# Dunk Tank Timber Sales

## Environmental Assessment and draft Finding of No Significant Impact

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United States Department of the Interior
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Marys Peak Field Office

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BLM
Salem District

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**BLM/OR/WA/AE-16/015+1632**

# DUNK TANK TIMBER SALES ENVIRONMENTAL ASSESSMENT

## Table of Contents


**1.0 INTRODUCTION....1**
1.1 PROJECT COVERED IN THIS EA....1
1.2 PROJECT AREA LOCATION....1
1.3 PURPOSE OF AND NEED FOR ACTION....3
1.4 DECISION TO BE MADE....5
1.5 PUBLIC INVOLVEMENT....5
1.6 ISSUES....5
1.6.1 ISSUES CONSIDERED IN THE EA....5
1.6.2 ISSUES CONSIDERED BUT NOT ANALYZED IN DETAIL....6
**2.0 ALTERNATIVES....9**
2.1 ALTERNATIVE DEVELOPMENT....9
2.1.1 PLANNING AND IMPLEMENTATION PROCESS....9
2.2 ALTERNATIVE 1 – NO ACTION....10
2.3 ALTERNATIVE 2 – PROPOSED ACTION....11
2.4 PROJECT DESIGN FEATURES AND BEST MANAGEMENT PRACTICES....20
2.5 CONFORMANCE WITH LAND USE PLANS, POLICIES, AND PROGRAMS....30
2.5.1 APPLICABLE LAND USE PLANS....30
2.5.2 SURVEY AND MANAGE REVIEW....30
2.5.3 RELEVANT STATUTES AND AUTHORITIES....31
2.6 COMPARISON OF ALTERNATIVES....32
2.7 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL....35
**3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS....37**
3.1 VEGETATION....37
3.1.1 AFFECTED ENVIRONMENT....37
3.1.2 ENVIRONMENTAL EFFECTS....42
3.1.3 CUMULATIVE EFFECTS....48
3.2 WILDLIFE....50
3.2.1 AFFECTED ENVIRONMENT....50
3.2.2 ENVIRONMENTAL EFFECTS....55
3.2.3 CUMULATIVE EFFECTS....60
3.3 FISHERIES AND AQUATIC HABITAT....62
3.3.1 AFFECTED ENVIRONMENT....62
3.3.2 ENVIRONMENTAL EFFECTS....63
3.3.3 Cumulative Effects....70
3.4 HYDROLOGY....72
3.4.1 AFFECTED ENVIRONMENT....72
3.4.2 ENVIRONMENTAL EFFECTS....75
3.4.3 CUMULATIVE EFFECTS....78
3.5 SOILS....81
3.5.1 AFFECTED ENVIRONMENT....81
3.5.2 ENVIRONMENTAL EFFECTS....82
3.5.3 CUMULATIVE EFFECTS....86
3.6 AIR QUALITY, FIRE RISK, AND FUELS MANAGEMENT....86

3.6.1 AFFECTED ENVIRONMENT ....86
3.6.2 ENVIRONMENTAL EFFECTS ....88
3.6.3 CUMULATIVE EFFECTS....91
3.7 RECREATION, RURAL INTERFACE, VISUAL RESOURCE MANAGEMENT ....91
3.7.1 AFFECTED ENVIRONMENT ....91
3.7.2 ENVIRONMENTAL EFFECTS ....93
3.7.3 CUMULATIVE EFFECTS....96
**4.0 COMPLIANCE WITH THE AQUATIC CONSERVATION STRATEGY ....98**
**5.0 CONTACTS AND CONSULTATION ....104**
5.1 ESA – SECTION 7 CONSULTATION ....104
5.2 CULTURAL RESOURCES – SECTION 106 CONSULTATION ....105
5.3 PUBLIC SCOPING AND NOTIFICATION ....105
**6.0 MAJOR SOURCES ....106**
6.1 LIST OF PREPARERS....106
6.2 INTERDISCIPLINARY TEAM REPORTS ....106
6.3 LITERATURE CITED ....107
**APPENDIX A – Glossary of Terms and Acronyms .... A-1**
**APPENDIX B – Watersheds in the Project Area ....B-1**
**APPENDIX C – Marking Guide for the Dunk Tank Timber Sales.... C-1**
**APPENDIX D – LiDAR-Derived Vegetation Heights .... D-1**
**APPENDIX E – Land Use Allocations in the Project Area ....E-1**
**APPENDIX F – Water Quality Management Plan ....F-1**

## List of Tables

Table 1-1. Comparison of Dunk Tank Project Stands to Projects with Project Level Carbon and Climate Change Analyses .... 7
Table 2-1. Stand ages, acres, and land use allocation by EA unit .... 12
Table 2-2. Road surface and final status for planned road work .... 14
Table 2-3. Activities in Alternative 2 – the Proposed Action.... 15
Table 2-4. Seasonal Restrictions.... 20
Table 3-1. Vegetation conditions on BLM-managed lands within the Marys River fifth-field watershed .... 38
Table 3-2. Summary of current stand attributes, Dunk Tank Project (trees > 7” DBH) .... 39
Table 3-3. Existing coarse woody debris within Dunk Tank units, including both standing dead snags per acre and downed wood pieces per acre .... 40
Table 3-4. Stand metrics with treatment and without treatment on a per acre basis in 2046 .... 45
Table 3-5. Habitat conditions in NSO home ranges overlapping the project area [1, 2] .... 52
Table 3-6. Red Tree Vole Survey Results from Section 19.... 54
Table 3-7. Bird species groups likelihood of occurrence within the project areas .... 54
Table 3-8. Proposed harvest units that fall within home range of northern spotted owl sites .... 57
Table 3-9. Effects of proposed action on federally listed wildlife species and their critical habitat .... 58
Table 3-10. Summary of proposed, past, and foreseeable harvest acreage on BLM lands .... 61
Table 3-11. Alternative 2: Proposed road renovation and haul route information .... 66
Table 3-12. Project area waterbody listing .... 74
Table 3-13. Harvest-related peak flow predictions by sixth-field watershed .... 78

Table 3-14. Haul activity by private industry in the project area ..... 80
Table 3-15. Haul activity by the BLM in the project area ..... 80

## List of Maps

Map 1. Vicinity Map ..... 2
Map 2. Proposed Action – Section 7 ..... 16
Map 3. Proposed Action – Section 17 ..... 17
Map 4. Proposed Action – Section 19 ..... 18
Map 5. Proposed Action – Section 21 ..... 19

# 1.0 INTRODUCTION

This environmental assessment (EA) includes an analysis of the impacts of the proposed actions on the human environment. The EA will provide the decision-maker, the Marys Peak 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 Bureau of Land Management (BLM) Salem District's Resource Management Plan (RMP) and whether a supplement to that Environmental Impact Statement is needed or if a Finding of No Significant Impact is appropriate.

This chapter provides a context for what will be analyzed in the EA, describes the kinds of actions the BLM will be considering, defines the project area, describes what the proposed actions need to accomplish, and identifies the criteria that the decision-maker will use for choosing the alternative that will best meet the purpose and need for this proposal.

## 1.1 PROJECT COVERED IN THIS EA

This EA includes an analysis of one project: the Dunk Tank timber sale(s). This proposal consists of thinning harvest, road work, and post-harvest fuel treatments on approximately 740 acres[1] of BLM-administered lands in Benton County, Oregon. The proposed action would likely be implemented through two or three timber sales between fiscal years 2017 and 2018. Forest considered and analyzed for treatment in this EA are approximately 37-76 years of age[2]. Section 2.3 of this EA describes the specific actions proposed, which include thinning harvest, road activities, and post-harvest fuel treatments. Section 2.4 describes the design features that would be applied to this project to minimize the risk of adverse impacts to resources.

## 1.2 PROJECT AREA LOCATION

The project area is located approximately six miles southwest of Philomath, Oregon, in Benton County on forested land managed by the Marys Peak Field Office of the Salem District BLM. Lands are with the Matrix (General Forest Management Area) and Riparian Reserves as described the Salem District RMP; approximately 490 acres are within the Matrix land use allocation and 250 acres are within in the Riparian Reserves land use allocation. The project area lies within the Marys River fifth-field watershed[3] in Township 13 South, Range 6 West, Sections 7, 17, 19, and 21, Willamette Meridian (see Map 1 on the following page). The BLM manages 2,240 acres of the 2,560 acres in the four sections. The proposed action area is located outside the coastal zone as identified by the Oregon Coastal Management Program.

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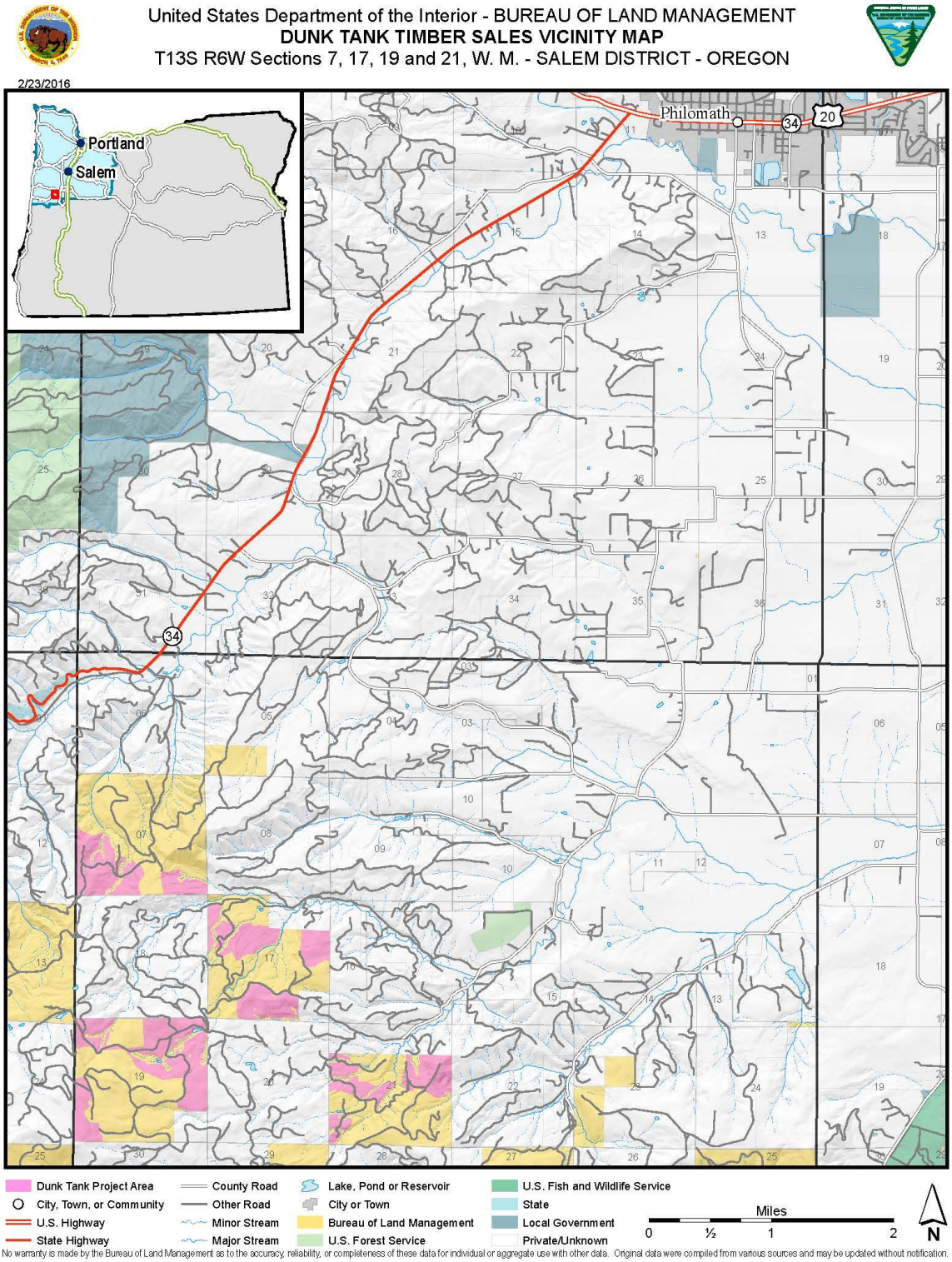
[1] 730 acres of thinning and 10 acres of new right-of-way construction.
[2] Ages in 2016. Ages were determined for each stand as an average of all trees in that stand.
[3] Impacts to resources may also be analyzed at the subwatershed level in Chapter 3 of this EA. For this project area, there are two sixth-field watersheds (Beaver Creek and Greasy Creek). A map of the fifth and sixth field watersheds referenced in this EA is located in Appendix B.

**Map 1.** Vicinity Map



## 1.3 PURPOSE OF AND NEED FOR ACTION

The Dunk Tank timber sales are designed to meet multiple resource objectives regarding the management of BLM forestland in the Salem District as outlined in the Salem District RMP. The project is also designed to meet the requirements of the 1937 O&C Lands Act. This Act requires that O&C lands be managed for permanent forest production in accordance with the principles of sustained yield (RMP p. 2). Another objective of the project is to design and offer timber sales that would provide jobs and contribute timber for manufacturing in local economies. Further, actions proposed in this EA are consistent with those recommended in the Benton Foothills Watershed Analysis (1997).

The BLM selected the forest stands[4] for treatment and designed treatments specifically to meet RMP direction. Stand structure within the Matrix and the Riparian Reserves is relatively uniform, simple, dense, and lacking in standing and down coarse woody debris (CWD). Section 3.1 of this EA provides additional information on current conditions in the project area.

The Dunk Tank timber sales are within the Matrix and Riparian Reserves land use allocations. The RMP anticipated that the majority of timber harvest across the Salem District would come from the Matrix land use allocation. The RMP provides specific management direction in these land use allocations:

***Matrix (General Forest Management Area)***

- Apply silvicultural systems that are planned to produce, over time, forests which have desired species composition, structural characteristics, and distribution of seral or age classes (RMP p. 46).

- Provide habitat for a variety of organisms associated with both late-successional and younger forests (RMP p. 20).

- Produce a sustainable supply of timber and other commodities to provide jobs and contribute to community stability (RMP p. 20). The quality of wood, value of logs ultimately produced, and economic efficiency would be important considerations for planned treatments (RMP Appendix D 1)

- To perform commercial thinning on suitable managed timber stands to promote tree growth and survival (RMP pp. 46–48, Appendix D-2).

There is a need for the timber volume that would be generated by the Dunk Tank timber sales. Timber harvests would contribute to annual district requirements. Additionally, recent forest stand exam data indicates that active timber management is necessary to meet RMP objectives for the land use allocation.

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[4] A forest stand is a contiguous group of trees sufficiently uniform in age-class distribution, composition, and structure, and growing on a site of sufficiently uniform quality to be a distinguishable unit. Stands were identified using BLM inventory data (Forest Operations Inventory or FOI) and field verification.

***Riparian Reserves***

- Apply silvicultural treatments to restore large conifers (RMP p. 7).
- Apply silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy Objectives (RMP p. 11).
- Design and implement watershed restoration projects in a manner that promotes long-term ecological integrity of ecosystems, conserves the genetic integrity of native species, and attains Aquatic Conservation Strategy objectives (RMP p. 14).
- To improve stand density and species complexity on a site-specific and landscape level in the long-term (RMP D-6).

Forest conditions in the Riparian Reserves are similar to those in the Matrix (upland); stands are dense, overstocked, and lacking in key structural components (e.g., large wood) and species diversity. Active forest management is needed to correct resource deficiencies. Variable density thinning treatments emphasize multi-species management and are likely the most favorable prescriptions for provide key habitat structural components for a diverse group of forest species.

***Road Management***

- Provide an adequate transportation system to manage timber resources and serve other management needs on federal, state, and private lands in a safe and environmentally sound manner (RMP p. 62).

Road access is required for harvest operations. There is a need to construct roads to access the timber stands and to renovate the current road system, which is in need of work to correct resource-related issues and deficiencies. To meet current Best Management Practices (BMP) standards, culvert replacements and road draining improvements are needed.

***Economic Viability and Efficiency***

- Contributions to local, state, and national economies through sustainable use of BLM-managed lands and resources (RMP p. 41)
- 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).

**Benton Foothills Watershed Analysis**

The watershed analysis provides several recommendations regarding the management of BLM-administered lands in the project area watershed (pp. 121-145). Recommendations are provided to address findings in several categories, including but not limited to, soil compaction and erosion, vegetation, Riparian Reserves, water quality, wildlife species and habitat, and human uses.

- In project areas between 20 and 70 years old, thin trees to increase growth and wood volume production and enhance species composition (p. 125). For stands over 70 years, manage density to maintain fast growth of dominant trees (p. 132).

- Inventory stands between 20 and 70 years to determine if they are developing older forest characteristics, and if they would benefit from density management or some other treatment to maintain or restore ACS objectives (p. 128).

- Design management activities in the Riparian Reserves to provide for down wood and snags in all decay classes over the life of the stand (p. 129).

## 1.4 DECISION TO BE MADE

The Marys Peak Field Manager will use the following criteria in the decision-making process. The Field Manager will select the alternative that best meets these criteria. The selected action would:

- Best meet the purpose and need of the action (section 1.3), which considered RMP-specific goals and objectives for the Matrix and Riparian Reserves, road management, and economic efficiency.

- Be consistent with the applicable land use plans (section 2.5)

- Not have significant impact on the affected elements of the environment beyond those already anticipated and addressed in the RMP EIS.

## 1.5 PUBLIC INVOLVEMENT

On June 23, 2015 the BLM sent a scoping letter to 25 potentially affected or interested individuals, groups, tribes, and agencies and posted the scoping letter on the Salem district website. The BLM received five responses (four during the formal scoping period and one received post-scoping) and used these comments to aid in the identification and analysis of issues described in the following section. The scoping comments are available for review at the Salem District office.

## 1.6 ISSUES

### 1.6.1 ISSUES CONSIDERED IN THE EA

The interdisciplinary team identified relevant issues based on applicable law, management direction contained in the RMP, and information gathered during the scoping and project planning process. Issues are analyzed in detail if the analysis of the issue is necessary to make a

reasoned choice between alternatives or if the issue is associated with potentially significant impacts or analysis is necessary to determine the significance of the impacts. Analysis of these issues provides a basis for comparing the environmental effects of the proposed action and the no action alternative and aids in the decision-making process. The interdisciplinary team considered the following issues as it developed and refined the project components, identified project design features (PDFs), and analyzed the environmental effects.

**Issue 1:** *What effects would thinning have on native vegetation, forest stand health and composition? How would the proposed thinning meet RMP objectives for the Matrix and Riparian Reserves? EA Section 3.1.2.*

**Issue 2:** *How would the proposed action impact Endangered Species Act, Bureau Special Status, including Survey and Manage, wildlife, fish, botanical and fungal species and their habitat? EA Sections 3.1.2, 3.2.2, and 3.3.2.*

**Issue 3:** *How would non-native plant populations (including noxious weeds) respond to the implementation of the proposed action? EA Section 3.1.2.*

**Issue 4:** *How would the proposed action affect wildlife terrestrial habitats within the project area and across the watershed? EA Section 3.2.2.*

**Issue 5:** *What effect would the proposed actions have on resident and anadromous fish and aquatic habitat? EA Section 3.3.2.*

**Issue 6:** *What effects would road new construction and road renovation and haul have on water quality and quantity? How would the proposed action effect erosion and sediment delivery to streams? Section 3.4.2*

**Issue 7:** *What effects would timber harvest activities have on water resources and soil productivity? How would the proposed action of harvesting and yarding timber effect erosion and sediment delivery to streams and soil productivity? Section 3.5.2.*

**Issue 8:** *What effects would the proposed action have on fuel loading, fire risk, and air quality? Section 3.6.2.*

**Issue 9:** *How would the proposed action affect designated and dispersed recreational use of the area? How would the proposed action affect the rural interface? What effects would the projects have on visual resources? Section 3.7.2.*

**Issue 10:** *How would the proposed action affect Aquatic Conservation Strategy objectives? EA Chapter 4.*

### 1.6.2 ISSUES CONSIDERED BUT NOT ANALYZED IN DETAIL

***Greenhouse Gases and Climate Change***

The Dunk Tank Timber Sales EA (DOI-BLM-ORWA-S050-2015-0001-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 dioxide levels. Responsive to public comment, the BLM elected to include project level analysis of carbon storage emissions.

Analyses completed for projects of similar scope, treatment type, stand type, and scale have supported the conclusion of the 1995 RMP that project emissions would be negligible (Revised Upper and Lower Alsea Watershed Enhancement EA, 2010, Upper Siletz Watershed Enhancement EA, 2010, Bottleneck Late Successional Reserve Enhancement, 2010, and Green Peak Density Management Project EA, 2010).

In Table 1–1, the stands analyzed in the Dunk Tank EA are compared to these four projects listed above.

**Table 1-1.** Comparison of Dunk Tank Project Stands to Projects with Project Level Carbon and Climate Change Analyses

| Project | Dunk Tank | Bottleneck LSR | Upper Siletz Watershed | Upper-Lower Alsea Watershed | Green Peak II Density Mgmt. |
|---|---|---|---|---|---|
| *Stand Type* | Douglas-fir | Douglas-fir | Douglas-fir | Douglas-fir | Douglas-fir |
| *Stand Age*[1] | 46-72 | 68 | 55 | 57 | 70 |
| *Prescription BA*[2] | 130-180 | 139 | 115 | | 92 |
| *Prescription TPA*[3] | 39-113 | 56 | 43 | 44 | 47 |
| *C Storage, No Action*[4] | Not Analyzed | 260 | 110 | 256 | 107 |
| *C Storage, Proposed Action*[5] | Not Analyzed | 60 | 32 | 58 | 2.4 |
| *C Storage, Proposed Action, percent of No Action* | Not Analyzed | 23% | 29% | 23% | 22% |

[1] Stand age in years, acre-weighted average of all stands.
[2] Prescribed treatment, residual square foot basal area of trees, acre-weighted average of all stands.
[3] Prescribed treatment, residual live trees per acre, acre-weighted average of all stands.
[4] Net annual carbon (C) storage tonnes, live tree storage minus emissions, 50-year analysis period.
[5] Net annual carbon (C) storage tonnes, in live trees and harvested wood minus emissions in harvested wood, harvest operations, and fuel treatment, 50-year analysis period.

Because of the similarity between previous analyses and their similarity stands and treatments analyzed in the Dunk Tank EA, it is expected that effects would be similar in scope, intensity, and character, supporting these conclusions:

- Under the Proposed Action, carbon would be released through logging, fuel treatments and emissions resulting from harvested wood, the majority within ten years after harvest.

- Under the Proposed Action, tree growth following harvest would offset greenhouse gases and result in net storage within approximately five years.

- Emissions resulting from the Proposed Action would be small and temporary, and therefore not significant.

- Under the no action alternative, no greenhouse gases would be emitted from harvest operations or fuels treatments.

- The Proposed Action would result in only 20-30 percent of the net storage of carbon over 50 years that would occur under the No Action alternative.

- The cumulative effect of management of BLM Western Oregon forest lands is a net increase of carbon storage above average historic conditions. (The WOPR EIS, 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 603 million tonnes, 5 percent higher than average historic conditions (576 million tonnes, WOPR, 3-224).

- 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.

# 2.0 ALTERNATIVES

## 2.1 ALTERNATIVE DEVELOPMENT

Pursuant to Section 102 (2) (E) of NEPA (National Environmental Policy Act 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." Within this EA, the BLM will analyze two alternatives: Alternative 1 (No Action) and Alternative 2 (the Proposed Action). The BLM did not identify any unresolved conflicts concerning use of resources that warranted the development of an additional alternative. Alternatives considered but not analyzed in detail are discussed in section 2.7 of this EA.

### 2.1.1 PLANNING AND IMPLEMENTATION PROCESS

**Planning Process**

In planning the Dunk Tank timber sales, the BLM used an interdisciplinary team (IDT) process. An IDT composed of experienced professional resource specialists developed criteria using direction in the RMP for selecting stands to be treated, types of silvicultural treatments, boundary locations, logging systems, fuel treatments, and road system design and use. The IDT also developed a set of project design features (PDFs) to guide implementation of the project. The IDT developed and analyzed the proposed action (including project design features).

Upon completion of this EA, the BLM will make the EA available for a 30 day public comment period. The BLM will consider and evaluate comments received in response to public review of this EA and make any necessary changes to the analysis or the proposed action. Changes to the project design and responses to comments would be incorporated in the project-specific Decision Record (DR)[5].

**Implementation Process**

The BLM proposes to implement the proposed action through timber sales offered between fiscal years 2017 to 2018. The BLM would implement the actions analyzed in this EA during project layout (physical delineation of treatment boundaries and road locations) and timber sale contract provisions.

The BLM would write and administer the timber sale contract and would require the timber sale operator to accomplish the requirements of the contract in a manner that is consistent with the actions and PDFs and BMPs analyzed in this EA. In all timber sale contracts, the BLM enforces compliance through standard contract administration procedures where performance is monitored by authorized BLM personnel. The Authorized Officer enforces compliance with the contract and would suspend operations if the operator fails to perform the required preventive

[5] At the time of this analysis, the first of the Dunk Tank timber sale(s) is scheduled to be offered in August 2017. The DR would be published at the time the notice of sale is published (approximately 30 days prior to the sale date).

and restorative practices. The BLM timber sale contract requires bonding in an amount sufficient for BLM to complete restoration work of the damages caused if the operator fails to perform the contract requirements.

*Logging Systems:* The BLM designed a basic logging systems plan to comply with the RMP, be technically and economically feasible, environmentally sound, use equipment and logging systems known to be commonly available in the area, and comply with BLM timber sale contract provisions and administration. There are many combinations of specific equipment and operating methods which could be used and the final plan implemented may be different than the plan analyzed in this EA.

Where there are recognized options, such as an area which may be logged with either ground-based or skyline systems, the EA analyzes the logging system with the highest potential impact. The BLM would analyze other logging systems and methods which may be proposed by operators to ensure that the specific impacts and effects are within the scope of the impacts and effects analyzed in this EA. When the BLM determines that the impacts and effects are within the scope analyzed, the BLM would document the determination and issue a decision on the proposed logging plan.

## 2.2 ALTERNATIVE 1 – NO ACTION

The No Action alternative describes the environmental 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 no timber management actions or connected actions would occur. If this alternative were selected, the following items would not be done in the project area at this time:

- Silvicultural treatments
- Timber harvest
- Road construction, decommissioning, renovation, or improvement
- Fuel reduction treatments

Only normal administrative activities and other uses (e.g., road use, programmed road maintenance, recreation, or harvest of special forest products) would continue on BLM-managed lands within the project area. On private lands adjacent to the project area, forest management and related activities are assumed to continue to occur. Selection of the No Action alternative would not constitute a decision to change the land use allocations of these lands, nor would it set a precedent for consideration of future action proposals.

## 2.3 ALTERNATIVE 2 – PROPOSED ACTION

The proposed project consists of thinning treatments on approximately 730 acres of early- and mid-seral forest stands[6]. Approximately 480 acres are within the Matrix (GFMA) land use allocation and 250 acres are within the Riparian Reserves land use allocation. Forest stands proposed for treatment range in age from 37 to 76 years of age at the time of this analysis. The figure (right) provides the age class distribution stands analyzed for treatment by 10 year age class (e.g., the 80 year age class includes stands from 76 years to 85 years of age).

**Figure 2-1.** Age Class Distribution of Forest Stands to be Treated

**Thinning Treatments**

Thinning is proposed in the Matrix and Riparian Reserves[7]. Existing stand conditions (e.g., structure, age classes, diversity) are similar between the two land use allocations. Similar prescriptions would be used for the two areas; however, differences would occur in the application of the marking guide. Post-harvest targets are based on prescribed basal areas, which vary by unit and range between 130 and 180 square feet per acre. Only Douglas-fir and western hemlock would be harvested; Douglas-fir would be favored first for removal. Minor species would be retained regardless of land use allocation.

Within the Matrix, the treatment would consist of thinning from below. This type of thinning favors removal of trees in the small diameter classes and typically reserves the larger, dominant trees.

Within the Riparian Reserves, a variable density treatment would be applied. The prescription would retain 50 percent or greater canopy cover post-harvest on a per-unit basis.

Additional information regarding the implementation of the proposed action is included in section 2.4 (project design features). Further, the marking guide in Appendix C provides specific marking and harvest metrics.

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[6] As stated section 1.1, the total disturbed area is approximately 740 acres: 730 acres of thinning and 10 acres of clearing for new road construction. Road acres are removed from calculations and discussions of thinning harvest.
[7] Within the Matrix, thinning is typically referred to as "commercial thinning;" within the Riparian Reserves, thinning is typically referred to as "density management."

**Photo.** Typical forest in the project area (EA Unit 19-1, 47 year old stand)

The BLM has identified 23 forest stands (hereafter referred to as units) to be treated in the project area. Table 2–1 below describes the land use allocations, acreage, and ages by EA unit.

**Table 2-1.** Stand ages, acres, and land use allocation by EA unit

| EA Unit | Stand Age | Total Acres | Riparian Reserves | Matrix |
|---|---|---|---|---|
| 17-1 | 52 | 22 | 16 | 6 |
| 17-2 | 48 | 6 | 3 | 3 |
| 17-3 | 48 | 20 | 14 | 6 |
| 17-4 | 52 | 37 | 0 | 37 |
| 17-5 | 47 | 33 | 5 | 28 |
| 17-6 | 41 | 33 | 10 | 23 |
| 17-7 | 60 | 9 | 7 | 2 |
| 17-8 | 41 | 22 | 1 | 21 |
| 17-9 | 65 | 4 | 0 | 4 |
| 19-1 | 47 | 39 | 11 | 28 |
| 19-2 | 69 | 35 | 22 | 13 |
| 19-3 | 76 | 52 | 1 | 51 |
| 19-4 | 65 | 1 | 1 | 0 |
| 19-5 | 60 | 122 | 30 | 92 |
| 21-1 | 65 | 11 | 8 | 3 |
| 21-2 | 65 | 26 | 11 | 15 |
| 21-3 | 50 | 42 | 3 | 39 |
| 21-4 | 54 | 22 | 19 | 3 |
| 21-5 | 37 | 22 | 20 | 2 |
| 21-6 | 50 | 16 | 12 | 4 |
| 7-1 | 44 | 79 | 30 | 49 |
| 7-2 | 41 | 42 | 17 | 25 |
| 7-3 | 47 | 35 | 9 | 26 |
| **Total** | | **730** | **250** | **480** |

### Logging Systems

Trees would be harvested by ground-based (80 percent) and skyline harvest (20 percent) systems and would adhere to project design features (section 2.4) to their respective systems. The BLM estimates that 145 landings would be necessary for safe and efficient harvest operations.

### Road Work

The proposed action includes new construction, renovation and improvement of existing roads, and road decommissioning. Table 2–4 describes the seasonal restrictions applied to particular activities (e.g., road construction) that guide when activities may or may not occur.

*New Construction:* At the time of analysis, the IDT has identified 14 spurs to be constructed. Spurs range from 64 feet to 1,774 feet in length and total 11,300 feet (2.2 miles). New road construction would occur in the Matrix; no new road construction would occur in the Riparian Reserves. For analysis purposes, the clearing width is assumed to be 40 feet, yielding a maximum disturbance area of 10 acres. Roads located in areas of gentle topography would require a narrower clearing width; given the location and design of many roads, it is expected that the average clearing width would be closer to 30 feet. Rock application is proposed for roads within skyline harvest units, while roads within or ground-based harvest units may be left as natural surface.

*Renovation:* The BLM has identified approximately 17.7 miles of existing road to be renovated. Renovation covers a large array of low to high disturbance activities; it may include blading and shaping, cutting brush from slopes, ditches and shoulders, cleaning out ditches and catch basins, cleaning out or replacing culverts, replacing aggregate surfacing, and compaction of sub-grade and/or surfacing material. Individual trees may be cut to facilitate the completion of the aforementioned activities.

*Improvement:* The BLM has identified approximately 1.3 miles (6,850 feet) of existing road to be improved. Improvement includes work to be done that will improve a road to a higher standard than its original design. Improvement can include adding an aggregate surface to a natural surface road, adding a drainage system of ditches, cross-drains, or drain dips to an outsloped road surface, or it may include re-alignments or repairs of road failures that improve a road to a better state than its original design.

*Decommissioning:* The BLM has identified approximately 900 feet of an old road segment in units 17-5 and 17-6 to be decommissioned independent of timber sale operations. This road is not currently drivable, but the BLM found evidence of its use as an off-highway vehicle (OHV) trail. Specific actions include decompacting the trail surface, recontouring to original slopes, creating a low spot to connect existing wet areas above and below the current road, felling trees across the road, mulching, and reseeding.

### Final road status

The BLM has identified a preliminary final status for new road construction and renovation (Table 2–2). Natural or dirt surface roads to be constructed or improved (approximately 1.64

miles) would be placed into a state of long-term storage and left in a hydrologically stable condition[8]. At a minimum, water bars would be installed and road entrances would be blocked to vehicular access. Additional actions, such as grass seeding, may be completed as necessary to ensure that the roads are left in a hydrologically stable condition.

