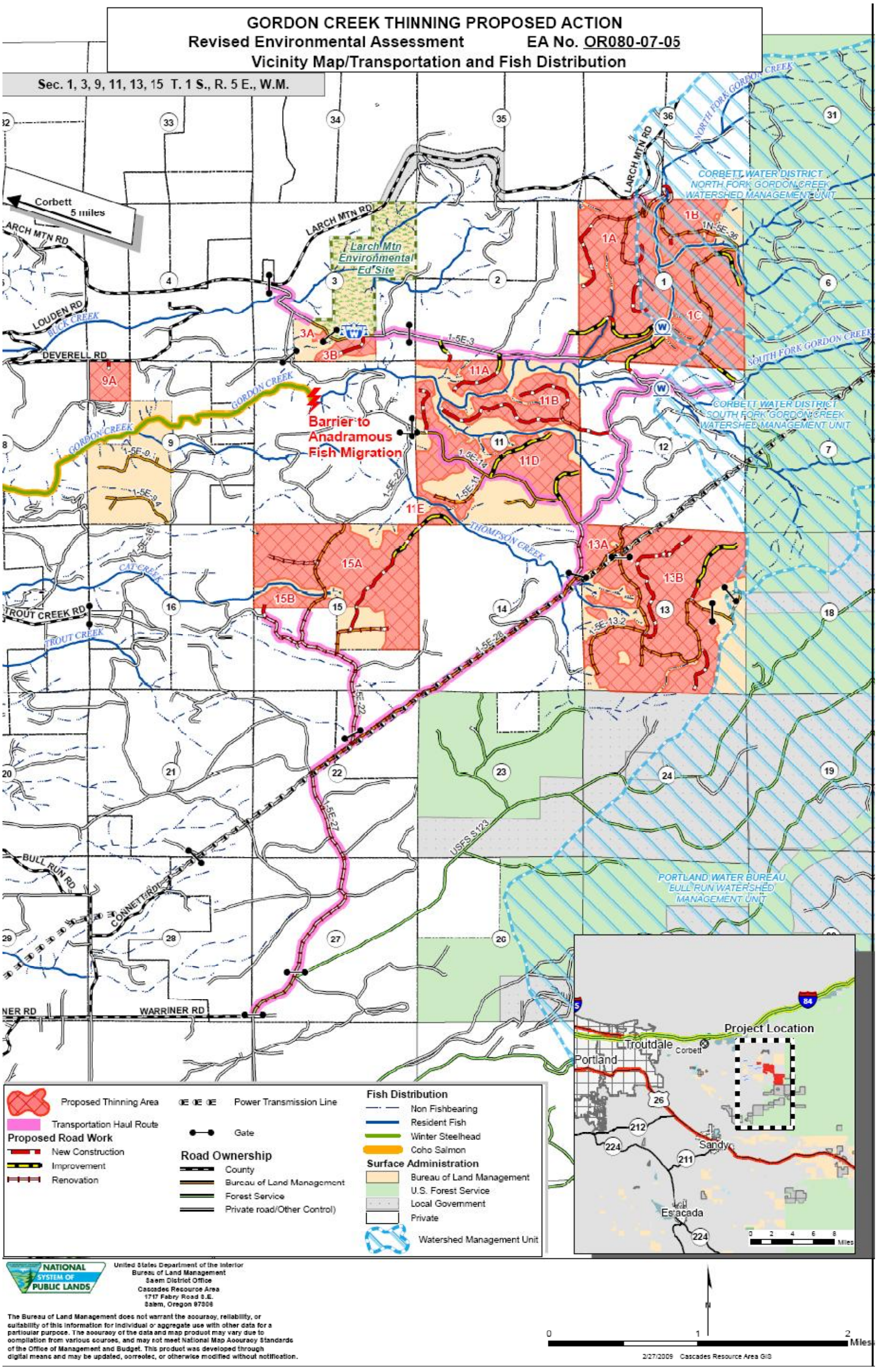
Occurrence	*Species and Status*	*Habitat Description*
D	*Arborimus Longicaudus* **SOC** Oregon red tree vole	Former Survey and Manage Species. The red tree vole is an arboreal vole of conifer forests below about 3,500 to 4,500 feet in elevation. Optimum habitat is older forests, but it is found in younger stands. *Known to be present in the Gordon Creek area (EA section 3.3.5)*
N	*Corynorhinus Townsendii* **BS/SOC/SC** Townsend's big-eared bat	Feeds on flying insects in a variety of habitats in forested areas. Primary habitat is caves, bridges, buildings and mines. *No suitable habitat is present in the Gordon Creek Area.*
S	*Lasionycteris Noctivagans* **SOC** silver-haired bat	Associated with buildings, snags, loose bark and cliff/cave habitat. Prefers older forests. Forages in a variety of forest habitats and riparian areas. *(EA section 3.3.5 - Bats)*
S	*Myotis Evotis* **SOC/SU** Long-eared myotis	Associated with snags, loose bark, buildings and cliff/cave habitat. Prefers older forests. Forages over water and riparian areas *(EA section 3.3.5 - Bats)*
S	*Myotis Thysanodes* **BS/SOC/SV** Fringed myotis	Associated with buildings, bridges, mines, snags and cliff/cave habitat. Likely in the north half of the Resource Area, at lower elevations closer to the Willamette Valley. Prefers older forests. Forages over water and riparian areas. *No suitable habitat is present in the Gordon Creek area.*
S	*Myotis Volans* **SOC/SU** Long-legged myotis	Associated with snags, loose bark, buildings, bridges and cliff/cave habitat. Prefers older forests. Forages over water and riparian areas. *Addressed in text.*
S	*Myotis Yumanensis* **SOC** Yuma myotis	Associated with buildings, bridges, snags and cliff/cave habitat. More closely associated with riparian areas than the other myotis. Prefers older forests. Forages over water and riparian areas. *(EA section 3.3.5 - Bats)*

KEY **Occurrence:**
N=Not Likely to Occur
S = Suspected (highly likely to occur)
D = Documented to occur

Status:
LE = Federal Endangered
LT = Federal Threatened
SOC = Species of Concern
BS = Bureau Sensitive
SE = State Endangered
ST = State Threatened
SC = State Critical
SV = State Vulnerable
SU = State Uncertain
SP = State Peripheral

7.2 Maps of the Action Alternatives

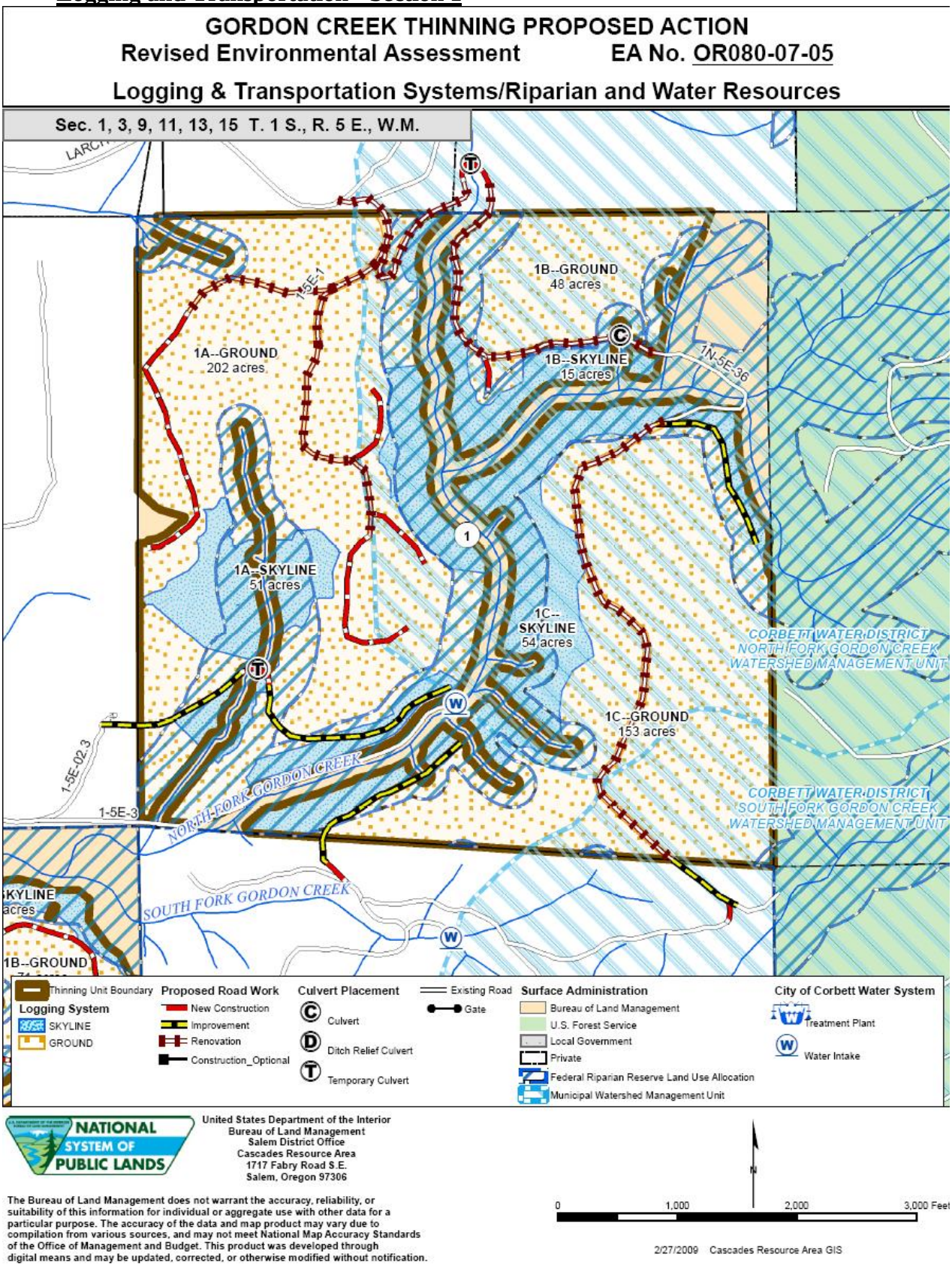
7.2.1 Vicinity and Fish Distribution Map with Revised Unit Boundaries



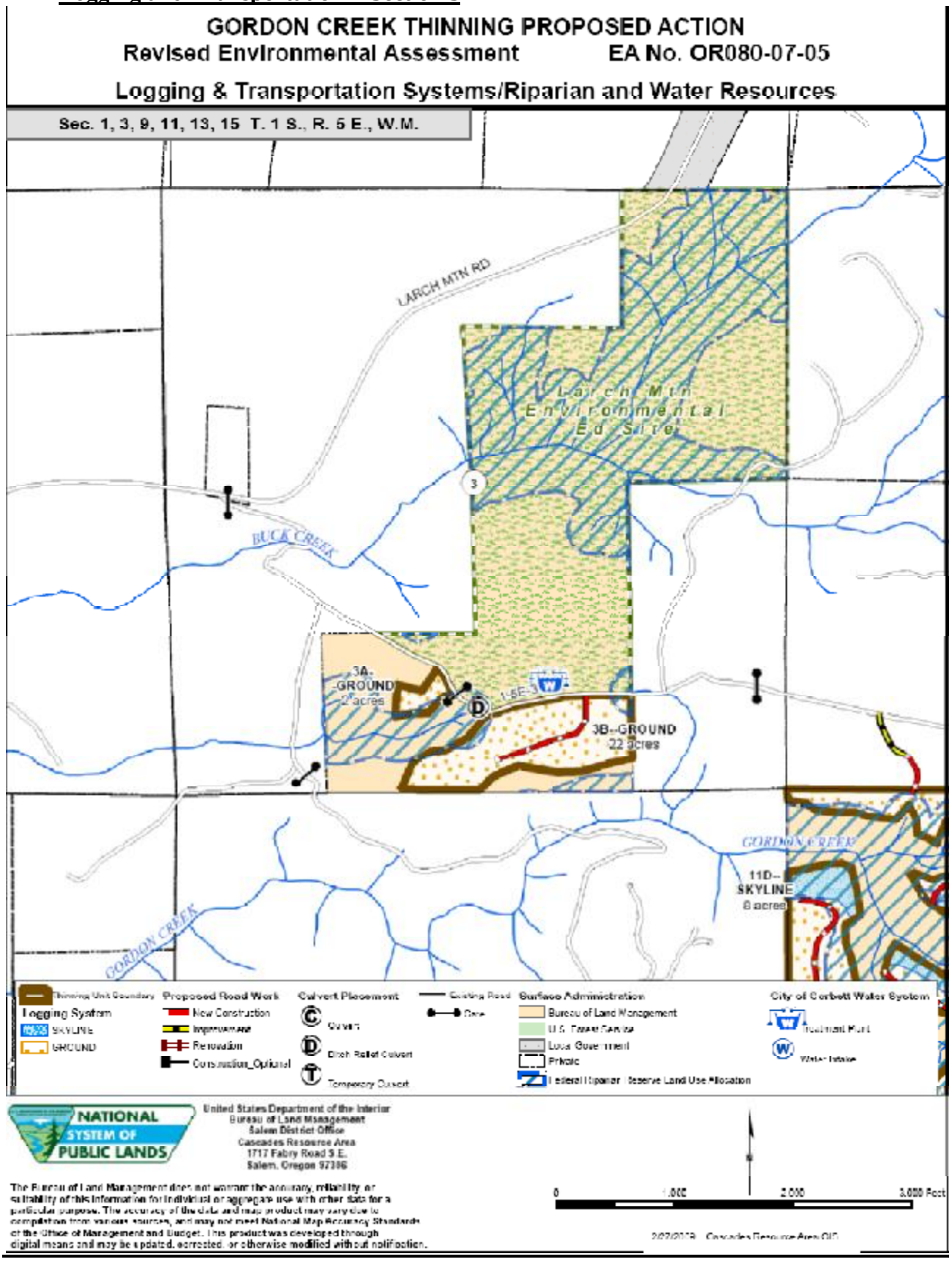
7.2.2 Current Proposed Action

7.2.2.1 Logging and Transportation Maps

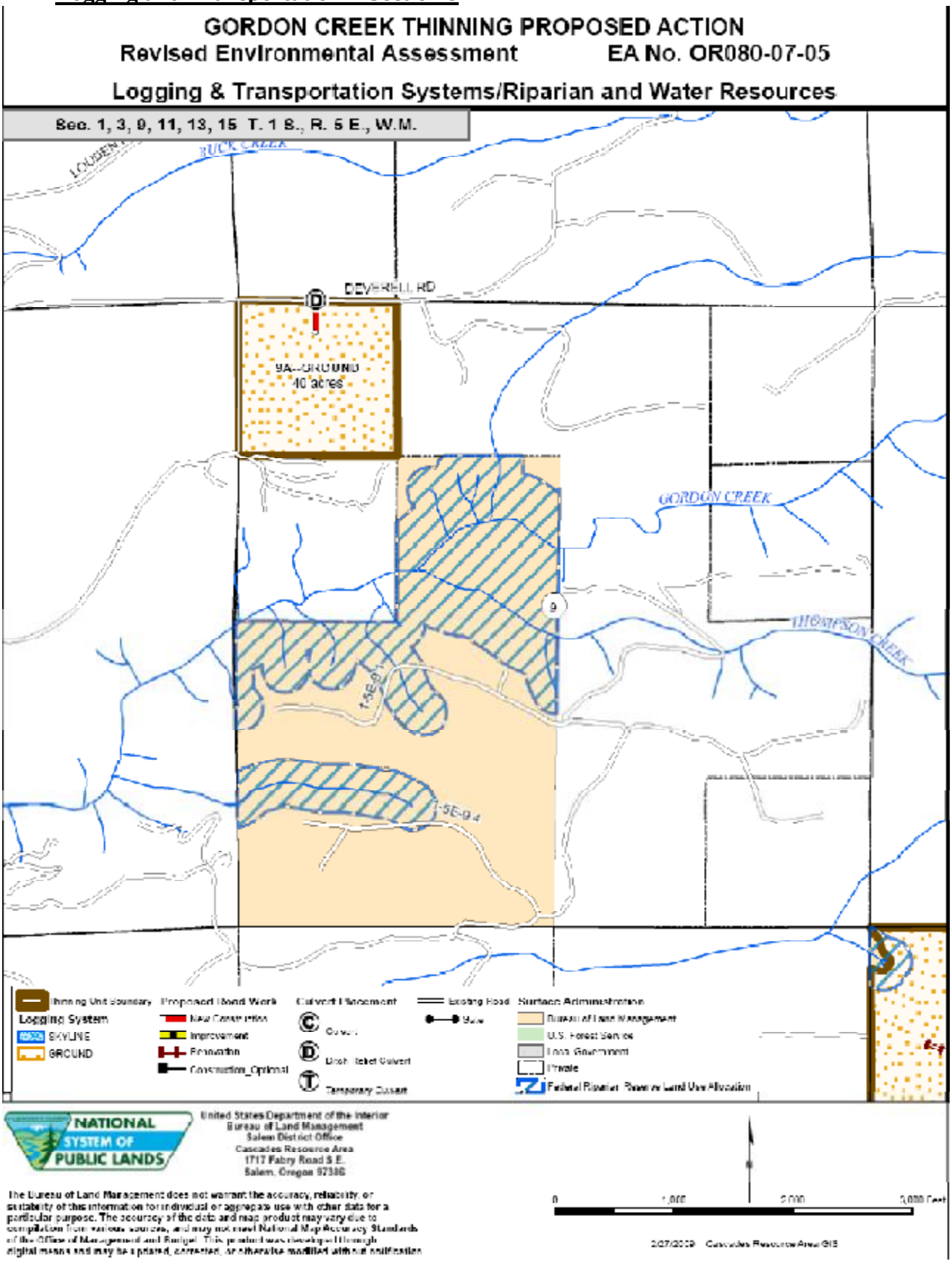
Logging and Transportation - Section 1



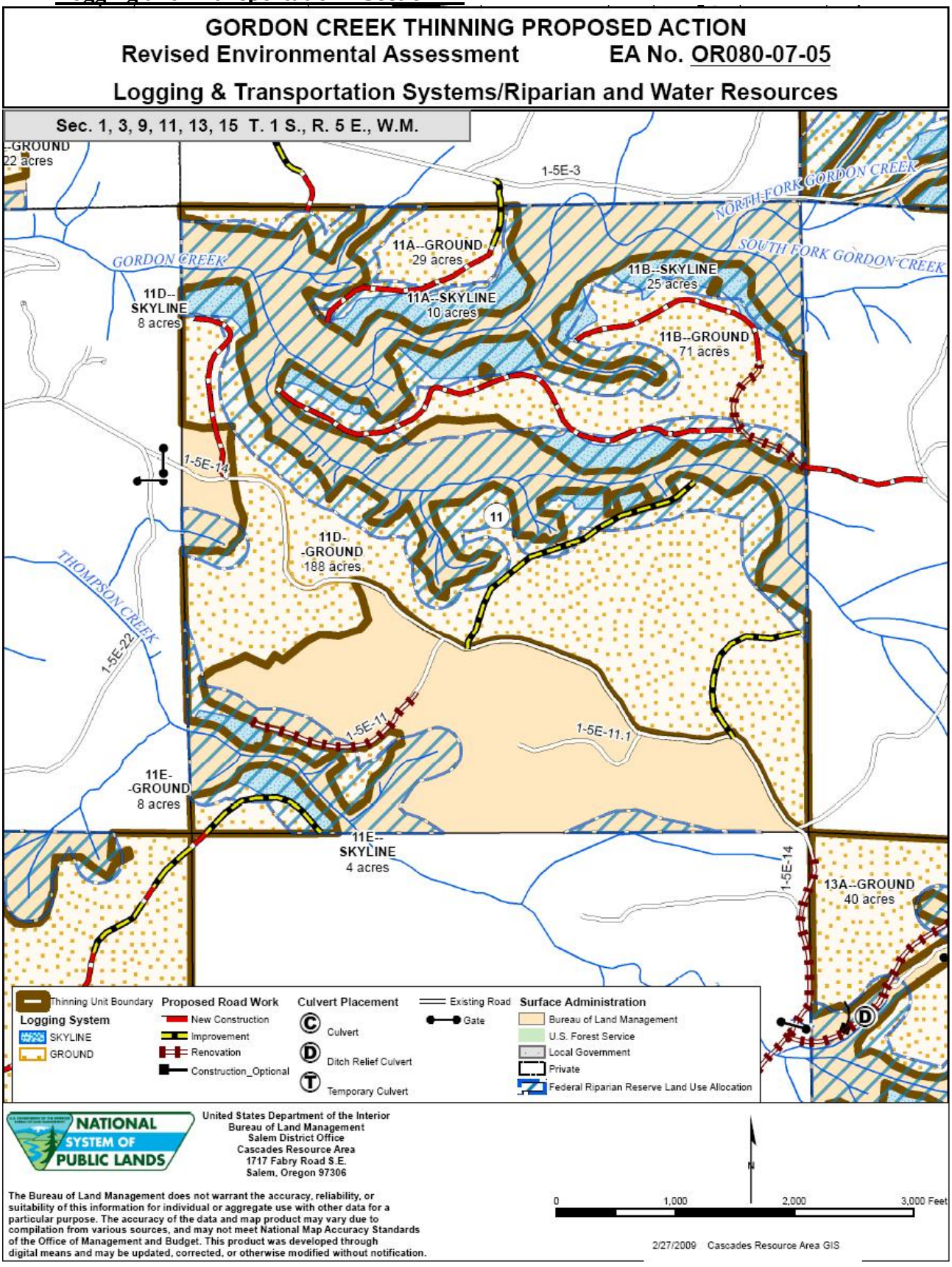
Logging and Transportation - Section 3



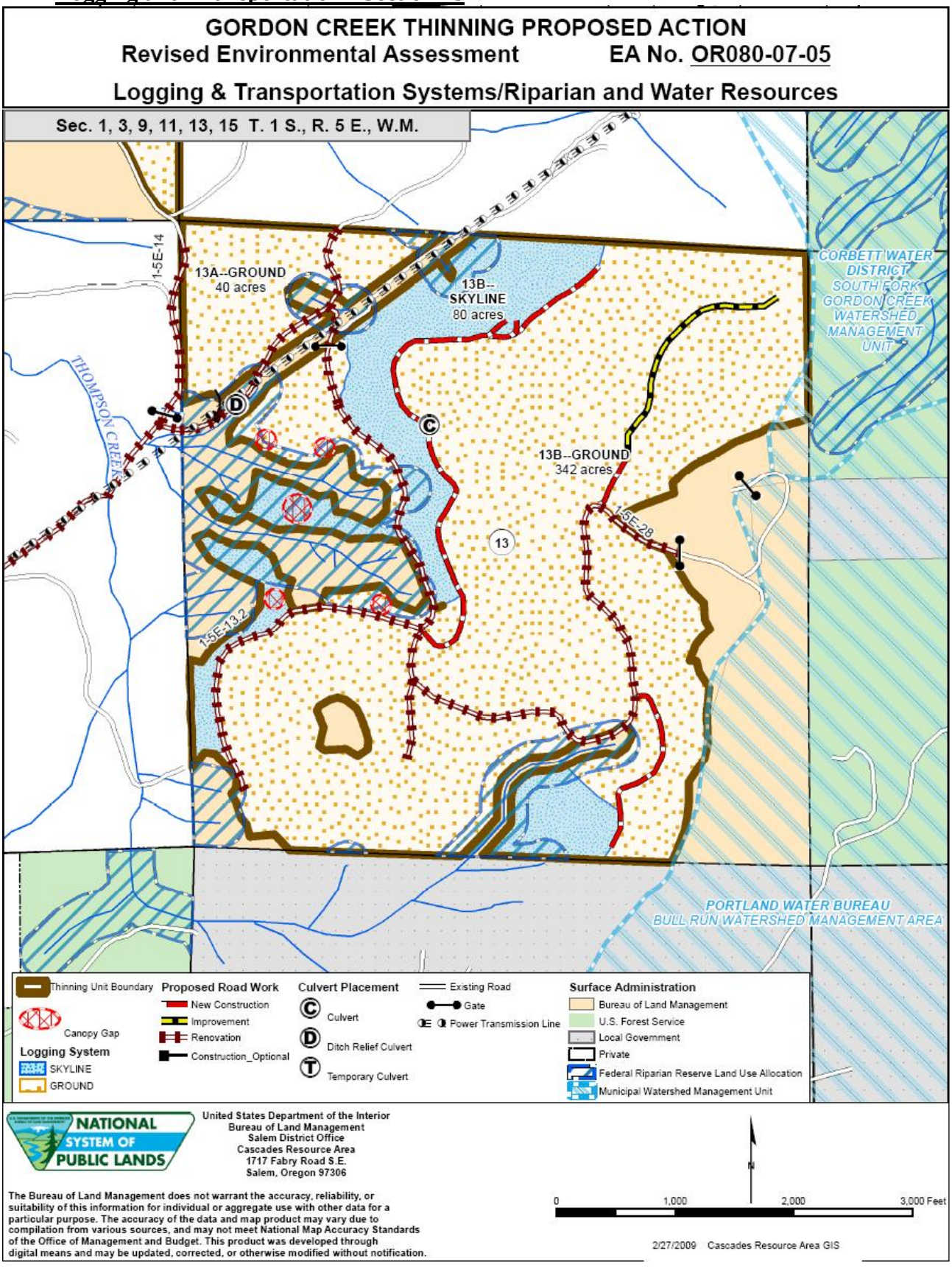
Logging and Transportation - Section 9



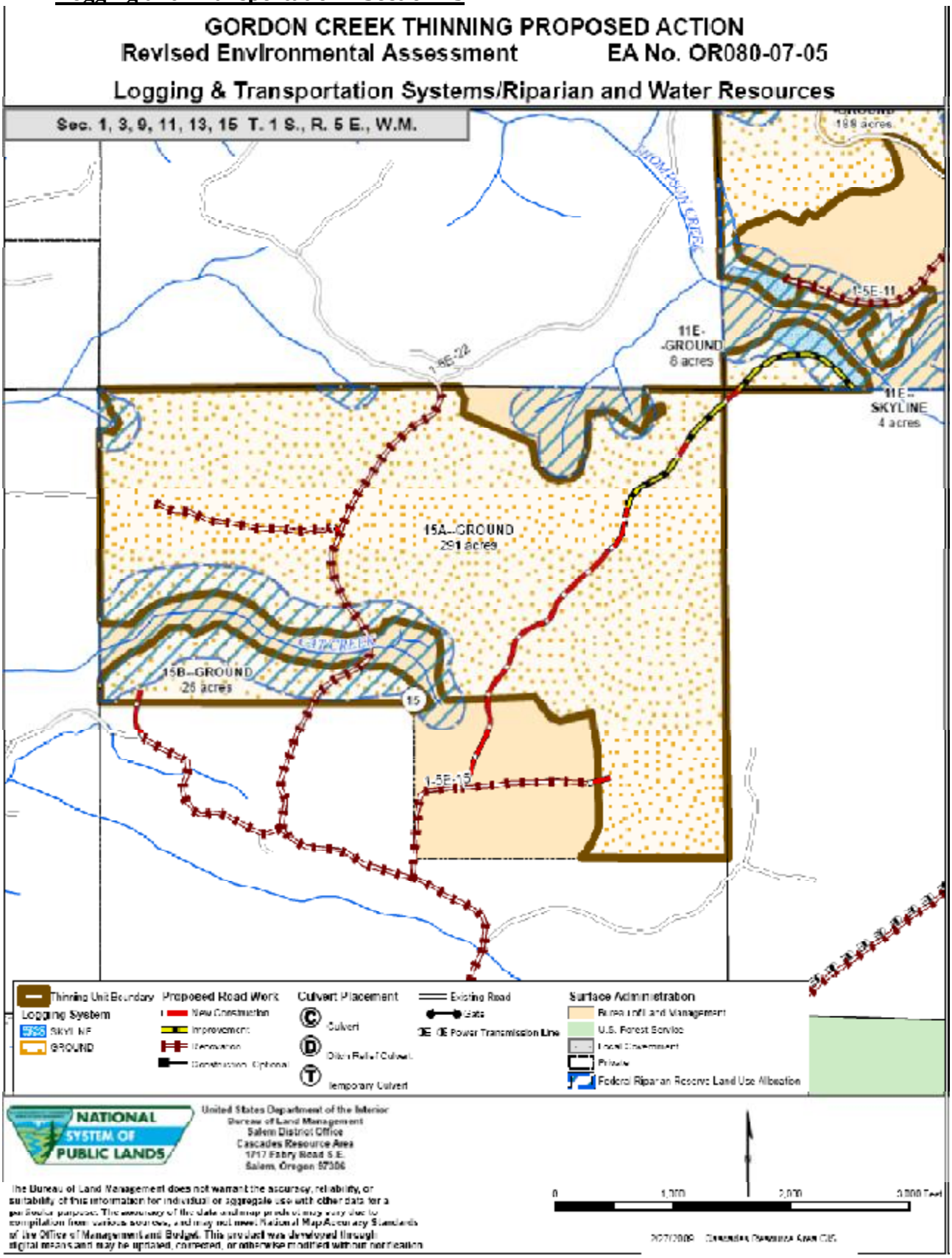