**Table 2-2.** Road surface and final status for planned road work

| Road | Activity | Length (ft.) | Surface | Final Status |
|---|---|---|---|---|
| P1 | Construct | 694 | Rock | Open |
| P2 | Construct | 188 | Rock | Open |
| P3 | Construct | 562 | Natural or Dirt Surface | Long-term storage |
| P4 | Construct | 1,033 | Rock | Open |
| P5 | Construct | 64 | Rock | Open |
| P6 | Construct | 340 | Rock | Open |
| P7 | Construct | 556 | Rock | Long-term storage |
| P8 | Construct | 1,142 | Natural or Dirt Surface | Long-term storage |
| P9 | Construct | 239 | Natural or Dirt Surface | Long-term storage |
| P10 | Construct | 1,774 | Rock | Long-term storage |
| P11 | Construct | 1,589 | Natural or dirt surface | Long-term storage |
| P12 | Construct | 957 | Natural or dirt surface | Long-term storage |
| P13 | Construct | 1,246 | Natural or dirt surface | Long-term storage |
| P14 | Construct | 906 | Natural or dirt surface | Long-term storage |
| R1 | Renovate | 790 | Rock | Open |
| R2 | Renovate | 738 | Rock | Open |
| R3 | Improve | 854 | Natural or Dirt Surface | Long-term storage |
| R4 | Improve | 837 | Rock | Long-term storage |
| R4 | Improve | 724 | Natural or Dirt Surface | Long-term storage |
| R5 | Improve | 430 | Natural or Dirt Surface | Long-term storage |

### Fuel Treatments

The BLM would conduct post-harvest fuel hazard surveys and would recommend site-specific treatments a needed for fuel reduction. Fuel treatment strategies would be implemented to reduce both the intensity and severity of potential wildfires in the long term (after fuel reduction has occurred).

Additional information regarding proposed fuel reduction treatments can be found in the following section, Project Design Features and Best Management Practices, and in section 3.6, Air Quality, Fire Risk, and Fuels Management.

### Post-Harvest Planting

The BLM would monitor the project area for reforestation needs, specifically in areas of *Phellinus weirii* treatment (see section 2.4).

[8] Subject to any encumbrances under reciprocal right-of-way agreements.

### Implementation

The timber sales would be offered between fiscal year 2017 and fiscal year 2018. Timber sale contracts are typically three years in length; the proposed action may be implemented up through calendar year 2021. Seasonal restrictions, as described in section 2.4, would limit when certain activities (e.g., road construction) may occur.

Table 2–3 below provides an overview of the actions covered under the Proposed Action.

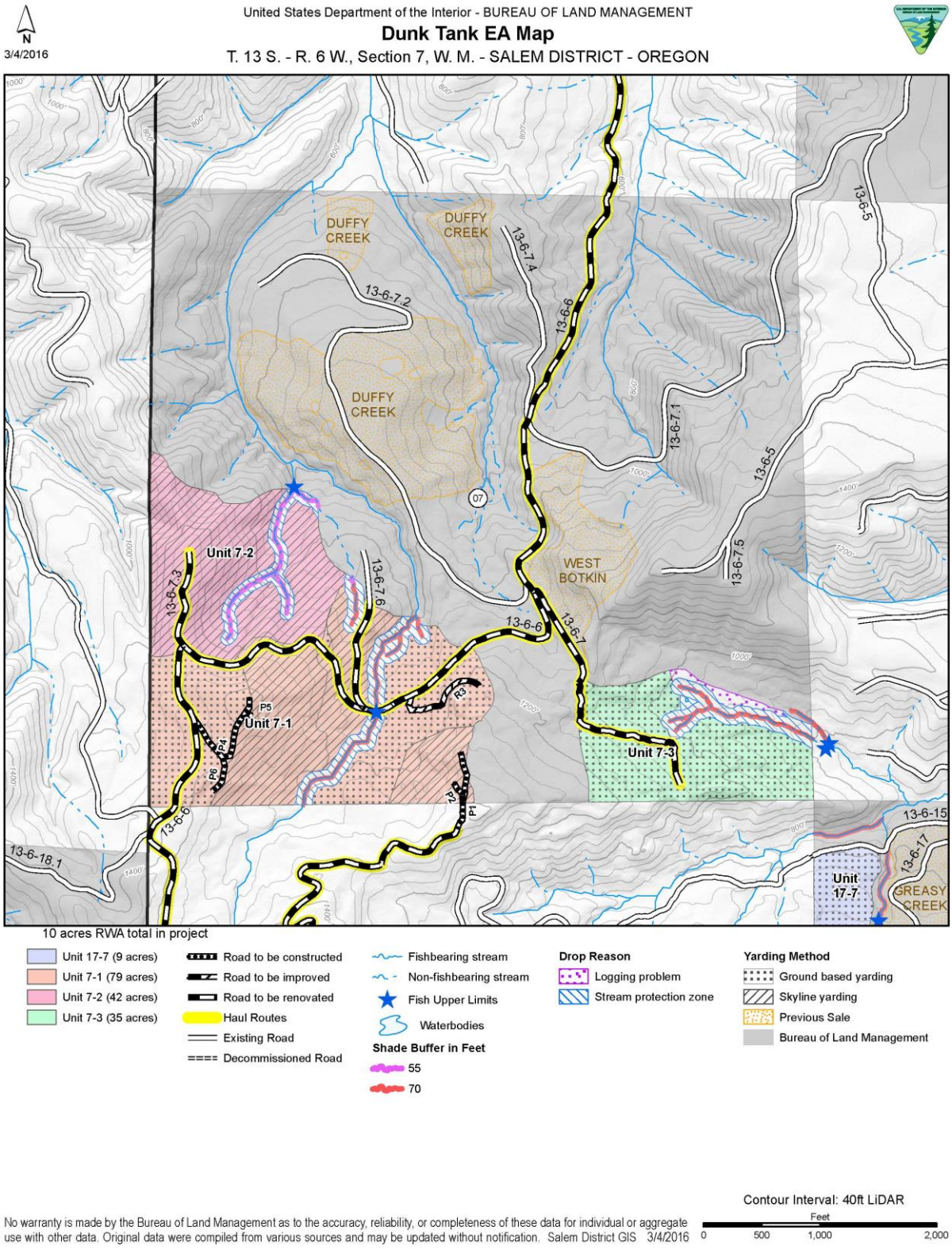
**Table 2-3.** Activities in Alternative 2 – the Proposed Action

| Activity | Alternative 2 – Proposed Action |
|---|---|
| Commercial thinning (GFMA) | 480 |
| Residual TPA (>7" DBH[1]) | 39-113 |
| Residual basal area | 130-180 |
| Density management (Riparian Reserves) | 250 |
| Residual TPA (>7" DBH) | 39-113 |
| Residual basal area | 130-180 |
| Ground-based yarding (acres) | 578 |
| Skyline yarding (acres) | 152 |
| New road construction (miles) | 2.2 |
| Road improvement (miles) | 1.3 |
| Road renovation (miles) | 17.7 |
| Road decommissioning (miles) | 0.17 |

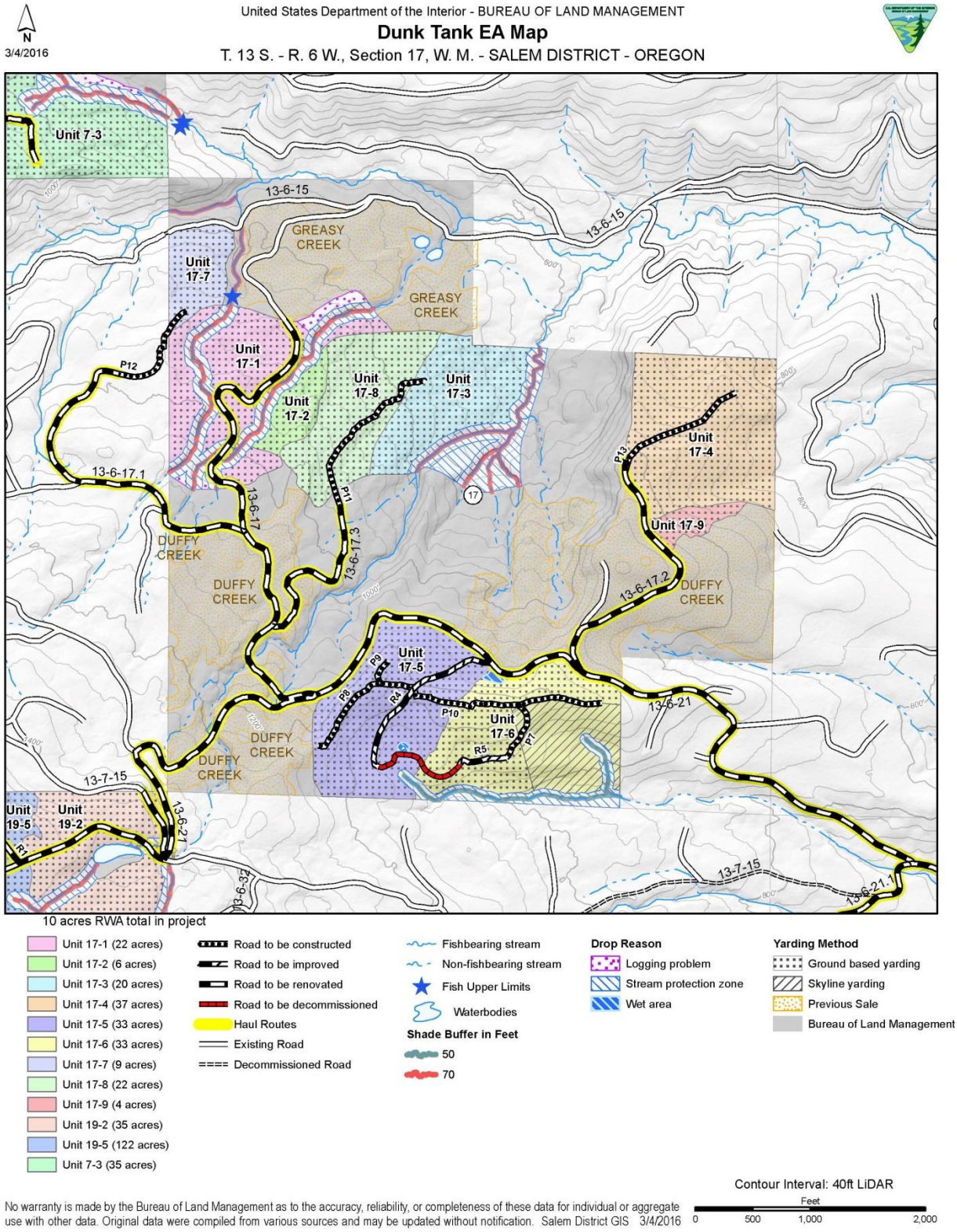
[1] Diameter at breast height (4.5 feet)

The maps on the following pages display the Dunk Tank timber sales as analyzed in Alternative 2 (Proposed Action). These maps display the harvest units independent of land use allocation. Maps in Appendix E display land use allocations within the proposed harvest unit.

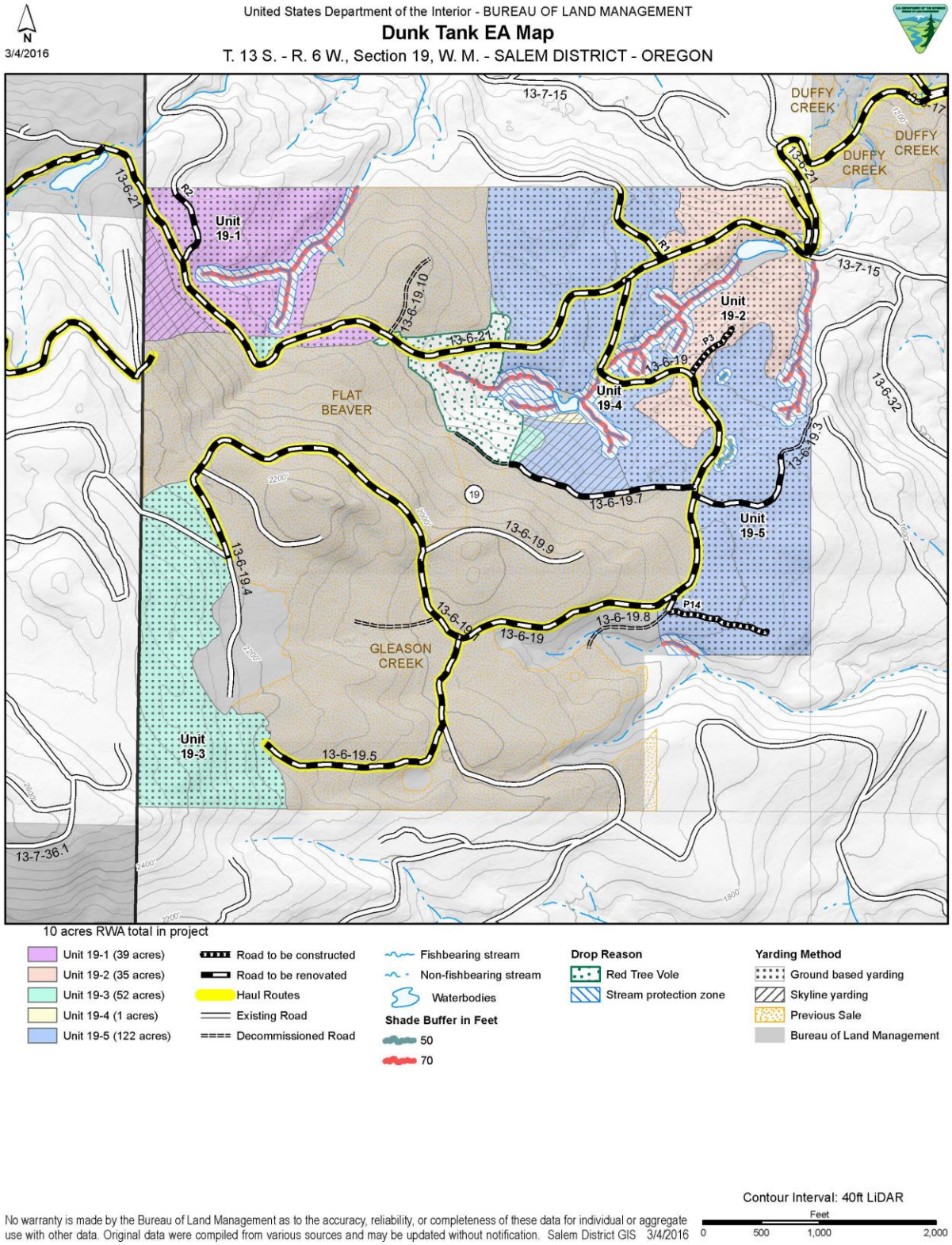
**Map 2.** Proposed Action – Section 7



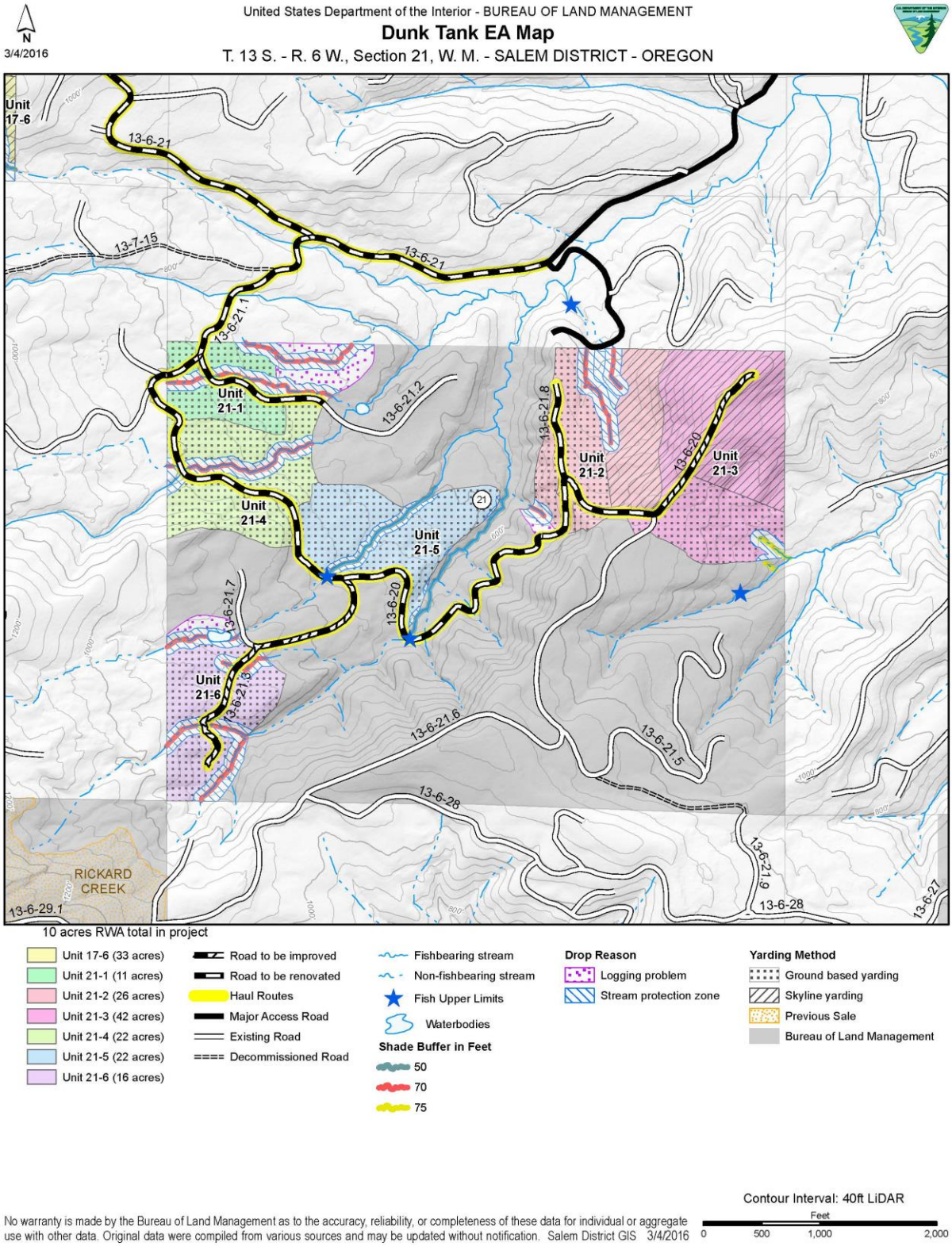
**Map 3.** Proposed Action – Section 17



**Map 4.** Proposed Action – Section 19



**Map 5.** Proposed Action – Section 21



## 2.4 PROJECT DESIGN FEATURES AND BEST MANAGEMENT PRACTICES

The actions described in EA Chapter 2, analyzed in EA Chapter 3, and the project design features in this section, taken together, form the best management practices (BMPs) for the Dunk Tank timber sales and are based on site-specific application of the principles contained in the RMP.

The following is a description of the project design features and best management practices (BMPs) that reduce the risk of adverse effects to the environment. These design features would be enforced through a timber sale contract administered by the BLM.

Table 2–4 summarizes the seasonal restrictions, the period in which they apply, and the intended objective of each restriction.

**Table 2-4.** Seasonal Restrictions

| Season of Operation or Operating Conditions[9] | Applies to Operation | Objective |
|---|---|---|
| During periods of low soil moisture[10], generally July 15 to October 15 | Ground-based yarding (Tractor) | Minimize soil erosion and compaction |
| During periods of low soil moisture, generally June 15 to October 31 | Ground-based yarding (Harvester/Forwarder or Hydraulic Loader) and machine chipping and/or piling | Minimize soil erosion and compaction |
| During periods of low precipitation, generally May 1 to October 31 | Road construction, improvement, renovation and decommissioning, dry culvert installation, quarry activities (drilling, shooting, blasting, crushing) | Minimize soil erosion |
| Generally year round | Hauling would be allowed year-round on rock surfaced roads except where the surface is deeply rutted or where runoff is causing a visible increase in turbidity to adjacent streams. | Minimize soil erosion and stream sedimentation |
| During periods of dry weather and low soil moisture, generally May 1 to October 31 | Hauling on the following roads: Native surface roads | Minimize soil erosion and stream sedimentation |
| July 1 to October 15 | In-stream work period | Minimize soil erosion and stream sedimentation |

[9] Actual conditions supersede calendar dates in determining operational periods.
[10] Low soil moisture is defined as between 15 and 25 percent or lower depending on soil type.

**To meet the objectives of the Riparian Reserves**

- Stream protection zones where no cutting and/or yarding is permitted would be established along streams and identified wet areas within harvest areas. Stream protection zone widths would be established through shade sufficiency analysis (TH 7) and would range from 50 feet to 75 feet[11].

- From the stream protection zone to the upper edge of the Riparian Reserve, stand density would be reduced using the same prescription used on the upland forest, retaining 50 or greater percent canopy cover in the secondary shade zone (S 9)

- To protect water quality, trees within one tree height of stream protection zones would be felled away from streams. Where a cut tree does fall within a stream protection zone, the portion of the tree within the stream protection zone would remain in place (TH 17, S 3)

- No refueling of equipment or containers larger than two gallons would be allowed within 100 feet of any standing or running water (SW 8, 9, SP 1, RST 10).

- Woody material removed from stream crossing for culvert maintenance would be retained in the stream network downstream of the culvert.

- Mechanical and hand piling of fuels intended for burning would occur outside of stream protection zones or a minimum of 100 feet from stream edges, whichever is greater.

- Treated trees within the stream protection zone or within one tree height of stream protection zones would be felled toward streams where possible.

- Tree falling within the stream protection zone to facilitate corridors would be spaced 150 feet apart at the stream. Incidental falling to facilitate cable tailholds within the stream protection zones would be kept to a minimum and spaced as wide as possible.

- Repair damaged culvert inlets and downspouts to maintain drainage design capacity (R 39, 43)

**To protect and enhance stand diversity and wildlife habitat components**

- Priorities for tree marking would be based on Marking Guidelines (Appendix C of this EA). Marking guidelines do not apply to rights-of-way.

- Density management tree selection would be designed to leave low-density areas sufficient to favor individual crown growth, leave a range of tree diameters, maintain

[11] Buffer widths may exceed the minimum requirement and may result in fewer acres of treated Riparian Reserves. Buffer widths displayed on maps in this EA are based on shade sufficiency analysis. GPS data of the final boundaries will be displayed in the project-specific decision record.

tree species diversity, create variable density of leave trees, and retain legacy and wildlife tree structure while reducing overall tree densities. Small gaps would be created that would allow establishment of understory trees. Additional trees would be cut around the largest diameter trees with the fullest live crowns to maintain their open-grown, wolf- tree structure.

- Within commercial thinning areas, tree selection would be designed to favor stand volume growth rather than individual crown development. Legacy and wildlife tree structure would be retained while meeting target densities.

- Any plus trees (trees selected for genetic traits), their reference trees, and bearing trees would be reserved from harvest.

- Understory conifers less than 7 inches DBH would be excluded from harvest

- Any Continuous Vegetation Survey plot reference trees would be reserved from harvest to aid in plot relocation for future plot measurements.

- Except in yarding corridors and skid trails, western red-cedar and hardwood tree species would be retained. Thinning in the Riparian Reserves would be implemented to maintain current species composition or to increase the proportion of minor species (such as western hemlock) where they are not abundant.

- To maintain tree species diversity, cottonwood, golden chinquapin, Pacific yew and Oregon ash trees larger than 12 inches DBH would be reserved from harvest.

- Within the Matrix land use allocation: In areas infected with *Phellinus weirii* (laminated root rot), symptomatic trees and all Douglas-fir trees (the most susceptible species) would be removed within approximately 50 feet of dead or symptomatic trees. If openings greater than approximately 0.5 acre are created, the need for planting would be evaluated. If planting is determined to be needed, seedlings of non-susceptible or immune species would be planted (e.g., western hemlock or western redcedar).

- Any tree found to have a stick or ball nest, regardless of size (tree or nest) would be protected, unless it is a safety hazard.

- Live trees with damage (e.g., hollow, cavities, dead or broken tops) would be reserved within the Riparian Reserves.

- Within harvest units (inside and outside of Riparian Reserves), open grown trees with high wildlife value, existing snags, and down logs would be reserved, except where they pose a safety risk, affect access and operability, or are the result from substantial natural disturbance, as described below. Any snags or logs felled or moved for these purposes would remain on site within the project area

- Within commercial thinning units, inputs of new coarse woody material (snags and down logs) would be achieved by indirect harvest activities (e.g., breakage, limbs, and tops). In addition, up to two trees per acre that are intended to be part of the residual stand but are incidentally felled or topped (e.g., tail trees, intermediate supports, guyline anchors, hang-ups) would be left on site to function as CWD. The trees which are intended to be retained as CWD would be stand average diameter breast height outside bark (DBH) or larger.

- Within the Riparian Reserves higher levels of CWD are desired. In these areas, an assessment of CWD recruitment resulting from harvest activities (stand damage, limbs and tops, felled/topped trees) and post-harvest processes (windthrow, bug kill, etc.) would be conducted within five years of the harvest action. Depending on the amount of CWD recruitment, up to four trees per acre may be added as snags or down logs.

**To minimize impacts during wet weather hauling**

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

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

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

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

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

- Avoid undercutting of cut-slopes when cleaning ditchlines. Seed with native species and use weed free mulch on bare soils that drain directly to wetlands, floodplains, and waters of the state.

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

- Prior to winter hauling activities, implement structural road treatments such as: increasing the frequency of cross drains, installing sediment barriers or catch basins, applying gravel lifts of road surfacing at stream crossing approaches, and cleaning and armoring ditchlines.

- Maintain road surface by applying appropriate gradation of aggregate and suitable particle hardness to protect road surfaces from rutting and erosion under active haul where runoff drains to wetlands, riparian management areas, floodplains, and waters of the state.

**To protect air quality, reduce fire risk, and manage fuels**

- Hazardous fuels surveys would be conducted and site specific plans for hazard fuels reduction treatments would be implemented by the Authorized Officer following harvest operations.

- A Prescribed Fire Burn Plan would be initiated and signed by the Authorized Officer prior to any prescribed burning activity.

- Burning would be conducted in accordance with the current signed Salem District RMP, Oregon State Implementation Plan and Oregon Smoke Management Plan as administered by the Oregon Department of Forestry and would comply with the provisions of the Clean Air Act. It would be conducted under good atmospheric mixing conditions to lessen the impact on air quality in Smoke Sensitive Receptor Areas.

- Prescribed burning may include landing pile or machine pile burning, swamper burning, or handpile construction and burning and may be used individually or in combination in areas where fuel loading is heavy or the fire risk is determined to be high.

- When hand, machine, or landing piles are identified by the Authorized Officer as the specified fuels treatment the following requirements would apply:

    - Piles would be located as far as possible, but at least 10 feet, from large snags over 20 inches, green trees, reserved trees, and to minimize damage.
    - Piles would be located at least 100 feet from stream channel edges.
    - For machine piles, large woody debris greater than six inches in diameter would be retained on site and not piled. No diameter restriction on landing piles.
    - As feasible, piles would not be constructed on top of stumps or existing coarse woody debris (CWD).

    - In skyline yarding areas landing piles would only be constructed within 25 feet of designated roads and landings. Equipment used in the construction of piles or landings would remain on the roads or landings during the construction.
    - In ground-based yarding areas: machine piles would not be constructed within 25 feet of property lines or unit boundaries.
    - To ensure rapid and complete consumption piles should be free of non-burnable material such as dirt, rock, and root wads. Equipment capable of lifting the woody debris should be used to create piles that are free of unburnable material.

- Piles would be covered with .004 mil. thick black polyethylene plastic, no greater than 100 square feet. The plastic shall adequately cover the pile to ensure ignition, and would be placed and anchored to help facilitate the consumption of fuels during the high moisture fall/winter burning periods.

- Treatment methods include: lopping and scattering, slash pullback, chipping, mastication, directional felling, and whole tree yarding. These methods may be incorporated in areas where the fuel load is light (generally along roads, property lines and trails) instead of piling and burning.

- Utilization of small diameter slash for firewood or energy production from biomass would be incorporated where appropriate. If biomass removal occurs in lieu of prescribed burning; only logging debris that is accessible from existing roads and landings would be available for removal.

- Manage and or restrict access to sale area during active logging, hauling, and fuel treatment operations to ensure public and operator safety, as required by Oregon Occupational Safety and Health Administration.

- In ground-based yarding areas:

    - Operating techniques would be designed to prevent gouging, soil compaction and displacement, and erosion.
    - Soil compaction would be limited outside of skid trails and landings to no more than twelve percent of the surface area of the unit – the amount of compaction analyzed for tractor-constructed fire trails (RMP C-9).
    - Machine piles would not be constructed within 25 feet of property lines and unit boundaries, or on slopes greater than 35 percent.

- To reduce impacts to areas of higher public use, minimize coarse woody debris creation within 25 feet of property lines, road prisms, and trails.

- Treat slash within 25 to 100 feet of open roads or closed roads with high recreation use.

- Treat slash as determined by the fuels specialist as needing treatment due to slope, aspect, fuel conditions, proximity to roads, recreation areas, private property, etc. A treated buffer at least 25 feet wide will be created in the areas determined to need fuels reduction.

- Consider treating activity fuels within 15 feet of OHV trails.

**To maintain recreational opportunities in the project area**

- Existing trails would be managed in consideration of the Memorandum of Understanding between the BLM, Starker Forests, Inc., and the Flat Mountain Riders Association (FMRA), signed April 26, 2013:

    - Coarse woody debris greater than 4 inches DBH would be removed by the BLM. Resigning and clearing would be completed by the FMRA.
    - Original trail alignments would be rehabilitated by the FMRA.

- To protect public safety, temporary closures in the project area may be required during active timber sale operations. Public notification would occur as part of any closure.

**To contain and/or reduce noxious weed infestations on BLM-managed lands using an integrated pest management approach**

- Soil disrupting equipment and other heavy equipment or transportation vehicles (e.g., low-boys and trailers) would be required to be clean and free of dirt and vegetation prior to arriving on BLM-managed lands as directed by the Authorized Officer (SP 1).

- Large areas of exposed mineral soil (e.g., roads to be constructed, skid roads, landings), as determined by the Authorized Officer, would be sown with red fescue (Festuca rubra) at a rate equal to 40 pounds per acre. Seed would meet or exceed the following factors:

    - Percent germination rate: 85 percent minimum
    - Percent pure seed: 97 percent minimum
    - Crop and weeds: none
    - Noxious weed seed: none

    If seed is not available, the project area would be sown with seed approved by the Field Office botanist. Prior to applying seed, the contractor would supply the BLM with the seed label showing the testing results listed above (R 97).

**To protect special status species**

- Federal Threatened and Endangered (T&E) or bureau special status, including survey and manage animal, botanical or fungal species site management and required pre-

disturbance surveys would be accomplished in accordance with BLM Manual 6840-Special Status Species Management and Record of Decision and Standards and Guidelines for Amendment to the Survey & Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (S&M ROD, January 2001) prior to project implementation.

- Clearances for botanical species would be completed by intuitive controlled survey methods, field clearances, field reconnaissance, inventories, database searches, known site maps and records and/or habitat examinations. Surveys for fungi are not required, because clearances for fungi are considered "not practical" and the project area does not occur in old-growth forests.

- The Field Office wildlife biologist and/or botanist would be notified if any special status animal, botanical, or fungal species are found within or adjacent to project areas. Site management of any federal T&E or bureau special status, including survey and manage species, found as a result of additional inventories or incidental findings would be accomplished in accordance with BLM Manual 6840 (12/12/2008, IM-2009-039) or the applicable agency directive for Survey and Manage Species (IM-OR-2014-037).

- Project implementation would be conducted in conformance with the applicable biological opinion or letter of concurrence concerning federally listed wildlife species. Pertinent terms and conditions from these consultation documents would include:

    - March 1–July 15 (critical breeding period): No project activities would occur within 300 meters (approximately 1,000 feet) of known northern spotted owl nest sites.

**To protect water quality, minimize soil erosion as a source of sedimentation to streams and to minimize soil productivity loss from soil compaction, loss of slope stability or loss of soil duff layer**

- Scatter treatment debris on disturbed soils and water bar yarding trails that could erode and deposit sediment in water bodies, floodplains, and wetlands (BMPs TH 18, 19, S4).

- Existing and new skid trails would be less than 10 percent of the harvest area (TH 9).

- Limit width of skid trails to what is operationally necessary for the equipment (approximately 12 foot width) (TH 10).

- Ensure one-end suspension of logs during harvest operations (TH 11).

- Restrict ground-based harvest and skidding operations to periods of low soil moisture when soils have resistance to compaction and displacement (TH 12)

- To the extent practicable, limit conventional ground-based equipment to slopes less than 35 percent (TH 14).

- Ground-based equipment would be allowed to operate on slopes averaging 45 percent or less within the skyline yarding areas. The equipment would be allowed to cut and pre-bunch logs only. No yarding of logs with ground based equipment would be allowed on slopes greater than 35 percent.