Logging and Transportation - Section 11



Logging and Transportation - Section 13

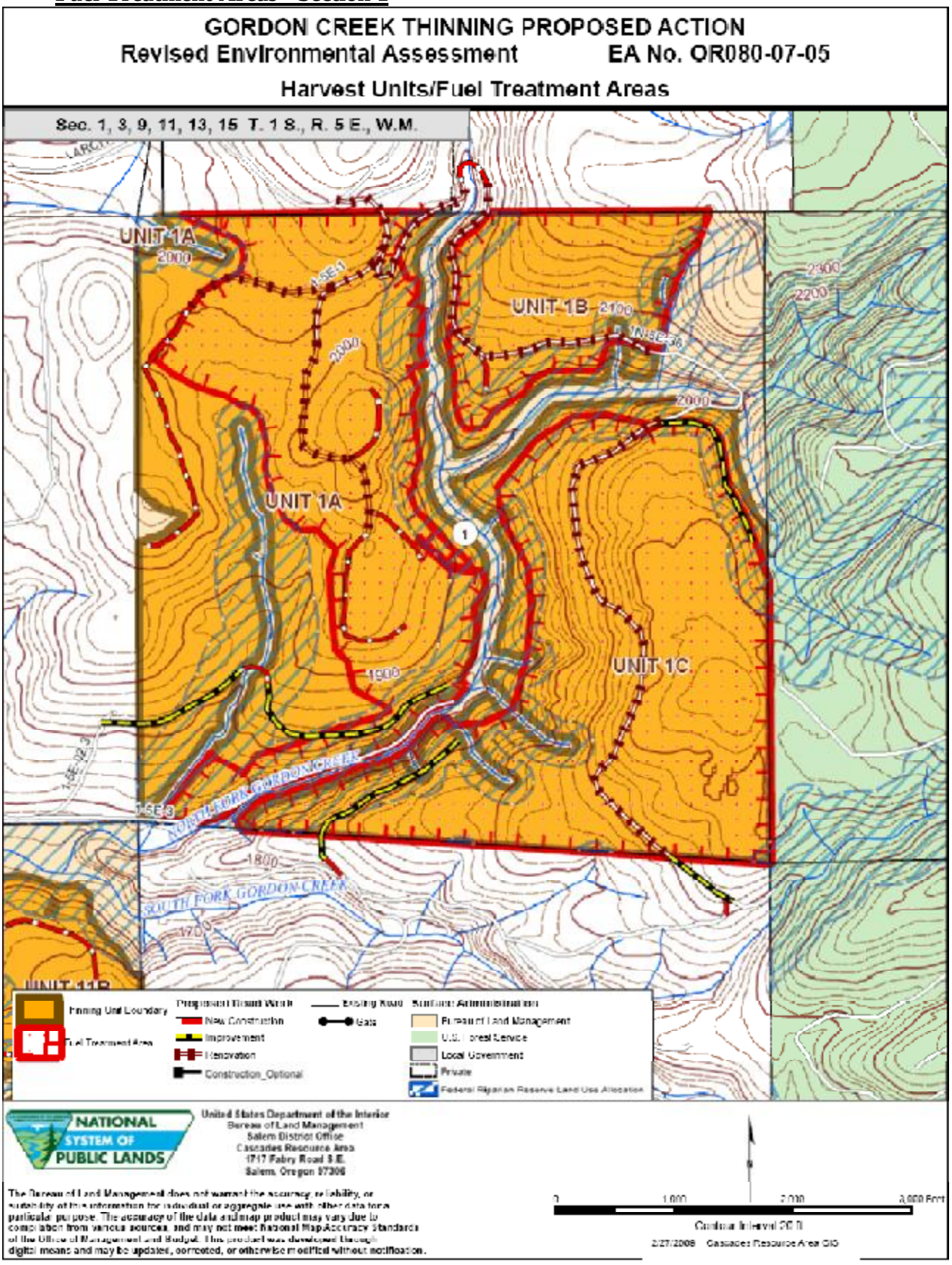


Logging and Transportation - Section 15

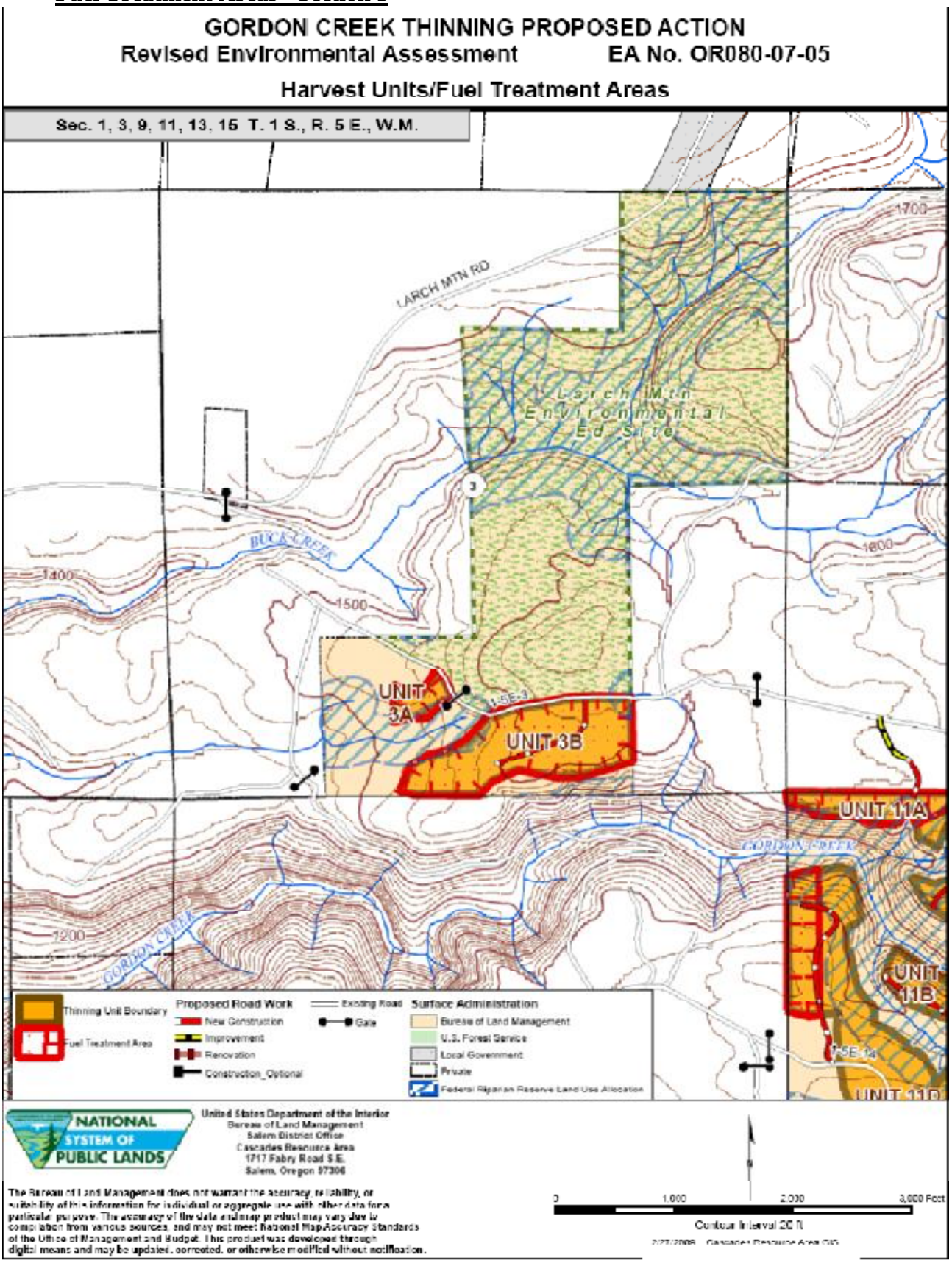


7.2.2.2 Fuel Treatment Area Maps

Fuel Treatment Areas - Section 1



Fuel Treatment Areas - Section 3



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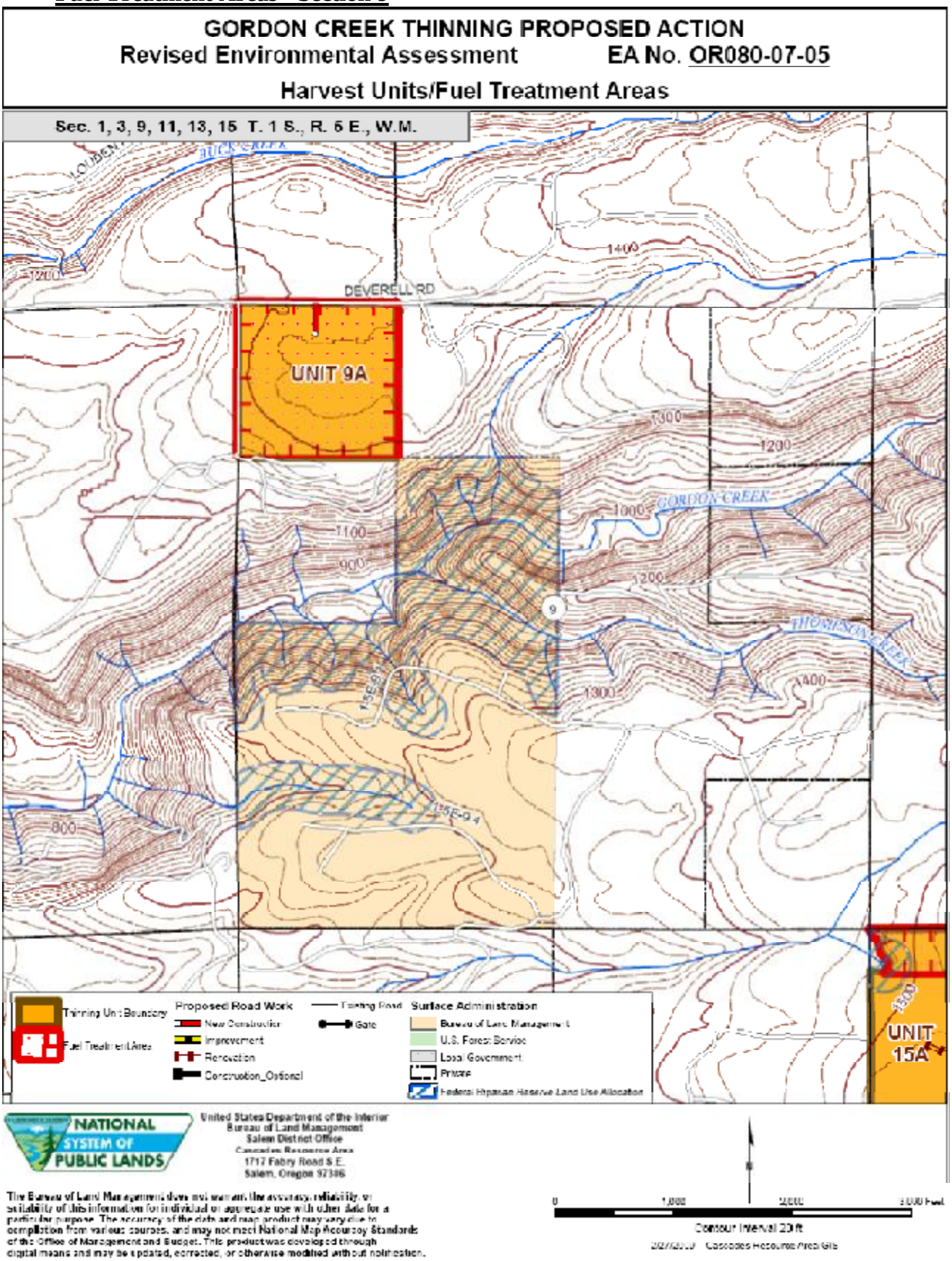