  This activity would occur with the following applied:

  - No new skid trails, landings or temporary roads would be constructed
  - Ground-based equipment would occur on the contours and would ride over a layer of slash.
  - The range of slopes would not exceed 45 percent slope for a sustained distance of 100 feet or more.
  - During and upon completion of the operation of a unit, the Hydrologist and/or Soil Scientist in conjunction with the Authorized Officer would review the unit to ensure that adverse effect to soil quality did not occur. Once that review was certified, then the operation could proceed to the next cable unit.

- Skid and harvest roads would be blocked where they access main vehicular roads following completion of ground-based yarding (TH 21).

- Fell harvested trees away from stream channels when possible (TH 17, S 3).

- During periods of rainfall when water is flowing off road surfaces, the Authorized Officer may restrict log hauling to minimize water quality impacts, and/or require the purchaser to install silt fences, bark bags, or apply additional road surface rock (R 73).

- Landings would be kept to the minimum size needed to accomplish the job safely and use existing road surfaces as much as possible (TH 13, R 1, 4, 6).

- Road decommissioning, as shown on the project maps, would result in the re-establishment of overland flow paths through the road prism and re-establishment of natural stream function where culverts are removed (R 90-100).

**In the event of natural disturbance**

Windthrown or other damaged trees within planned harvest areas may be harvested or salvaged under the following conditions:

1) The project interdisciplinary team (IDT) determines them to be in excess of needs for coarse woody debris, consistent with land use allocation objectives;

2) The project IDT determines the action would be consistent with the project purpose and need and falls within the expected range of effects;

3) Logging system and equipment would be limited to those conditions analyzed for the initial harvest, limited to existing roads, skyline corridors, and skid trails, and

4) Subject to applicable project design features contained herein. Affected areas would be surveyed for reforestation needs and may be planted with tree seedlings.

**To maintain a safe and efficient road system (tree removal within the right-of-way)**

- Trees (both conifer and hardwood) greater than 50 feet from streams may be harvested along project haul routes on BLM-managed land if the following criteria are met:
    - Occur within 50 horizontal feet of the roads, and
    - Hardwood trees leaning toward or over the roadbed, and/or
    - Hardwood trees with canopies overtopping the roadway, and/or
    - Hardwood and conifer trees with conditions of likely or imminent failure.
- For trees within 50 feet of streams that meet any of the aforementioned criteria, these trees may be felled, but may not be removed from the stream channel.

**To protect cultural resources**

- If any cultural and/or paleontological resource (historic or prehistoric site or object) is discovered during project activities all operations in the immediate area of such discovery shall be suspended until an evaluation of the discovery can be made by a professional archaeologist to determine appropriate actions to prevent the loss of significant cultural or scientific values.

**Monitoring**

- A silviculturist would closely monitor tree marking to ensure prescription compliance. A silviculturist and/or Authorized Officer would monitor prescription compliance during treatments to ensure contract compliance and intent of the prescription, GFMA, and Riparian Reserve objectives. Random inspection plots would furnish specific information about the trees, densities and other attributes needed to remain on target.
- Post-harvest monitoring would be necessary to determine site preparation and fuel treatment needs, the extent of *Phellinus weirii* infection centers, reforestation needs and implementation, reforestation maintenance and success, and subsequent treatment needs.

## 2.5 CONFORMANCE WITH LAND USE PLANS, POLICIES, AND PROGRAMS

### 2.5.1 APPLICABLE LAND USE PLANS

The BLM designed this project to comply with the applicable land use plans. The current RMPs are the Northwest Forest Plan, the 2001 ROD as amended, and the 1995 Salem District RMP. These documents direct and provide the legal framework for management of BLM-administered lands within the Salem District.

The above documents, along with the interdisciplinary team reports (EA section 6.2), are incorporated by reference in this EA and are available for review in the Salem District office. Additional information about the proposed project is available in the Dunk Tank Timber Sales analysis file, which is also available at the Salem District office.

### 2.5.2 SURVEY AND MANAGE REVIEW

The project is consistent with court orders relating to the Survey and Manage mitigation measure of the Northwest Forest Plan, as incorporated into the Salem District RMP.

In 2006, the District Court for the Western District of Washington (Judge Pechman) invalidated the agencies' 2004 RODs eliminating Survey and Manage due to National Environmental Policy Act (NEPA) violations. Following the District Court's 2006 ruling, parties to the litigation entered into a stipulation exempting certain categories of activities from the Survey and Manage standard (hereinafter, "Pechman exemptions").

Judge Pechman's Order from October 11, 2006 directs:

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

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

The BLM has reviewed the Dunk Tank timber sale in consideration of Judge Pechman's October 11, 2006, order. Because the project includes no regeneration harvest and includes thinning only in stands less than 80 years old, this project meets Exemption "a" of the Pechman Exemptions (October 11, 2006, Order) and, therefore, may still proceed to be offered for sale.

### 2.5.3 RELEVANT STATUTES AND AUTHORITIES

This section provides a summary of the relevant statutes, acts, and authorities that apply to this project and briefly describes the project's consistency with each.

**Aquatic Conservation Strategy (ACS) –** Chapter 4 of this EA addresses how the Dunk Tank timber sales meet each of the nine objectives of the Aquatic Conservation Strategy. In addition, Chapter 3 describes how project design features (section 2.4) applied to the proposed action would maintain and not retard ACS objectives.

**Archaeological Resources Protection Act of 1979** – The project is consistent with this act because harvest operations would be suspended upon discovery of cultural material is discovered and the BLM would conduct protocol post-harvest surveys for portions of the project with the Coast Range Physiographic Province. Portions of the project area with the Willamette Valley Physiographic Province have been surveyed. Addressed in EA section 5.2.

**Clean Air Act (1990)** – This project is in compliance with this direction because the project would not result in significant impacts to air quality. Impacts would be minimal and of short duration (a few days at a time over a three year contract period). Addressed in EA section 3.6.

**Clean Water Act of 1972** – This project complies with the Clean Water Act through use of Best Management Practices designed to minimize or prevent the discharge of both point and non-point source pollutants from forest roads, developments, and activities. Addressed in EA section 3.4, Chapter 4.

**Endangered Species Act (ESA) of 1973** – The project is consistent with this act because the project would not result in adverse impacts to any threatened or endangered species or their critical habitat. No critical habitat for the northern spotted owl or marbled murrelet is within the project area. The BLM completed consultation as required under the ESA. Addressed in EA sections 3.2 and 5.1.

**Federal Land Policy and Management Act of 1976 (FLPMA)** – FLPMA provides the basic policy guidance for the BLM's management of public lands. The project is consistent with FLPMA's direction to provide for multiple use (including the need for domestic timber) and sustained yield, because it provides timber for local economies and balances objectives for protection, production, and restoration.

**Healthy Forests Restoration Act of 2003** – The project is in compliance with this direction because thinning treatments would decrease the risk of fire and help restore forests to healthy functioning condition. Addressed in EA sections 3.1, 3.6.

**Migratory Bird Treaty Act of 1918** – This project is in compliance with this direction because treatments would protect migratory birds and would restore natural resources that could degrade habitat for migratory birds. Addressed in EA section 3.2.

**National Environmental Policy Act (NEPA) of 1969** – The BLM utilized an interdisciplinary team approach when developing the Dunk Tank timber sales as documented in this EA. The BLM has satisfied requirements regarding documentation, public involvement, alternative development, analysis, and disclosure.

**Oregon and California Act (1937)** – The O&C Act governs BLM-administered O&C lands in western Oregon. The project is consistent with this direction because it produces timber in accordance with sustained-yield principles to protect watersheds, regulate stream flow, provide for recreational facilities, and contribute to the economic stability of local communities and industries.

**Wild and Scenic Rivers Act (as amended)** – The project is in compliance with this act because there are no wild and scenic rivers within or adjacent to the project area.

**Wilderness Act of 1964** – The project is consistent with this act because no wilderness areas (proposed or existing) are within or adjacent to the project area.

## 2.6 COMPARISON OF ALTERNATIVES

This section provides a brief comparison of alternatives analyzed in this EA in the context of the Purpose and Need for the project (EA section 1.3).

***Matrix Land Use Allocation and Economic Efficiency***

*Matrix: Apply silvicultural systems that are planned to produce, over time, forests which have desired species composition, structural characteristics, and distribution of seral or age classes (RMP p. 46). Provide habitat for a variety of organisms associated with both late-successional and younger forests (RMP p. 20).*

> **Alternative 1 – No Action:** Does not meet or delays the achievement of the purpose and need. Selection of this alternative represents a lost opportunity for the BLM to actively manage stands and develop structure desired in the RMP. Current conditions, including low levels of standing and down coarse woody debris (CWD) would remain. Natural disturbance (e.g., wind) would be the agent for producing stand structural diversity, though the timing and intensity are impossible to predict.
>
> **Alternative 2 – Proposed Action:** Thinning on approximately 480 acres of the Matrix land use allocation would accelerate the development of desired stand characteristics. Thinning would not change the age class distribution of the forest and would continue to provide habitat for a variety of organisms associated with early and mid-seral forest stands.

*Matrix: Produce a sustainable supply of timber and other commodities to provide jobs and contribute to community stability (RMP p. 20). The quality of wood, value of logs ultimately produced, and economic efficiency would be important considerations for planned treatments (RMP Appendix D 1)*

**Alternative 1 – No Action:** Does not meet the purpose and need. Recreational use of the area would continue to contribute to public recreation opportunities, but no revenue would be generated by timber harvest. This represents a missed opportunity to meet annual timber targets in the Salem District and support local communities.

**Alternative 2 – Proposed Action:** The Dunk Tank timber sales would provide timber and employment to local communities between 2017 and 2021 (projected years of project implementation). The proposed action has been designed, consistent with RMP direction, to result in economically viable and efficient timber sales.

*To perform commercial thinning on suitable managed timber stands to promote tree growth and survival (RMP pp. 46–48, Appendix D-2).*

**Alternative 1 – No Action:** Does not meet the purpose and need. Stand density would continue to increase; subsequently, density mortality in the smaller age classes would increase. Residual trees would lose vigor and would likely develop more slowly than a thinned stand. As densities increase over time, lower limbs would be lost due to shading, crowns would recede, and height growth would be favored over diameter growth.

**Alternative 2 – Proposed Action:** Thinning would occur on approximately 480 acres in the Matrix. A reduction of stand densities would decrease competition and would increase the health, vigor, and growth of remaining trees. Increased diameter growth, preservation of lower limbs, and higher crown ratio would be expected.

***Riparian Reserves***

*Apply silvicultural treatments to restore large conifers (RMP p. 7). Apply silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy Objectives (RMP p. 11).*

**Alternative 1 – No Action:** Does not meet the purpose and need. This would represent a lost opportunity to apply active management to restore large conifers and acquire desired vegetation characteristics in the Riparian Reserves (e.g., large coarse woody debris). Similar to the upland, stand density would continue to increase; subsequently, density mortality in the smaller age classes would increase. Residual trees would lose vigor and would likely develop more slowly than a thinned stand. As densities increase over time, lower limbs would be lost due to shading, crowns would recede, and height growth would be favored over diameter growth. Hardwood tree species would become overtopped and most of them lost from the stand. Stand conditions would remain on the current trajectory of increasing density and decreasing individual tree growth rates.

**Alternative 2 – Proposed Action:** Thinning would occur on approximately 250 acres in the Riparian Reserves. A reduction of stand densities would increase the health, vigor, and growth of remaining trees. Increased diameter growth, preservation of lower limbs, and higher crown ratio would be expected. Coarse woody debris levels would be monitored post-harvest; if found to be deficient, additional actions to increase inputs would occur.

*Design and implement watershed restoration projects in a manner that promotes long-term ecological integrity of ecosystems, conserves the genetic integrity of native species, and attains Aquatic Conservation Strategy objectives (RMP p. 14).*

**Alternative 1 – No Action:** 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. Does not meet the purpose and need to accelerate the development of desired characteristics to meet ACS objectives.

**Alternative 2 – Proposed Action:** The proposed action is designed and analyzed at the fifth- and sixth-field watershed scales. Density management would restore watershed conditions by providing a gradual transition in structural characteristics of treated stands that would more closely resemble late-seral forest and promote stand diversity, provide more light to accelerate growth of selected conifers, and promote species diversity.

*To improve stand density and species complexity on a site-specific and landscape level in the long-term (RMP D-6).*

**Alternative 1 – No Action:** Does not meet the purpose and need. 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.

**Alternative 2 – Proposed Action:** This project considers opportunities for treatment at the watershed scale, which includes approximately 730 acres of forest stands across four sections. Approximately 250 acres are within the Riparian Reserves. The project area watersheds lack structural diversity and coarse woody debris. Alternative 2 would enhance late-successional forest conditions in the long-term and speed up attainment of these conditions across the landscape. Project design features allow for opportunities to create coarse woody debris and large woody debris post-harvest if conditions remain deficient. Minor species would be maintained in all land use allocations.

***Road Management***

*Provide an adequate transportation system to manage timber resources and serve other management needs on federal, state, and private lands in a safe and environmentally sound manner (RMP p. 62).*

**Alternative 1 – No Action:** There would be no change to road densities or conditions in the short term. Programmed road maintenance would continue to occur, though the BLM would miss the opportunity to correct deficiencies associated with old, failing culverts.

**Alternative 2 – Proposed Action:** Renovation and improvement of existing roads would occur on approximately 19 miles. Approximately 2.16 miles of road construction would occur within the Matrix land use allocation; no construction would occur within the Riparian

Reserves. Road densities would increase slightly to an average 5.4 miles per square mile, which is typical for forest densities in the Oregon coast range.

## 2.7 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

The BLM is required to include a discussion of a range of reasonable alternatives to the proposed action, alternatives which are technically and economically feasible and which meet the purpose and need, and which have a lesser environmental impact.

**No New Road Construction**

In response to comments received during the public scoping period, the IDT considered an alternative that would utilize only existing roads and was void of new road construction. The areas available for harvest would either be reduced (by approximately 20 percent) or would require helicopter logging.

The IDT has extensive experience in determining logging costs and economic feasibility of timber sales in western Oregon. Helicopter yarding was eliminated from further analysis for several reasons: topography, land use allocation, future management opportunities, cost, and timber volumes of the planned harvest units.

The Dunk Tank project is located in the Matrix (GFMA) and Riparian Reserves land use allocations. The planned thinning harvests are an intermediate treatment in the Matrix; an additional, final harvest (or regeneration harvest) is expected to occur in the following decades.

Topography is generally gentle and new roads would be located outside of the Riparian Reserves. Original road placement included new road construction in portions of the Riparian Reserves. In response to concerns about road building in the Riparian Reserves, the BLM rerouted these road segments so that new roads would only occur within the Matrix. Roads and road work would adhere to project design features and BMPs, which would reduce the likelihood of road-related resource problems, and would provide for future administrative access.

The planned harvest units would yield a relatively low volume, averaging 21 MBF per acre. Within the last 10 years, the Marys Peak Field Office has sold five timber sales with helicopter yarding. In each of these sales[12], the volume has exceeded 28 MBF per acre, which is a third more per acre than that of the Dunk Tank timber sales. Low volume sales are unlikely to offset the high logging costs associated with helicopter yarding. This would likely result in a no-bid sale; thus, no treatment would occur. A no-bid sale would not meet the purpose and need of treating forest stands in an economically feasible way. Due to these reasons, this alternative was not analyzed in detail.

[12] Thin Lindsey timber sale (2015): 28.2 MBF/acre, North Fork Overlook timber sale (2012): 37.5 MBF/acre, Potter Elk timber sale (2012): 47.9 MBF/acre, McFall Creek timber sale (2008): 49.9 MBF/acre, Maxfield Creek timber sale (2007): 41.0 MBF/acre.

### Regeneration Harvest

The IDT considered an alternative with regeneration harvest as the primary treatment in the Matrix (GFMA). Considering the age and structure of the forest stands, the IDT determined that the stands considered for treatment are more appropriate for thinning. The stands have not yet reach culmination of mean annual increment, indicating that more volume would be accrued with later harvest. Additionally, regeneration harvest in the Matrix would limit BLM's ability to treat the adjacent Riparian Reserves. The BLM included these stands in the proposed action specifically for the need for treatment to meet RMP objectives.

### Wider No-Cut Stream Buffers

During public scoping for this project (June-July 2015), the BLM identified a potential alternative with wider no-cut buffers in the Riparian Reserves. The BLM ultimately concluded that developing this alternative in detail was not necessary. Analysis of the proposed action did not identify any significant impacts regarding treatment in the Riparian Reserves or the prescribed no-cut stream buffers. The BLM decision maker (the Marys Peak Field Manager) reserves the discretion to modify the proposed action at the time of decision. In the context of stream buffers, the decision maker may elect to implement wider no-cut stream buffers; a standalone action alternative is not necessary to do so.

# 3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

This section summarizes the physical, biological, and social environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented in the previous chapter. The interdisciplinary reports are incorporated by reference in this EA. Reports in their entirety are available at the Salem District Office and upon request.

## 3.1 VEGETATION

The following issues will be addressed in the environmental effects section below:

*What effects would thinning have on native vegetation, forest stand health, and composition? How would the proposed thinning meet RMP objectives for the Matrix and Riparian Reserves?*

*Would the proposed action have any impacts on Endangered Species Act, Bureau Special Status, including Survey and Manage, wildlife, fish, botanical and fungal species and their habitat?*

*How would non-native plant populations (including noxious weeds) respond to the implementation of the proposed action?*

### 3.1.1 AFFECTED ENVIRONMENT

**Landscape Level Conditions**

The Dunk Tank Timber Sales would occur on BLM-managed lands within the Marys River fifth-field watershed. A watershed analysis was conducted on a portion of this watershed 19 years ago (USDI-BLM 1997). That analysis described the past 150 years since settlement which brought forth extensive timber harvest that has resulted in the loss and fragmentation late-successional forest conditions on the upland portion of the watershed. Private forest lands in this part of the Oregon Coast Range are now dominated by early-seral and mid-seral forest stands that are currently being managed on short harvest rotations of 40-50 years (Cohen et al. 2002, Kennedy and Spies 2004, Ohmann et al. 2007). Almost all remaining late-seral and old-growth forest stands (LSOG) in these watersheds are on BLM and Forest Service lands. The proposed action would not affect any of these LSOG forest stands. At the landscape scale, mid-seral conifer-dominated forest stands are the most prevalent vegetation type on BLM-managed lands (Table 3–1), accounting for about 40 percent of BLM-managed lands. Maps in Appendix D of this EA show the approximate heights of vegetation (e.g., trees) in the project area as derived by LiDAR.

**Table 3-1.** Vegetation conditions on BLM-managed lands within the Marys River fifth-field watershed

| Vegetation Type | BLM Lands in Watershed (acres) | Percent |
|---|---|---|
| Non-vegetated | 28 | 0.4% |
| Early Seral Open (0-9 years old) | 92 | 1.4% |
| Early Seral Plantation (10-39 years old) | 843 | 12.7% |
| Mid-Seral Forest (40-79 years old) | 2,703 | 40.8% |
| Late-Seral Forest (80-129 years old) | 2,376 | 35.9% |
| Old-growth Forest (130+ years) | 443 | 6.7% |
| Young Hardwoods (0-39 years old) | 0 | 0.0% |
| Older Hardwoods (40-110 years old) | 136 | 2.1% |
| Totals | 6,621 | 100.0% |

### Site Conditions

The project area is located in the Northern Oregon Coast Range, at elevations ranging from 560 to 2,520 feet. The site index (King, 50-year) is productive, averaging Site Index 131 (site II), with slopes ranging from 5 percent to 65 percent. The climate is dominated by the influence of the Pacific Ocean, with cool, wet winters and warm, dry summers. The project area is in the western hemlock plant associations described by McCain and Diaz (2002) in the Field Guide to Forested Plant Associations of the Northern Oregon Coast Range.

The Timber Production Capability Class (TPCC) describes soil and site issues that contribute to fragility of lands to management impacts or reforestation failure under even-age (clearcut) harvest. These are a very general inventory of likely characteristics, identified primarily from photo interpretation and soil maps. Site-specific knowledge from project planning is meant to supersede this when better information is gained. The majority of the project area has no identified problems (code “NP”).

### Present Stand Condition and History

Project area stands originated between 1940 and 1979 and are fully stocked, dominated by small sawtimber (11-21 inches DBH) to large sawtimber (greater than 21 inches DBH). Stand species composition is dominated by Douglas-fir, with a component of western hemlock. Stand structure varies in average tree diameter, but is generally uniform and simple, with limited evidence of wildfire or older legacy trees, indicative of previous clearcut harvest. Project area stands also contain a hardwood component, including red alder in the moist areas and bigleaf maple in the drier uplands.

Inter-tree competition can be described by the concept of relative density (RD), based on Reineke’s stand density index concept (Table 3–2). Below an RD of 0.25, trees in stands experience limited inter-tree competition, and at 0.35, stands are considered to be ‘fully stocked’. Above and RD of approximately 0.55, competition becomes strong with tree growth and vigor declining, and mortality of suppressed trees beginning. Currently the weighted average stand RD is 0.63.

Stand exam data was collected in 2007, 2014 and 2015, and is summarized below (Table 3–2).

**Table 3-2.** Summary of current stand attributes, Dunk Tank Project (trees > 7" DBH)

| EA Unit | Total Acres | Total Age[2] | Trees Per Acre (TPA)[3] | Tree Height (Ft.)[4] | Basal Area/Acre (Ft.$^2$/Acre)[5] | QMD (Inches)[6] | RD[7] | Canopy Cover (%)[8] |
|---|---|---|---|---|---|---|---|---|
| 7-1 | 79 | 44 | 241 | 104 | 274 | 14.5 | .72 | 78 |
| 7-2 | 42 | 41 | 166 | 98 | 205 | 15.0 | .53 | 70 |
| 7-3 | 35 | 47 | 204 | 114 | 212 | 13.8 | .57 | 75 |
| 17-1 | 22 | 52 | 221 | 116 | 263 | 14.8 | .70 | 80 |
| 17-2 | 6 | 48 | 140 | 104 | 190 | 15.8 | .50 | 71 |
| 17-3 | 20 | 48 | 164 | 103 | 214 | 15.5 | .55 | 67 |
| 17-4 | 37 | 52 | 164 | 103 | 214 | 15.5 | .55 | 67 |
| 17-5 | 33 | 47 | 210 | 98 | 279 | 15.6 | .71 | 74 |
| 17-6 | 33 | 41 | 195 | 93 | 280 | 16.2 | .70 | 74 |
| 17-7 | 9 | 60 | 177 | 137 | 303 | 17.7 | .72 | 73 |
| 17-8 | 22 | 41 | 195 | 93 | 280 | 16.2 | .70 | 74 |
| 17-9 | 4 | 65 | 98 | 137 | 229 | 20.7 | .50 | 64 |
| 19-1 | 39 | 47 | 191 | 117 | 260 | 15.8 | .65 | 74 |
| 19-2 | 35 | 69 | 211 | 138 | 304 | 16.2 | .75 | 76 |
| 19-3 | 52 | 76 | 75 | 145 | 244 | 24.3 | .49 | 52 |
| 19-4 | 1 | 65 | 135 | 135 | 206 | 16.8 | .50 | 72 |
| 19-5 | 122 | 60 | 212 | 124 | 294 | 15.9 | .74 | 78 |
| 21-1 | 11 | 65 | 206 | 133 | 256 | 15.1 | .66 | 72 |
| 21-2 | 26 | 65 | 206 | 133 | 256 | 15.1 | .66 | 72 |
| 21-3 | 42 | 50 | 168 | 112 | 215 | 15.3 | .57 | 70 |
| 21-4 | 22 | 54 | 248 | 126 | 296 | 14.8 | .77 | 78 |
| 21-5 | 22 | 37 | 264 | 94 | 200 | 11.8 | .59 | 75 |
| 21-6 | 16 | 50 | 232 | 117 | 233 | 13.6 | .63 | 74 |

[1] Forest Operations Inventory (FOI).
[2] Stand age in 2016. Stand exam data collected in 2007, 2014 and 2015. Ages are average of all trees.
[3] Trees Per Acre (TPA): Number of trees per acre greater than 7 inches diameter at breast height in 2016.
[4] Average Height of tallest 40 trees, based on stand data analyzed in FVS-Organon growth model.
[5] Basal Area/Acre: Cross-sectional area (square feet) occupied by tree boles per acre; a measure of stand density.
[6] Quadratic mean diameter: Diameter at breast height (4.5 feet) of the tree of average basal area.
[7] Relative Density, Curtis (1982): Stand density metric based on Reineke's Stand Density Index (1933). Relative Density (RD) represents the density of trees per acre relative to the maximum density possible (Reineke 1933).
[8] Percent canopy cover from stand data analyzed in FVS-Organon growth model.

### Coarse Woody Debris

Coarse woody debris is an important habitat component desired for its ecological function in the treatment area and includes downed wood, snags, and live trees with dead or broken tops or decay. Table 3–3 provides a summary of coarse wood metrics for Dunk Tank units.

**Table 3-3.** Existing coarse woody debris within Dunk Tank units, including both standing dead snags per acre and downed wood pieces per acre

| EA Unit Number | Snags/Acre | | Downed Wood (pieces per acre) | | | | |
|---|---|---|---|---|---|---|---|
| | > 10" DBH | >20" DBH | 0-3" Diameter | 3-6" Diameter | 6-12" Diameter | 12-20" Diameter | >20" Diameter |
| 7-1 | 49.8 | 0.0 | 15.9 | 12.7 | 17.7 | 13.3 | 0.0 |
| 7-2 | 8.1 | 0.0 | 9.1 | 14.6 | 19.5 | 14.9 | 0.0 |
| 7-3 | 7.3 | 0.0 | 9.0 | 14.4 | 19.2 | 14.7 | 0.0 |
| 17-1 | 26.3 | 0.1 | 12.1 | 11.6 | 14.4 | 12.4 | 0.0 |
| 17-2 | 8.5 | 0.0 | 8.8 | 14.1 | 18.7 | 14.6 | 0.0 |
| 17-3 | 8.2 | 0.4 | 9.3 | 11.7 | 15.4 | 13.1 | 0.0 |
| 17-4 | 8.2 | 0.4 | 9.3 | 11.7 | 15.4 | 13.1 | 0.0 |
| 17-5 | 35.3 | 0.1 | 13.9 | 12.7 | 17.6 | 13.5 | 0.0 |
| 17-6 | 31.0 | 0.0 | 15.2 | 12.1 | 16.8 | 13.6 | 0.0 |
| 17-7 | 8.8 | 0.1 | 9.2 | 14.7 | 19.6 | 14.9 | 0.0 |
| 17-8 | 31.0 | 0.0 | 15.2 | 12.1 | 16.8 | 13.6 | 0.0 |
| 17-9 | 0.4 | 0.0 | 9.1 | 14.6 | 19.5 | 14.8 | 0.0 |
| 19-1 | 33.4 | 0.1 | 9.5 | 14.4 | 19.4 | 14.7 | 0.0 |
| 19-2 | 32.7 | 0.2 | 11.8 | 12.1 | 15.8 | 13.1 | 0.0 |
| 19-3 | 9.7 | 1.2 | 8.1 | 11.0 | 14.9 | 12.5 | 0.1 |
| 19-4 | 0.5 | 0.0 | 8.9 | 14.2 | 18.9 | 14.6 | 0.0 |
| 19-5 | 13.4 | 0.6 | 11.4 | 11.6 | 15.6 | 13.1 | 0.0 |
| 21-1 | 14.5 | 0.2 | 11.9 | 12.4 | 17.1 | 13.6 | 0.0 |
| 21-2 | 14.5 | 0.2 | 11.9 | 12.4 | 17.1 | 13.6 | 0.0 |
| 21-3 | 1.6 | 0.4 | 9.1 | 14.6 | 19.5 | 14.8 | 0.0 |
| 21-4 | 56.9 | 0.1 | 15.2 | 12.3 | 17.6 | 13.5 | 0.0 |
| 21-5 | 0.8 | 0.0 | 9.1 | 14.7 | 19.6 | 14.8 | 0.0 |
| 21-6 | 3.1 | 0.0 | 9.1 | 14.6 | 19.5 | 14.8 | 0.0 |

### Forest Health

Stand exam data included scattered disease and insect presence in the stands. The project silviculturist visited the stands and did walk-through exams to review stand health. There are no known threats to forest health beyond the following endemic processes in the project area.

Laminated root rot, caused by the fungus *Phellinus weirii*, is a native root pathogen that spreads through root to root contact between live, susceptible trees, including Douglas-fir and grand fir. It kills trees by destroying their roots, which can then result in windthrow. The pathogen is a natural part of many forest ecosystems (Thies and Sturrock 1995) and contributes snag and downed wood habitat to affected stands over time. *Phellinus weirii* affects less than 5 percent of the project area, creating small (0.1 to 0.25 acre) openings. These areas have experienced tree

mortality dating from the last few decades as well as recent mortality and can be expected to spread outward at a rate of approximately one foot per year.

Red ring rot, caused by the fungus *Phellinus pini,* is one of the most common and widespread heart rots and is found in several Douglas-firs in the project area. The pathogen decomposes cellulose and lignin in a white pocket rot in the heartwood. Like most heartrots, it enters the tree as airborne spores through wounds.

The Douglas-fir bark beetle (*Dendroctonus pseudotsugae*) is endemic throughout the Coast Range, including the project area. Bark beetles feed on the cambium under the bark of live and recently dead trees (within 1-2 years), laying eggs there that hatch and mature under the bark and later emerge as adults. Recently downed Douglas-fir trees facilitate the growth of beetle populations, which can subsequently attack and kill standing Douglas-fir trees. Douglas-fir trees weakened by root disease infection are more likely to be attacked by the beetle (Hadfield 1986). In stands less than 100 years old, the risk of mortality to healthy green trees is low, even when beetle populations are high.

The risk of windthrow from severe winter storms always exists, with the upper lee slopes of major southeast- to northwest-running ridges generally experience the highest degree of windthrow in the Oregon Coast Range. Thinning is not likely to result in a high incidence of windthrow or broken tops due to wind. Although the potential for windthrow from winter storms would be higher for the first decade following treatment, primarily within commercial thinning areas, the risk would be reduced by selecting leave trees with deep, healthy crowns, as specified in the silvicultural marking guidelines. However, some areas may be more susceptible to such damage.

**Federal threatened and endangered (T&E) and bureau special status (includes Survey and Manage) botanical and fungal species**

Inventories of the project area for bureau special status vascular plant, lichen, bryophyte and fungal species were accomplished through review of: 1) existing survey records and spatial data; 2) habitat evaluation and evaluation of species-habitat associations and presence of suitable or potential habitat; and 3) field clearances, field reconnaissance and inventories utilizing intuitive controlled surveys, in accordance with survey protocols for the specific groups of species. Specific field surveys for bureau sensitive species were conducted by the Marys Peak Field Office botanist in the spring and summer of 2014 and 2015.

One bureau survey and manage fungal species, *Rickenella Swartzii*, was located within a stream protection zone and outside of the thinning area. No other special status fungal sites are known to be within the project area. There are no known sites of any federal T&E or bureau special status vascular plant, lichen, or bryophyte species within the project area.

**Noxious weeds**

The following noxious weeds occur in the Dunk Tank project area, almost exclusively along existing right-of-ways: Armenian blackberry (*Rubus bifrons*), bull and Canadian thistles (*Cirsium vulgare* and *C. arvense*), False brome (*Brachypodium sylvaticum*), Geranium-herb Robert (*Geranium robertianum*), Scot's broom (*Cytisus scoparius*), St. John's wort (*Hypericum perforatum*), and Tansy ragwort (*Senecio jacobaea*).

### 3.1.2 ENVIRONMENTAL EFFECTS

## Alternative 1 – No Action

The No Action alternative would more slowly attain desired stand or landscape conditions or upland and riparian forests. Under Alternative 1, stands would remain densely stocked, with a high level of canopy closure. There would be little change in species composition or the distribution of live and dead vegetation in the near-term. Over the long-term, the rate of individual tree growth would continue to decline, and mortality would increase because the self-thinning phase of forest succession would persist for decades. Without management, the portion of the landscape in the stem exclusion stage would continue to increase as younger plantations enter the stem exclusion stage and as the Dunk Tank stands remained stalled in this stage.

**Stand Development with No Treatment - General Forest Management Area**

Without treatment, current project area stands would continue to increase in density. Stand growth projections were modeled using the FVS-ORGANON growth and yield computer simulation program based on stand exam plot data collected in 2007, 2014 and 2015. In 30 years, the relative density of project area stands would average 0.70. Culmination of mean annual increment, when the current growth rate has dropped below the stand lifetime average growth rate, will have occurred in the project area stands (on average) by year 2033 (ranging from 2024 to 2049). Early seral habitat would occur in small areas comprising 0-5 percent of the area as a result of disturbances such as disease, insects, and wind. Snag and coarse wood levels would have increased as a result of density mortality, predicted to average 33 trees per acre of 10.2 inches DBH.

Existing laminated root rot pockets would likely spread within the project area, creating gaps over time. Over time, these gaps would likely become forested with hardwood trees and shade-tolerant conifer. The effect would not be detrimental to wildlife habitat, but would not contribute to sustained growth of timber to meet objectives of the Matrix (GFMA) land use allocation.

Under the No Action alternative, the RMP direction to produce a sustainable supply of timber, provide habitat for a variety of organisms associated with both late-successional and younger forest, and contributing to local economies would not be met.