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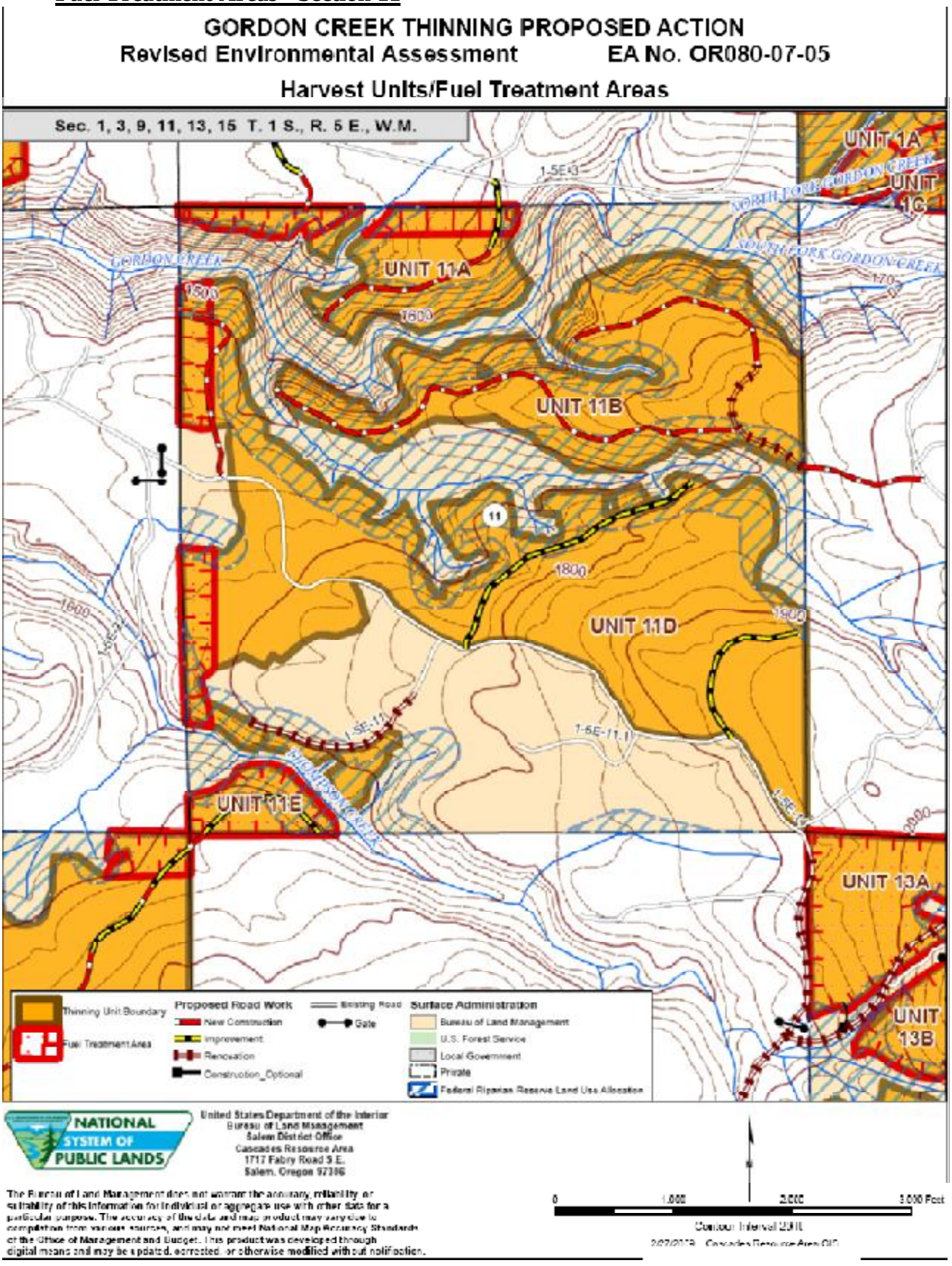
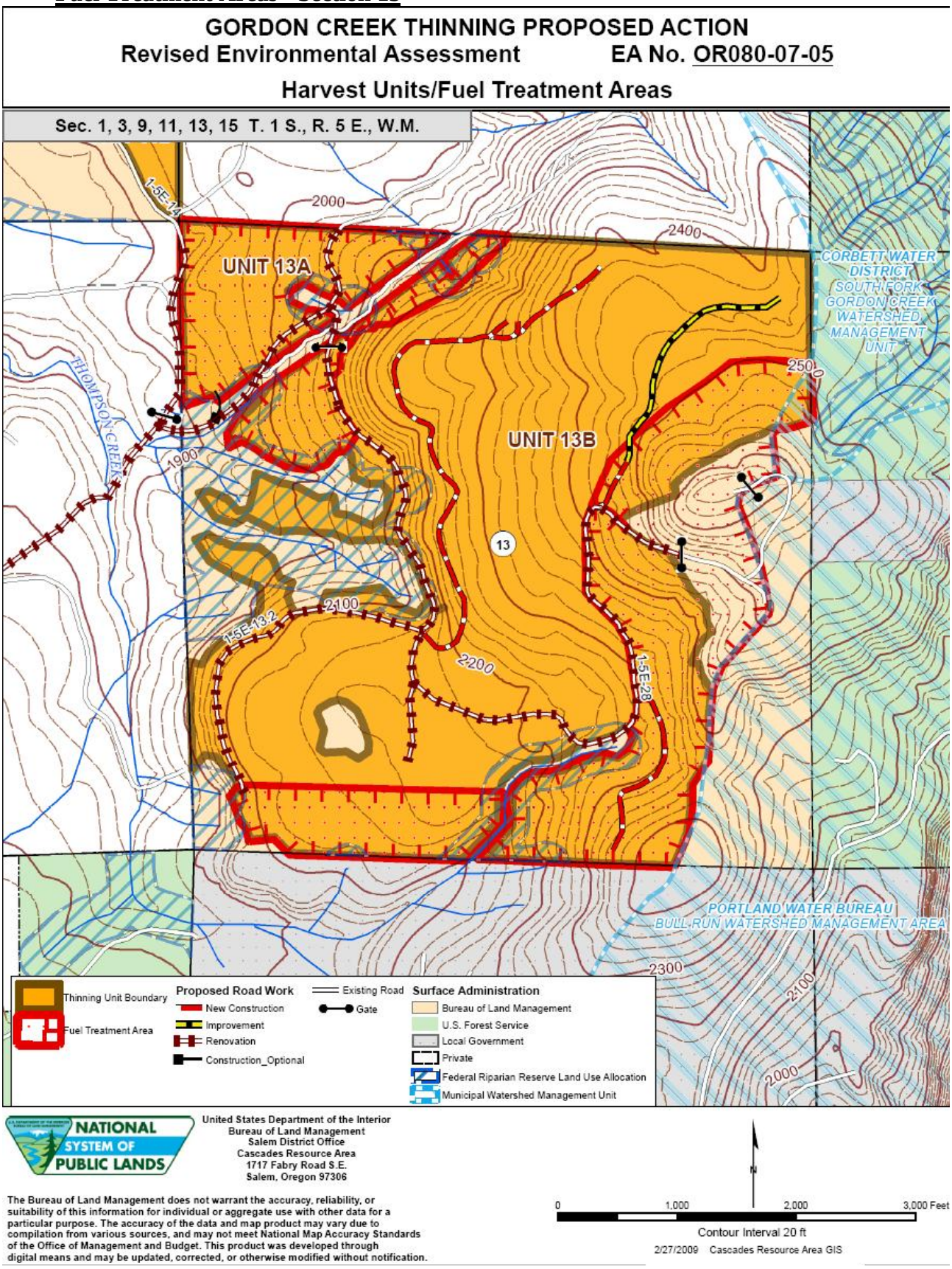
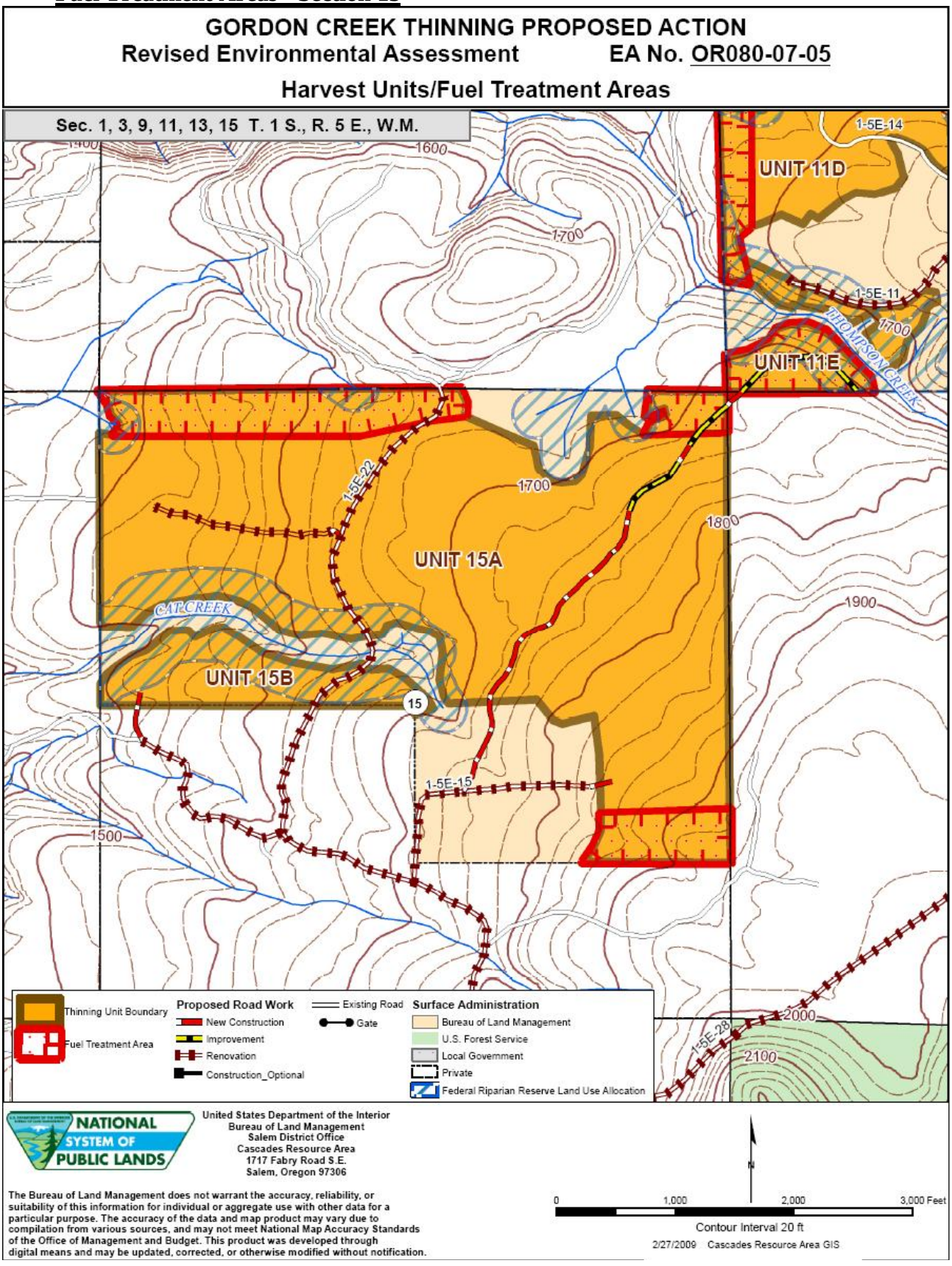


Fuel Treatment Areas - Section 13

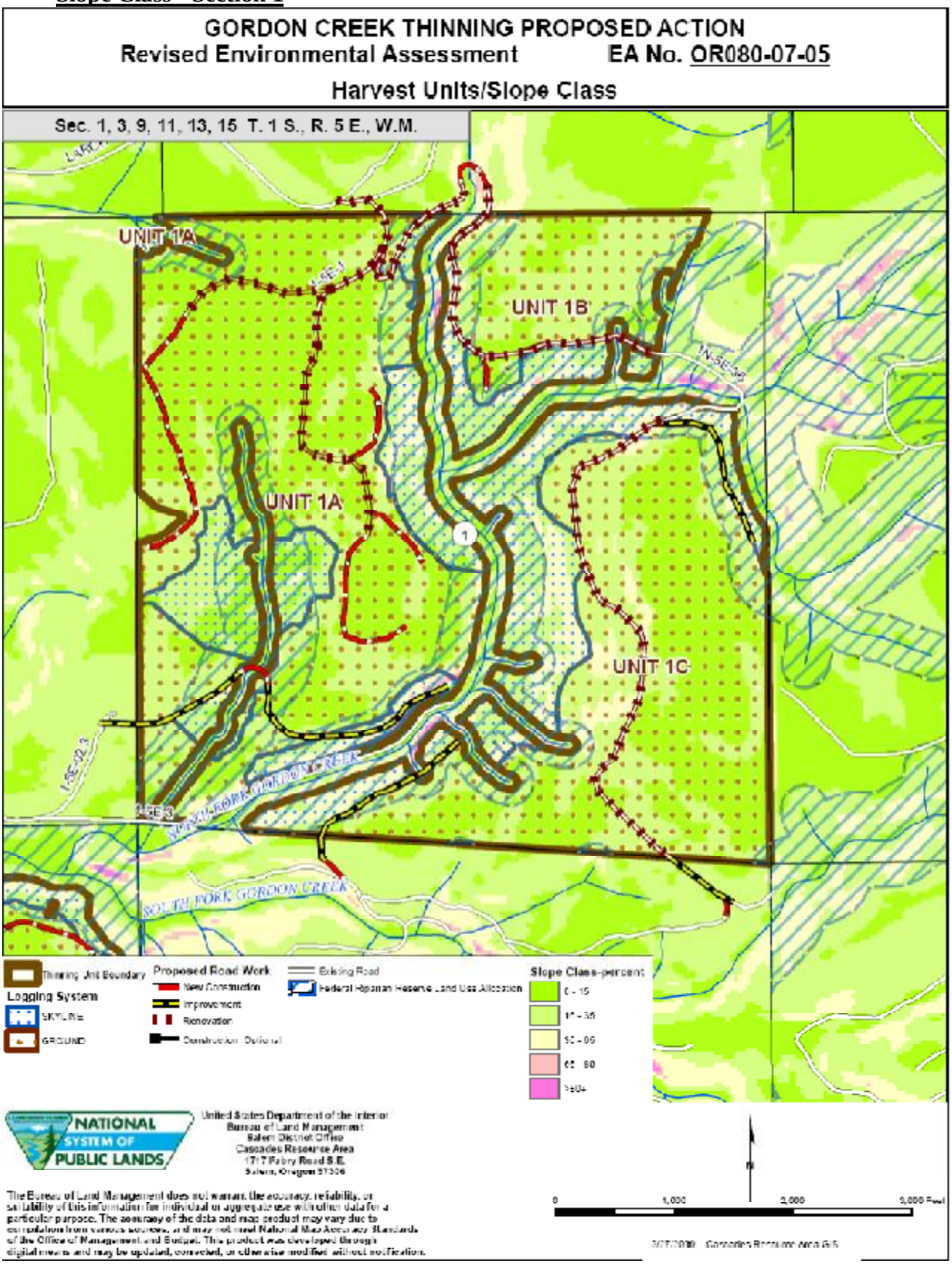


Fuel Treatment Areas - Section 15

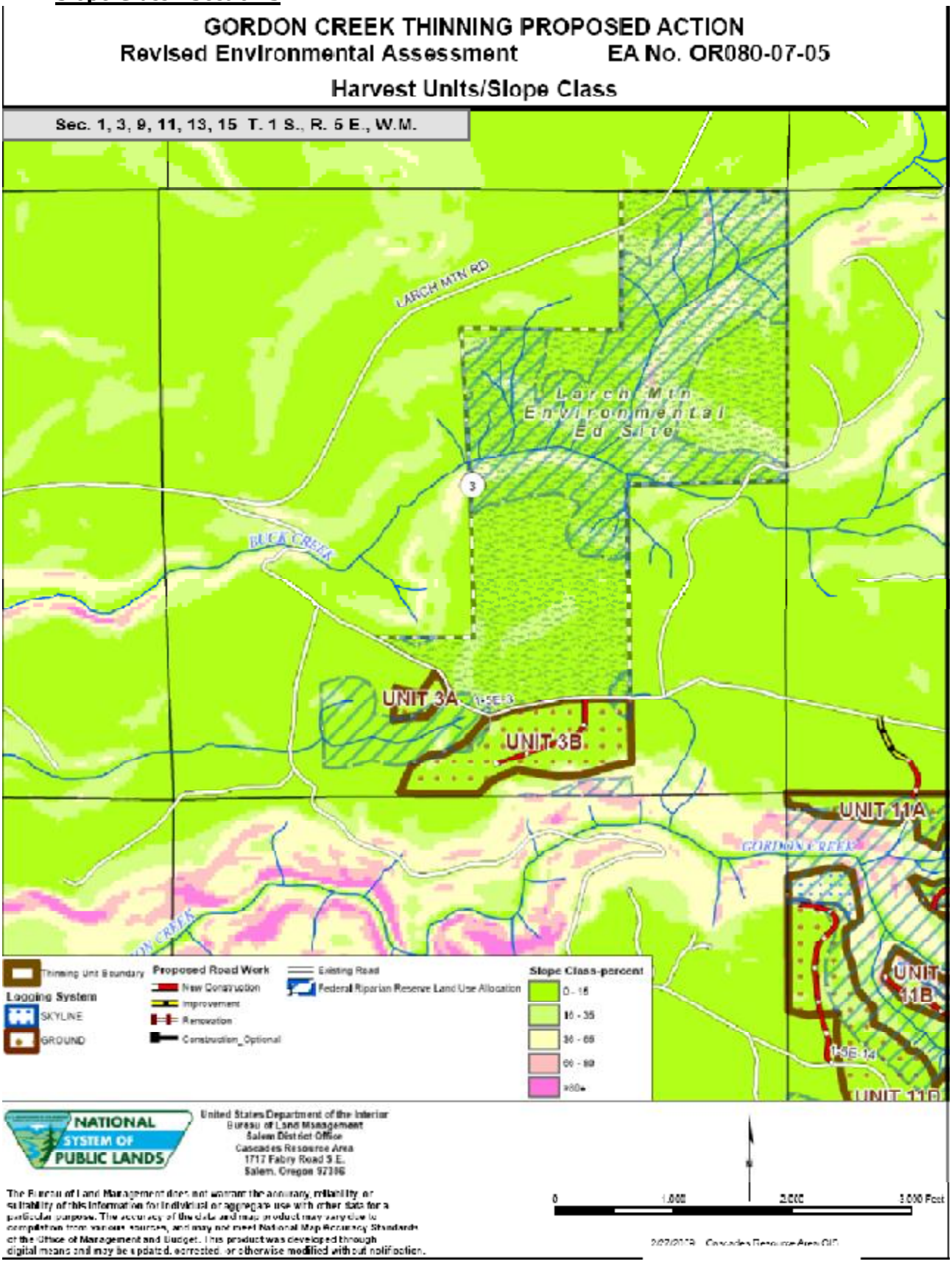


7.2.2.3 Slope Class Map

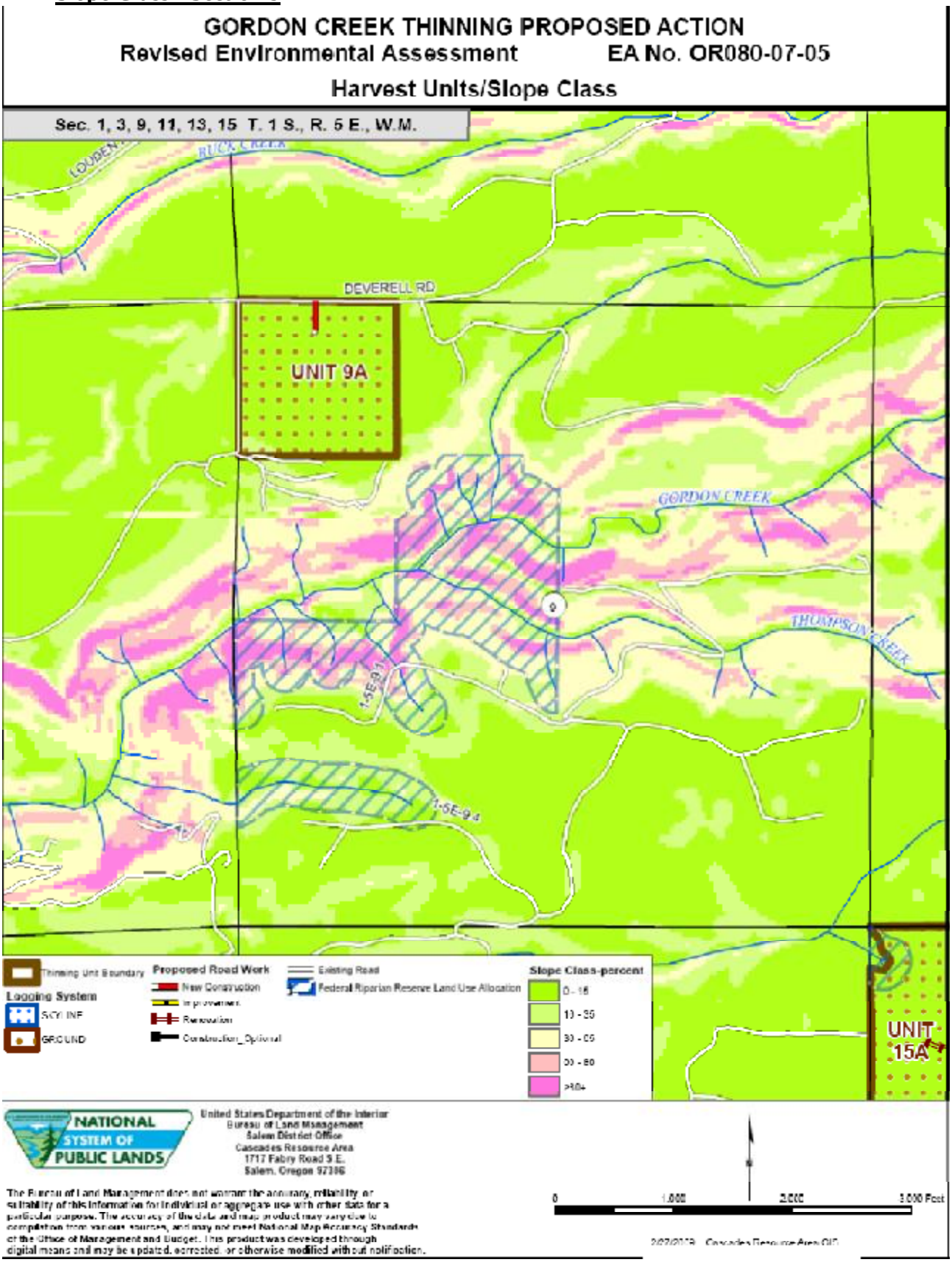
Slope Class - Section 1