**Stand Development with No Treatment - Riparian Reserves**

Without treatment, stand structure would become increasingly uniform, except for gaps created by disturbance such as disease, insects, and wind that would create stand structural diversity and contribute to late-successional structural development in the Riparian Reserves. The timing and intensity of these conditions are unknown, but it is expected that diversity would take considerably longer to develop than if the proposed treatment were implemented.

Hardwood tree species would become overtopped and most of them lost from the stand. Stand conditions would remain on the current trajectory of increasing density and decreasing individual tree growth rates. In 30 years without treatment, the relative density of stands would increase from the current average of 0.63 to an average of 0.70.

The main input of coarse woody debris would come from density mortality, disturbance events, and endemic levels of insects and disease, resulting in more snags and downed logs than with treatment. In general, the quantity of mortality would be much greater than if the stands were thinned, but resulting coarse wood recruitment would be smaller in size. Density mortality predicted (FVS-ORGANON model) an average of 33 trees per acre averaging 10.2 inches DBH over the next 30 years without treatment, and only 1 tree per 2 acres of 18 inches DBH with density management within the same 30-year time period.

The modeling provides a basis for comparison but does not include mortality from disturbance and stochastic events. One study of stands aged 14–38 years, over 22 years showed total annual stem mortality of 1–5 percent (Lutz and Halpern 2006). Since the stands in the project area are older than the researched stands, annual mortality would likely be less. In the study, wind damage accounted for 18 percent of the stem mortality, but represented 50 percent of the bole biomass lost because trees lost from wind are relatively larger than trees lost to density mortality. Understory development would be very limited: very few new understory trees would establish, and existing understory trees would die or slow in growth due to increasing competition.

This alternative does not meet the objectives for speeding development of complex, late-successional forest habitat within Riparian Reserves.

**Federal T&E and bureau special status (includes Survey and Manage) botanical and fungal Species**

Under this alternative, vegetation and habitat within the project area would not be altered through commercial thinning. The *Rickenella swartzii* site would remain unaffected, positively or negatively. Unmanaged forest succession would continue to shape the habitat within the project area.

**Noxious Weeds**

Major rocked access routes within the project area would continue to be maintained for vehicular use through road maintenance activities such as: applying additional rock, grading roadways, mowing competing vegetation, culvert replacement, pulling ditches and reshaping the roadway. Roads would remain open for use by private industry and the public. Due to these activities, individual noxious weeds located within the road prisms tend to increase in number the year following road use disturbances, but then decrease as native vegetation reclaims the road prism. The establishment of noxious weeds located outside of the road prism, and within the project area would be minimal due to the lack of sunlight and lack of mineral soil disturbances.

## Alternative 2 – Proposed Action

Direct effects are those that are triggered immediately as a result of implementation at the stand scale. Indirect effects are those that would occur within the treatment areas and at the landscape-scale over a period of one to five decades. The disclosure of effects below applies to both upland and riparian forests.

Proposed treatments would consist of thinning from below. This type of thinning favors removal of trees in the smaller diameter classes and typically reserves the larger, dominant trees. Within

the Riparian Reserves, a variable density treatment would be applied with the prescription retaining 50 percent or greater canopy cover post-harvest.

The Proposed Action would implement thinning from below to enhance the growth, health, and vigor of residual trees and restore stand density, and species and structural diversity similar to those considered characteristic under a natural disturbance regime, while establishing stand trajectories to meet RMP management direction for Matrix and Riparian Reserves. Table 3–4 compares the direct effects of the Proposed Action and of No Action on stand density, species composition, quadratic mean diameter, relative density, and canopy cover.

As a whole, the long-term indirect effects of the Proposed Action would be beneficial. While suppression mortality would be reduced by all treatments, the growth of the leave trees would be accelerated by thinning. At the individual tree scale, thinning would reduce inter-tree competition and resultant suppressed diameter growth and mortality. At the stand scale, understory growth and establishment would initiate the layering that is characteristic of late-successional structure within the gentle valley bottom landscape areas.

**Table 3-4.** Stand metrics with treatment and without treatment on a per acre basis in 2046

| Unit | Treatment | Age | TPA >7" DBH | % DF (TPA) | BA/A | QMD | RD | % CC |
|---|---|---|---|---|---|---|---|---|
| 7-1 | 140 BA | 74 | 93 | 62 | 264 | 22.8 | .56 | 66 |
| | No Treatment | | 137 | 75 | 334 | 21.2 | .73 | 74 |
| 7-2 | 130 BA | 71 | 80 | 91 | 275 | 25.1 | .55 | 64 |
| | No Treatment | | 131 | 95 | 354 | 22.2 | .75 | 74 |
| 7-3 | 130 BA | 77 | 80 | 59 | 226 | 22.7 | .48 | 65 |
| | No Treatment | | 148 | 77 | 323 | 20.0 | .72 | 76 |
| 17-1 | 140 BA | 82 | 101 | 31 | 240 | 20.9 | .53 | 71 |
| | No Treatment | | 161 | 48 | 338 | 19.6 | .77 | 80 |
| 17-2 | 130 BA | 78 | 75 | 36 | 247 | 24.6 | .52 | 68 |
| | No Treatment | | 113 | 57 | 329 | 23.2 | .70 | 75 |
| 17-3 | 140 BA | 78 | 69 | 85 | 237 | 25.1 | .48 | 58 |
| | No Treatment | | 124 | 93 | 312 | 21.5 | .67 | 68 |
| 17-4 | 140 BA | 82 | 69 | 85 | 237 | 25.1 | .48 | 58 |
| | No Treatment | | 124 | 93 | 312 | 21.5 | .67 | 68 |
| 17-5 | 150 BA | 77 | 69 | 98 | 280 | 27.3 | .54 | 59 |
| | No Treatment | | 110 | 100 | 344 | 24.0 | .70 | 68 |
| 17-6 | 150 BA | 71 | 68 | 100 | 284 | 27.7 | .54 | 58 |
| | No Treatment | | 115 | 97 | 364 | 24.0 | .74 | 69 |
| 17-7 | 180 BA | 90 | 62 | 100 | 268 | 28.2 | .51 | 57 |
| | No Treatment | | 109 | 100 | 349 | 24.3 | .71 | 68 |
| 17-8 | 150 BA | 71 | 68 | 100 | 284 | 27.7 | .54 | 58 |
| | No Treatment | | 115 | 97 | 364 | 24.0 | .74 | 69 |
| 17-9 | 160 BA | 95 | 50 | 87 | 255 | 30.5 | .46 | 54 |
| | No Treatment | | 85 | 93 | 330 | 26.7 | .64 | 65 |
| 19-1 | 140 BA | 77 | 62 | 100 | 249 | 27.1 | .48 | 57 |
| | No Treatment | | 110 | 100 | 323 | 23.2 | .67 | 68 |
| 19-2 | 150 BA | 99 | 70 | 60 | 217 | 23.9 | .45 | 59 |
| | No Treatment | | 152 | 76 | 349 | 20.5 | .77 | 74 |
| 19-3 | 160 BA | 106 | 38 | 100 | 213 | 32.2 | .38 | 42 |
| | No Treatment | | 68 | 100 | 300 | 28.5 | .56 | 54 |
| 19-4 | 150 BA | 95 | 67 | 32 | 234 | 25.3 | .47 | 64 |
| | No Treatment | | 99 | 35 | 299 | 23.5 | .62 | 72 |
| 19-5 | 150 BA | 90 | 48 | 79 | 233 | 29.8 | .43 | 51 |
| | No Treatment | | 142 | 59 | 373 | 22.0 | .80 | 75 |
| 21-1 | 150 BA | 95 | 61 | 100 | 207 | 24.8 | .42 | 53 |
| | No Treatment | | 129 | 100 | 287 | 20.2 | .64 | 68 |
| 21-2 | 150 BA | 95 | 61 | 100 | 207 | 24.8 | .42 | 53 |
| | No Treatment | | 129 | 100 | 287 | 20.2 | .64 | 68 |
| 21-3 | 130 BA | 80 | 56 | 72 | 240 | 27.9 | .48 | 56 |
| | No Treatment | | 107 | 89 | 324 | 23.5 | .68 | 68 |
| 21-4 | 150 BA | 84 | 79 | 90 | 226 | 22.9 | .47 | 58 |
| | No Treatment | | 133 | 97 | 313 | 20.8 | .69 | 71 |
| 21-5 | 130 BA | 67 | 105 | 94 | 242 | 20.6 | .55 | 65 |
| | No Treatment | | 187 | 97 | 316 | 17.6 | .76 | 75 |
| 21-6 | 130 BA | 80 | 79 | 100 | 256 | 24.4 | .52 | 60 |
| | No Treatment | | 121 | 100 | 305 | 21.5 | .66 | 69 |

### Forest Health

Laminated root rot (*Phellinus weirii*) would be reduced by removing susceptible trees from around current infection centers in the Matrix, halting the spread of disease. Patch removal would effectively eliminate the spread of the root rot as long as infection centers were recognized and tree species of lower susceptibility were replanted. The root rot could remain and spread outward from clumps of leave trees. It is also possible that infection centers will be latent or not recognized, allowing continued spread in Douglas-fir regeneration, but harvest will not increase the rate of spread.

### Stand and Tree Growth

Commercial thinning of the proposed stands would meet objectives of providing sustained timber yield in the GFMA. The stands have not yet reach culmination of mean annual increment, indicating that more volume would be accrued with later harvest. Proposed treatments also would better meet the objective of increasing volume growth for the GFMA Land Use Allocation by capturing volume that would occur as density mortality in the stand without treatment.

After 30 years of growth, project area stands are projected to average 91.2 MBF per acre (range 71.1-113.6 MBF per acre). Commercial thinning and density management treatments would benefit residual trees by increasing individual tree growth and increasing tree stability, achieving an average quadratic mean diameter of 25.5 inches within 30 years. Specifically, the predicted average increase in QMD for overstory trees as a result of density management thinning is 3.4 inches. Immediately following thinning, the current stand average QMD would increase from 16.0 inches (range 11.8-24.3 inches) to 19.4 inches (range 14.2-27.7 inches) from the removal of smaller trees. After 30 years of tree diameter growth, QMD then would increase to 25.8 inches (range 20.4-32.3 inches), increasing an average of 9.8 inches over current stand QMD. Without thinning, after 30 years of tree diameter growth, average stand QMD is predicted to increase to 22.4 inches (range 18.0-28.5), an increase of 6.4 inches over current stand QMD. Therefore, relative to no treatment, proposed density management is predicted to result in an additional 3.4 inches of diameter growth in 30 years, 53 percent more diameter growth than no treatment.

### Risk assessment

Stands would experience a short-term (one to three years) elevated risk of a bark beetle infestation from increased fresh down wood inputs resulting from the logging operation. Risk would be limited due to the relatively small size of the down wood. Additional mortality is highly unlikely to reduce tree stocking below desired levels.

Laminated root rot (*Phellinus weirii*) would be reduced in the Matrix[13] by removing susceptible trees from around current infection centers, halting the spread of disease. It is possible that infection centers will be latent or not recognized, allowing continued spread, but harvest would have a neutral effect on the rate of spread.

The potential for windthrow from winter storms would be higher for the first decade following

[13] Laminated root rot would not be treated in the Riparian Reserves.

treatment, primarily within commercial thinning acres. The risk would be reduced by selecting leave trees with deep, healthy crowns, as specified in the silvicultural marking guidelines. Risk is greater near harvest on adjacent private land has occurred, and where aspect (the lee side of ridges from prevailing winds), topography, and shallow soils increase risk. Windthrow is not expected to reduce tree stocking by more than 20 percent for the first decade after treatment over the commercial thinning area (Busby et al. 2006). A two-year study of wind damage following variable density thinning (Roberts et al. 2007) showed a loss of 1.3 percent of stems, with losses concentrated in topographically vulnerable conditions.

Skyline and ground-based yarding systems would result in bole and crown damage to a small percentage (estimated 1–3 percent) of the residual trees. Damage may result in greater incidence of stem decays in the future. Excessive damage to reserve timber, as determined by the Authorized Officer, will result in suspension of the yarding operations until measures are in place to prevent further damage, as approved by the Authorized Officer. If the Authorized Officer determines that excessive damage to reserve timber occurs during operations, suspension of yarding operations would be implemented until measures were put in place to prevent further damage, per contract specifications.

**Federal Threatened and Endangered and Bureau Special Status (includes survey and manage) Botanical and Fungal Species**

The *Rickenella swartzii* site is located within a riparian buffer, outside of the treatment area, and would be protected.

This project could affect bureau special status botanical and fungal species which occur within the project area, but were not located during surveys. No bureau special status species are suspected to occur within the project area due to the young age of the coniferous stands. These species are generally associated with older forest structure, which is absent from the project area. Bureau special status fungal species have been determined to be not practical to survey for.

Thinning dense homologous stands and creating diversity through various density treatments would provide future habitat for several bureau special status species. Thinning dense stands allows for increased secondary conifer growth, maintains live lower limbs in the canopy, and provides sunlight for the development of a coniferous understory. In addition, thinning allows for an increase in size and density of understory woody shrub species. The increase in sunlight, in response to conifer thinning, would result in the development of suitable habitat for several bureau sensitive species.

**Noxious Weeds**

Exposed mineral soil creates environments favorable for the establishment of non-native plant species. Aspects of the proposed project which create exposed mineral soil provide for an increased risk for the establishment of non-native plant species. These activities include but are not limited to road construction and renovation, culvert installation, road maintenance activities, ground-based skidding operations, skyline cable logging corridors, and vehicles.

All noxious weed species that occur within and adjacent project areas are classified by the Oregon Department of Agriculture as “B” designated weeds. “B” designated weeds are weeds of economic importance which are regionally abundant, but which may have limited distribution in

some counties. Where implementation of a fully integrated statewide management plan is not feasible, biological control shall be the main control approach.

The noxious weeds species that are known to occur within the Dunk Tank project area are regionally abundant and widespread throughout western Oregon. A fully integrated statewide management plan has not been implemented for these species. The Marys Peak Field Office has an integrated non-native plant management plan in place for the control of non-native plant species and is active in its control of Oregon listed noxious weeds.

Adverse effects from the establishment of non-native species that occur within or near the project area are not anticipated. The risk rating for the long-term establishment of these species and consequences of adverse effects on this project area is low because;

1) Design features have been incorporated into this project to reduce the ability of noxious weeds from becoming established (e.g., sowing seed, requiring clean vehicles upon move-in);
2) The size of the projects on a landscape scale are small, effects would be localized;
3) The implementation of the Marys Peak integrated non-native plant management plan allows for early detection of non-native plant species which allows for rapid control;
4) The noxious weeds species which occur in the project area are widespread throughout Benton County, and control measures generally consist of biological control;
5) Generally, any new non-native plant populations persist for several years after becoming established but soon decline as native vegetation increases in density and size within the project areas; and
6) There are no other Oregon listed noxious weed species that are anticipated to become established with the implementation of this project and design features.

In addition, project areas would be monitored for additional noxious weed populations. Monitoring would provide for the early detection of noxious weed infestations and allow for a rapid response to implement control, if needed. U.S. State listed noxious weed species would be eradicated as funding allows.

Sowing seed on exposed soil areas tends to reduce or limit the establishment of noxious weeds through competition. If the seed does not meet the seed specifications, the number of non-native species in the project area may increase and may lead to a greater infestation of noxious weeds than anticipated.

### 3.1.3 CUMULATIVE EFFECTS

The Benton Foothills Watershed Analysis Area encompasses approximately 80,647 acres, of which BLM manages approximately 6,600 acres or 8 percent. The project area occurs on approximately 730 acres or 11 percent of BLM-managed lands and less than 1 percent of the entire watershed analysis area. Effects of the proposed action on native vegetation are expected to be localized and occurring on less than 1 percent of the analysis area. The BLM is not planning additional harvests in the Benton Foothills Watershed Analysis Area at this time.

The potential of the action alternatives to result in either adverse or beneficial cumulative effects to forest vegetation is addressed at the scale of the Dunk Tank planning area. The proposed

activities were taken into account in the analysis of vegetative age class distribution. The time frame for analyzing cumulative effects is 10 to 50 years, the period of time that thinning would most influence today's pattern of stand vegetation.

Commercial thinning in the action alternatives would beneficially reduce the existing stem exclusion vegetation within the planning area. As such, thinning would reduce inter-tree competition, thus reducing mortality associated with stem exclusion stand dynamics. Thinning would help promote maturity and out of the stem exclusion stage, helping to meet desired landscape conditions for the Matrix land use allocation. No cumulative effects at the watershed level would be expected for the Dunk Tank project area with regard to forest cover because the proposed thinning would maintain a forested setting in the same age class as before thinning and would not change overall vegetation patterns in the watershed. When considered in the context of past, present, and foreseeable actions, it is determined that the Proposed Action would have no meaningful negative cumulative impacts and that the proposed activities and connected actions represent a positive contribution to vegetative conditions in the planning area. In contrast, the No Action alternative would have no meaningful cumulative impacts on vegetation except in the context of foregone opportunities.

As stated above, thinning dense homologous stands and creating diversity through various density treatments would provide future habitat for several bureau special status species. The increase in sunlight, in response to conifer thinning, would result in the development of suitable habitat for several bureau sensitive species.

Noxious weed populations within the watershed are expected to rise and fall through the implementation of soil disturbing projects. Populations are anticipated to maintain the present level as mineral soil is exposed and as native vegetation reclaims disturbed sites and through the application of noxious weed reduction treatments.

Many forest management activities and natural events within western Oregon create soil disturbance, increase available light, and increase soil temperatures, all of which influence the spread of noxious weeds. These activities and events include, but are not limited to, forest management actions, farming, road construction, landslides, floods, wind storms, and recreational activities. Activities that do not necessarily create disturbance but influence the spread of weed seeds include; vehicle use and recreational activities. Other sources of seed dispersal include wildlife migration, water movement, plant dehiscence, and wind.

Many common and anticipated noxious weed species known in Northwestern Oregon are not shade tolerant and generally do not persist in a forest setting because they become out-competed for light as native tree and woody shrub densities increase in response to timber management. However, these species are able to maintain populations along the managed road systems due to the management of competing vegetation and road grading which maintain sunlight exposure.

The implementation of this project would likely increase the number of existing common and widespread noxious weed species within the project areas in the short-term, but the effects would remain localized. In the long term, noxious weed species would be expected to return to the approximate baseline level prior to the implementation of the project. Cumulative effects from the establishment of noxious weeds within the Dunk Tank project area, as a whole or within any adjacent watershed are not anticipated.

## 3.2 WILDLIFE

The following issues will be addressed in the environmental effects section below:

*How would the proposed action impact Endangered Species Act, Bureau Special Status, including Survey and Manage, wildlife, fish, botanical and fungal species and their habitat?*

*How would the proposed action affect wildlife terrestrial habitats within the project area and across the watershed?*

### 3.2.1 AFFECTED ENVIRONMENT

**Special Habitats and Special Habitat Components**

Special habitat types as recognized by the Salem District RMP and the associated Watershed Analyses include caves, cliffs, exposed rock, talus, wetland types, and meadows. These habitat types often host unique floral and faunal species that contribute valuable biodiversity to the local landscape (Hagar 2007b, Swanson et al. 2011). There are no recognized (greater than one acre) special habitat types within the project units, but there is a micro-site wet area (approximately 0.2 acres in Unit 17-5) that has been buffered to avoid disturbance.

Within forested ecosystems, dead wood (snags and down logs), often referred to as coarse woody debris (CWD), is a special habitat component that has been shown to strongly influence the diversity and abundance of wildlife species. Rose et al. (2001) identify 93 vertebrate wildlife species in Oregon and Washington that use snags (for nesting, foraging, roosting, courtship, drumming, hibernating), and 86 species that use down logs (for nesting, foraging, denning, hibernation, hiding cover, thermal cover, travel corridor, lookout). Most of the 93 species associated with snags prefer trees that are 15 inches in diameter or larger, while about one third of these species prefer snags 30 inches in diameter or larger. The larger diameter hard snags (>30 inches, Decay Class 1 and 2) and hard down logs will, over time, provide for the needs of more wildlife species than smaller and soft snags (Decay Class 3, 4, and 5) and down logs (Mellen-McLean et al. 2009, Rose et al. 2001).

Mid-seral forests in this region exhibit a wide range in the density of snags and down logs (Hagar 2007a; Mellen-McLean et al. 2009; Rose et al. 2001). As expected, due to past harvest history and young stand age, the proposed harvest units exhibit an abundance of small diameter snags and numerous pieces of down logs that are less than 20 inches on the large end. Larger size snags and down logs (greater than 30 inches DBH) that benefit the greatest number of wildlife species are essentially absent from these units. Suppression mortality processes and small wind-throw events continue to contribute additional small diameter snags and down logs in most units. Stand exams surveys did not detect sufficient down logs to meet or exceed the minimum down log retention requirements for GFMA lands (240 feet of hard logs greater than or equal to 20 inches diameter on large end and greater than or equal to 20 feet long pieces) due largely to the relatively young stand age and past harvest history.

## Special Status and Special Attention Species

Special Status Species that may occur within this project vicinity and which may be affected by the proposed action include the northern spotted owl, marbled murrelet, and red tree vole. A recent review of an agency databases (GeoBOB, NRIS) and the Oregon Biodiversity Information Center Database found no records of any other Special Status Species or Survey and Manage wildlife species locations within the planned harvest units.

### *Northern Spotted Owl (NSO)*

The northern spotted owl generally inhabits forests older than 80 years of age that provide habitat for nesting, roosting and foraging (NRF). Stands that fulfill all three of these needs are commonly referred to as suitable habitat. Suitable habitat typically consists of: multi-layered, multi-species canopies dominated by large overstory trees greater than 20 inches in diameter breast height; canopy cover of 60 to 80 percent; open spaces within and below the canopy of the dominant overstory; presence of trees with large cavities and deformities such as broken tops and dwarf mistletoe infections; numerous large snags; and large amounts of down wood (Thomas et al. 1990, USDI-FWS 1990, Courtney et al. 2004).

The younger, mid-seral forest stands (<80 years old) usually lack habitat components suitable for nesting. These stands may provide some roosting and foraging opportunities or at least provide forested connectivity between suitable patches to facilitate dispersal (Courtney et al. 2004, USDI-FWS 2011a). Dispersal habitat is defined as conifer-dominated forest stands with canopy closure exceeding 40 percent, and an average DBH of 11 inches or greater (Thomas et al. 1990). Dispersal habitat is essential to the movement of juvenile and non-territorial (e.g., single birds) northern spotted owls, enabling territorial vacancies to be filled, and for providing adequate gene flow across the range of the species (USDI-FWS 2011a).

The mid-seral forest conditions within the proposed harvest units may currently provide dispersal habitat for northern spotted owls since these units lack older forest structure that would provide suitable nesting, roosting, and foraging habitat for this species (Courtney et al. 2004, USDI-FWS 2011a). There is no suitable habitat that would be modified by the proposed action. Small patches of suitable habitat lie adjacent to a few units in Section 21. There is no designated Critical Habitat for northern spotted owls on BLM lands in this project area.

There are two northern spotted owl sites located within 1.5 miles of the proposed harvest units. The Crooked Corner owl site lies about 0.8 miles the west of the harvest units in section 7. This site was established by a breeding pair in 2014, yet only a male was present in 2015. The other site (Greasy Creek) lies about 0.5 miles from the nearest unit (7-2) and appears to be vacant for the past 3 years, having only two detections that are likely from the Crooked Corner male. The BLM and cooperators have conducted spotted owl surveys in the vicinity of the project area since 1986. The BLM also initiated additional owl surveys in Section 19 and 21 in 2015 and had no northern spotted owl responses. However, a pair of barred owls was regularly detected in Section 21.

For analysis purposes, habitat conditions in the vicinity of a northern spotted owl site are assessed by evaluating suitable and dispersal habitat conditions at three analytical scales: home range, core area, and nest patch (USDI-FWS et al. 2008, USDI-FWS 2011a). In this project

vicinity, a spotted owl home range is approximated by a circle with a radius of 1.5 miles surrounding the activity center. Throughout the year, northern spotted owls may occasionally visit and forage at isolated patches at the periphery of their home range, especially outside of the nesting season, or when non-nesting. The Core Area is represented by a 0.5-mile radius circle, encompassing an area of approximately 500 acres that is the most heavily used area during the nesting season. Core areas are defended by territorial northern spotted owls and generally do not overlap the core areas of other spotted owl home ranges. The Nest Patch is located within the core area and is represented by a circle 300-meter in radius encompassing about 70 acres centered on the nest tree.

Table 3–5 provides a summary of habitat conditions at the two northern spotted owl sites that overlap the proposed harvest units. Each of these owl sites includes BLM, Forest Service, and various private landowners within their home range. Habitat contributions of private forest lands are considered in this analysis, but are not expected to provide any more than dispersal habitat in the long term. The habitat conditions at both owl sites show very low levels of suitable habitat (NRF) at all spatial scales. Northern spotted owl sites with greater than 50 percent suitable habitat within their core area appear to have higher annual survival and greater reproduction than sites with less than 50 percent (USDI-FWS 2016). For both of these owl sites, it appears that the relatively high percentage of dispersal habitat at each analysis scale has helped facilitate occupancy.

There is a 45 year history of motorcycle trail use in the project vicinity, with about 2 miles of trails within proposed harvest units (see section 3.7). The trails have a narrow footprint and seasonal use which has a negligible impact on the functional value of habitat patch quality for northern spotted owls. The seasonal use by motorcycles may overlap the critical breeding period for spotted owls, but the potential for noise disturbance is negligible because the nest patch for each northern spotted owl site is beyond 100 yards of existing trails, and the long history of trail use suggests the any resident northern spotted owls in this vicinity would acclimate to the seasonal increase in the ambient noise environment.

**Table 3-5.** Habitat conditions in NSO home ranges overlapping the project area [1, 2]

| Owl Site Name and Number | Home Range Habitat Acres (%) | | Core Area Habitat Acres (%) | | Nest Patch Habitat Acres (%) | |
|---|---|---|---|---|---|---|
| | NRF | Dispersal | NRF | Dispersal | NRF | Dispersal |
| Greasy Creek (0002) | 415 (9) | 2346 (52) | 116 (23) | 213 (43) | 16 (23) | 38(55) |
| Crooked Corner (0561) | 375 (8) | 2637 (58) | 121 (24) | 186 (37) | 29 (41) | 25 (36) |

[1] Vegetation cover conditions were interpreted from BLM stand data, 2012 aerial photos, and 2011 LiDAR imagery. Habitat conditions were estimated on all land ownerships within home range radius of owl sites that had a resident single or pair of spotted owls detected in the past 5 years.
[2] Nesting, Roosting, Foraging (NRF) and Dispersal Habitat conditions on all lands within respective analysis circles are in acres, with percent of total radius area shown in parenthesis. Home Range acres include Core Area and Nest Patch acres; Core Area acres include Nest Patch acres.

### *Marbled Murrelet*

This project area is 30 miles inland from the ocean and the nearest known occupied marbled murrelet is on BLM lands about 4 miles to the west. The forests stands in the planned harvest units do not contain any potential nesting structure for murrelets, which is usually composed of older conifer forest stands (greater than 120 years old) having large canopy branches, mossy limbs, and abundance of branch whorl platforms (McShane et al. 2004). Some of the older forest patches in the local vicinity (less than 3 miles) were surveyed (Evans-Mack et al. 2003) for murrelets at various dates from 1991 to 2015. In that time period, there have been 209 survey visits at 61 survey stations without any murrelet detections. There is no designated marbled murrelet critical habitat (USDI-FWS 1996, USDI-FWS 2011b) within the project area.

### *Red Tree Vole*

The red tree vole is the only Bureau Sensitive Species and Survey and Manage mammal species (USDA-FS and USDI-BLM 2001, Huff et al. 2012) that may be affected by the proposed action. The red tree vole is a small arboreal rodent that feeds primarily on Douglas-fir needles and has been found to be closely associated with late-seral and old-growth forests (LSOG). This species appears to have limited dispersal capabilities and there is concern for isolation of populations due to fragmentation of LSOG habitat. The life history and current status of red tree voles has been well described in the Final Supplement to the 2004 FSEIS To Remove or Modify the Survey and Manage Mitigation Measure (USDA-FS and USDI-BLM 2007). In 2011, the U. S. Fish and Wildlife Service published a 12-month finding (USDI-FWS 2011c) which evaluated the status of a Distinct Populations Segment (DPS) of the red tree vole in the northern Oregon Coast Range. The Service decided that listing this DPS as threatened or endangered was warranted but precluded by higher priority listing actions. This DPS of the red tree vole is now a Candidate Species for listing. BLM policy requires that Candidate Species are to be treated as Bureau Sensitive Species. The project area lies within the southern portion of the range of the DPS (south of highway 20; USDI-FWS 2011c).

The Dunk Tank project units were designed in accordance with the 2001 Survey and Management ROD (USDA-FS and USDI-BLM 2001), and in compliance with a court order from February 2014 (and subsequent BLM policy IM-OR-2014-037). Because all of the proposed harvest units involve thinning in forest stands less than 80 years old, they are exempt from pre-disturbance surveys or management of known sites (Pechman Exemption). However, because the red tree vole is a federal Candidate Species and Bureau Sensitive Species, the BLM has an interest in evaluating potential impacts to this species to avoid contributing to the need for future listing. For this reason, surveys were conducted in a small portion of Section 19 (17 acres) where the proposed thinning units included a scattered cohort of older legacy trees and wolfy trees that had a high likelihood of red tree vole presence. Following ground transects in 2015, 9 potential nest trees were selected from climbing, and red tree voles were detected in 6 of the 9 trees (Table 3–6).

**Table 3-6.** Red Tree Vole Survey Results from Section 19

| EA Units | Survey ID | Stand Age | Survey Area | Climbed Trees | RTV Nest Status |
|---|---|---|---|---|---|
| Dunk Tank 19-3,4,5 | DunkTank-19A | 60-76 | 17 acres | 9 | 6 active nest trees;<br>3 trees had no voles |

Since 2010, BLM has been conducting an inventory and monitoring program for red tree voles on BLM land within the Marys River Watershed. Vole populations in this watershed appear to be abundant and widely distributed (Forsman et al. 2004, USDI-FWS 20011c), and have persisted in all buffered habitat reserves that resulted from previous BLM harvest actions (GeoBOB and BLM internal data). A few of the long-term RTV monitoring areas are located in older forest stands adjacent to proposed thinning units in Section 21. Red tree voles are often found in younger forest stands, especially if there are nearby patches of LSOG forests (USDI-FWS 2011c, Price et al. 2015). But vole use of younger stands may be temporary or intermittent (USDI-FWS 2011c). The younger stands proposed for thinning may currently have low numbers of red tree voles, with the likelihood of vole occurrence higher in those units in Section 21 that are adjacent to the older forest patches.

### Birds of Conservation Concern

All of western Oregon, including this analysis area, falls within the Northern Pacific Forests Bird Conservation Region (USDI-FWS 2008). Within this region there are several migratory land birds which are considered Birds of Conservation Concern (BCC) because they appear to be exhibiting downward population trends for several years (Altman and Alexander 2012, USDI-FWS 2008). Thirty-three of the 88 landbird species that regularly occur in the Marys Peak Field Office are considered BCC species (Table 3–7). Twenty-three BCC species have a high or moderate likelihood of occurring within the planned harvest area. Incidental observations obtained during wildlife-related field work within the proposed units have confirmed the presence of 14 of these species during the breeding season.

**Table 3-7.** Bird species groups likelihood of occurrence within the project areas

| Bird Species Grouping | Within MPRA | Likelihood of occurrence in Project Areas [1] | | | |
|---|---|---|---|---|---|
| | | High | Moderate | Low | Not Present |
| Bird of Conservation Concern | 33 | 15 | 8 | 7 | 3 |
| Other Regularly Occurring Landbirds | 55 | 19 | 12 | 16 | 8 |
| Total bird species | 88 | 34 | 20 | 23 | 11 |

[1] The likelihood that bird species occur in the project areas based on current literature review and recent field observations.

### 3.2.2 ENVIRONMENTAL EFFECTS

## Alternative 1 – No Action

This alternative would not conduct any harvest action within the project area. There would be no immediate change to the mid-seral conifer forest conditions on BLM-managed lands in this area. Stand development processes would continue unaltered within the mid-seral forest stands of the proposed units. Over the next few decades, barring any stand disturbance events such as windthrow, the continuing process of suppression mortality would contribute snags and down logs to these stands, mostly in the smaller size classes (less than 20 inches DBH). It would take several decades for these stands to accumulate larger snags and down logs (greater than 20 inches DBH) through suppression mortality. In 30 years, stand modeling results suggest that without harvest treatment, most units would have between 1.1 and 6.7 snags per acre that are greater than 20 inches DBH. Thus, it is likely that most of the proposed units would have achieved the minimal desired level of snags and down logs to meet RMP requirements within 30 years.

Dispersal habitat conditions for northern spotted owls would be unchanged. It would likely take several decades for proposed harvest units to develop sufficient late-seral forest structure (usually stands greater than 120 years old) to provide suitable nesting structure for northern spotted owls or marbled murrelets. Red tree voles that may currently be present in low numbers in some units would be expected to occur at low densities for a several decades until these stands developed sufficient late-seral forest structure to support population persistence. In general, the current pattern of habitat use by forest-associated wildlife species within the project area would be expected to continue unchanged. This alternative would avoid any short-term disturbance and displacement of the existing wildlife species in the project area.

## Alternative 2 – Proposed Action

**Stand Level Conditions**

The Proposed Action and associated activities would alter the existing forest structure of the planned harvest units. The anticipated changes to stand structure are well described in the silvicultural prescription in the analysis file. Wildlife species are most likely to be effected by the following direct and indirect changes to forest habitat conditions at the stand level.

Short-term (less than 30 years):

- moderate reduction of canopy cover (resulting canopy >40 percent) over entire treatment area (730 acres);
- increased horizontal spatial variability within treated stands;
- minor reduction and disturbance to existing CWD (snags and down logs) resulting from felling, yarding, road construction, and fuels reduction;
- reduced recruitment rate of small sized snags and down logs, which would be partially offset by increased potential for windthrow in first few years post-treatment;
- retention of minor conifer species, hardwood trees, and shrub diversity, and;
- existing wolfy trees and legacy trees would be released from canopy encroachment.

Long-term (greater than 30 years):

- a significant recovery of overstory canopy cover within treated stands;
- the gradual transition in structural characteristics of the treated stands to more closely resemble late-seral forest (larger diameter trees and limbs, sub-canopy development, greater tree species diversity, greater volume and size of hard CWD, canopy gaps);
- extended persistence of legacy trees and wolfy tree structure;
- extended persistence of minor conifer species, hardwood trees, and shrub cover.
- Slow recovery of snag and down log recruitment rate.

The proposed thinning harvest would result in altered forest stand conditions, such that expected use by some wildlife species may decline while other species would increase or stay the same (Hagar and Friesen 2009). The reduction in current canopy cover, minor loss of small snags, increased growth of shrubs, and abundance of created slash would likely disrupt the current pattern of wildlife use for the short term. However, the post-treatment thinning units would continue to function as mid-seral conifer-dominated habitats for most of the wildlife species which currently use these stands. Assuming that these BLM-administered lands retain a similar land-use allocation going forward, it is possible that future harvests would occur on some or all units after 20 years.

**Special Habitats and Special Habitat Components**

No special habitats would be affected by the proposed action. The condition of the CWD component would be affected by the countervailing processes of reduced suppression mortality and windthrow. The proposed thinning would reduce and nearly eliminate the accumulation of smaller sized snags and down logs that would result from suppression mortality. After three decades post-harvest, the treated stands are also expected to have fewer large snags (range from 0.2 to 3.8 snags per acre greater than 20 inches) as compared with no treatment. Thus, it is likely that many of the proposed units (particularly the youngest stands less than 50 years old) would still fall short of providing the desired level of hard snags and down logs to meet RMP objectives after 30 years, and could possibly remain deficient for at least another decade. The Salem RMP acknowledges that partial-harvest areas (such as commercial thinning units) may not be capable of providing CWD to meet the RMP requirements expected of regeneration harvests due to the stage of stand development at time of treatment (RMP p. 21). It is possible that some, or all, of these proposed thinning units may be subject to future harvest within 30 years, whereby resulting snag and down log quality and quantity would be designed to meet RMP requirements at that time.

Post-harvest mortality resulting from abiotic sources (such as mechanically damaged trees and windthrow) may provide a short-term boost in CWD of all size classes. In a study of early-seral conifer stands (14 to 38 years) in western Oregon, Lutz and Halpern (2006) examined 22 years of tree growth and mortality data and found that suppression mortality of Douglas-fir killed more than 3 times as many trees as abiotic mortality, but the total mass of dead wood created by abiotic agents was more than 4 times greater than the total mass of dead wood created by density-dependent suppression mortality (regardless of stand age). At the landscape scale, the loss of the suppression mortality component in CWD would be a minor concern because:

- the variation in stand density within post-treatment units would include some areas of higher stem density (especially in Riparian Reserves close to streams) where suppression mortality would still occur at a similar rate;
- current stand development processes would not be altered within adjacent stands that were dropped or deferred from harvest, and;
- landscape patterns of CWD density are known to be patchy (Mellen-McLean et al. 2009, and Rose et al. 2001) and RMP guidelines are expected to reflect treatment area averages, and are not expected to be attained on every acre (RMP p. 21);
- design features related to CWD augmentation would provide approximately 2 trees per acre as snags or down logs (of average stand diameter) across all units, and would allow for subsequent CWD creation in Riparian Reserves (within 5 years) where deficits persist), and;
- mid-seral forest stands on private lands in the watershed are currently abundant and many of these stands do not get thinned before final harvest.

Additionally, about 34 percent (250 acres) of the proposed thinning units fall within Riparian Reserve land-use allocation where CWD augmentation could occur following post-harvest monitoring (expected within 5 years post-harvest). If needed, creation of CWD would target those stands found to have deficient level of snags and down logs, and that have shown minimal recruitment from windthrow.

### Special Status and Special Attention Species

#### *Northern Spotted Owl*

No suitable habitat for northern spotted owls would be affected by the proposed action. All of the planned harvest units are expected to maintain sufficient canopy cover (greater than 40 percent) such that they would retain their current function as dispersal habitat within this project area. Four of the proposed harvest units fall within the home range of the two spotted owl sites (Table 3–8).

**Table 3-8.** Proposed harvest units that fall within home range of northern spotted owl sites

| Spotted Owl Site and ID Number | Proposed Harvest Unit | | Dispersal Habitat in Proposed Harvest Units that fall within Home Range [1] | | |
|---|---|---|---|---|---|
| | Unit | Acres | Outer Perimeter (0.5-1.5 mi.) | Core Area (<0.5mi) | Nest Patch (<300m) |
| Greasy Creek (0002) | 7-1 | 42 | 39 | 3 | 0 |
| | 7-2 | 79 | 79 | 0 | 0 |
| | 7-3 | 35 | 35 | 0 | 0 |
| | **Total** | **156** | **153** | **3** | **0** |
| Crooked Corner (0561) | 7-1 | 42 | 42 | 0 | 0 |
| | 7-2 | 79 | 79 | 0 | 0 |
| | 19-1 | 39 | 34 | 0 | 0 |
| | **Total** | **160** | **155** | **0** | **0** |

[1] The portions of treatment unit acres that fall inside each non-overlapping zone within an owl site home range (1.5 miles radius circle) are shown – no acres are double-counted.

The amount of dispersal habitat affected by proposed thinning harvest represents less than 4 percent of the total home range area of each owl site, and except for 3 acres of Unit 7-1, the affected units are outside of the core area for each site. Because the Greasy Creek owl site appears to be vacant, and no northern spotted owls have been detected within or adjacent (<0.25 miles) to proposed units on recent surveys, the proposed action is not likely to adversely affect northern spotted owls. A summary of effects to northern spotted owls are provided in Table 3–9.

**Table 3-9.** Effects of proposed action on federally listed wildlife species and their critical habitat

| Affected Component | Determination [1] | Notes |
|---|---|---|
| **Northern Spotted Owl** | | |
| Noise Disturbance | No Effect | Two adjacent owl sites are located beyond 0.25 miles noise disturbance threshold. Current survey efforts have not detected northern spotted owls in or adjacent to the proposed units. |
| Habitat Modification | NLAA | A negligible amount of dispersal habitat (<4%) affected by thinning at the outer edge of each home range and thinned units would retain dispersal function. Landscape conditions of dispersal habitat remain high on both federal and non-federal lands. No suitable habitat would be altered, and there is no known use of proposed units. |
| Critical Habitat | No Effect | There is no designated Critical Habitat on BLM lands in this project area. |
| **Marbled Murrelet** | | |
| Noise Disturbance | No Effect | No occupied murrelets sites within 4 miles of proposed units. Abundant surveys (209) within 3 miles of proposed units found no murrelet detections in past 25 years. |
| Habitat Modification | No Effect | No suitable nesting structure would be affected by this action. |
| Critical Habitat | No Effect | There is no designated Critical Habitat on BLM lands in this project area. |

[1] Endangered Species Act consultation requires the following affect determinations: LAA= Likely to adversely affect; NLAA= not likely to adversely affect; and No Effect.

### *Marbled Murrelet*

There is no suitable marbled murrelet habitat affected by the proposed action. There are no known occupied murrelet sites within 4 miles of the project area, and no murrelets have been detected on the abundant surveys within 3 miles of the planned harvest units in the past 25 years. Therefore this action would have no negative effects on marbled murrelets as outlined in Table 3–9.

### *Red Tree Vole*

The proposed harvest units are within mid-seral forest stands that lack older forest characteristics which could support persistent populations of red tree voles (Huff et al. 2012). A small portion (17 Acres, see EA Map 4) of three units in Section 19 was found to have active red tree vole nests, and has been reserved as a Habitat Area to avoid negative effects to an occupied vole site in accordance with management direction (USDA-FS and USDI-BLM 2000). About 1,000 feet

of a motorcycle trail runs along the north end of the reserved patch and the main road bisects this patch. Because adjacent forest patches are younger in age (see EA Appendix D-4) and voles are present on either side of the road in the reserved patch, it appears that the road has not curtailed vole persistence in the smaller portion of the patch. Further, the motorcycle trails which have a very narrow footprint and receive only seasonal use are expected to have a negligible impact on the functional value of habitat for voles in this patch.

Red tree voles may be present at low densities in other proposed units, especially if there are patches of older forest in close proximity. If any active vole nests become established within the proposed units, then the planned thinning harvest would likely displace these voles and degrade habitat quality in the short-term (less than 30 years) by removing adjoining trees crowns that provide cover and connectivity, which could increase vulnerability to predation (USDI-FWS 2011c, Wilson and Forsman 2013). But expected ingrowth of canopy cover and development of deeper live crowns with epicormic branching following thinning, would likely create suitable habitat conditions in the long-term (greater than 30 years).

**Photo (right).** Large tree within the 17 acre Habitat Area removed from harvest units.

The proposed action is not likely to contribute to the need to list this species under the ESA, because:

- All of the proposed harvest units are mid-seral habitat (less than 80 years old) that are currently unlikely to support persistent vole populations;
- A occupied patch of 17 acres would be reserved from harvest and managed for red tree vole conservation (USDA-FS and USDI-BLM 2000);
- Recent monitoring within this watershed has shown that red tree voles appear to persist in all small patch reserves that have been surveyed (GeoBOB, BLM internal data);
- Red tree vole populations in this watershed appear to be abundant and widely distributed (Forsman et al. 2004, USDI-FWS 2011c, GeoBOB dataset);
- The recent status review for this species (USDI-FWS 2011c) concluded that existing regulatory mechanisms on Federal land are adequate to provide for the conservation of the North Oregon Coast DPS of the red tree vole.

**Birds of Conservation Concern**

In the central Oregon Coast Range the majority of birds complete their breeding cycle within the April 15 to July 15 time period, while some birds (eagles, owls, hawks, woodpeckers) begin breeding as early as February or March and others (flycatchers, finches) may not finish breeding until August (Marshall et al. 2003). Due to the ubiquitous nature of breeding birds within their suitable habitat, it is reasonable to expect that soil disturbance (affecting ground-nesting birds) and vegetation manipulation may have a direct negative impact on bird nesting success if it occurs during the breeding season. Felling and yarding trees during the breeding season in proposed harvest units would likely destroy some nests and disrupt normal breeding behavior of any BCC species that nest or forage in these units.

The proposed action would result in habitat conditions which would be unfavorable to some bird species, while the thinned forest stands would be favorable habitats to other species (Hagar and Friesen 2009). At the scale of the analysis area, this proposed action is expected to have no discernable negative effects on populations of BCC species because all of the proposed thinning units would retain forest canopy cover (greater than 40 percent), canopy cover reduction would largely recover within 30 years, and these mid-seral conifer stands that are targeted for treatment are currently an abundant age-class on both federal and non-federal lands within this watershed.

### 3.2.3 CUMULATIVE EFFECTS

Private lands within these watersheds appear to be managed on short harvest rotations (estimated to be 40 to 50 year rotations), whereby about 20 to 25 percent of the current area of mid-seral forests are expected to be harvested over the next decade. This private harvest will likely be balanced by the in-growth of a similar percentage of early-seral forest stands that are transitioning to mid-seral forest conditions over the next decade.

In addition to the proposed action, BLM has previously thinned (since 1995) approximately 983 acres within this watershed (Table 3–10). BLM has no thinning harvest planned in this watershed in the foreseeable future (next five years).

The previously completed and currently proposed harvest actions affected about 63 percent of the available mid-seral forests on BLM-administered lands within this watershed. While this cumulative modification represents well over half of the existing mid-seral forest stands on BLM-administered lands, these thinning harvests do not result in a loss of forest function or connectivity across the watershed. This level of habitat modification would not contribute to the need to list any wildlife species of concern, because mid-seral forest structure is still abundant and is not a limiting factor for any wildlife species of concern. Therefore the proposed action would have no appreciable cumulative negative effects on wildlife species and their habitat.

**Table 3-10.** Summary of proposed, past, and foreseeable harvest acreage on BLM lands

| Baseline Data and BLM Harvest Action Time Periods | Marys River Watershed |
|---|---|
| **Baseline Data** | |
| Amount of Mid Seral Forest Stands on BLM | 2,703 |
| Total BLM-administered lands in Watershed | 6,621 |
| Total Forested Watershed Area [1] | 138,810 |
| **Proposed Action** | |
| Commercial and Density Management Thinning | 730 |
| Variable Retention/Regeneration Harvest | 0 |
| **Past Actions on BLM [2]** | |
| Commercial and Density Management Thinning | 983 |
| Variable Retention/Regeneration Harvest | 248 |
| **Foreseeable Future Actions on BLM [3]** | |
| Commercial and Density Management Thinning | 0 |
| Variable Retention/Regeneration Harvest | 100 |

[1] Watershed area includes upland forests and excludes agricultural and residential areas.
[2] Past Actions occurring on BLM-administered lands in this Analysis Area since 1995 (beginning of Northwest Forest Plan implementation), to include all thinning and regeneration harvest actions.
[3] Foreseeable future actions on BLM-administered lands for the next five years (current planning horizon).

Within the northern Oregon Coast Range, the condition of dispersal habitat for northern spotted owls is a matter of elevated concern (Courtney et al. 2004, USDI-FWS 2007, USDI-FWS 2011a). The proposed action (occurring entirely outside of critical habitat), would not appreciably contribute to the cumulative loss of dispersal habitat available for northern spotted owls in this watershed. There would be no cumulative effects to marbled murrelet since no suitable nesting structure would affected, and there would be no cumulative effects to red tree voles since existing vole sites have been protected and no older forest habitats (which best support population persistence) would be affected.

## 3.3 FISHERIES AND AQUATIC HABITAT

The following issues will be addressed in the environmental effects section below:

*How would the proposed action impact Endangered Species Act, Bureau Special Status, including Survey and Manage, wildlife, fish, botanical and fungal species and their habitat?*

*What effect would the proposed actions have on resident and anadromous fish and aquatic habitat?*

### 3.3.1 AFFECTED ENVIRONMENT

Beaver Creek sub-watershed (HUC12), encompassing the Starr Creek, Duffy Creek, Upper Beaver, and Middle Beaver drainages (HUC14), is the major stream system for the tributaries draining to the east from the project area. Greasy Creek sub-watershed (HUC12), encompassing the Upper Greasy HUC14 drainage, is the major stream system for tributaries draining to the northeast portion of the project area. Chinook salmon, coho salmon, steelhead, cutthroat trout, speckled dace, pacific lamprey, and sculpin are known or suspected to occur within the analysis area. The Marys River is thought to be inhabited by 21 native fish species and 13 introduced fish species (Ecosystems NW 1999). Most of these native and introduced species prefer low gradient habitat occupying habitat in the lower reaches of Marys River (ODFW 1992) and generally would not occur in the project area streams. Distribution for salmon and steelhead of the Marys River are described on StreamNet (2009).

Coastal cutthroat trout (*Oncorhynchus clarki*) have been documented to occur throughout the Marys River Watershed (BLM 1997). Fish presence assessments were conducted for stream reaches adjacent to project units. Cutthroat trout were documented in the treatment area occupying habitat for many of the unnamed tributaries draining the treatment units. Limiting stream flows and increasing slopes are the most common limits on distribution in proximity to these sale areas. Resident fish are present in association with the Botkin Road and Beaver Creek haul routes.

**Rare, Threatened, and Endangered Species**

The Upper Willamette River (UWR) Steelhead Evolutionarily Significant Unit (ESU) is listed as threatened under the ESA (64 FR 14517 – 14528). Marys River was not included in National Marine Fisheries Service (NMFS) Critical Habitat designation of ESA listed Upper Willamette River (UWR) Winter Steelhead (70 FR 52848 – 52849). This exclusion is based on previous findings that historical steelhead distribution did not extend beyond Calapooia River (64 FR 14521). StreamNet (2009) distribution data indicates steelhead may occur more than 0.5 mile downstream from the project area and under one paved stream crossing. Based on surveys in 2010, juvenile steelhead were located seven miles downstream of the paved portion of Botkin Road (MRWC 2010). These juveniles were not believed to be born of progeny of Greasy Creek, or its tributaries, based on utilization surveys between 2006 and 2010.

The UWR Spring Chinook salmon ESU are listed as threatened under the ESA (64 FR 14308-14328). The upper limit of UWR Chinook salmon in Middle Beaver Creek is over 2.2 miles from the project area.

Pacific lamprey is identified as a sensitive species under the BLM Manual 6840 (IM-OR-2015-028). Greasy Creek and Beaver Creek would likely be utilized by Pacific lamprey for spawning and rearing, and would be similar in distribution to Chinook and coho salmon distribution. Generally, Pacific lamprey distribution would occur downstream from the treatment areas, potentially in proximity to lower potions of Botkin Road and Beaver Creek Road.

Protection of EFH as described by the Magnuson/Stevens Fisheries Conservation and Management Act and consultation with NOAA NMFS is required for projects which may adversely affect EFH of Chinook and Coho Salmon. Chinook salmon habitat is at least 2.2 miles downstream from the project area (StreamNet 2009). Coho salmon habitat occurs at least 70 feet from one unit and over 260 feet from all other units. Only one paved crossing occurs over EFH, no unpaved crossings occur in the project area.

### 3.3.2 ENVIRONMENTAL EFFECTS

No effects are anticipated to UWR Spring Chinook salmon and UWR winter steelhead, in either Beaver Creek or Greasy Creek drainages, due to the distance to occupied habitat. Project effects to these species shall not be assessed further.

Approximately 1,950 feet of road renovation is proposed in the Upper Alsea River fifth-field watershed within the Upper Crooked Creek Drainage as part of the proposed action. No road construction would occur within the Riparian Reserves. With no connectivity to stream channels, no impacts to fish and aquatic habitat would occur in this watershed, and additional discussion on fish resources is not warranted.

Other native species (sculpins, lamprey, and crayfish) may be present concurrent with resident trout in the affected drainages. Analysis of potential effects to native cutthroats was assumed to be sufficient to address impacts to these other species.

## Alternative 1 – No Action

***Flow, Sediment, Large Woody Debris (LWD), and Temperature Effects*** – In general, impacts to aquatic habitat would be unlikely with the implementation of the No Action alternative. Current forest stand conditions would be maintained. Expected benefits of thinning riparian stands, accelerating the growth rates of retained trees, subsequently increasing the average diameters of trees available for future LWD recruitment, would not be realized.

Generally, based on distance to fish habitat, any localized effects resulting from unmanaged roadways in the project area would be unlikely to affect fish. The existing road network would remain unchanged, with no new road construction or road decommissioning. Sporadic road maintenance would occur and may remove trees that fall across the road. As a result, a very small fraction of these trees could be lost to the stream network. The amount of wood lost would be extremely small, no more than eight feet of stream channel may be affected. Based on the dispersed nature of wood loss and the very small number of trees that may be affected, no measurable effects to fish habitat would be anticipated.

Private hauling on unpaved routes where connected ditch line flow occurs would continue to deliver small pulses of sediment to streams during winter freshet events, unchecked by road treatments, primarily associated with Botkin Road and Beaver Creek Road.

## Alternative 2 – Proposed Action

Based on field surveys resident fish are known to be within one site potential tree (210 feet) of six project units (7-1, 7-2,17-3, 17-7, 21-4, and 21-5). Based on analyses of BLM GIS maps, resident fish are known or suspected to be less than a half mile from 20 of the 23 proposed treatment units.

**Flow Effects**

*Falling and Yarding* – As no discernible changes in peak and base flows within the treatment area are anticipated (Fitting 2016), no alterations to fish habitat would be anticipated.

*Road Construction and Decommissioning* – Impacts to aquatic habitat downstream would not be anticipated.

*Road Renovation* – Due to the limited amount of cross drain work anticipated, proposed renovation is highly unlikely to have any detectable impact on flows. No impacts are anticipated to fish and aquatic habitat.

*Hauling* – Hauling has no causal mechanisms to alter stream flow and would have no effects to fisheries and aquatic habitat.

*Pile Burning* **–** With incorporation of project design features, buffers and fuels, the project would not be expected to alter stream flows and would not be expected to impact fisheries or aquatic habitat.

**Sediment**

*Falling and Yarding* – As the proposed actions are not likely to measurably alter water quality characteristics at the treatment sites, they would be unlikely to alter aquatic habitat downstream from the project area.

*Road Construction and Decommissioning* – Based on location of new roads and the one road proposed for decommissioning, combined with seasonal restrictions, road construction and decommissioning are unlikely to increase sediment which may alter stream channels and fish habitat.

*Road Renovation (e.g., brushing, ditch reconstruction, rocking and grading)* – With ground-disturbing renovation work limited to the dry season (grading and ditch reconstruction), combined with distance of road renovation to fish habitat, the small increase in turbidity which may be generated by rocking, ditching, grading at stream crossing sites would be undetectable against background turbidity where fish reside; thus, impacts to fish and aquatic habitat would likely be immeasurable. Implementation of erosion control measures at the fish bearing gravel crossings would minimize sediment delivery at these sites.

*Road Renovation (roadside hardwood removal)* – Four fish bearing culverts may be affected. One of the four fish crossing sites may be replaced as part of road renovation associated with Botkin Road. For the Botkin Road culvert replacement site, sediment impact would be within the range of affects analyzed for culvert replacement. The three remaining fish bearing perennial streams proposed directional felling toward the stream may result in short-term sediment impacts immediately following tree felling. Sediment movement would be assimilated into the background within 300 to 400 feet downstream from the treatment site (Duncan et al. 1987). Fish present where tree felling occurs would be expected to avoid elevated turbidity or reduce feeding activity (Bjorn and Reiser 1991). Fish behavior would return to normal shortly following turbidity event.

*Road Renovation (Culvert Replacement)* - Four stream crossing replacements are proposed as part of road renovation work. One stream crossing replacement may be located on a fish bearing stream on Botkin Road. Implementation of effective stream flow bypass on perennial streams and installation of BMP erosion prevention devices would be expected to keep sediment and turbidity generation to a minimum. Replacement would occur during the in stream work period (Marys River: July 1–October 15) at very low stream flows. Direct impacts to fish would be limited to the one fish bearing culvert, relocating fish away from the project site. Following rewatering, fish below the culvert replacement site may be affected by elevated turbidity within 300 to 400 feet downstream of the crossing site. Fish exposed to high turbidities would be expected to avoid elevated turbidity or reduce feeding activity (Bjorn and Reiser 1991). Fish behavior would return to normal shortly following turbidity event.

Sediment and turbidity may be locally detectable immediately below the four replacement sites in the first winter freshets following replacement. Sediment movement would be expected to be assimilated into bed load within 300 to 400 feet below the crossing (Duncan et al 1987). Sediment impacts to aquatic habitat would be limited to the first 300 to 400 feet below the crossing sites. The 3 non-fish bearing culverts proposed for replacement are 334 feet, 1,746 feet, and 2,788 feet upstream from fish habitat. Based on the distance of the three culvert sites, sediment impacts are unlikely to reach fish habitat. Habitat impacts from sediment would be undetectable after the first winter subsequent to multiple winter freshet events redistributing sediment into background conditions.

*Hauling* – Hauling can increase the risk of sediment reaching stream channels and negatively impacting aquatic habitat. The majority of the sale area and most haul roads are located near the ridge tops and are graveled. Buffer distances of at least 100 feet would be expected to capture the majority of sediment generated from hauling on road surfaces before reaching fish habitat (Burroughs and King 1989, Corbett and Lynch 1985, Swift 1986, Belt et al. 1992). Based on the location of most proposed haul roads, combined with the distance from fish habitat, sediment transport would be unlikely to reach fish habitat on most haul roads (Table 3–11). Distances are estimates based on BLM 1:24,000 stream hydrography maps using ArcMap measurement tools from nearest line segment to listed fish habitat.

**Table 3-11.** Alternative 2: Proposed road renovation and haul route information

| Project Roads/ Haul Routes | Miles of Road | Road Surface | Season of Use | Number of Crossings Over | | | Crossing Distance To (feet) | | Road Within 100' of Fish (feet) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Resident Fish | P[1] | I[2] | Resident Fish | LFH | |
| 13-6-17 | 0.92 | Gravel | Year | 0 | 1 | 3 | 456 | 31,589 | |
| 13-6-17.1 | 0.59 | Gravel | Year | 0 | 0 | 4 | 356 | 33,312 | |
| 13-6-17.2 | 0.48 | Gravel | Year | 0 | 0 | 0 | 3,540[a] | 26,715 | |
| 13-6-17.3 | 0.32 | Gravel | Year | 0 | 0 | 1 | 818 | 31,639 | |
| 13-6-17R4 | 0.30 | Gravel | Year | 0 | 0 | 0 | 4,342[a] | 29,954 | |
| 13-6-18.5 | 0.63 | Gravel | Year | 0 | 0 | 0 | 439[a] | 58,165 | |
| 13-6-19 | 1.24 | Gravel | Year | 0 | 1 | 0 | 5,205 | 34,892 | |
| 13-6-19.1 | 0.05 | Gravel | Year | 0 | 0 | 0 | 6,670[a] | 38,572 | |
| 13-6-19.3 | 0.21 | Gravel | Year | 0 | 0 | 0 | 4,669[a] | 37,625 | |
| 13-6-19.4 | 0.75 | Gravel | Year | 0 | 0 | 0 | 7,745[a] | 40,701 | |
| 13-6-19.5 | 0.34 | Gravel | Year | 0 | 0 | 0 | 7,107[a] | 36,768 | |
| 13-6-19.7 | 0.37 | Gravel | Year | 0 | 0 | 0 | 6,215[a] | 39,171 | |
| 13-6-19.8 | 0.03 | Gravel | Year | 0 | 0 | 0 | 4,979[a] | 34,640 | |
| 13-6-19R1 | 0.15 | Gravel | Year | 0 | 0 | 0 | 4,656[a] | 37,612 | |
| 13-6-19R2 | 0.14 | Gravel | Year | 0 | 0 | 0 | 2,290[a] | 42,007 | |
| 13-6-20 | 1.60 | Gravel | Year | 3 | 0 | 2 | 0 | 24,840 | 1,016 |
| 13-6-20P13 | 0.05 | Gravel | Year | 0 | 0 | 0 | 1,526[a] | 21,141 | |
| 13-6-21 | 3.75 | Gravel | Year | 0 | 4 | 2 | 0 | 22,435 | 243 |
| 13-6-21.1 | 0.40 | Gravel | Year | 2 | 0 | 0 | 0 | 25,033 | 635 |
| 13-6-21.2 | 0.24 | Gravel | Year | 0 | 1 | 0 | 442 | 25,135 | |
| 13-6-21.3 | 0.47 | Gravel | Year | 0 | 2 | 0 | 115 | 26,073 | |
| 13-6-21.8 | 0.16 | Gravel | Year | 0 | 0 | 0 | 393[a] | 23,652 | |
| 13-6- | 1.51 | Gravel | Year | 3 | 0 | 3 | 0 | 11,690 | 993 |
| 13-6-6[8] | 0.67 | Paved | Year | 3 | 0 | 0 | 0 | 45,368 | 1,775 |
| 13-6-6 | 2.12 | Gravel | Year | 1 | 0 | 2 | 0 | 48,812 | 210 |
| 13-6-7 | 0.47 | Gravel | Year | 0 | 0 | 0 | 1,560[a] | 43,111 | |
| 13-6-7.3 | 0.16 | Gravel | Year | 0 | 0 | 0 | 1,209[a] | 55,470 | |
| 13-6-7.6 | 0.18 | Gravel | Year | 0 | 0 | 0 | 119[a] | 55,356 | |
| 13-6-7R3 | 0.16 | Gravel | Year | 0 | 0 | 0 | 278[a] | 56,758 | |
| 13-7-13.7 | 1.25 | Gravel | Year | 0 | 0 | 0 | 1,065[a] | 41,827 | |
| 13-7-15 | 0.31 | Gravel | Year | 0 | 2 | 1 | 800 | 35,744 | |
| 13-7-24.5 | 0.03 | Gravel | Year | 0 | 0 | 0 | 2,922[a] | 43,128 | |

[1] P – Perennial stream
[2] I – Intermittent stream

Potential impacts to fish and aquatic habitat would be limited to minor short-term, site-specific effects to short reaches of fish habitat downstream of the fish bearing culvert crossings on Beaver Creek Road (13-6-21), the 13-6-20 Road, and the 13-6-21.1 Road due to sediment generated from year round hauling. Sediment movement would be expected to be assimilated into bed load within 300 to 400 feet below the crossing (Duncan et al. 1987). Sediment impacts to aquatic habitat would be limited to the first 300 to 400 feet below the crossing sites. Resident fish may experience short-term direct negative effects as a result of proposed wet season hauling due to localized increase in turbidity in the stream channel. Generally fish would be expected to move away from high turbidity to areas of low turbidity or reducing activity during periods of

elevated turbidity (Bjorn and Reiser 1991). Application of sediment control PDFs (e.g., silt fences, hay bales) and cessation of haul during heavy rainfall would minimize the magnitude of sediment reaching streams. The duration of sediment reaching stream would be short-term, occurring during the wet season freshets, during and immediately following hauling activities.

The lower two-thirds mile of Botkin Road (13-6-6) is paved. Crossing over paved surfaces are not anticipated to generate sediment and no effects to fish and aquatic habitat would occur. There is one unpaved crossing over fish habitat on Botkin Road. The ditches draining the site become dispersed more than 50 feet from drain feature associated with the road surface. The vegetated buffer widths ranging from 40 to100 feet are sufficient to prevent sediment from reaching streams (Burroughs and King 1989, Corbett and Lynch 1985, Swift 1986, Sweeney and Newbold 2014). The existing 50 foot buffers at the site would be expected to capture sediment prior to reaching stream channels and impacts to fish habitat would not be anticipated.

*Pile Burning* – The proposed design feature requiring 100 feet between streams and any piles combined with stream protection zones associated with the project, a minimum of 50 feet, would be expected to provide sufficient distance of undisturbed soils and vegetation to capture any surface erosion from pile burning treatments.

**Temperature**

*Falling and Yarding* – Site level project designs for treatment units included a standard design feature stream protection zone of at least 50 feet. Protection of stream shade is the critical component in protecting stream temperature regimes (Beschta et al. 1989, Belt et al. 1992, Moore et al 2005). According to the stream shading sufficiency analysis done for the proposed treatment units, the proposed stream protection zones of 50–75 feet was sufficient to protect critical shade in the primary shade zone, based on topography and average tree height (Fitting 2016). The proposed vegetation treatment in the secondary shade zone (approximately one tree height from the stream) would not result in canopy reduction of more than 50 percent. Stream shading would be maintained and no change to water temperature from the activities proposed in this project would be anticipated (Fitting 2016). Based on the shade sufficiency analysis, the hydrology report water quality analysis, and the project design features the proposed actions are unlikely to impact fish habitat both at the treatment site and downstream.

*Road Construction and Decommissioning* – There are no stream channels in proximity to the new road construction. The minimum buffer distance of 210 feet or more between the new roads and streams would protect the stream channels from any increase in solar radiation. Thus, new road construction would not have any effect on stream temperatures at the site and no impacts aquatic habitat or fish downstream.

The road proposed for decommissioning is on the north side of the stream and located at least 150 feet from the stream. No changes in solar exposure would be anticipated. Therefore, no changes in stream temperature would occur.

*Road Renovation (grading, ditch cleaning, rocking, brushing, road side hardwood removal, culvert replacement)* – Grading, ditch cleaning and rocking have no causal mechanisms to alter stream shade or stream temperatures. Clearing of brush and small alders over perennial stream crossings may alter solar exposure which in turn could affect stream temperature. The

small openings created from brushing and alder removal associated with the perennial stream crossings would affect very short reach reaches of stream, no more than 20 feet of stream on up to 21 perennial streams. Based on the small area in openings associated with the proposed roadside tree removal no detectable increases in stream temperature would be anticipated (Fitting 2016) and impact to fish and aquatic habitat would be unlikely.

*Hauling* – Hauling has no causal mechanisms to alter stream temperatures and would have no effects on fisheries or aquatic habitat.