Slope Class - Section 3



Slope Class - Section 9



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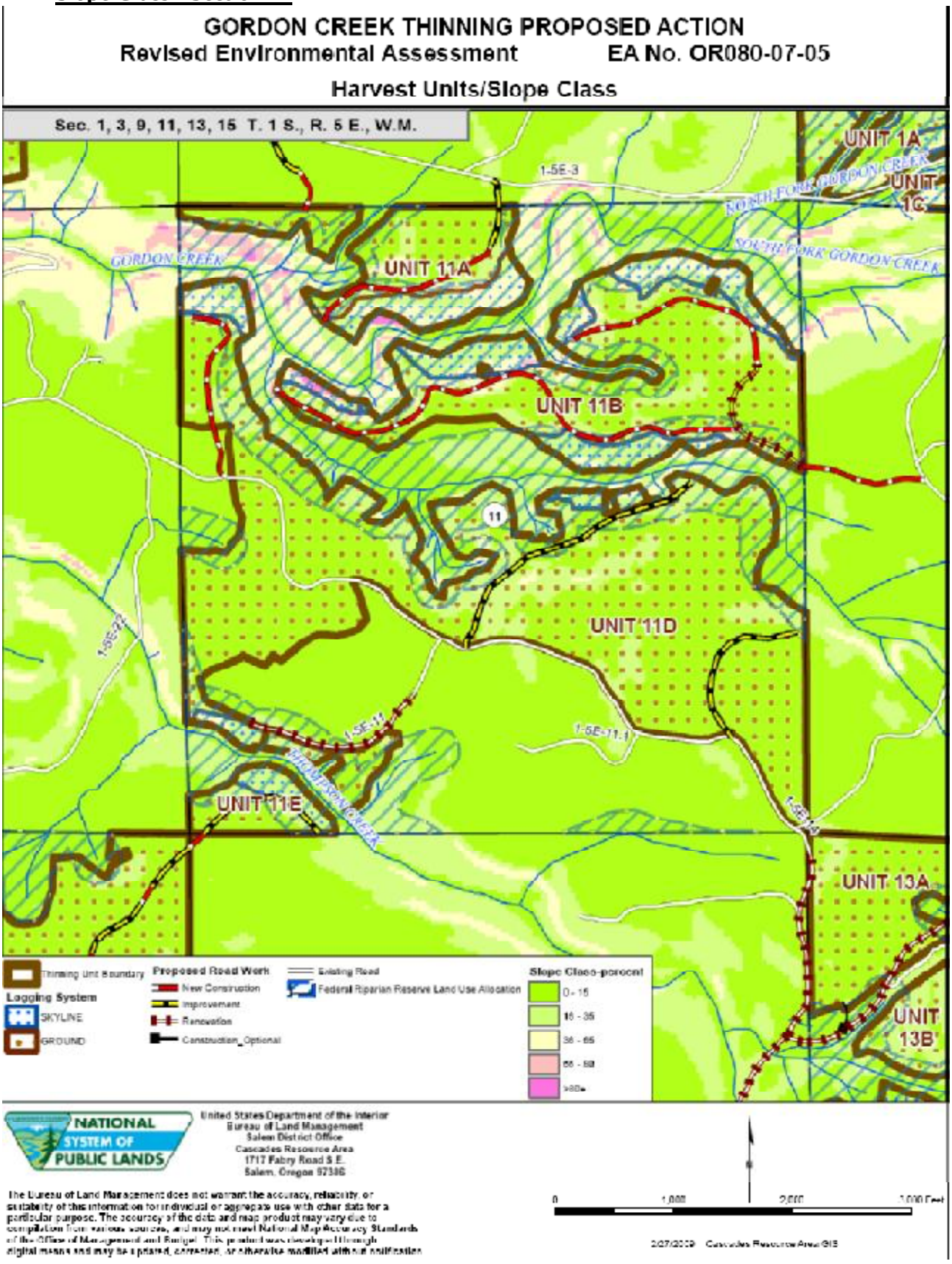
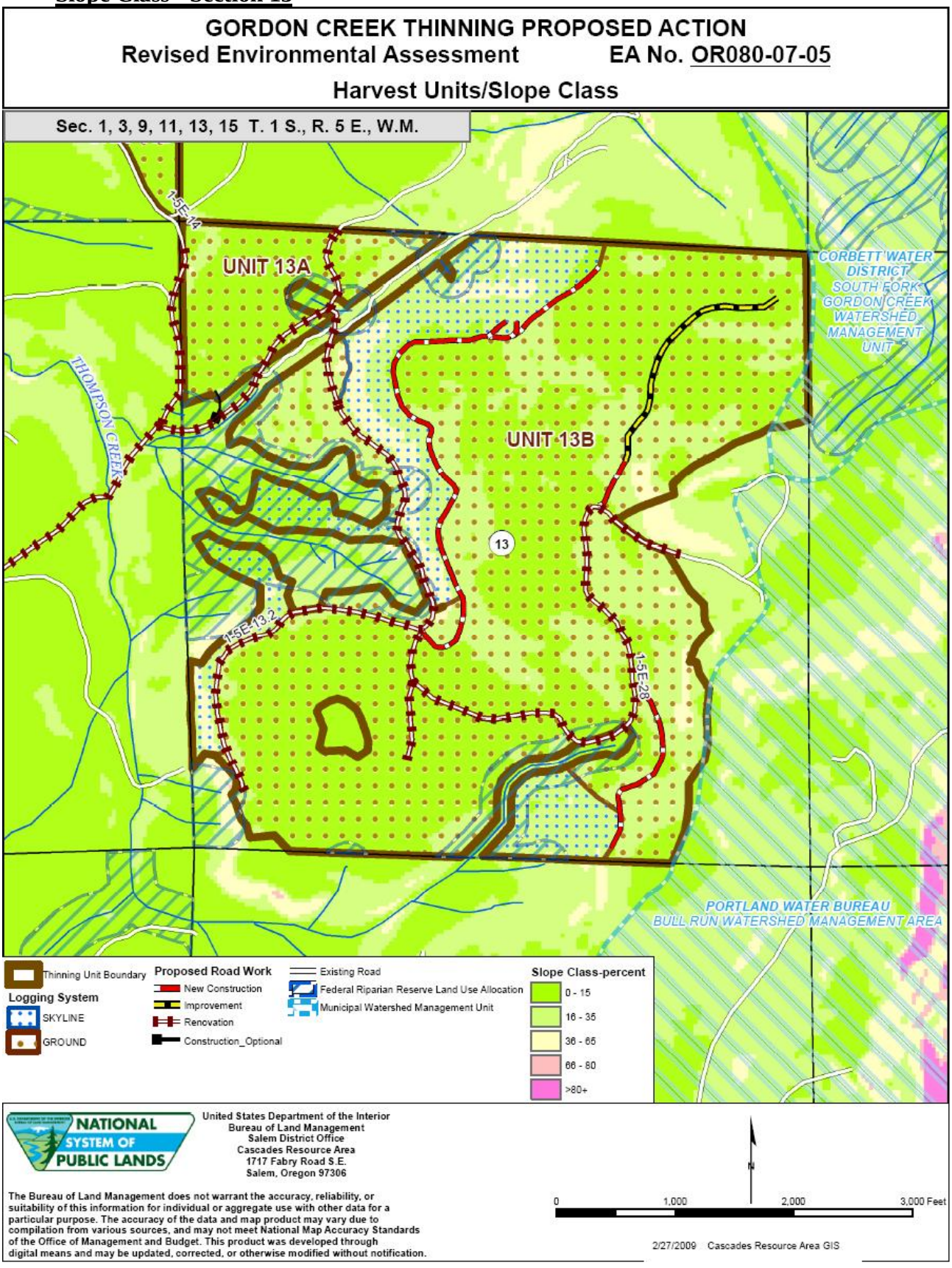
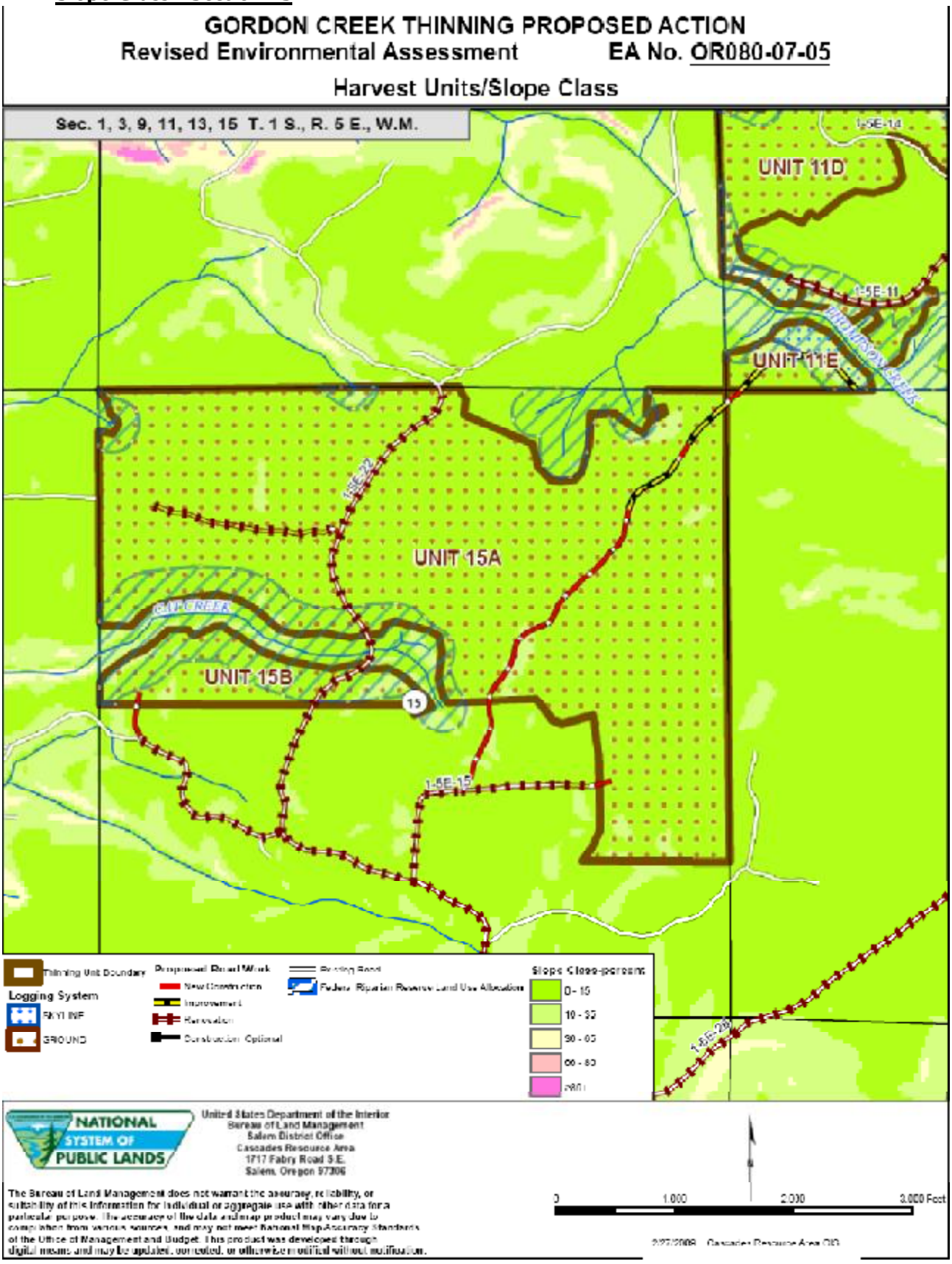