*Pile Burning* – With incorporation of PDFs, buffers and fuels, the project would not be expected to alter stream temperatures and would not be expected to impact fisheries or aquatic habitat.

**Large Woody Debris**

*Falling and Yarding* – Loss of CWD and LWD due to harvest can alter the stability and quality of aquatic habitat (Chamberlin et al. 1991, Beechie et al. 2000). The thinning treatments incorporate stream protection zones that leave a portion of the stand nearest the stream edge untreated, minimum of 50 feet and increases up to 75 feet based on increasing tree height and hill slope gradient. This stream protection zone includes stream channels: fish bearing, non-fish bearing, perennial, and intermittent channels with evidence of scour/deposition and a defined channel. Existing snags within the stand would be retained to the extent practical; safety concerns may result in felling of some snags. The proposed treatment would avoid areas of instability, to the extent identifiable, thus leaving land movement recruitment zone untreated.

To minimize potential impacts to wood recruitment at the site scale, the stream protection zone leaves a majority of the recruitment zone unaffected in the short-term and utilizes thinning prescriptions that leave large diameter trees that are more likely to provide functional value in the long-term. Wood recruitment studies conducted in the Pacific Northwest in stands less than 80 years of age, or of mixed species, have shown 50 percent of wood was recruited within 14 feet of the stream edge, the majority (70 percent) of woody debris recruitment occurs within 23 to 36 feet of the stream edge, and approximately 90 percent of wood recruited to the stream occurs within 45 to 65 feet of the stream (McDade et al 1990; Van Sickle and Gregory 1990, Meleason et al 2002). Units with a 70 foot stream protection zone would have no detectable short-term impacts to wood recruitment patterns. Therefore, the proposed actions within 70 foot buffers would not be highly unlikely to result in short-term effects to aquatic habitat at the site or downstream.

The 50 foot stream protection zones are proposed on three units (17-5, 17-6, and 21-5). The proposed minimum stream protection zone widths of 50 feet accounts for at least 77 percent of the 90 percent woody debris recruitment zone (McDade et al 1990; Van Sickle and Gregory 1990, Meleason et al 2002). The minimum stream protection zone width of 55 feet is applied to one unit (7-3) accounting for at least 85 percent of the 90 percent potential recruitment zone. Based on GIS ArcMap buffer analysis, the project units would treat approximately 2.8 acres within the 50 to 65 foot band where a small fraction of the short-term wood recruitment may occur. Treatments in the impacted units (17-5, 17-6, 21-5, and 7-3) would leave approximately 35 percent of the trees per acre (Wessell 2016). Based on wood recruitment studies these trees are located in zones where less than 30 percent of the wood recruitment would occur that may

reach the stream. The locations of potential wood recruitment area impacted would be spread over nearly 8,000 feet of steam length, leaving approximately 5.4 miles of streams adjacent project units unaffected in the short term. The surrounding riparian areas would be expected to continue to provide wood to the stream. With retention of stream protection zones, the green tree retention level, and the dispersed nature of the impact area, short-term impacts to wood recruitment patterns and rates would be extremely minor as a result of the proposed action and impacts to fish and aquatic habitat at the project sites and downstream would be immeasurable.

Proposed thinning in the riparian treatment areas is anticipated to increase the average growth of the remaining trees over 30 years compared to not treating the stands (Wessell 2016). As the stand matures over time, between 80 and 200 years of age, the predicted source distance wood recruitment zone would be expected to increases to 85 feet, which incorporates 90 percent of the cumulative input (Meleason 2002; McDade 1990). Based on this expansion of potential recruitment area as the stand matures, the strip of timber outside the stream protection zone would be expected to benefit from treatment over the next several decades. Treatment would be expected to improve wood recruitment characteristics of individual trees such as:

- increased survival of the total number of live limbs on the bole which would increase total CWD pieces and per tree volume that could be recruited to the stream,
- larger diameter branches on the bole that could function as future coarse debris,
- larger diameter tree boles overall, and
- potentially greater tree height.

A potential impact of thinning may occur as the stand matures into the 80-200 years recruitment widths by proposed tree removal. Treatment may alter stand density on between 23.7 to 50.5 acres within the long term 80-200 year recruitment zone, based on the 85 to 105 feet widths. The long term impact on wood recruitment would be minimized by multiple project design features. First, the prescription retains approximately 35 percent of the stand post treatment using a thin from below objective (Wessell 2016). Second, only a small portion of the Riparian Reserves adjacent to stand units is proposed for treatment from within the long term wood debris recruitment zone (9.5 to 20 percent, based on 250 acres within the Riparian Reserves), removing only limited number of trees that may reach the stream, and is spread over 7 miles of stream. Finally, long-term stand growth, including treatment growth response and understory reproduction (Tappeiner et al. 1997; Bailey and Tappeiner 1998), would be expected to offset potential woody debris lost as a result of thinning. Based on the prescription retention level, natural regeneration, the small portion of the riparian's impacted spread over a large area, and the small number of individual trees lost to potential recruitment spread over substantial time frames (120 years), the long term negative impact of thinning reducing potential LWD is unlikely to have detectable impacts on stream function and fish habitat.

As a result of the increase in the size of trees in treated riparian areas, combined with greater heterogeneity of the stand characteristics, there would be an expected benefit in LWD recruitment to the stream channel. In the long-term upslope RR stands enhanced by accelerated growth rates, natural regeneration, combined with untreated stream protection zone stands would be expected to result in recruitment of wood across a larger range of sizes (boles and branches). Thus treatment would potentially improve the quality/complexity of aquatic habitat adjacent to the treatment areas in the future.

*Road Construction and Decommissioning*– Proposed road construction would not occur within a site potential of stream channels and would not be anticipated to impact LWD recruitment at the site scale. Based on the distance of proposed decommissioning from the stream, more than 150 feet, short-term or long-term impacts to wood recruitment and fish habitat would be highly unlikely

*Road Renovation (e.g., brushing, ditch reconstruction, rocking and grading, and culvert replacement)* –No wood removal would occur that meets large wood debris criteria (24 inch DBH by 50 feet long). Any larger material removed from culvert fill slopes would be replaced in the stream channel below the crossing. Based on the very small magnitude of wood recruitment impacted at the site level, and the affected stream channels being small with limited capacity to transport large wood, the magnitude of impacts to fish and aquatic habitat would be immeasurable.

*Road Renovation (roadside hardwood removal)* - Hardwoods, primarily alder, leaning toward and overhanging the roadway may be felled within 50–75 feet from approximately 21 streams in the project area. The majority of crossing sites are upstream of fish bearing streams. Based on fish distribution data, only six stream crossings may be treated in proximity to fish habitat. Proposed directional falling trees toward the stream would result in a short term wood recruitment increase to nearby streams, benefitting overhead cover and pool quality of aquatic habitat.

The long term impacts of road side hardwood removal at the six fish bearing crossings would likely be the loss of one or two small alder trees at the site of treatment. It would be anticipated that most trees would fall on the road prism in absence of the proposed treatment. Road maintenance generally would remove any trees boles that fall across the road and these trees would be lost to the stream network. That tree loss has a small potential to alter overhead cover and pool quality at the site. Hardwood regeneration would occur in the treated areas off-setting the loss of removed hardwood over the long term. Based on the very small magnitude of wood recruitment impacted at the site, and the affected stream channels being small with limited capacity to transport large wood, the magnitude of impacts to fish and aquatic habitat would be immeasurable.

*Hauling* – Hauling has no causal mechanisms to alter LWD and would have no effects on fisheries or aquatic habitat.

*Pile Burning* – With incorporation of project design features, the project would not alter LWD recruitment and no impact fisheries or aquatic habitat would occur.

### 3.3.3 Cumulative Effects

Based on the fisheries analysis, hauling was predicted to have short-term site level effects; sediment delivery to several stream channel crossings may occur during the wet season. Culvert replacement and roadside hardwood removal may also have short term site level effects during implementation. Over the long-term wood recruitment may be impacted by proposed falling as stand reach heights potentially capable of reaching stream channel. All other project activities were determined to have no more than immeasurable or highly unlikely effects on sediment

delivery, LWD recruitment, stream temperature, and stream flows and thus would not contribute towards cumulative effects.

**Sediment and Turbidity**

Other road work activities may occur in the affected drainages related to private timber management. In addition, the BLM Rickard Creek timber sale is currently in progress; hauling on the sale is anticipated to be completed in 2016 and final road maintenance would occur in the summer of 2016 or 2017. Hauling and road work on Rickard Creek timber sale is anticipated to be completed prior to the initiation of hauling and road work on the Dunk Tank timber sales. There are no other known proposals to implement road work currently, or in the near future, with the BLM proposed action in the Riparian Reserves of the Marys River Watershed. Hauling from private timber sales is highly likely during implementation of the proposed action.

Oregon Department of Environmental Quality regulates sediment delivery to stream channels for all forest related activities. ODEQ mandates no more than a 10 percent increase in turbidity below a source area (OAR 340-041-0036). The proposed action would not generate sediment beyond this standard. Project design features incorporated into the timber sale would require cessation of hauling where the road surface is deeply rutted or covered by a layer of mud and where runoff is causing a visible increase in turbidity to adjacent streams. All other private and public activities, except those permitted or exempted, in both watersheds would comply with the 10 percent regulation. Impacts of other hauling activities, from both the private and public forests, may contribute to cumulative impacts to fish habitat at the fifth-field scale.

**Large Woody Debris**

Other forest treatment activities may occur in the affected drainages related to private timber management. Harvest within 210 feet of streams from private timber sales is highly likely during implementation of the proposed action. The BLM is nearing the completion of the Rickard Creek timber sale (regeneration harvest) in the Upper Reese Creek drainage which included thinning a small portion of the Riparian Reserve. The Rainbow Ridge timber sale, a variable retention harvest, is partially located in Rambo Creek drainage of the Marys River Watershed. No Riparian Reserves treatments are proposed in the Marys River Watershed portion of the sale.

Approximately 11 percent of the land base within the Marys River Watershed is administered by the BLM. The U. S. Forest Service also manages approximately 9,000 acres in the watershed near Marys Peak. The trend in LWD recruitment on federal lands is increasing as the stands mature within the Northwest Forest Plan designated Riparian Reserves (Reeves et al. 2006). Analysis conducted under the FEIS Revision of the Resource Management Plans of Western Oregon indicated trends of LWD recruitment on all Western Oregon and Washington BLM administered Riparian Management Areas. Overall, LWD recruitment was considered likely to continue to improve over the next 100 years (BLM 2008). An assessment of Oregon Forest Practices indicated on non-federally administered forest lands roughly 94 percent of the riparian network would be considered inadequately stocked for future recruitment of LWD (IMST 1999). However, based on the various policies currently being applied to coastal Oregon forest lands, the amount of riparian area with large and very large conifer trees, which would contribute towards large wood recruitment, is projected to increase substantially (Spies et al. 2007).

# 3.4 HYDROLOGY

The following issues will be addressed in the environmental effects section below:

*What effects would timber harvest activities have on water resources and soil productivity?*

*How would the proposed action of harvesting and yarding timber effect erosion and sediment delivery to streams and soil productivity?*

## 3.4.1 AFFECTED ENVIRONMENT

**Water Quantity**

The project area receives approximately 75–80 inches of rain annually and has a mean 2-year precipitation event of 3.0–3.5 inches in a 24-hour period (NOAA Precipitation-Frequency Atlas for Oregon). Most runoff is associated with winter storm events that result from low pressure fronts moving inland from the southwest off the Pacific Ocean. Peak stream flow events are concentrated in the months of November through March when Pacific storm fronts are strongest. As a result of little or no snow pack accumulation and infrequent rainfall, stream flow in the summer is typically a fraction of winter levels and many headwater channels retreat to subsurface flow. At a distance of over 30 miles from the ocean, and east of the Coast Range, fog and fog drip are not major contributors to watershed hydrology in the project area.

Elevation in the project area watersheds ranges from approximately 300–3,000 feet and the majority of project activities are located below the 2000 foot elevation which is considered the transient snow zone in the Oregon Coast Range (USDI 1995). Approximately 39 acres in Unit 19-1 are between 2,200 and 2,500 feet elevation, which is considered within the transient rain on snow zone; however, there are no stream channels located in this unit. The area is not vulnerable to extreme storm events that may lead to large flood events (USDI 1997).

Using data from the 2008 WOPR analysis, the predicted amount of “open acres” (lands with less than 30 percent crown cover) in each watershed for 2016 was 6.5 percent in the Greasy Creek watershed and 19.3 percent in the Beaver Creek watershed. The 2008 WOPR rain peak flow results included non-forest acres in the analysis; including the non-forest acres will underestimate hydrologic recovery in watersheds with other land use components (such as agriculture and urban areas). The analysis determined that both watersheds were at a low risk for peak flow increases due to the existing level of harvest in the rain-dominated watersheds. Grant et al. (2008) developed a process to help determine potential effects to peak flows from forest practices. This process differs between rain-dominated and transient snow zone dominated watersheds. Both of the watersheds in this analysis are rain-dominated. Using the envelope curve for rain dominated watersheds, it was determined that if the change in peak flow was less than 10 percent it would be undetectable due to natural variability. The analysis determined that a rain-dominated watershed needed to have over 45 percent of its land base in an “open” condition to result in a peak flow increase above the detection limit of 10 percent.

The Salem District BLM developed a GIS script using LiDAR vegetation information from 2009-2013. In the Marys Peak Field Office, vegetative recovery of hydrological process

(interception and evapotranspiration) is assumed to be achieved when vegetation reaches a height of about 15 feet (personal observation of Douglas-fir plantations) and vegetative canopy openings are less that one acre in size. When plantations reach a height of 15 feet, tree canopies begin to overlap and interlock, returning intercepting and evapotranspiration levels to pre-harvest rates. Studies conducted in the coast range of northern California showed stream flows conditions returned to pre-treatment conditions in approximately 10 years following clear cut harvest (Keppeler 2012). At this height, vegetation has well-developed, interlocking canopies capable of returning interception and evapotranspiration rates back to pre-harvest levels.

Using the LiDAR data and USFS photos from 2014, Greasy Creek was found to have 15 percent and Beaver Creek was found to have 45 percent its watershed in "open" conditions. The lower portion of Beaver Creek is located in the Willamette Valley floor and approximately 3,500 acres of this sixth-field watershed have been permanently converted to agriculture lands. These agriculture practices of land conversion included the removal of native vegetation, draining of wetlands, stream channelization and other modifications that have dramatically altered the hydrologic functions and stream channel morphologies in the lower watershed and does not contribute to peak flow changes in the forested portion of the watershed.

If the 3,500 acres of agriculture lands were removed from this calculation, the forested portion of Beaver Creek was found to have 28 percent of its watershed in "open" conditions. This information will be used to help predict potential changes to peak flow increases based on the proposed new road construction and landings greater than one acre in size. Skid trails were not considered created openings in this analysis due to their relatively narrow width (12 feet or less) and because the remaining canopy cover (overstory) provides for interception and evapotranspiration.

### Project Area Streams

The project area includes numerous perennial and intermittent 1$^{st}$, 2$^{nd}$, and 3$^{rd}$ order tributaries mainly draining to Beaver, Duffy, and Greasy Creeks. All three streams flow into Muddy Creek, a tributary to the Mary's River. The 1$^{st}$ and 2$^{nd}$ order streams range from steep 4-10 percent gradients with dominant channel substrates consisting of gravel and cobble to lower gradient 2-4 percent channels with dominant channel substrates consisting of sand and gravel. The steeper channels are typically narrow with moderate to steep side slopes, low width-to-depth ratios and low sinuosity. The lower gradient channels have wider channels with flatter side slopes, low width to depth ratios and moderately low sinuosity. These streams tend to have high amounts of small woody debris and moderate amounts of larger woody debris. The larger 3$^{rd}$ order streams have 2-4 percent gradients with dominant channel substrates consisting of gravel and cobbles. These channels have moderate width to depth ratios, flatter to moderately steep side slopes and low to moderately low sinuosity. These streams have moderate to high amounts of both small and large woody debris. There are several small (less than one acre) wet areas, which are surrounded by conifers and hardwoods and most often are located within existing riparian areas that are removed from proposed harvest units.

### Water Quality

Project area watersheds are listed by the Oregon Department of Environmental Quality (ODEQ) on the Clean Water Act 303(d) list (ODEQ 2012) for exceeding year around stream temperature

for fish. The table below displays the listed parameters and area of listing extent relevant to the project area.

**Table 3-12.** Project area waterbody listing

| Waterbody | 303(d) Listed parameters (2010 List) | Extent of Listing |
|---|---|---|
| Muddy Creek | Various Parameters including: Dissolved Oxygen, PH, Sediment and Temperature | Includes BLM Lands Mile 0.0 to 33.4 |

In 2006, the ODEQ completed the Willamette Basin Total Maximum Daily Load (TMDL) which was approved by the U.S. Environmental Protection Agency (EPA) in September, 2006 and placed on the 319 List of approved TMDLs. Approved actions in this basin include implementation of federal land management activities provided that BMPs and project design features are implemented to prevent exceedance of the TMDL.

**Fine Sediment and Turbidity**

During field review of stream channels in the project area, the perennial channels were observed to be mostly stable and functional with sediment supplies in the range expected for their stream type. Channel substrates were typically sand, cobbles, and gravels. Some channel reaches contained moderate to large amounts of small and large woody debris. Many channels contained sections of discontinuous flow where water either went subsurface or there was no flow observed in the channel. Average road density is 5.3 miles per square mile in the Beaver Creek watershed and 5.45 miles per square mile in the Greasy Creek watershed, which is typical for watersheds in the coast range. Assuming an average right-of-way width of 40 feet, roads in all ownerships occupy less than 5 percent of each project watershed.

The BLM identified approximately 900 feet of an existing road for decommissioning. This trail is located in units 17-5 and 17-6 in the Riparian Reserves and shows evidence of OHV use. The trail has berms that disconnect surface flow of a perennial wet area to downstream waterbodies. Additionally, it is severely compacted and restricting subsurface flow from the wet area to downstream waterbodies.

**Stream Temperature**

No stream temperature data was available for the Dunk tank timber sales; however, there are no stream segments in the project boundaries (Units) that are listed by DEQ for temperature impairment. The BLM identified stream protection zone widths recommended by the Northwest Forest Plan shade sufficiency analysis; no effect or increase in stream temperature would be expected. There are numerous intermittent and perennial streams in the project area. Perennial and intermittent channels are generally shaded by alder, conifer, ferns, and brush. Stream shading varies between dense canopy cover by conifers to a mix of deciduous and conifer canopy at flatter reaches. Streams in the project area are classified by the watershed analysis as having a “low” risk of detrimental changes in water temperature based on stream bank vegetation shading (USDI 1998). Based on field observations and aerial photo reviews of streams in the project area, current streamside vegetation and valley topography appears adequate to shade

surface waters during summer base flow and it is likely that stream temperatures consistently meet the Oregon state standard (18 degrees Celsius) for these waters.

**Beneficial Uses**

There is one known domestic water user in the project area, located in the northwest quarter of Section 21. Additional recognized beneficial uses of the stream-flow in the project area include resident fish, anadromous fish, recreation, and esthetic value.

### 3.4.2 ENVIRONMENTAL EFFECTS

## Alternative 1 – No Action

The No Action alternative would result in a continuation of the condition and trends of water resources as described above. No reduction of forest canopy would occur; overstocked stands would continue to be suppressed. No additional disturbance to flow paths resulting from timber harvest and road work or use would occur. Road renovation, maintenance, and culvert replacement would not occur; erosion and sediment delivery from non-improved road systems would continue. Streams disturbed from past management would continue to evolve towards a stable condition.

## Alternative 2 – Proposed Action

**Water Quality**

**Vegetative Management**

***Fine sediment and Turbidity***

The construction of new roads, yarding corridors and the mechanical removal of trees are unlikely to significantly increase sedimentation into project area streams. Harvest-generated slash would be maintained in the yarding corridors to minimize the need for machines to travel on bare soil and ground-based equipment would only be allowed on slopes less than 35 percent. Ground-based skidding would occur during periods of low soil moisture with little or no rainfall, in order to minimize soil compaction and erosion.

The project is unlikely to affect stream channel stability and function as all field identified streams and wet areas would be protected with a no cut buffer ranging from 50 to 75 feet. No yarding would occur across streams. No bank stabilizing vegetation would be removed, including trees used for tailholds or that need to be felled for skyline corridors. Stream protection zones in riparian areas have high surface roughness, which can function to trap any overland flow and sediment before reaching streams (Belt et al. 1992). Ground-based skidding would occur during periods of low soil moisture with little or no rainfall, in order to minimize soil compaction and erosion. Sediment delivery to streams from timber harvest activities is unlikely to result from these activities. Tree removal is not proposed on steep, unstable slopes where the potential for mass wasting adjacent to streams is high. Therefore, increases in sediment delivery to streams due to mass wasting are unlikely to result from this action.

#### *Temperature*

For the protection of stream channels and aquatic resources, riparian buffers or no-treatment zones were applied to all stream channels and "high water table areas" (small wet areas, ponds, marshes, etc.) in the project area. These zones were determined in the field by BLM personnel following the protocol outlined in the *Northwest Forest Plan Temperature Implementation Strategies* (USDA, USDI-BLM 2005, revised 2012). Stream buffers extend from 50 to 75 feet from stream channels and to the extent of the riparian vegetation around wet areas in the thinning units would meet the widths recommended in the Northwest Forest Plan Temperature TMDL Implementation Strategy primary shade zone sufficiency analysis (USDA, USDI-BLM 2005, revised 2012). Stream protection zones would meet the widths recommended to maintain a minimum of 80 percent effective stream shade, resulting in no change to water temperature from the activities proposed in this project.

### Fuels Treatment

#### *Fine Sediment and Turbidity*

The majority of slash associated with this project in the tractor yarding areas would be left on site. Where large amounts of slash are found along roads, property boundaries and landings, it would be piled and burned. The 45 acres of pile burning proposed in this alternative could produce small areas without soil cover that are more susceptible to erosion. Burning could also produce patches of bare soil with altered properties that restrict infiltration. Burn piles would occupy very small areas surrounded by larger areas that would absorb runoff and trap any sediment that moved from the burn sites.

These burned areas would be expected to reestablish vegetation entirely within one to two growing seasons. No burning would occur within 100 feet of stream and waterbodies to protect water resources and the remaining vegetation would filter out any sediment delivered from upslope areas. Pile burning is completed at a time of the year when soil moistures are higher and the soil is likely to experience low to moderate impacts by the lower intensity heat generated from the burning. This lower heat type would minimize the damage to the shallow roots of shrubs and forbs. It is not expected that any additional erosion would occur from these burn areas and thus there should be no impact from sediment delivery or nutrient levels in stream and waterbodies.

Observations over three decades of burning piled slash (both hand and machine piles) in this portion of the Marys Peak Field Office has resulted in little to no evidence of surface erosion from pile burning. Based on this local experience, little to no increase in surface erosion would occur and no sediment delivery or nutrient loading to waterbodies is expected.

#### *Temperature*

No pile burning would occur within 100 feet of streams and waterbodies, which is outside of the stream protection zones, and would have no effect to stream shade and water temperature.

## Road Work and Hauling

### *Fine Sediment and Turbidity*

The risk of impacts to water quality due to new road construction would be limited by restricting work to periods of low rainfall and runoff. Construction would employ techniques to reduce concentration of runoff and sediment to a minimum, such as out sloping, ditch lines, and water-bars on steeper sections of road. The proposed new road construction road system is located in a stable geologic landform and there is very little risk of road related landslides. The placement of the road locations are mostly on or near ridge tops, requiring no new stream crossings, and are at least 210 feet from streams where any road generated water or sediment would have no impact on drainages in the project area. Road construction and use would result in no expected additions of sediment to stream channels in the project area.

Drainage and other improvement work on approximately 19 miles of existing roads would be completed where needed, including adding rock surfacing on project haul roads where needed. The 13-6-21 road would have a perennial stream culvert replaced to improve crossing stability. Additional stream crossing and relief culvert replacement work would occur based on the engineering road culvert inventory. Road maintenance activities (hazard tree removal, brushing, blading, and spot rocking) are unlikely to measurably impact channel morphology or water quality over the long term (beyond the renovation period). The current road conditions are in a deteriorating condition and road renovation and improvements would improve road surfacing and drainage, greatly improving water quality over existing conditions.

Hazard and hardwood tree removal would occur along haul routes for a distance up to 50 feet on both sides of the road. Hazard trees proposed for removal within the harvest units stream protection zones would be directionally felled toward the stream channel and left on site where possible. Trees felled into the stream channel may create a small amount of stream sediment disturbance and/or temporary increase in turbidity, but would quickly fade into background levels within several feet downstream of the localized disturbance.

Timber hauling would be permitted year-round on rock-surfaced roads. Timber hauling during periods when water is flowing on roads and into ditches could potential increase stream turbidity if flows from ditches were large enough to enter streams. Hauling would be restricted at any time of the year if necessary to avoid excessive increases in erosion and sedimentation. Implementing the Wet Weather Haul project design features would minimize the BLM and private log truck haul sediment delivery and in most cases actually reduce sediment delivery and turbidity below current conditions during BLM log truck hauling activities.

### *Temperature*

Road work proposed tree removal along the haul routes within the stream protection zone both inside and outside of harvest units would not have a detectable effect to stream temperature, due to the low number of trees removed. Hauling would have no effect to stream temperature in the project area.

### 3.4.3 CUMULATIVE EFFECTS

**Water Quantity**

Increases in mean annual water yield following the removal of watershed vegetation have been documented in numerous studies around the world (Bosch et al. 1982). Vegetation intercepts and evapotranspires precipitation that might otherwise reach the soil and become runoff. Thinning would maintain canopy cover well above 30 percent (2008 WOPR), so no additional created openings would be created. Approximately 39 acres in Unit 19-1 are located between 2,200 and 2,500 feet elevation, which is considered within the transient rain on snow zone; however, no stream channels are located in this unit and post-treatment canopy cover would remain at 50 percent, so interception and evapotranspiration processes would be maintained.

This analysis assumes recovery of past harvested stands when vegetation reaches a height of 15 feet, open areas are less than one acre in size, and the current level of harvest activity on private lands remains the same through the reasonably foreseeable future. When plantations reach a height of 15 feet tree canopies begin to overlap and interlock, returning intercepting and evapotranspiration levels to pre-harvest rates. Studies conducted in the coast range of northern California showed stream flows conditions returned to pre-treatment conditions in approximately 10 years following clear cut harvest (Keppeler 2012).

New road construction acres would result in less than 30 percent crown cover when completed and would be considered newly created openings. The analysis includes all forested lands including both BLM-managed lands and private ownership. Acres include all forested portions of the watersheds in Greasy and Beaver Creek but excludes the 3,500 acres of agriculture lands in the lower portion of the Beaver Creek watershed. Currently, 15.2 percent or 3,394 acres in the Greasy Creek watershed are in an open condition and 27.9 percent or 3,151 acres in an open condition in the Beaver Creek watershed (Table 3–13). New road construction would create an additional 1.7 miles of road or 8.2 acres (assuming a 40 foot wide clearing limit) in the Beaver Creek watershed. New road construction would create an additional 0.44 miles of road or 2.1 acres assuming a 40 foot wide clearing limit in the Greasy Creek watershed.

**Table 3-13.** Harvest-related peak flow predictions by sixth-field watershed

| Watershed | Size (Acres) | Existing Open (Acres) | Open Condition (%) | Proposed Construction (Acres) | Open Condition with New Road Construction (%) | Increase in Peak Flow[1] |
|---|---|---|---|---|---|---|
| Beaver Creek | 11,305 | 3,151 | 27.87 | 8.2 | 27.9 | <1 |
| Greasy Creek | 22,403 | 3,394 | 15.15 | 2.1 | 15.2 | 0 |

[1] Grant determined that levels below 10% were undetectable from natural processes.

Using the peak flow estimation method developed by Grant (2008) and adding in the proposed new road construction acres to each sixth-field watershed, the percent of the watersheds in an open condition increased slightly for each watershed. The predicted project specific increase for each watershed is listed in Table 3–13.

Based on these sideboards, it is expected that the addition of the proposed new road construction activity in each of the sixth-field watersheds would fall into the unmeasurable level for peak flow increases based on the Grant envelope curve (Grant et al. 2008).

Increases in peak flow can also occur when roads and other impermeable areas occupy more than 12 percent of a catchment scale watershed (Harr et al. 1975). Average road density is 5.45 miles per square mile in the Greasy Creek watershed and 5.3 miles per square mile in the Beaver Creek watershed. With the addition of 8,969 feet of new road in Beaver Creek, road densities would increase to 5.4 miles per square mile and the addition of 0.44 miles new road in Greasy Creek, road densities would increase to 5.46 miles per square mile. Assuming an average right-of-way width of 40 feet, roads in all ownerships occupy less than 5 percent of the analysis areas. Because the road densities are below the 12 percent level in each watershed, it is not expected that any increases in peak flow would occur when roads are constructed (Harr et al. 1975).

The cumulative water yield increases for both watersheds remain well under 10 percent which is below the detection level established by Grant. Assuming that levels of future timber harvest, road constructing and vegetative recovery on BLM-managed lands and private ownership remain at historic and present levels, both watersheds would remain well below the 45 percent opening threshold for measurable increases in peak flows.

**Vegetative Management**

**Hauling and Road Maintenance**

***Water Quality – Sediment***

Timber hauling would be permitted year-round on rock-surfaced roads. Research has shown that timber hauling during periods when water is flowing on roads and into ditches could potentially increase stream turbidity if flows from ditches were large enough to enter streams (Bilby et al. 1989, Burroughs and King 1989, Luce and Black 1999). Recent studies in western Oregon noted the occurrence of log truck traffic increased the median sediment yield by roughly three times and the primary driver for sediment yield from the road segments studied was storm runoff volume (Miller 2014). Other research concluded increases in turbidity from log truck traffic depended on storm events, size distribution of surfacing material, length of ditchline draining to channel, depth and durability of surface material and traffic levels (Dent et al. 2003, Sullivan 2003, Luce and Black 2001). In many studies, increases in turbidity and sediment yield varied widely between the different crossings and typically only a few of the stream crossings contributed the majority of sediment while others in the study area only showed minor increases. Studies cited above measured sediment and turbidity directly below the culvert outlet and did not measure the persistence of the elevated increases downstream to determine when they faded into the background levels.

To address cumulative effects of potential increases in turbidity and sediment yield from log truck traffic on the two proposed main haul routes, the BLM considered past, present, and reasonably foreseeable future timber haul, and haul route volumes from both private industry and BLM to determine the percentage increase in log truck traffic from the proposed action.

This analysis assumes that private timber haul would remain similar to levels in the recent past, and that the proposed haul would increase the percentage of log haul over the same roads. Table

3–14 depicts the number of log trucks using Beaver Creek and Botkin haul roads for private industry from 2011 until present. Numbers were calculated with the assumption that each log truck can haul 5,000 board feet. Since hauling occurs on a year-round basis, this analysis assumes that half of the log truck haul would occur during wet weather conditions and half occurs during dry weather conditions. Since the number of private industry log trucks varies from year to year, the average number of log trucks was used in the analysis. The BLM hauling activities were evenly divided for the three year duration of the project hauling activities.

**Table 3-14.** Haul activity by private industry in the project area

| **Beaver Creek Road** | | | |
|---|---|---|---|
| **Year** | **Volume (MBF)** | **Total Number of Trucks** | **Number of Trucks Wet Weather Haul** |
| 2009 | 4,329,600 | 866 | 433 |
| 2013 | 2,636,000 | 527 | 264 |
| 2014 | 2,513,000 | 503 | 252 |
| Total | 9,478,600 | 1,896 | 949 |
| Average | | | 316 |
| **Botkin Road** | | | |
| 2009 | 1,410,000 | 282 | 141 |
| 2010 | 1,817,000 | 363 | 182 |
| 2011 | 1,242,000 | 248 | 124 |
| 2013 | 834,000 | 167 | 84 |
| Total | 5,303,000 | 1,060 | 531 |
| Average | | | 133 |

Table 3–15 depicts the number of log trucks using Beaver Creek and Botkin haul roads by the BLM from 2018 until 2020 (three year contract length) for the Dunk Tank timber sales.

**Table 3-15.** Haul activity by the BLM in the project area

| **Beaver Creek Road** | | | |
|---|---|---|---|
| **Year** | **Volume (MBF)** | **Total Number of Trucks** | **Number of Trucks Wet Weather Haul** |
| 2018 | 4,430,200 | 886 | 443 |
| 2019 | 4,430,200 | 886 | 443 |
| 2020 | 4,430,200 | 886 | 443 |
| Total | 13,290,600 | 2,658 | 1,329 |
| Average | | | 443 |
| **Botkin Road** | | | |
| 2018 | 1,007,933 | 202 | 101 |
| 2019 | 1,007,933 | 202 | 101 |
| 2020 | 1,007,933 | 202 | 101 |
| Total | 3,023,800 | 606 | 303 |
| Average | | | 101 |

As the tables above indicate, the BLM would add an estimated 101 additional log trucks (76 percent increase) for a three year period on the Botkin road haul route and 443 additional log trucks (140 percent increase) for a three year period on the Beaver Creek road haul route.

This haul route analysis assumes that half the log trucks from this project would occur during wet weather conditions, however 80 percent (578 acres) of the project area is scheduled for ground-based harvest which can only occur during the drier summer months when soil moistures are low. Due to this restriction there would probably be more haul activity during the drier summer months than during wet weather conditions.

As stated above, the current road conditions are in a deteriorating condition and road renovation and improvements would improve road surfacing and drainage, greatly improving water quality over existing conditions. Additionally, implementing the Wet Weather Haul project design features (section 2.4) would minimize the BLM and private log truck haul sediment delivery and in most cases actually reduce sediment delivery and turbidity below current conditions during Dunk Tank log truck hauling activities.

Hauling would be restricted at any time of the year if necessary to avoid excessive increases in erosion and sedimentation. Based on the road locations and the project design features there are minimum expected impacts on stream sedimentation and turbidity from the project proposal.

## 3.5 SOILS

The following issues will be addressed in the environmental effects section below:

*What effects would timber harvest activities have on water resources and soil productivity?*

*How would the proposed action of harvesting and yarding timber effect erosion and sediment delivery to streams and soil productivity*

### 3.5.1 AFFECTED ENVIRONMENT

Soil properties were observed in the field and descriptions were obtained from the web-based USDA-NRCS Soil Survey (http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm).

Soils in the project area are typical of those found in the Oregon coast range. There are no TPCC for high surface erosion or mass wasting in the project area. The major management concern with the soils is their low resistance to compaction when moist or wet and their subsequent reduction in infiltration rate when compacted. The off-trail erosion hazard and soil rutting hazard ranges from slight to severe based on ground slope. The majority of the higher hazard areas are located in Unit 7-2 and Unit 21-3. The steeper slopes in the project area (greater than 35 percent) are poorly suited for ground-based equipment. The proposed new road segments are located mostly on or near ridge tops on soils and slopes that are moderately suited to road construction, which means that some maintenance would be needed to keep the roads in good shape. Proposed harvest activity is located on soils that have a moderate to high infiltration rates with moderately deep to very deep layers that impede the downward movement of water.

Slopes on most of the skyline yarding areas vary from 35 percent to 50 percent; a few included areas have slopes up to 70 percent for short distances. Slopes on the ground-based yarding areas vary from 5 to 35 percent. Less than two percent of the proposed project area is occupied by distinguishable skid trails and recreation trails. Trees and brush have grown within old skid trails, which have mostly recovered. The skid trails and old haul roads are generally less than 12 feet in width so the timber stands are fully occupied by tree canopies. The recreation trails are generally narrow, three to four feet wide and receive some maintenance by the local user groups.

The existing rocked road surfaces within the proposed project area are stable, but are in need of some maintenance work. A few sections of natural surfaced roads show signs of limited surface erosion where surface water accumulates and runs down the compacted road surface. Proposed reshaping, water bars, or other drainage work would correct these problem areas. No areas were found that had a high risk of contributing large amounts of sediment to streams through surface erosion or mass failure.

### 3.5.2 ENVIRONMENTAL EFFECTS

## Alternative 1 – No Action

This alternative would result in no change to the affected environment. Existing road densities in both watersheds are in the 5.5 miles per square mile range and have maintenance needs to reduce road surface erosion. Short-term impacts to soils would be avoided.

## Alternative 2 – Proposed Action

**Compaction, disturbance, and displacement of soil**

Following completion of harvest activities, the majority of understory vegetation and root systems would remain, along with surface soil litter and slash from harvested trees. Expected amounts of surface soil displacement, surface erosion, and dry ravel resulting from harvest operations should be minimal in the skyline yarding areas. Some additional soil displacement and compaction can be expected in the ground-based yarding area, but overall the aerial extent and degree would remain below the established RMP guidelines (12 percent or less).

**Roads, Trails, and Landings**

Construction of new spur roads would result in loss of top soil and compaction of sub-soil on approximately 11,300 feet (less than two percent of the total project area). The area currently is forested land that would be converted to non-forested. The roads to be constructed are on gentle topography; typical clearing width is expected to be approximately 20 feet (though in some spots it may be up to 40 feet in width). The majority of new road construction is located within in Sections 7 and 17, with a small amount in Section 19. Approximately 1.26 miles of the new construction would be native surface (dirt) have surface drainage features installed, be blocked to vehicle traffic and placed in long term storage following harvest, so some recovery back to a forested condition would occur in this area over time.

Approximately 0.45 miles of new road construction would be a rock surface and would be blocked to vehicle traffic and placed in long-term storage following harvest. The remaining 0.44

miles of new road construction would be rocked and remain open. Road renovation and improvement would result in no change in amount of current non-forest land. Some encroaching vegetation along these older roads would be removed, surface drainage re-established and surface rock would be added where needed. The improvements would provide better drainage and road surface conditions, resulting in less road surface erosion into the surrounding area. The improvement work is expected to result in some minor short term roadside erosion where established vegetation in the ditch and culvert catchment areas are removed during the cleaning and reshaping or culvert installment operations. Litter fall accumulations and growth of vegetation generally re-establishes within two seasons and erosion rates return to near natural levels thereafter. The landings would be located along existing roads, outside of stream protection zones, and would be less than one acre in size. The landings would have surface drainage features installed following completion of harvest operations.

Decommissioning of 900 feet would include pulling the berms, decompacting and re-contouring and placing debris to block vehicular access. Blocking vehicular access would limit additional sedimentation and compaction. Funding for the trail decommissioning work would come from Title II, 2016 RAC funding sources.

**Logging**

***Soil compaction, disturbance, and displacement***

Following completion of this proposed action, the majority of the understory vegetation and root systems would remain along with surface soil litter and slash from the harvested trees. 4.3 acres of hand piling slash and 40.5 acres of machine piling of slash is also proposed. Expected additional amounts of surface soil displacement, surface erosion, and dry ravel resulting from harvest operations should be minimal. Additional soil compaction can be expected to result from this project. Approximately 14.5 acres in landings and 7.6 acres in skid trails would be needed. Past timber sales of similar type in the Marys Peak Field Office indicate that 0.2 acres is a reasonable assumed average for landings (0.1 acre of existing road surface and 0.1 acre of new disturbance).

Any disturbance of these soils would not be expected to significantly affect long-term productivity of the site, but may lead to some short-term affects to vegetation composition. The estimated reduction in growth rate for trees on moderate to severely impacted areas is 15–30 percent during the first 10–20 years of growth. As trees age and become established, the 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 or displacement tends to be in narrow strips as is the case with skyline yarding corridors and small landings.

Approximately 145 landings would be needed to facilitate harvest operations. About half of the surface area used for landings would be the existing road surface; additional ground adjacent to the road would be used for turning equipment, sorting, and decking of logs until transport; however, none of the landing locations would be larger than one acre in size. Heavy compaction and disturbance to the top soil layer would be expected where equipment frequently operates or turns, increasing the percent of the project area with compaction and disturbance.

Skyline yarding corridors usually result in light compaction of a narrow strip less than four feet in width. This is especially true for this type of project where logs are relatively small and there would be adequate slash on the ground in the corridors to yard over. Measurable long term effects on site productivity from this type of disturbance are minimal to none.

For ground-based yarding, impacts would vary depending on the type of equipment used, soil moisture during heavy equipment operations, and depth of slash in the skid trails. In ground-based skid trails, a moderate amount of top soil displacement would be expected approximately 12 feet wide and moderate to heavy soil compaction depending on the amount of use. In harvester/forwarder yarding trails, soil displacement is generally minimal to none and soil compaction is light to moderate.

With crawler tractors, a moderate to heavy degree of soil compaction and a moderate amount of top soil displacement would be expected in skid trails and at landings. If a harvester/forwarder system were used, very little top soil loss or displacement would be expected.

Some of the potentially impacted acreage listed above includes existing skid trails from previous logging in the late 1970 to 1980 period. Where practical, portions of these existing roads would be reused for skid trails for this project.

#### *Site Productivity*

For skyline yarder systems, with the application of project design features, soil impacts in skid trails are expected to result in light compaction in a narrow strips less than four feet in width. The trees in the project area have ample crowns; adequate slash is expected on the ground during yarding operations. The effect on overall site productivity from light compaction is expected to be low (no measurable reduction in overall yield for the project area).

For harvester/forwarder systems, soil impacts in skid trails would be expected to result in light to moderate compaction. The trees in the project area have ample crowns; it is expected that adequate slash would be available for yarding corridors. The effect on overall site productivity from light to moderate compaction would be no measurable reduction in overall yield for the project area.

For tractor yarding (including landings), soil impacts would be expected to result in moderate to heavy, fairly continuous compaction within the landing areas and the main skid trails. Impacts would be light to moderate and less continuous on less traveled (e.g., two trips) portions of skid trails; a maximum reduction in productivity for the acres of landings and skid trails would be a permanent 20 percent reduction in yield.

The ground-based thinning harvest area skid trails would be treated as needed to reduce compaction and limit erosion. Such actions would sustain long-term site productivity and stability by maintaining the infiltration capacity, the nutrient storage and cycling and minimizing surface water flow and erosion.

These estimates in reductions of overall yield are based on studies and observations done in western Oregon and Washington and are by no means conclusive. Observation and study results vary widely. Studies completed by Weyerhaeuser indicate that negative effects from compacted soil on growth of young trees become negligible within 8–12 years of planting (Heninger et al.

2002). Effects from top soil loss or displacement may have more long term impacts than the associated compaction.

The initial severity of compaction and the amount of soil displacement can be reduced when slash and small logs are left in the skid trails and the total number of passes is low (less than 10). Operating only when soils are dry and soil strength is high would reduce the crushing of individual soil aggregates and resulting depth of compaction. Multiple passes on moist or wet soil typically results in heavy compaction.

In ground-based harvest areas, skid trails may be decompacted, and water barred, and slash may be scattered. To avoid damage to existing tree roots in ground-based harvest units, ripping of skid trails to reduce compaction would not be conducted. To minimize soil impacts, design features include limiting soil disturbance and compaction by yarding on top of slash as much as possible and conducting ground-based yarding during periods of low soil moisture with a minimum of yarding trails.

No measurable amounts of surface erosion are expected from the forested lands treated under this proposed alternative. With timber hauling restricted to periods when no water is flowing on road surfaces, the amount of sediment produced from roads would be negligible to none.

Water-barring, blocking, and placing debris on skid trails in the ground-based units would promote out-slope drainage and prevent water from accumulating in large quantities, running down the trail surface and causing sediment inputs to streams. After several seasons, the accumulated litter fall on the closed surfaces would further reduce the surface erosion potential.

**Fuel Treatments**

Approximately 45 acres of slash pile burning is also proposed. Burning conditions would be established to ensure that fuel conditions were met that would lead to a low to moderate burn intensity of these areas. With a low to moderate intensity burn these areas would be expected to reestablish vegetation entirely within one to two growing seasons. No burning would occur within stream protection zones to protect water resources and the remaining vegetated buffer would filter out any sediment delivered from upslope areas. Pile burning is completed at a time of the year when soil moistures are higher and the soil is not likely to be impacted by the low to moderate intensity heat generated from the burning. This lower to moderate heat type of burn does not kill the shallow roots of shrubs and forbs around each burn pile and the short-term flush of nutrients from the ash helps to generate vegetative recovery. It is not expected that additional erosion would move far off site from the burn piles; thus, no off site erosion or sediment delivery would be expected. With slash and existing undergrowth being left on nearly all of the area no measurable amounts of surface erosion are expected from the forested lands treated.

Placement of water bars and blocking of skid trails would promote out-slope drainage and prevent water from accumulating and running down the skid trail surfaces in large enough volumes to cause erosion that could reach streams. A small amount of localized erosion can be expected on some of the tractor skid trails the first year or two following yarding. Eroded soil is not expected to move very far from its source and would be diverted by the water bars or out sloping to spread out in the vegetated areas adjacent to the trails and infiltrate into the ground.

After several seasons, the accumulated liter fall on the skid trails would reduce the impact of rain fall droplets on the soil surface further reducing the potential erosion of the skid trails.

### 3.5.3 CUMULATIVE EFFECTS

*Soil Compaction* - Assuming that all 40.5 acres of machine piling would result in disturbance, this would result in a total disturbance level of 7.7 percent (2 acres existing disturbance, 7.25 acres in landings, 7.6 acres in skid trails, and 40.5 acres of machine piling). The aerial extent and degree of disturbance would remain within accepted RMP guidelines of less than 12 percent disturbance.

*Road Density* - Approximately 11,300 feet of proposed new road would be constructed, 8,969 feet is located in the Beaver creek watershed, and 2,318 feet in the Greasy Creek watershed. The average road density in the Beaver Creek watershed would increase from 5.3 to 5.4 miles per square mile and average road density in the Greasy Creek watershed would increase from 5.46 to 5.47 miles per square mile. These densities are typical of those found in the Oregon Coast Range. No other road construction in planned in the watersheds at this time.

*Site Productivity* - The effect on overall project site productivity resulting from the impacted acres is expected to be less than 3 percent reduction in overall yield for the project area. There would be no measurable cumulative impact to the soils resource outside the project area.

*Fuels Treatment* - Observations over three decades of burning piled slash (both hand and machine piles) in this portion of the Marys Peak Field Office has resulted in little to no evidence of surface erosion from areas where piled slash has been burned. Based on this local experience, little to no increase in surface erosion and no sediment delivery is expected from this proposed activity.

## 3.6 AIR QUALITY, FIRE RISK, AND FUELS MANAGEMENT

The following issue will be addressed in the environmental effects section below:

*What effects would the proposed action have on fuel loading, fire risk, and air quality?*

### 3.6.1 AFFECTED ENVIRONMENT

**Air Quality**

The major source of air pollutants within the Dunk Tank project area would come from smoke associated with wildfire starts and from smoke associated with resource management activities including prescribed burning (hand, machine, and landing piles), logging, log hauling, fossil fuel combustion and dust from the use of natural-surfaced roads.

The Willamette Valley experiences periods of air stagnation. When this occurs cold air often becomes trapped near the valley floor with slightly warmer air aloft, creating conditions known as temperature inversions. These conditions result in trapping and concentrating air pollutants near the ground. Wintertime temperature inversions contribute to high particulate levels, often due to wood burning for home heating and fossil fuel combustion. Stagnant periods contribute to

increases in ozone levels, causing the local air quality to deteriorate. Under the State of Oregon Smoke Management Plan the Willamette Valley has been classified for the highest level of protection, and has been designated as a Smoke Sensitive Receptor Area.

**Fire Hazard and Risk**

Northwest Oregon has a temperate marine climate. It is mild and wet in late fall, winter and early spring. In the Oregon Coast Range Mountains, snowfall accumulation remains at higher elevations (approximately 2,500 feet and greater) for an extended period of time, but does not persist for long periods at lower elevations. Summers are warm with periods of dry weather during the months of July, August, and September. Summer mean temperatures during this period average approximately 55-60 degrees Fahrenheit for lows and highs of 75-80 degrees Fahrenheit. Extreme high temperatures reaching into the mid to upper 90s, and occasionally topping 100 degrees Fahrenheit, are common, but infrequent and occur for short durations. During average weather years, the conditions under the forest canopy remain relatively moist.

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

Wildfires within the project area have been primarily human-caused. Wildfire risk from humans is higher than compared to lightning because the analysis area is accessible to the general public via paved and rocked roads year around. Additionally, OHV trails in the project area introduce motorized vehicles to areas not otherwise easily accessible to humans. Dry lightning (lightning that has no accompanying moisture) is uncommon in Northwest Oregon. The project area is located within the Oregon Department of Forestry's Northwest Oregon Area - West Oregon District - Philomath Unit. Over the last ten years an average of one fire per year is attributed to lightning while six fires per year are human caused. The average size of lightning fires is approximately one tenth of an acre while the average size of human caused fires is approximately one acre (ODF 2016).

**Fire Regime and Condition Class (FRCC)**

The Fire Regime classifies the role fire would play across the landscape in the absence of recent human intervention. The Condition Class classifies the degree of departure from the natural fire regime. The modeling predictions for fire regime and condition class are modeled from the LANDFIRE Rapid Assessment Vegetation Model (USDA Forest Service, 2007).

According to this model, the analysis area occurs within the Pacific Northwest Forested landscape and the potential natural vegetation groups are Douglas-fir-western hemlock (dry mesic), and Douglas-fir-western hemlock (wet mesic), and falls within two different Fire Regimes. Fire Regime III is characterized by a moderate to low fire return interval with a mixed severity and is associated with south and west facing slopes. More than 75 percent of fires are characterized as mixed or low severity. Fire Regime V is characterized by a low fire return interval with a high severity and is associated with north facing slopes. More than 70 percent of fires are characterized as stand replacement.

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

Management of the surrounding private land adjacent to the Dunk Tank analysis area affects the Condition Class to such an extent that actions are unlikely to change the Condition Class rating across the landscape.

**Fire History**

The pre-settlement fire history of the Dunk Tank analysis area is not well documented, although it is known that Native Americans burned within the Willamette Valley, to what extent this burning extended into the Coast Range foothills and up the river corridors is not specifically known.

Fire does play a major role as a natural disturbance agent, as do people. Past forest management has shaped the analysis area. Many of the proposed harvest units were previously harvested between the 1940s and late 1970s. In addition, many areas adjacent to the analysis area on private timber land have also been harvested during this time to the present. Harvest areas on BLM-managed land during this period often had been broadcast burned or had spot burning associated with them. Burning primarily occurred for site preparation prior to tree planting but also to reduce the fuel load and limit the potential of a future wildfire.

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

### 3.6.2 ENVIRONMENTAL EFFECTS

## Alternative 1 – No Action

**Air Quality**

Much of the project area would remain open to the general public. Exhaust fumes and dust created from existing vehicle traffic on gravel or natural-surface roads would contribute effects to air quality. These effects would be localized to the immediate vicinity of the project areas.

Under the No Action alternative there would be no harvest and no need for prescribed burning and, therefore, no localized effects to air quality. However, as the timber stands continue to grow, the high stocking density would cause the stands to become more susceptible to a stand replacement fire event due to fuel loading. In the event of a wildfire, poor air quality would be expected due to the high volume of smoke produced.

**Fire Hazard and Risk**

The analysis area would continue on its current trend. The current risk of a fire start would remain low. There would be a slow increase in the coarse woody fuel load (1000 hour fuel class (greater than 3 inch diameters)), and in the smaller size fuel classes, 1 hour fuels (less than ¼

inch diameter), 10 hour fuels (¼ to 1 inch diameter), and 100 hour fuels (1-3 inch diameter)) in these timber stands as stress-induced mortality within the stands increases. The hours correspond to the amount of time it takes the moisture content of individual fuels to reach equilibrium with changes in relative humidity. Ladder fuel densities would increase as additional trees are suppressed in the understory, shade tolerant species seed in, and dominant trees grow larger. The potential for these stands to eventually succumb to a wildfire would continue to increase as they near the maximum fire return interval and the Condition Class departs further from the natural fire regime.

## Alternative 2 – Proposed Action

### Air Quality

An increase in vehicle traffic would occur over access roads during the implementation of this project. The increases would be considered short-term while the project is implemented. Fossil fuel combustion and dust created from vehicle traffic from proposed project activities on gravel or natural-surface roads would contribute short-term (during project work) effects to air quality. These effects would be localized to the immediate vicinity of the operations.

The fuel load would increase following harvest activities. Post-treatment fuels surveys would be conducted and the Photo series for quantifying forest residues in the: Coastal Douglas-Fir-HemlockType/Coastal Douglas-Fir-Hardwood Type (Maxwell and Ward 1976), Stereo Photo Series for Quantifying Forest Residues in Coastal Oregon (Ottmar and Hardy 1989), or the Stereo Photo Series for Quantifying Forest Residues in the Douglas-fir Type of the Willamette National Forest (Ottmar et al. 1990), would be used to help identify areas with increased fuel loads. If these methods determine that an increased fire hazard exists or that fuel reduction is required for site preparation, prescribed burning would be conducted and smoke would be generated.

Hand and and/or machine pile construction and burning in the commercial thinning or density management harvest areas and logging debris (slash) located near landings, and especially along roads, OHV trails or property lines would be targeted for fuel reduction treatments because these areas have the highest risk of an unplanned ignition. Within the harvest units, approximately 50.9 acres of the highest risk areas (open roads, motorized trails, and property boundaries) within the project have been analyzed and could be treated with prescribed fire. This would remove approximately 26.7 tons of slash per acre or approximately 1,539 total tons from the highest risk areas within the project.

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

Burning would be conducted when the prevailing winds are blowing away from Smoke Sensitive Receptor Areas (SSRAs) in order to minimize or eliminate the potential for smoke intrusions.

Pile burning is typically conducted in the fall and winter when moisture becomes more frequent and smoke dispersion improves and outside of peak recreation season. The potential for a smoke intrusion would be further reduced by burning under atmospheric conditions that favor good vertical mixing so that smoke and particulate matter is dispersed by upper level atmospheric winds. Prescribed burning would cause short-term impacts to air quality that would persist for one to three days within one-quarter to one mile of the project units. None of the treatment units are sufficiently close to any major highways that motorist safety would be affected. The overall effects of smoke on air quality is predicted to be local and of short duration. Activities associated with the proposed action would comply with the provisions of the Clean Air Act.

**Fire Hazard and Risk**

Following treatments the fuel load and risk of a fire start would increase and would be greatest during the first year following treatment when needles are dry and remain attached to tree limbs. The ability to control a fire would decrease during this period as a result of the proposed action. The modeling predictions for fire behavior based on "Standard Fire Behavior Fuel Models" (Scott and Burgan 2005), fuel models would move the commercial thinning and density management stands from Fuel Model TL 5 (High Load Conifer Litter) to Fuel Model SB1 (Low Load Activity Fuel), or Fuel Model SB2 (Moderate Load Activity Fuel). Treatment areas would see a short-term (0-5 year) increase in fire ignition potential because of the increase in fine dead fuels.

Removing trees in units would decrease both the amount of potential ladder fuels and the available fuel density in the canopy (canopy bulk density). The average relative density of the timber stands within area is approximately 79 percent. The silvicultural prescription will lower this relative density to approximately 41 percent. A relative density of 35 percent – 45 percent or lower has been identified as the point where canopy bulk density is unlikely to sustain a high intensity crown fire (Agee 1996). The silvicultural prescription for all of the units in the analysis area falls within or below this range.

The project proposes to reduce the risk of a fire by decreasing the fuel load in areas that are accessible to people and along property boundaries with fire risk. Surface fuels would be reduced in strategic locations within commercial thinning and density management areas along roads, OHV trails, property lines, and at landings. The treatments would result in lower fire intensity, rates of spread and flame lengths.

The Oregon Department of Forestry has responsibility for fire protection on BLM-managed land in western Oregon. Their ability to successfully control wildfires in the fuels treatment areas as small, low intensity, ground fires would remain high. For the short-term (0-5 years), the fire risk would increase in all of the treatment areas, however due to decreased crown density, a reduction in ladder fuels, and hazardous fuels reduction treatments, containment of wildfires at less than 1 acres in size should continue to be attainable during initial attack.

At the completion of harvest operations, fuels surveys would be conducted and project locations identified as containing hazardous fuel loads, or areas needing site preparation may be targeted for hand or machine slash piling and burning. Hand or machine piles may be constructed along roads or property lines, and at landings. If fuel loads are relatively light along roads and property lines, slash pullback may be incorporated as the desired fuels treatment.

### 3.6.3 CUMULATIVE EFFECTS

There would be no cumulative effects to air resources, as the direct and indirect effects from the projects would be local and of short duration. No other reasonably foreseeable projects are planned in the project areas affecting this resource. Based on past experience with pile burning within this habitat type and adherence to smoke management plans, there are no expected cumulative effects on air quality from the planned fuels treatment under this proposal.

There would be an increase in fuel loading and resultant fire hazard in the short-term (0-5 years). In the commercial thinning and density management areas the hazard and risk of fire would be minimized by the use of fuels reduction treatments. The localized increase in fire risk would diminish over time as slash decomposes. There would be positive benefits to the thinned stands in the longer term due to the wider spacing between tree crowns and the removal of most of the ladder fuels that are conducive to the spread of fire into the tree canopy. Due to reduced canopy density and ladder fuels, the potential for the stand to carry a crown fire would be reduced in the long term (greater than five years).

## 3.7 RECREATION, RURAL INTERFACE, VISUAL RESOURCE MANAGEMENT

The following issues will be addressed in the environmental effects section below:

*How would the proposed action affect designated and dispersed recreational use of the area?*

*How would the proposed action affect the rural interface? What effects would the projects have on visual resources?*

### 3.7.1 AFFECTED ENVIRONMENT

**Recreation**

Primary access into the project area consists of traveling on paved county roadways to gravel surfaced routes developed primarily for timber management. The checkerboard ownership causes roadways to meander through private lands managed for timber production and those lands managed by BLM. Evidence of man-made modifications such as roads and past timber harvest activities are commonplace on both private and public lands across the surrounding landscape.

Dispersed recreational activity within the project area consists primarily of collecting special forest products such as mushrooms, OHV use, target shooting, hunting, and driving for pleasure within the forested landscape. Use primarily takes place in the fall for hunting activities, early spring for mushroom collection, and late spring and early summer for OHV use. Firewood collection is determined by availability and may be available at any time outside of a declared fire season. Many of the roadways accessing the BLM-managed parcels are available for public access; however, portions of the project area are limited by landowner discretion and may not

offer vehicle access to the public. There are no designated BLM recreation sites within the project area.

#### *Off-Highway Vehicle Use*

The Flat Mountain area has a 45 year history of OHV recreation, specifically off-road motorcycles, on both the BLM and Starker-managed lands. The existing OHV trail network covers approximately 9,080 acres and totals approximately 15.5 miles. The timber harvest units contain 2 miles of trail (13 percent of the overall mileage). All trails are connected via road; there are approximately 86 miles of road within the riding area, with 9 miles within the project area, equaling 10 percent of the overall mileage.

The Flat Mountain Riders Association (FMRA), a local motorcycle club based out of Corvallis, has adopted the trail network and has worked with both Starker and BLM to keep the network in a sustainable condition. Starker manages access to the trails with access passes that are earned with volunteer work on the network, which is planned and conducted by the FMRA. This has resulted in seasonal closures administered by Starker for both fire and wet conditions. During a typical 12 month calendar year, about four to five months from late-spring into the fall are available for riding. Staging, or parking, is done at intersections and along existing roads in the area.

### Rural interface

The northern half of units 21-2 and 21-3 are within rural interface designations. The rural interface within these locations was not mapped in the 1995 Salem District RMP; however, the area is zoned rural interface as 40 acre or larger lots with homes adjacent to or near BLM-managed lands. There are two vacant homes in close proximity to the project area and one home less than 0.5 mile from the project area. The homes within the closest proximity to the project area are currently vacant with windows boarded. The occupied home within one-half mile from the project area is situated along Beaver Creek Road, a county roadway.

### Visual Resource Management

The project area is characterized as rural with small communities separated by agriculture lands and managed forests. The landscape exhibits extensive forest management on the rolling hills of the eastern slopes and hilltops of the Coast Range. The Willamette Valley is located east of the project area. The overall VRI Class rating for the project area is Class IV. This rating resulted from the overlap of a Scenic Quality Rating of B, which factors in the timber management landscape, coupled with low Visual Sensitivity to change and the foreground-middle ground and background Distance Zones from the nearest Inventory Observation Points.

Views of the project area are primarily available when traveling south on Highway 99W and when recreational users travel west along Bruce Road to visit William L. Finley National Wildlife Refuge, Oregon. The viewable landscape from this area covers approximately 380 acres in scattered patches on the northern and eastern side of the Dunk Tank timber sale; however, roadside trees, buildings, dips, ridge angles and rises in the valley bottom can hide the harvest site from view. Viewable acreage was calculated from those slopes viewable as exposed to Key Observation Points (KOPs).

The foreground and middle ground is predominately agricultural fields bordered by deciduous trees and shrubs, and as the lands become less flat within the middle ground, the vegetation includes conifer species. The background landscape consists of forest lands managed for timber harvest. The background landscape could be described as a patchwork quilt-like pattern with each parcel consisting of a different-aged stand defined by straight lines that may run vertically on facing slopes creating unnatural contrast of color and texture or may create horizontal patterns that flow with the landforms. The varying stand ages and heights provide various textures and colors to the landscape from browns of freshly harvested units to a wide range of greens as planted parcels age.

### 3.7.2 ENVIRONMENTAL EFFECTS

## Alternative 1 – No Action

**Recreation**

Collection of special forest products such as mushrooms and firewood, target shooting, OHV use, hunting and driving for pleasure are the primary recreational activities within the project area. Under the no action alternative, these activities would continue to occur. Any changes in recreational use would be dependent upon factors other than BLM land management activities therefore there would be no effects to the recreational users under this alternative.

***Off-Highway Vehicle Use***

Under the No Action Alternative, none of the management activities proposed under Alternative 2 would occur at this time or within the foreseeable future. Selection of the No Action Alternative would mean that the two miles of trail and nine miles of road would continue to be available with no impacts from the Dunk Tank timber harvest, as identified under Alternative 2.

**Rural Interface**

Under the no action alternative, there would be no effect to rural interface lands.

**Visual Resource Management**

Visual effects associated with the No Action Alternative would include the continuance of existing BLM management activities in the project area. The BLM would expect the project area to remain in the current condition of continued stand progression unless natural or catastrophic events were to occur. The BLM anticipates landscape changes which may affect visual qualities within the project area to persist following timber management activities on patchwork, privately owned forest lands.

## Alternative 2 – Proposed Action

**Recreation**

The proposed action would apply thinning treatments on early- and mid-seral forest stands within Matrix and Riparian Reserve land classifications. Thinning treatments have been designed

to retain 50 percent or greater canopy cover, promoting growth opportunity to the remaining stands.

During project operations, restricted use and temporary closures may be incorporated for site-specific activities to promote public safety. Recreational opportunities would continue to be available on BLM-managed lands outside of project specific locations during harvest activities.

#### *Special Forest Products*

The project area is commonly used for the collection of edible mushroom species. During project activities restricted use or temporary area closures may prevent collection activities at some locations, likely attracting visitors to alternate or new collection sites. The proposed project may disperse mushroom collection activities to alternate locations during and initially following project activities but it is unlikely it will limit or stop public collection of mushrooms on BLM-managed lands within the Watershed.

Firewood collection would remain a permit-based opportunity; collection locations would be outlined when the firewood permit is issued. Following project activities the area may provide additional opportunities associated with firewood collection.

#### *Target shooting, hunting, and driving for pleasure*

Target shooting is prevalent both within the analysis area and the surrounding forested landscape. High use target shooting areas consist of landings, road spurs off of the main travel routes, and in areas where gates block further access. Within these areas it is common to find numerous spent shells and discarded target materials. Development of new landing sites, road spurs, and road improvements have the potential to provide access to locations currently receiving little or no target shooting activities. Target shooting activities are not expected to substantially increase within the project area but there is a perceived expectation of shooting activities spreading into the newly accessible areas. Due to visitors not picking up the targets and shells, presence of shooting materials may be recognized as an increase in use.

Hunting activities within the analysis area would not be significantly affected by the proposed action. Thinning treatments may promote the short-term development of additional forage in areas where sunlight reaches the understory and as the stands develop they may provide the benefit of hiding cover for deer and elk. Additional forage and hiding cover, although beneficial, are not expected to affect hunting opportunities as these animals routinely roam across large expanses of land.

Public use within the project area is primarily activity-related, such as accessing OHV trails, target shooting, or special forest product collection. The majority of the recreation-related travel within the area takes place on weekends and during summer months, June through September. Driving for pleasure, although not as prevalent, is known to take place within the project area. Temporary road closures during project activities and additional heavy truck traffic during the week may pose a slight inconvenience to pleasure drivers, but is not expected to substantially limit opportunities.

The proposed action will increase heavy truck traffic along Botkin Road by an average of 202 log trucks each year over a 3-year period and Beaver Creek Road would increase by an average

886 log trucks each year over a 3-year period. Each truck would use the haul route twice per trip, once to access the site and again to exit the area. Botkin and Beaver Creek Roads access residential areas and are primary access points into the larger forested areas for recreational purposes. Narrow road widths and the need to use existing pull-outs may cause in an inconvenience to travelers when encountering the larger truck. The haul routes identified in the project proposal are commonly used for timber extraction purposes by both BLM and private forest industry. Due to the commonality of heavy truck use along these routes, the level of inconvenience to homeowners and recreational users over the predicted three year period is expected to be low.

#### *Off-Highway Vehicle Use*

This area would be closed to use during harvest, with two miles of trail and nine miles of roads closed to OHV use. This would result in a 23 percent reduction in riding opportunity, depending on season of harvest. If harvest occurs during a period the area is closed to OHV's, then impacts would be lessened by that period and dependent on post-harvest closure period.

The timber harvest will build roughly 14 new spur roads throughout the area, resulting in a potential for new trails connecting these road ends to each other and to the existing trail network. Such trails would be put through the NEPA process if it was determined they were needed. Of the 14 spurs built to assist harvest activities, only 7 would remain open to the public for motorized access post-harvest. The other 7 would be closed and physically blocked at their entrance. BLM would monitor these closed routes to ensure they were not converted to OHV trails unless properly analyzed and designated. The BLM District Trails Coordinator would also solicit verbal reports from the FMRA during trail maintenance evolutions regarding any unauthorized trail construction they may have seen throughout the area.