Slope Class - Section 13

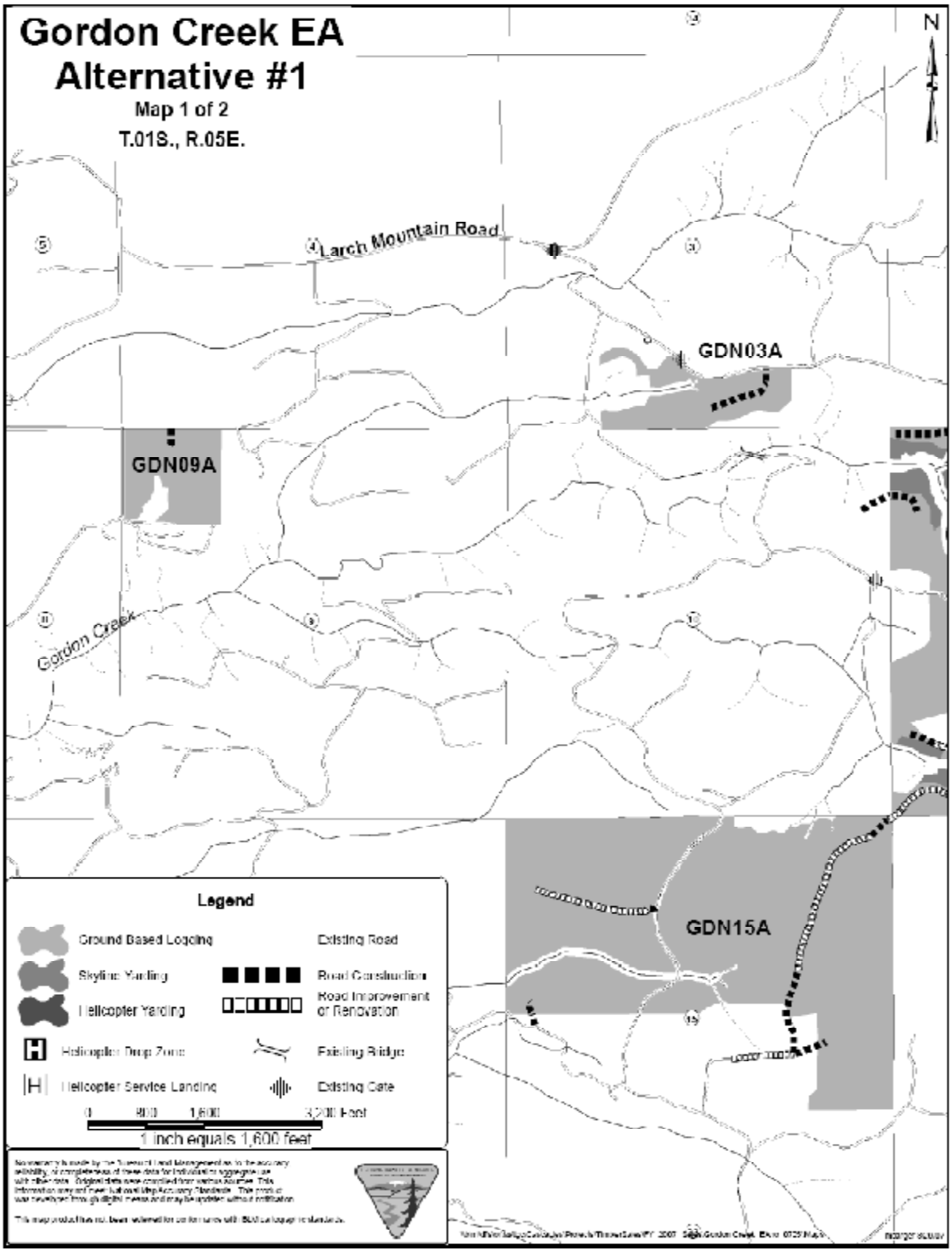


Slope Class - Section 15

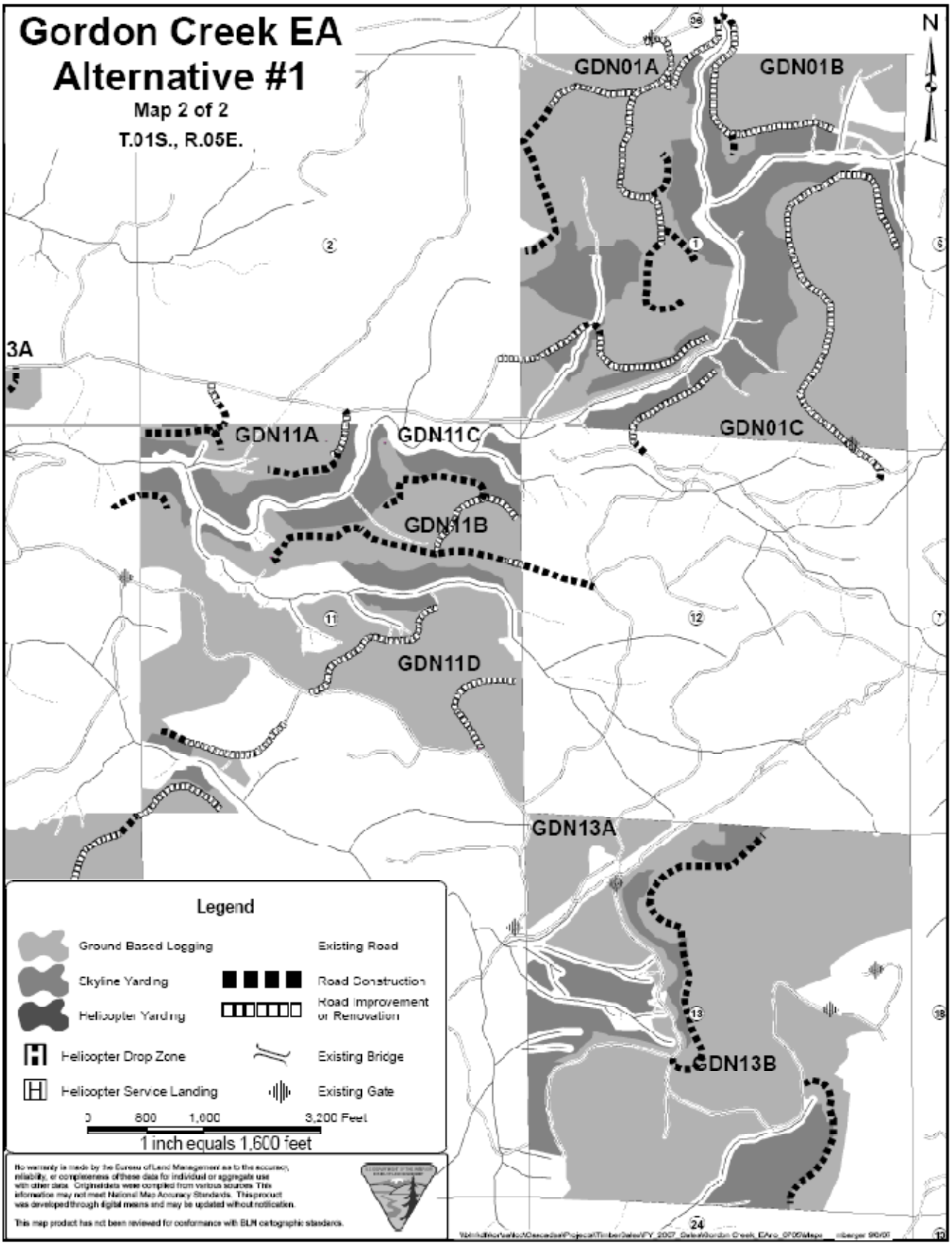


7.2.3 Original Proposed Action

7.2.3.1 Map of Original Proposed Action - Sections 3, 9, 15

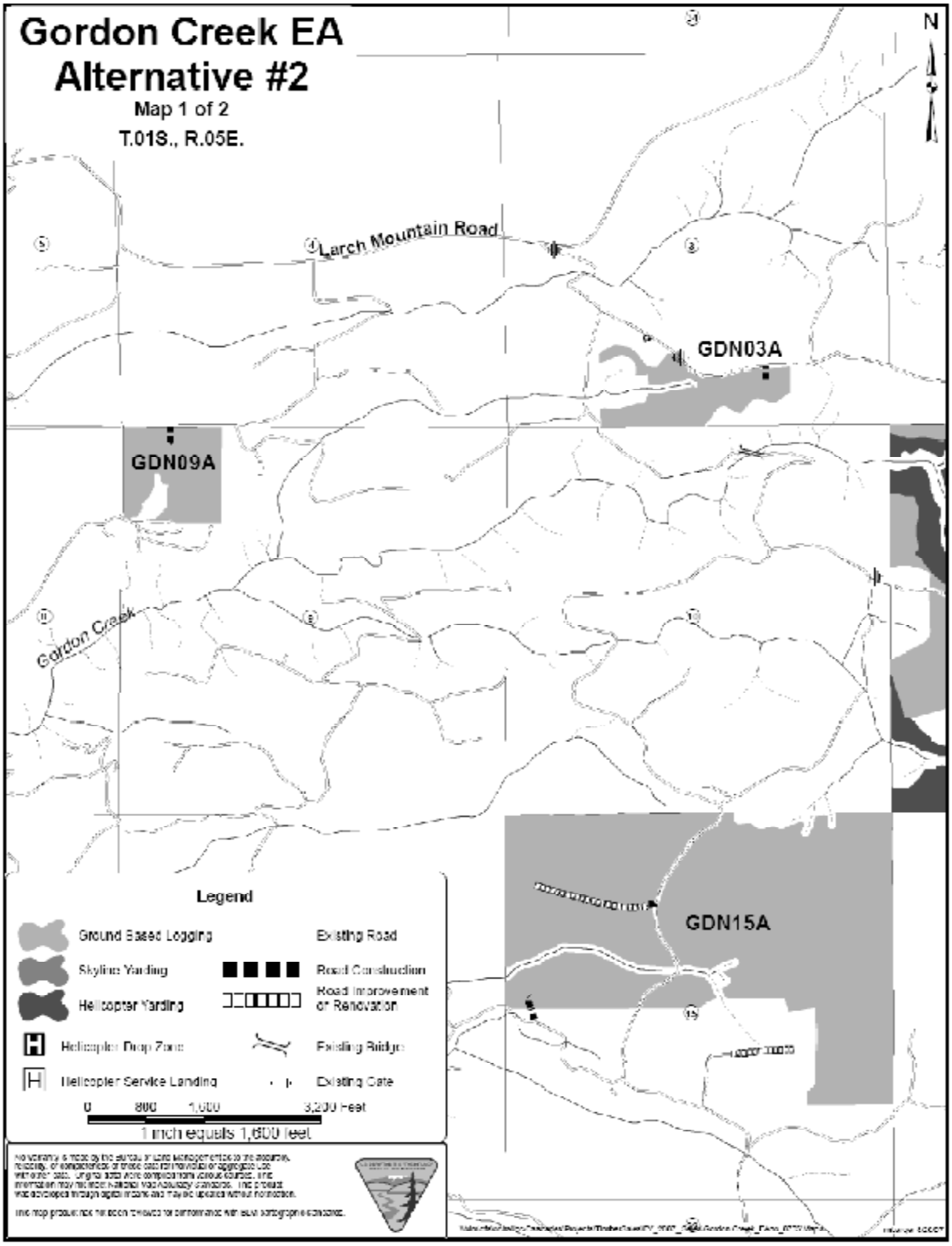


7.2.3.2 Map of Original Proposed Action - Sections 1, 11, 13

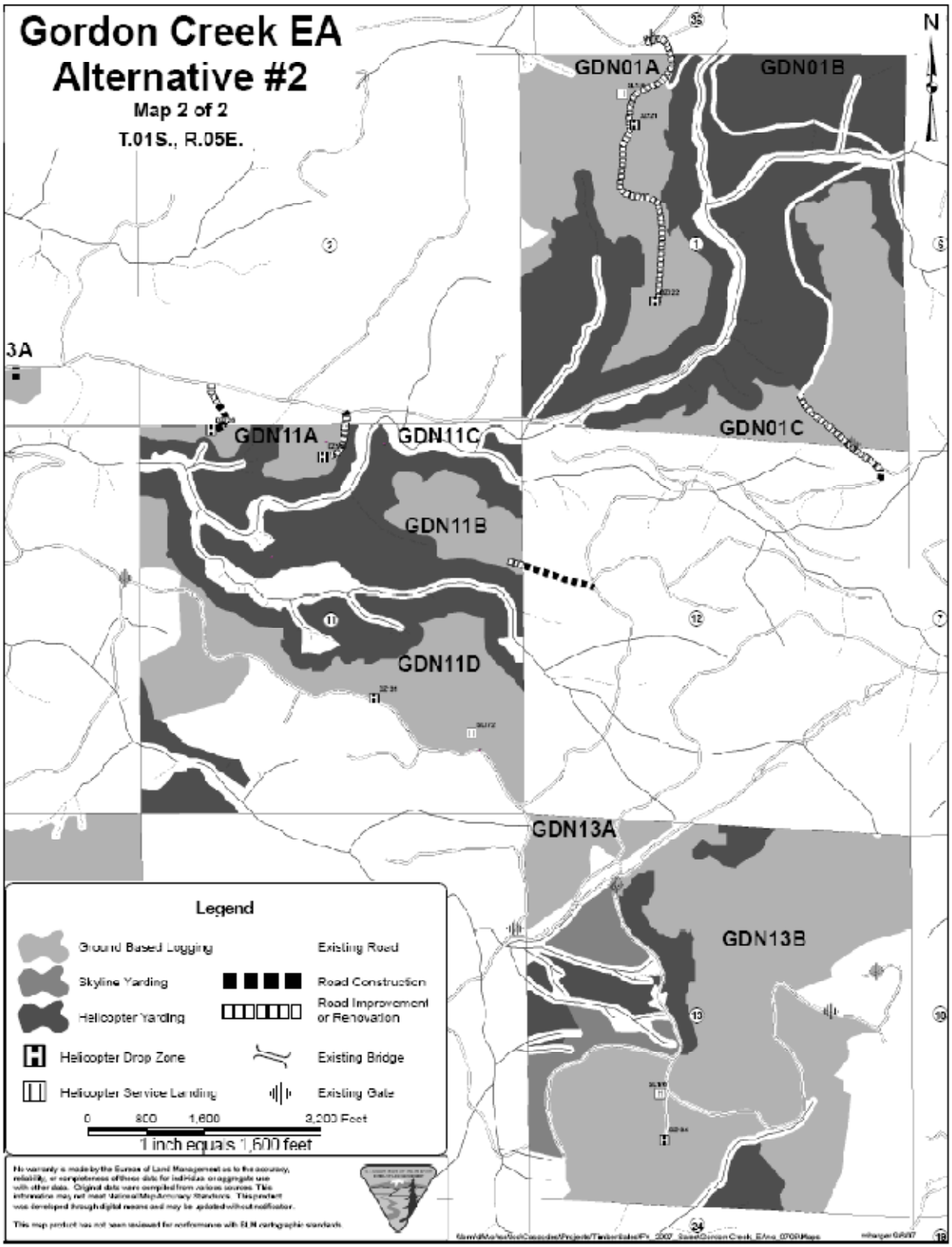


7.2.4 Alternative 2

7.2.4.1 Map of Alternative 2 - Sections 3, 9, 15

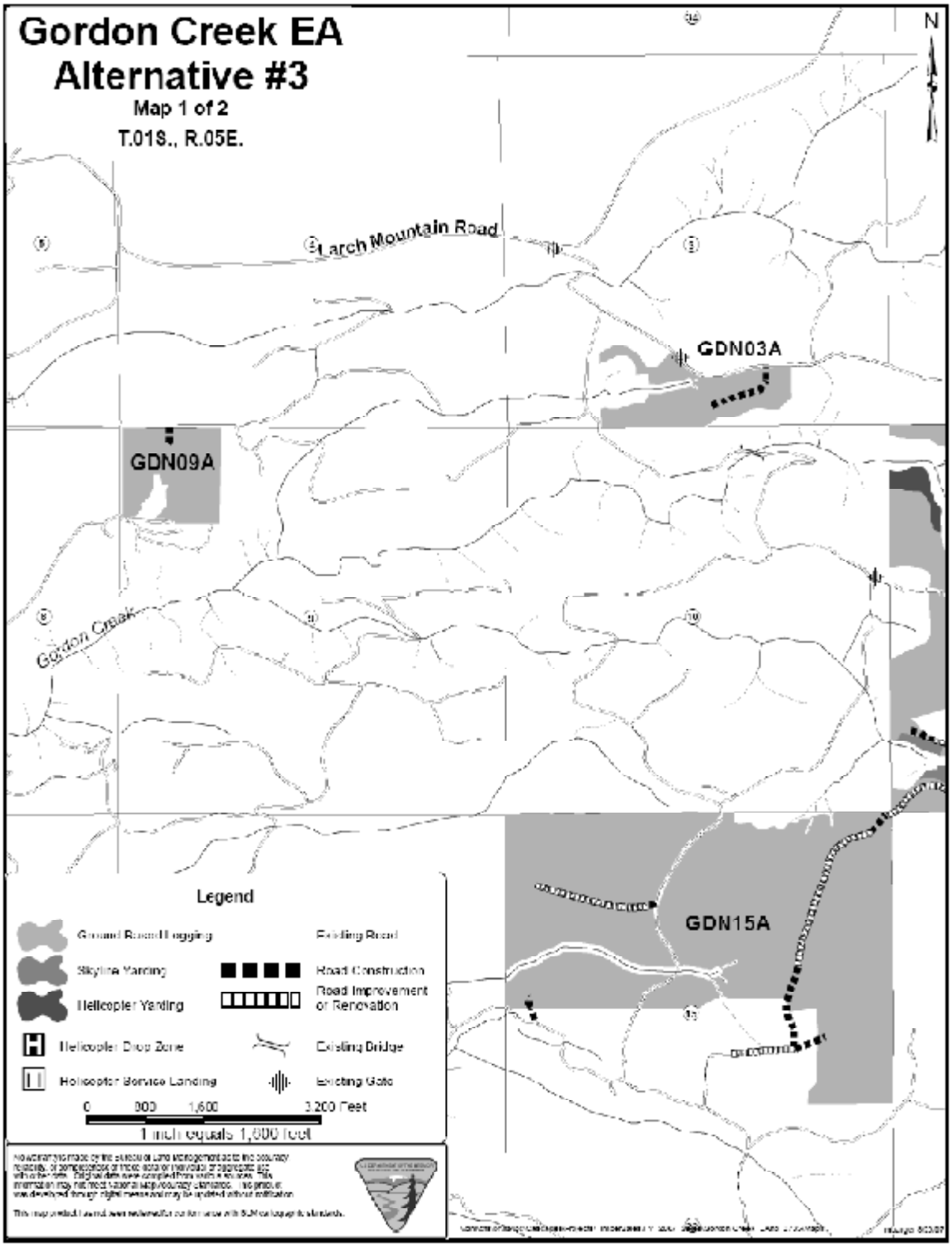


7.2.4.2 Map of Alternative 2 - Sections 1, 11, 13

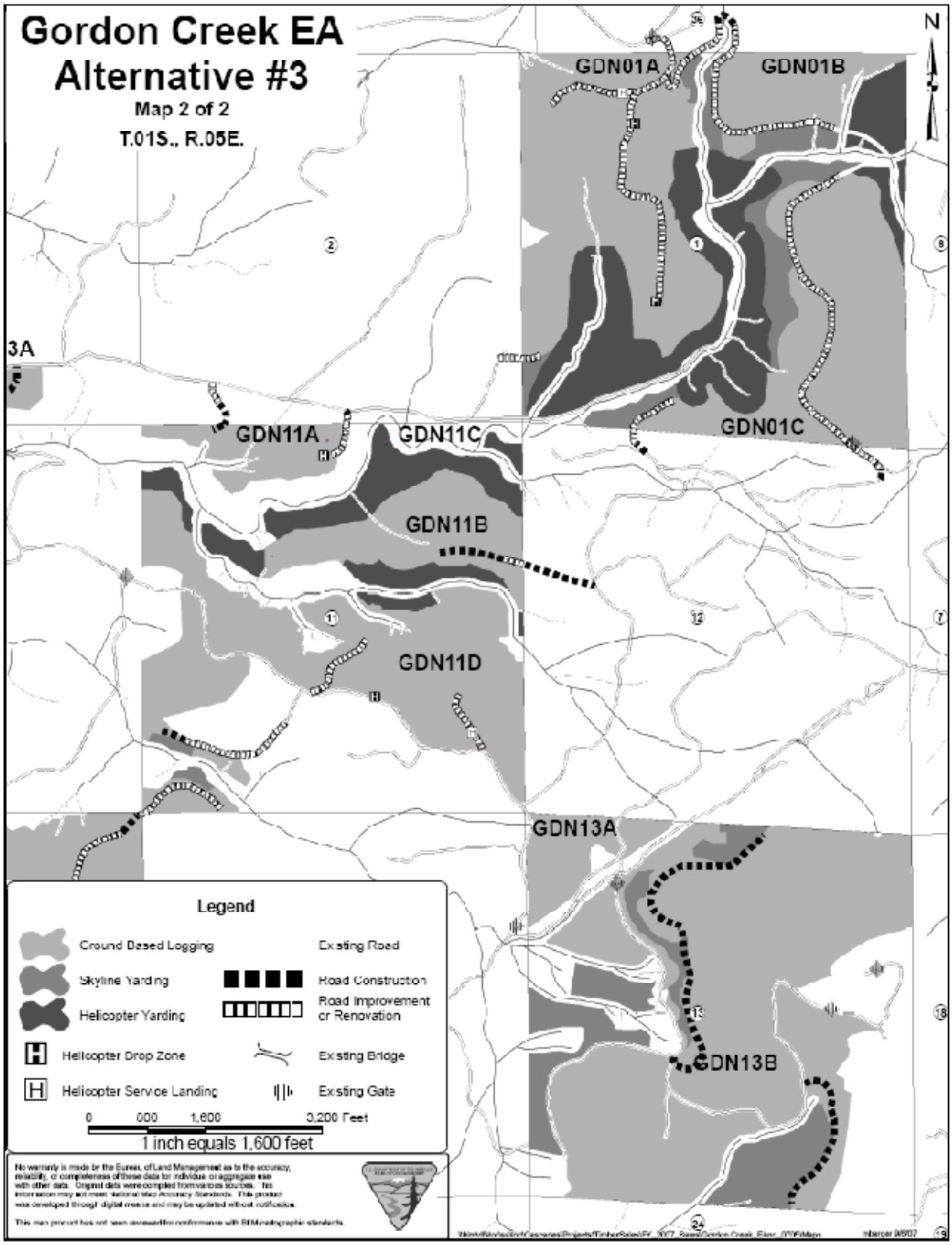


7.2.5 Alternative 3

7.2.5.1 Map of Alternative 3 - Sections 3, 9, 15



7.2.5.2 Map of Alternative 3 - Sections 1, 11, 13



8.0 GLOSSARY AND COMMON ACRONYMS

8.1 Glossary

303(d) Water Quality Listing - Impaired waters that do not meet water quality standards, identified by DEQ, as required by the Clean Water Act.

acre - A measure of surface land area in U.S.customary units that is 43,560 square feet, which is 1/640 of a square mile (or approximately 0.4 hectares).If square, it is nearly 209 feet on each side.

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

allowable sale quantity - The timber yield that a forest can produce continuously under the intensity of management outlined in the RMP from those lands allocated for permanent forest production.

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.*

analysis - The scientific evaluation of the environmental impacts of proposed planning decisions.

analytical assumption - A judgmental decision that is based on the science and relationships of natural systems assumed to be true and from which conclusions can be drawn to supply the missing values, relationships, or societal preferences needed for proceeding with an analysis of alternatives.
(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.

aquatic habitat - Habitat for vertebrate and invertebrate wildlife species and vascular and non-vascular plants occurring in free water (e.g.lakes, ponds, streams, rivers, springs and seeps).

authority - The right and power to make decisions and give orders such as the United States Congress exerts when passing legislation (e.g.the O&C Act and the Endangered Species Act).

basal area - The cross-sectional area of a single stem, of all stems of a species in a stand, or of all plants in a stand (including the bark) that is measured at breast height (about 4.5 feet up from the ground) for larger plants (like trees) or measured at ground level for smaller plants.

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).

biological assessment A biological assessment is a document that evaluates potential effects of a proposed action to listed and proposed species and designated and proposed critical habitat and determines whether any such species or habitats are likely to be adversely affected by the action.It is used in determining whether formal consultation or conferencing with the U.S.Fish and Wildlife Service or National Marine Fisheries Service is necessary (50 CFR 402.12[a])

(BO) biological opinion - An opinion by the U.S, Fish and Wildlife Service or the National Marine Fisheries Service as to whether or not a federal action is likely or not to jeopardize the continued existence of listed species, or would result **in** the destruction of or adverse modification of critical habitat.The opinion may contain reasonable and prudent alternatives, a statement of anticipated take of listed animals, and conservation recommendations for listed plants.

Bureau Strategic Species - A special status species category established by the Oregon/Washington BLM that includes animal, plant and fungi species that are of concern in the two states. The special status species policy (BLM **6840**) does not apply to these species, and no analysis of them is required in NEPA documents. Field units are required to collect occurrence field data and maintain records.Also see *Bureau sensitive species*.

Bureau Sensitive Species - A special status species category established by the BLM that includes those plant and animal species eligible for status as federally listed, federal candidate, state listed, or state candidate (plant) species; **on** List 1 of the Oregon Natural Heritage Database or approved for this category by the BLM state director; or included under agency species conservation policies. Also see *Bureau strategic species*.

canopy - The more or less continuous cover of branches and foliage formed collectively by adjacent trees and other woody species in a forest stand. Where significant height differences occur between trees within a stand, formation of a multiple canopy (multi-layered) condition can result.

canopy closure - 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.

checkerboard land ownership pattern - A land ownership pattern in which square-mile sections of federal lands are typically intermixed, on the basis of alternating sections, with adjoining private lands. The O&C lands of western Oregon are an example of checkerboard ownership. This ownership pattern resulted from the revestment back to the federal government of lands granted by the federal government to early railroad companies. The checkerboard ownership pattern of the O&C lands creates additional access, management, and perception issues.

(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*.

Consultation - A formal review between the U.S.Fish and Wildlife Service or National Marine fisheries Service and another federal agency when it is determined that an action by the agency may affect critical habitat or a species that has been listed as threatened or endangered to ensure that the agency's action does not jeopardize a listed species or destroy or adversely modify critical habitat. Critical habitat is an Endangered Species Act term denoting a specified geographic area occupied by a federally listed species, and on which the physical and biological features are found that are essential to the conservation and recovery of that species and that may require special management or protection.

crown - The upper part of a tree that has live branches and foliage.

crown fire - Fire that moves through the crowns of adjacent trees independent of any surface fire. Crown fires can often move faster and ahead of ground fires.

culmination of mean annual increment (CMAI) The age in the growth cycle of a tree or stand at which the *mean annual increment* (MAI) for volume is at its maximum.

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 (e.g. some of the canopy gaps and the 117 year old stand) – 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).

floodplain Level lowland bordering a stream or river onto which the flow spreads at flood stage.

Forest Operations Inventory (FOI) - An intensive inventory that provides managers with information regarding the age, species, stand location, size, silvicultural needs, and recommended treatment of stands based on individual stand conditions and productivity.

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.

forest habitat - An area containing the forest vegetation with the age class, species composition, structure, sufficient area, and adequate food source to meet some or all of the life needs (such as foraging, roosting, nesting, breeding habitat for northern spotted owls) of specific species.

harvesting -The process of onsite cutting and removing of merchantable trees from a forested area.

key watershed -A Northwest Forest Plan term that denotes a watershed that contains habitat for potentially threatened species, stocks of anadromous salmonids, or other potentially threatened fish, or is an area of high-quality water and fish habitat. Also see *watershed*.

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

modeling - A scientific method that operates by a structured set of rules and procedures to simulate current conditions and predict future conditions. Also see *analysis*.

multi-layered canopy - Forest stands with two or more distinct tree layers in the *canopy*.

National Marine Fisheries Service - A federal agency under the United States Department of Commerce that is responsible for working with others to conserve, protect, and enhance anadromous fish and their habitats. NMFS is an agency in the National Oceanic Atmospheric Administration (National Marine Fisheries Service [NMFS] is now called NOAA Fisheries)

non-point source pollution - Water or air pollutants where the source of the pollutant is not readily identified and is diffuse, such as the runoff from urban areas, agricultural lands, or forest lands. Also see *point source*.

(NWFP) Northwest Forest Plan - 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 Related Species within the Range of the Northern Spotted Owl (1994) (Northwest Forest Plan). A 1994 common management approach for the 19 national forests and 7 BLM districts located in the Pacific Northwest ecological region and jointly approved by the Secretary of Agriculture and the Secretary of the Interior.

nutrient cycling - Circulation of elements (such as carbon or nitrogen) between vegetation/organic material and soil, water and air.

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.

plan conformance - The determination that a management action is consistent with the terms, conditions, decisions, and is within the anticipated environmental consequences, of an approved resource management plan.

point source - An origin of water or air pollutants that is readily identified, such as the discharge or runoff from an individual industrial plant or cattle feedlot. Also see *nonpoint source*.

relative density - A means of describing the level of competition among trees or site occupancy in a stand, relative to some theoretical maximum that is based on tree size and species composition. Relative density is determined mathematically by dividing the stand basal area by the square root of the quadratic mean diameter. Also see *basal area and quadratic mean diameter.*

(RMP) Resource Management Plan - Salem District Record of Decision and Resource Management Plan (1995). A BLM planning document, prepared in accordance with Section 202 of the Federal Land Policy and Management Act that presents systematic guidelines for making resource management decisions for a resource area. An RMP is based on an analysis of an area's resources, their existing management, and their capability for alternative uses. RMPs are issue oriented and developed by an interdisciplinary team with public participation.

rotation - The planned number of years between establishment of a forest stand and its regeneration harvest.

salmonid - 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 *anadromous fish.*

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.

special forest products (SFP) - Those plant and fungi resources that are harvested, gathered, or collected by permit, and have social, economical, or spiritual value. Common examples include mushrooms, firewood, Christmas trees, tree burls, edibles and medicinals, mosses and lichens, floral and greenery, and seeds and cones, but not soil, rocks, fossils, insects, animal parts, or any timber products of commercial value.

special status species - Those species that are listed under the Endangered Species Act as threatened or endangered (including proposed and candidate species); listed by a state as threatened, endangered or candidate species; and listed by the BLM as sensitive species. Under the BLM Special Status Species policy (BLM 6840), the BLM State Director has created an additional category called Bureau Strategic Species (see glossary ***Bureau strategic species***).

stand - An aggregation of trees occupying a specific area and sufficiently uniform in composition, age, arrangement, and condition so that it is distinguishable from the forest in adjoining areas.

standards and guidelines - 1995 RMP rules for managing the different land use allocations.

stream, intermittent - Drainage feature with a dry period, normally for three months or more, where the action of flowing water forms a channel with well-defined bed and banks, supporting bed-forms showing annual scour or deposition, within a continuous channel network.

stream, perennial - Permanent channel drainage feature with varying but continuous year-round discharge, where the base level is at or below the water table.

structurally complex stage - Stage at which stands develop characteristics approximating "old-growth" stands.

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.

Timber Production Capability Classification (TPCC) - An analytical tool that inventories and identifies sites as capable of sustaining intensive timber management without it degrading their productive capacity. This tool evaluates a site's soil depth, available moisture, slope, drainage, and stability to determine site capacity for timber management activity. Sites that prove incapable of sustaining intensive timber management are typically not included in the harvest land base.

understory - Portion of trees or other woody vegetation that forms the lower layer in a forest stand, and that consists of more than one distinct layer.

(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.

8.2 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

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PIF SAD; Partners in Flight Species Assessment Database RC = Regional Concern; RS = Regional Stewardship. The area encompassed by this list is BCR 5 which includes more than western Oregon and Washington. Available at: www.rmbo.org/pif/jsp/BCRmap.asp

USFWS BCC; U.S. Fish and Wildlife Service Birds of Conservation Concern. Available at: http://www.fws.gov/migratorybirds/reports/bcc2002.pdf. The area encompassed by this list is BCR 5 which includes more than western Oregon and Washington.

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