With the provided monitoring measures, the Proposed Action is not expected to appreciably increase OHV trails or use in the area.

Post-harvest impacts would be minimized to the 4-inch and smaller woody debris not cleared as part of the timber harvest contract. Per the above MOU, the FMRA would clear this debris and restore the trail tread to pre-harvest conditions as soon as possible, minimizing the period of limited access.

### Rural Interface

Three residential structures are located within rural interface boundaries in association with project area. Two of the structures are currently unoccupied and boarded. One occupied residence is situated along the county controlled roadway. Truck traffic noise accompanying proposed operations may be heard however truck traffic associated with logging on both private and federal lands within the area is commonplace. Little distinction is expected to be observed with the incorporation of the proposed project.

**Visual Resource Management**

***Within 5 years after harvest***

Immediately after harvest, landscape appearance would consist of green tree retention at a relative density of approximately 130 trees per acre throughout project area, roughly a 50 percent reduction in tree density and canopy cover. The ridge lines would continue their current appearance due to the substantial green tree retention over the entire project area, with brown stems (tree trunks) still mostly blocked from view by tree canopies. A slight change in texture and color may be present on steeper slopes with greater vertical distance between tree tops providing more area for brown stems to show. There would be treatment on approximately 380 viewable acres.

The proposed action would not cause any change in the overall VRI Class rating or any of its components. The area would retain the features of the surrounding landscape which is comprised of a patchwork pattern with harvested and intact conifer stands of varying stand ages. The project area has been previously graded as possessing low visual quality; the proposed action would not contribute to heightened sensitivity levels or cause the scenic quality of the overall landscape to change.

***5 years after harvest***

After an overall average of 8.5 years, tree canopies would be expected to fill in any post-harvest gaps and brown stems would be hidden, returning the area to a pre-harvest color and texture. Variances in canopy closure are calculated at a range of 6-17 years, with 8.5 years being the average of the 21 units.

No design features would be necessary with this type of harvest. With a thinning prescription such as this, especially in a Class IV as described above, the area would retain the features of the surrounding landscape, requiring no mitigation.

### 3.7.3 CUMULATIVE EFFECTS

No cumulative effects are expected with regard to recreational use. Current recreation use within the harvest area would be restricted in the short term and is expected to return to current use patterns following harvest operations. There are alternative areas within close proximity to the project area to conduct recreational activities while the project is occurring. This project would have minimal to no impact on recreational uses and rural interface.

Starker may harvest other areas within the general time period as the Dunk Tank harvest, resulting in greater area and road/trail mileage closures. Many of the trails flow back and forth between Starker and BLM lands, so overall affected mileage may be greater if Starker closes a segment of trail; the entirety of the given trail may effectively be closed by such an action.

The cumulative effect would be a minor change in the color and texture of the entire treated area. The cumulative effects to the form of the landscape would be minimal and likely go unnoticed. Various landowners with varying land management objectives (e.g., timber harvest and agriculture) and natural events such as fires and high winds will maintain the ever-changing, patchwork pattern on the landscape over time, maintaining the overall VRI Class IV rating.

Past, present and reasonably foreseeable future actions across the landscape consist of extensive forest management and agricultural practices, creating a mosaic of colors, patterns, and textures on hillsides and the valley floor. The Dunk Tank timber sale is a forest management activity that fits within this mosaic pattern. The project would not substantially change the appearance of the larger landscape because it is similar to the type and size of forest management activities that occur in the area. Many of these hillsides have recently been harvested and replanted to varying degrees.

The project would not cause any change in the overall VRI Class rating or any of its components. The area would retain the features of the surrounding landscape which is comprised of a patchwork pattern with harvested and intact conifer stands of varying stand ages. The project area has been previously graded as possessing low visual quality; the project would not contribute to heightened sensitivity levels or cause the scenic quality of the overall landscape to change.

# 4.0 COMPLIANCE WITH THE AQUATIC CONSERVATION STRATEGY

**Review of Aquatic Conservation Strategy Compliance**

Review of this analysis indicates that the project meets the Aquatic Conservation Strategy (ACS). The following shows how the project complies with the four components of the ACS.

Component 1 – Riparian Reserves: Maintaining canopy cover along all streams and wetlands would protect stream bank stability and water temperature. The BLM established stream protection zones, ranging from 50-75 feet on each side of the stream, in which no harvest will occur. Riparian Reserve boundaries would be established consistent with direction from the Salem District RMP. Proposed activities within the Riparian Reserves are intended to enhance riparian condition.

Component 2 – Key Watershed: The Dunk Tank timber sales are not within any key watersheds.

Component 3 – Watershed Analysis: The Benton Foothills Watershed Analysis (1997) describes the events that contributed to the current condition such as early hunting and gathering by aboriginal inhabitants, road building, agriculture, wildfire, and timber harvest. The following are watershed analysis findings that apply to or are components of this project:

- Historically, landslide frequency has been low. Although harvest activities are expected to increase due to the land use allocation, substantial increases in land sliding rates are not expected (p. 4).

- Surface erosion is accelerated when low growing ground cover and/or duff layer are removed. Thinning, density management harvest, and pile burning for site preparation leave the majority of the soil surface protected or undisturbed (p. 4).

- Riparian Reserves in the project area watersheds lack older forest characteristics. Approximately three-quarters of the Riparian Reserves are in early and mid-seral age stands. Many of these stands tend to be overstocked and lack vertical structure. Density management would benefit structural diversity (p. 7).

- Management activities in the Riparian Reserves can be used to promote older forest characteristics, attain ACS objectives, and move the Riparian Reserves on a trajectory toward older forest characteristics. Desired riparian characteristics include diverse vegetation appropriate to the water table, diverse age classes (multi-layered canopy), mature conifers where they have occurred in the past, and dead standing and down wood (p. 9).

- Water quality conditions in the forested uplands appear to be generally good, but there is little data to verify this. The parameter of greatest concern is turbidity and suspended sediment, particularly chronic inputs of fine sediments from road and trail surfaces (p. 12).

- Dispersal by highly mobile wildlife species and habitat to allow dispersal to adjacent areas is not a significant issue within the analysis area (p. 13).

- Drainage structures on many of the BLM-controlled roads are deteriorating and/or are inadequately sized for 100-year flood events (p. 16). Replacement of failing culverts is included in the Dunk Tank timber sales.

- Generally avoid new road construction in the Riparian Reserves to meet ACS objectives (p. 17). The current planning process for new road construction requires the involvement of affected resource specialists, including the hydrologist, soils scientist, botanist, wildlife biologist and/or aquatic biologist, and road engineer. At the present time, the BMPs are being used to assist in determining road locations, general road design features, design of cross drains and stream crossings, as well as the actual road construction. There is no new road construction in the Riparian Reserves.

Component 4 – Watershed Restoration: Road renovation would improve habitat conditions for native fish species and assist in restoring and improving ecological health of watersheds and aquatic systems by replacing failing culverts and reducing road related impacts for the long-term restoration of the aquatic system (EA section 3.3.2).

Density management would restore watershed conditions by providing a gradual transition in structural characteristics of treated stands that would more closely resemble late-seral forest and promote stand diversity, provide more light to accelerate growth of selected conifers, and promote species diversity.

**Attainment of Aquatic Conservation Strategy Objectives within the Riparian Reserves**

Approximately 250 acres (34 percent) of the proposed action is within the Riparian Reserves boundaries. From the stream protection zone to the upper edge of the Riparian Reserve, stand density would be reduced using the same prescription used on the adjacent upland forest in units where 50 percent or greater canopy cover would be retained following thinning. In units where the upland prescription would result in canopy cover below 50 percent, additional leave trees would be retained in order to maintain canopy cover at or above 50 percent. Habitat for aquatic and riparian dependent species would be maintained or enhanced in Riparian Reserves in the following ways:

***Long term increase in quality instream large woody debris (LWD) recruitment***

With treatment, trees would reach large diameters earlier compared to the no treatment option, creating opportunities for high quality LWD recruitment. Smaller wood would continue to fall from within the untreated stream protection zones, and larger wood would begin to be recruited from farther up the slopes as the treated stands reach heights of 200 feet. Thus, wood with a larger range of sizes would potentially be recruited into streams over the long term in treated stands.

***Maintenance of stream temperature through shading***

Stream shading would not be affected by the proposed treatments. Stream Shading Sufficiency

Analysis (USDA-USDI 2005, amended 2012) was completed for the proposed treatment, and stream protection zones widths are of sufficient width to provide shade in the primary shade zone, based on topography and average tree height. Additional criteria required for shade sufficient to maintain stream temperatures include high vegetation density that would benefit from thinning and vegetation treatment in the secondary shade zone (from the primary shade zone to approximately one tree height from the stream) would not result in canopy reduction below 50 percent.

***Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands***

From research on the BLM Western Oregon Density Management Study (Ares et al. 2009 and Olson and Rugger 2007), thinning affects vegetation structure by increasing cover of grasses and forbs and increasing species richness, a measure of diversity. Richness increased because forest floor herb species typically found under forest canopies remained and flourished, and were joined by open-site herbs and grasses not typically found under forest canopies. In the six year period following treatment, plant communities transitioned from an increased cover of species associated with open sites and early-seral stages, to a greater proportion of shade-tolerant forest floor species. Davis and Puettman (2009) analyzed data from the Young Stand Thinning and Diversity Study on the Willamette National Forest. They found that thinning resulted in initial declines of bryophytes and shrubs, but recovery within five years. Herbs displayed little initial response, but a release of early-seral species was evident in the thinned stands by 5–7 years post treatment.

***Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.***

Research has found that thinning treatments generally maintained habitat for native plant, invertebrate and invertebrate riparian-dependent species (Ares et al. 2009, Olson and Rugger 2007, Norvell and Exeter 2004, Progar and Moldenke 2002). Specifically, thinning was found to increase species richness of arthropods, and forest riparian buffers serve as refuge for both forest-upland and forest-riparian arthropod species. Thinning was found to have minimal effects on most species of aquatic vertebrates including salamanders. Native plants were found to persist and increase in coverage after density management. Habitat elements seem to be protected because the microclimate, as well as the structure and composition of the forest stand and understory vegetation are protected within the untreated buffer.

**Consistency with the Nine Aquatic Conservation Strategy Objectives**

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.***

Does not prevent the attainment of ***ACSO 1***. Addressed in Text (*EA section 3.3 and 3.4*). 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.

**Proposed Action:** The project area watersheds lack structural diversity and CWD. Alternative 2 would enhance late-successional forest conditions and speed up attainment of these conditions across the landscape. Project design features allow for opportunities to create CWD and LWD post-harvest if conditions remain deficient.

***2. Maintain and restore spatial and temporal connectivity within and between watersheds.***

Does not prevent the attainment of ***ACSO 2***. Addressed in Text (*EA sections 3.3 and 3.4*). In summary:

**No Action Alternative:** The No Action alternative would have little effect on connectivity except in the long term within the watersheds.

**Proposed Action:** New road construction is located on or near ridge tops and no stream crossing culverts would be needed that would potentially hinder movement of aquatic species; therefore, no aquatic barriers would be created. Stream crossing culverts proposed for replacement would be sized for the 100 year flow event allowing for improved woody debris and aquatic organism passage. Both terrestrial and aquatic connectivity would be maintained, and over the long-term, as Riparian Reserves develop late successional characteristics, lateral, longitudinal and drainage connectivity would be restored. Improvement of the transportation system would not affect spatial connectivity.

***3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.***

Does not prevent the attainment of ***ACSO 3***. Addressed in Text (*EA section 3.4*). In summary:

**No Action Alternative:** It is assumed that the current physical integrity would be maintained.

**Proposed Action:** A minimum of 50 to 75 foot stream protection zones would maintain the integrity of shorelines, banks, and stream bottom configurations in the project area. Trees would be directionally felled within one tree height of the stream protection zone and any part that falls within the stream protection zone would be left on site, thereby preventing disturbance to stream banks and stream bottom configurations.

Road renovation and improvements such as surface blading, ditch maintenance, placement of surfacing material and potential culvert installation on the haul route are all intended to reduce the risk of road embankment failures and sediment input into aquatic systems.

***4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems.***

Does not prevent the attainment of ***ACSO 4***. Addressed in Text (*EA section 3.4*). In summary:

**No Action Alternative:** It is assumed that the current condition of the water quality would be maintained.

**Proposed Action:** Stream temperature: According to the stream shading sufficiency analysis, the proposed stream protection zones (50 to 75 feet) would be sufficient to protect critical shade in the primary shade zones, based on topography and average tree height. Sedimentation and stream turbidity: see below. Road improvement practices are intended to reduce the likely deposition of road fill material into adjacent streams on the haul route.

***5. Maintain and restore the sediment regime under which aquatic ecosystems evolved.***

Does not prevent the attainment of ***ACSO 5***. Addressed in Text (*EA section 3.4*). In summary:

**No Action Alternative:** It is assumed that the current levels of sediment delivery into streams would continue.

**Proposed Action:** The project is designed to minimize the risk of a mass soil movement event (e.g., slump or landslide). Stream protection zones and project design features would minimize any potential sediment from harvest and road-related activities from reaching water bodies. Road renovation and drainage improvements on existing roads would help to restore the sediment regime to streams in the area. Road improvement best management practices and project design features would reduce the amount of sediment that enters streams by installing culverts and minimizing road surface erosion and sediment delivery.

***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.***

Does not prevent the attainment of ***ACSO 6***. Addressed in Text (*EA section 3.4*). In summary:

**No Action Alternative:** No change in in-streams flows would be anticipated.

**Proposed Action:** The proposed project would not measurably alter instream flows under the proposed action. Density management (thinning) prescriptions in this project will maintain canopy cover well above 30 percent so there will be no additional created openings from BLM harvest activities. New road construction (outside the Riparian Reserves) would result in additional 0.02 percent openings in the Beaver Creek watershed and an additional 0.01 percent opens in the Greasy Creek watershed. This increase in percent openings would fall into the unmeasurable level for detectable levels of increases in peak flows.

Cumulative effects to stream flow from this level of activity are too small to be measured with reasonable accuracy.

***7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.***

Does not prevent the attainment of ***ACSO 7***. Addressed in Text (*EA section 3.4*). In summary:

**No Action Alternative:** No change in in-streams flows would be anticipated.

**Proposed Action:** Design features for the project, such as stream protection zones, coupled with the relatively small percent of vegetation canopy proposed to be removed, would maintain groundwater levels and floodplain inundation rates. Detectable direct or indirect effects to stream flow as a result of this action are unlikely.

The proposed action would not alter existing patterns of floodplain inundation or water table elevation as it would have no effects on existing flow patterns and stream channel conditions particularly for these streams in the headwaters of both basins. Proper drainage of roads would maintain water tables and flood plain functions along the haul route.

***8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands.***

Does not prevent the attainment of ***ACSO 8***. Addressed in Text (*EA section 3.4*). 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.

**Proposed Action:** The actual riparian areas (aquatic system plus associated riparian vegetation) along streams would be excluded from treatment during project implementation by designating stream protection zones. There would be no change to riparian vegetation, on banks or within the riparian zones along streams through the implementation of these projects. Overall diversity of riparian vegetation would not be affected.

***9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.***

Does not prevent the attainment of ***ACSO 9***. Addressed in Text (*EA section 3.4*). In summary:

**No Action Alternative:** Habitats would be maintained over the short-term and continue to develop over the long-term with no known impacts on species currently present.

**Proposed Action:** Habitat to support well distributed riparian-dependent and riparian associated species would be restored by reducing overstocked stands which would create additional diversity and increase the density of vegetation. It would increase tree species diversity and alter forest structural characteristics while amending CWD conditions. Proper drainage of road surfaces and ditches would improve water quality which would benefit riparian dependent species.

# 5.0 CONTACTS AND CONSULTATION

## 5.1 ESA – SECTION 7 CONSULTATION

**United States Fish and Wildlife Service (USFWS)**

Due to potential affects to northern spotted owls, as outlined in Table 3–9, consultation is required in accordance with Section 7(a) of the Endangered Species Act. The Section 7 Consultation for the proposed action will be addressed by inclusion within a Biological Assessment (BA; currently in preparation) that would analyze all projects that may modify the habitat of listed wildlife species on federal lands within the Northern Oregon Coast Range during fiscal years 2017 and 2018. This proposed action has been designed to incorporate all appropriate design standards that will be included in the BA. A Letter of Concurrence would be expected from the Service in early October 2016, prior to any timber sale decision date.

**National Marine Fisheries Service (NMFS)**

***Threatened and Endangered Species***

UWR Spring Chinook distribution is more than 2.2 miles downstream from project activities. Based on distance no project level impacts would affect UWR Spring Chinook or its critical habitat. Steelhead distribution is possible more than 0.5 mile from stand treatments (StreamNet 2009). Project hauling may occur over one paved stream crossing in the project area (StreamNet 2009). Survey data does not indicate the presence of the species in the project area (MRWC 2010) and no critical habitat is designated in the Marys River. No sediment impacts due to hauling would occur over the paved crossing where steelhead may occur. No sediment, temperature, or LWD impacts would occur to listed fish habitat based on proposed treatments design features minimizing site level impacts and distance to potential steelhead habitat. No flow impacts would occur to steelhead habitat based on project treatments (Fitting 2016) combined with distance. No ESA consultation is warranted when no effects would occur to the listed species or its critical habitat.

***Essential Fish Habitat***

Protection of EFH as described by the Magnuson/Stevens Fisheries Conservation and Management Act and consultation with NOAA NMFS is required for all projects which may adversely affect EFH of Chinook and coho salmon. The treatment area is at least 2.2 miles from nearest habitat utilized by Chinook salmon in Beaver Creek; coho are not noted to occur in Beaver Creek (StreamNet 2009). In the Greasy Creek Chinook are not noted to occur; however, coho salmon are at least 70 feet from one treatment unit (StreamNet 2009). All other units are 260 feet or greater from EFH based on coho distribution. Wet season haul over potential EFH streams occurs on paved roads. The nearest unpaved wet season haul is at least 950 feet upstream of EFH. Based on distance of vegetation treatments and hauling activities from occupied habitat proposed project would have no adverse effects on EFH. Consultation with NOAA NMFS on EFH is not required for these projects.

## 5.2 CULTURAL RESOURCES – SECTION 106 CONSULTATION

Portions of the timber sale in sections 17 and 21 occur in the Willamette Valley Ecoregion, and were inventoried in accordance with 2015 Oregon Bureau of Land Management – Oregon State Historic Preservation Office Protocol, Appendix A, *Survey Techniques for Densely Vegetated Areas of Western Oregon*, *Plan*, Protocol for Managing Cultural Resources on Lands Administered by the Bureau of Land Management in Oregon.

Per the 2015 protocol, high-potential zones would be surveyed post-harvest. Ground-disturbing work would be suspended if cultural material is discovered during project work until an archaeologist assesses the significance of the discovery.

## 5.3 PUBLIC SCOPING AND NOTIFICATION

For information on project scoping early in the project planning process, see EA section 1.6.

The EA and FONSI will be made available for public review from May 6, 2016 to June 6, 2016 and posted on the BLM ePlanning website at https://eplanning.blm.gov/epl-front-office/eplanning. The notice for public comment will be published in a legal notice in the Gazette-Times newspaper. Written comments should be addressed to Paul Tigan, Field Manager, Marys Peak Field Office, 1717 Fabry Road SE, Salem, Oregon, 97306. Comments may also be e-mailed to pdtigan@blm.gov or faxed to (503) 375-5622.

# 6.0 MAJOR SOURCES

## 6.1 LIST OF PREPARERS

| Name | Position |
|---|---|
| Debra Drake | Outdoor Recreation Specialist |
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| Mellissa Rutkowski | Engineering Technician |
| Scott Snedaker | Fisheries Biologist |
| Susan Sterrenberg | GIS Specialist |
| Heather Ulrich | Cultural Resources Specialist |
| Chris Waverek | Fuels Specialist |
| Stephanie Wessell | Silviculturist |

## 6.2 INTERDISCIPLINARY TEAM REPORTS

The reports listed below are incorporated by reference into this EA. Acres or figures within these reports may be similar to, but not necessarily identical to, those in this EA. These differences are often due to rounding or inclusion or exclusion of portions of project units. These differences are minor and do not require a new analysis. The figures utilized in this EA are based on the best available information at the time of publishing.

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Exeter, R. 2016. Dunk Tank Botany Report. Marys Peak Field Office, Salem District, Bureau of Land Management. Salem, OR.

Fitting, D. 2015. Dunk Tank Hydrology and Soils Reports. Marys Peak Field Office, Salem District, Bureau of Land Management. Salem, OR.

Greatorex, F. 2016. Dunk Tank Cultural Resources Report. Salem District Office, Bureau of Land Management. Salem, OR.

Hopkins, S. 2016. Dunk Tank Wildlife Biological Evaluation. Marys Peak Field Office, Salem District, Bureau of Land Management. Salem, OR.

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Snedaker, S. 2016. Dunk Tank Fisheries Report. Marys Peak Field Office, Salem District, Bureau of Land Management. Salem, OR.

Wessell, S. 2015. Dunk Tank Silviculture Prescription. Marys Peak Field Office, Salem District, Bureau of Land Management. Salem, OR.

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# APPENDIX A – Glossary of Terms and Acronyms

**ACS** – Aquatic Conservation Strategy.

**Alternative** – Proposed project (plan, option, or choice).

**Anadromous fish** – Fish that are born and reared in freshwater, move to the ocean to grow and mature, and return to freshwater to reproduce.

**Area of Critical and Environmental Concern (ACEC)** – Lands where special management attention is needed to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish, and wildlife resources or other natural systems or processes or to protect life and provide safety from natural hazards..

**Basal area (BA)** – The cross-sectional area of a tree at breast height (4.5 feet) measured in square feet.

**Beneficial use** – In water use law, reasonable use of water for a purpose consistent with the laws and best interest of the people of the state. Such uses include, but are not limited to, the following: instream, out of stream, and ground water uses, domestic, municipal, industrial water supply, mining, irrigation, livestock watering, fish and aquatic life, wildlife, fishing, water contact recreation, aesthetics and scenic attraction, hydropower, and commercial navigation.

**Best Management Practices (BMPs)** – Methods, measures, or practices designed to prevent or reduce water pollution. Usually, BMPs are applied as a system of practices rather than a single practice.

**Biological Opinion (BO)** – The document resulting from formal consultation that states the opinion of the U.S. Fish and Wildlife Service or National Marine Fisheries Service as to whether or not a federal action is likely to jeopardize the continued existence of a listed species or results in destruction or adverse modification of critical habitat.

**BLM** – Bureau of Land Management. Federal agency within the Department of the Interior responsible for the management of 275 million acres.

**Board foot (BF)** – Lumber or timber measurement term. The amount of wood contained in an unfinished board 1 inch thick, 12 inches long, and12 inches wide.

**Bureau Sensitive Species** – Plant or animal species eligible for federal listed, federal candidate, state listed, or state candidate (plant) status, or on list 1 in the Oregon Natural Heritage Data Base, or approved for this category by the BLM State Director. Species included under agency species conservation policies.

**Canopy closure** – The proportion of sky hemisphere obscured by vegetation when viewed by a single point.

**Canopy cover** – Percentage of ground covered by a vertical projection of the tree canopy.

**Coarse Woody Debris (CWD)** – Refers to a tree, or a portion thereof, that has fallen or been cut and left on the ground. Usually refers to pieces at least 20 inches in diameter.

**Consultation** – A formal interaction between the U.S. Fish and Wildlife Service and another federal agency when it is determined that the agency's action may affect a species that has been listed as threatened or endangered or its critical habitat.

**Council on Environmental Quality (CEQ)** – Established by the National Environmental Policy Act of 1969 (NEPA) to guide the implementation of NEPA.

**Crown** – Upper part of a tree or other woody plant that carries the main system of branches and the foliage.

**Cumulative effects** – The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what 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.

**DBH** – Diameter at breast height (4.5 feet).

**Density management** – The cutting of trees for the primary purpose of widening their spacing so that growth of remaining trees can be accelerated. Density management may be designed to improve forest health, to open the forest canopy, or to accelerate the attainment of late-successional forest structural characteristics.

**Endangered species** – Any species of plant or animal defined through the Endangered Species Act as being in danger of extinction throughout all or a significant part of its range, and published in the Federal Register.

**Environmental assessment (EA)** – A systematic analysis of site-specific activities used to determine whether such activities have a significant effect on the quality of the human environment.

**Ephemeral Streams** – Streams that contain running water only sporadically, such as during and following storm events or snow melt.

**Epicormic branching** – Vegetative growth from buds located on the main stem of a tree, usually resulting in fan shaped branching below the live crown of a conifer.

**Essential Fish Habitat (EFH)** – Anywhere Chinook or coho salmon could naturally occur.

**Fifth-field watershed** – Individual watershed within a Hydrologic Unit as defined by the U.S. Geological Survey; it typically averages 87,000 acres in size.

**Fish-bearing stream** – Any stream containing any species of fish for any period of time.

**Fuel Loadin**g – The amount of combustible material present per unit of area, usually expressed in tons per acre (dry weight of burnable fuel).

**Girdle** – Removal of the inner bark from the entire circumference of a tree, which typically results in the death of the tree within three to five years.

**Ground-based yarding** – Utilizing equipment operating on the surface of the ground to move trees or logs to a landing where they can be processed or loaded.

**Harvester/Forwarder Equipment** – Cut-to-length system which uses harvesters to fell, strip the tree of limbs, and cut it into logs, paired with a tracked forwarder with a long reach to gather up the logs and transfer them to a log truck. Many such systems are known for their low pounds per square inch (PSI) impact to the ground.

**Helicopter logging** – Use of helicopters to transport logs from where they are felled to a landing.

**Heterogeneous** – Consisting of dissimilar elements. Implied here to indicate diversity among a forest stand.

**Homogenous** – Uniform throughout in structure or make-up.

**Hypogeous** – Below the surface of the ground.

**Interdisciplinary Team (IDT)** – A group of individuals of various disciplines assembled to solve a problem or perform a task.

**Intermittent Stream** – Any nonpermanent flowing drainage feature having a definable channel and evidence of scour or deposition. Includes ephemeral streams if they meet these two criteria.

**Invasive species** – A non-native species whose introduction does, or is likely to, cause economic or environmental harm or harm to human health.

**Key Watershed** – A land use allocation used in the Northwest Forest Plan. A watershed containing: (1) habitat for potentially threatened species or stocks of anadromous salmonids or other potentially threatened fish, or (2) greater than 6 square miles with high-quality water and fish habitat.

**Landing** – Any designated place where logs are placed after being yarded and awaiting subsequent handling, loading, and hauling.

**Land use allocation** – Uses that are allowed, restricted, or prohibited for a particular area of land, as designated in the Northwest Forest Plan.

**Large woody debris (LWD)** – Woody material found within the bankful width of the stream channel and is specifically of a size 23.6 inches diameter by 33 feet length (per Oregon Department of Fish and Wildlife – Key Pieces).

**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.

**MBF –** Thousand board feet. Timber sale volume estimates are typically expressed in total MBF and MBF per acre.

**Monitoring** – The review on a sample basis, of management practices to determine how well objectives are being met, as well as the effects of those management practices on the land and environment.

**National Marine Fisheries Service (NMFS)** – Federal agency within NOAA which is responsible for the regulation of anadromous fisheries in the United States.

**Non-Native Plant** – Any plant species that historically does not occur in a particular ecosystem.

**Non-Point** – No specific site.

**Noxious Weed** – Plant species designated by federal or state law as generally possessing one or more of the following characteristics: aggressive and difficult to manage, parasitic, a carrier or host of serious insects or diseases, or non-native, new, or not common to the United States.

**ODEQ** – Oregon Department of Environmental Quality.

**Off-Highway Vehicle (OHV)** – Any motorized track or wheeled vehicle designed for cross-country travel over any type of natural terrain.

**Off-highway vehicle designation** – Designation of lands made in a land use plan for use of off-highway vehicles:

- Open: All types of vehicle use is permitted at all times, anywhere in the area subject to certain operating regulations and vehicle standards.
- Limited: Restricted at certain times, in certain areas, and/or to certain vehicular use.
- Closed: Off-road vehicle use is prohibited.

**ORGANON** – A computer-based program used to model projected tree growth, stand density, and crown ratio using existing stand tree species and size.

**Peak flow** – The highest amount of stream or river flow occurring in a year, or from a single storm event.

**Perennial Stream** – A stream that typically has running water on a year-round basis.

**Riparian area** – A geographic area containing an aquatic ecosystem and adjacent upland areas that directly affect it.

**Road Decommissioning** – Road is closed to vehicular traffic. Road is waterbarred to reestablish hillslope drainage patterns. May include removal of culverts, ripping, and seeding of roadbed.

**Road Improvement** – Improvement includes work to be done that will improve a road to a higher standard than its original design. Improvement can include adding an aggregate surface to a natural surfaced road. It can include adding a drainage system of ditches, cross-drains, or drain dips to an outsloped road surface. It can also include re-alignments or repairs of road failures that improve a road to a better state than its original design.

**Road Reconstruction** – Retired terminology, now categorized by the terms Renovation and Improvement. Previously, Reconstruction described restoring a damaged or deteriorated road to a usable condition, and possibly to a higher standard than the original design. It could have included re-alignment, repairing a slide or fill failure, and/or structure improvements or replacements. It generally involved a higher degree of disturbance than Improvement or Renovation work. Roads were generally not drivable prior to Reconstruction.

**Road Renovation** – Renovation includes work to be done that will bring a road back to its original design standard. Renovation covers a large array of low to high disturbance activities performed on existing roads. It may include blading and shaping, cutting brush from slopes, ditches and shoulders, cleaning out ditches and catch basins, cleaning out or replacing culverts, replacing aggregate surfacing, and compaction of sub-grade and/or surfacing material.

**Road Storage –** Roads closed to all vehicles on a long-term basis using an earthen or similar barrier. Roads may be used again in the future. Prior to closure, the road is prepared to avoid future maintenance needs. That is, the road is left in an erosion resistant condition by establishing cross drains and removing fills in stream channels and potentially unstable areas. Exposed soils are treated to reduce sedimentation.

**Rural Interface** – BLM-managed lands within ½ mile of private lands zone for 1 to 20 acre lots. Areas zone for 40 acres and larger with homes adjacent to or near BLM-managed lands.

**Seral stages** – The series of relatively transitory plan communities that develop during ecological succession from bare ground to the climax stage.

**Silvicultural practices (or treatments or system)** – The set of field techniques and general methods used to modify and manage a forest stand over time to meet desired conditions and objectives.

**Silvicultural prescription** – A plan for controlling the establishment, composition, constitution, and growth of forests.

**Site class** – A forest management term denoting site productivity and measured in productivity classes (example: Site Class I – highest productivity).

**Skid trails** – Path through a stand of trees on which ground-based equipment operates.

**Skyline cable system (yarding)** – Harvesting timber using a machine that reaches out a long distance to lift logs off the ground (wholly or partially) and move them via a cable to a landing where they are hauled away.

**Snag** – Any standing dead, partially dead, or defective (cull) tree at least 10 inches diameter at breast height and at least 6 feet tall. A hard snag is composed primarily of sound wood, generally merchantable. A soft snag is composed primarily of wood in advanced stages of decay and deterioration, generally not merchantable.

**Soil compaction** – An increase in bulk density (weight per unit volume) and a decrease in soil porosity (particularly macropores) resulting from applied loads, vibration, or pressure.

**Soil productivity** – Capacity or suitability of a soil, for establishment and growth of a specified crop or place species.

**Special status species** – Plan or animal species in any of the following categories:

- Threatened or endangered species
- Proposed threatened or endangered species
- Candidate species
- State-listed species
- Bureau sensitive species

**Stand –** A contiguous group of trees sufficiently uniform in age-class distribution, composition, and structure, and growing on a site of sufficiently uniform quality to be a distinguishable unit.

**Stream protection zone (SPZ)** – A buffer along streams and identified wet areas where no material would be removed and heavy machinery would not be allowed. The SPZ is measured to the slope break, change in vegetation, or 50 feet from the channel edge, whatever is greatest.

**Succession** – Stages a forest stand makes over time as vegetation competes and natural disturbances occur. The different stages in succession are often referred to as seral stages.

**TES** –Threatened, Endangered, Sensitive.

**Topped** – Completely severing the upper portion of a standing live tree. The typical purpose for this action is to enhance wildlife habitat by creating snags from standing live trees.

**Visual Resource Management (VRM)** – The inventory and planning action to identify values and establish objectives for managing those values and the management actions to achieve those objectives.

**VRM classes** – Categories assigned to public lands based on scenic quality, sensitivity level, and distance zones. There are four classes. Each class has an objective that prescribes the amount of change allowed in the characteristic landscape.

**Waterbars** – A ridge of compacted soil or loose rock or gravel constructed across disturbed rights-of-way and similar sloping areas.

**Watershed** – The drainage basin contributing water, organic matter, dissolved nutrients, and sediments to an identified outlet location, usually a stream or lake.

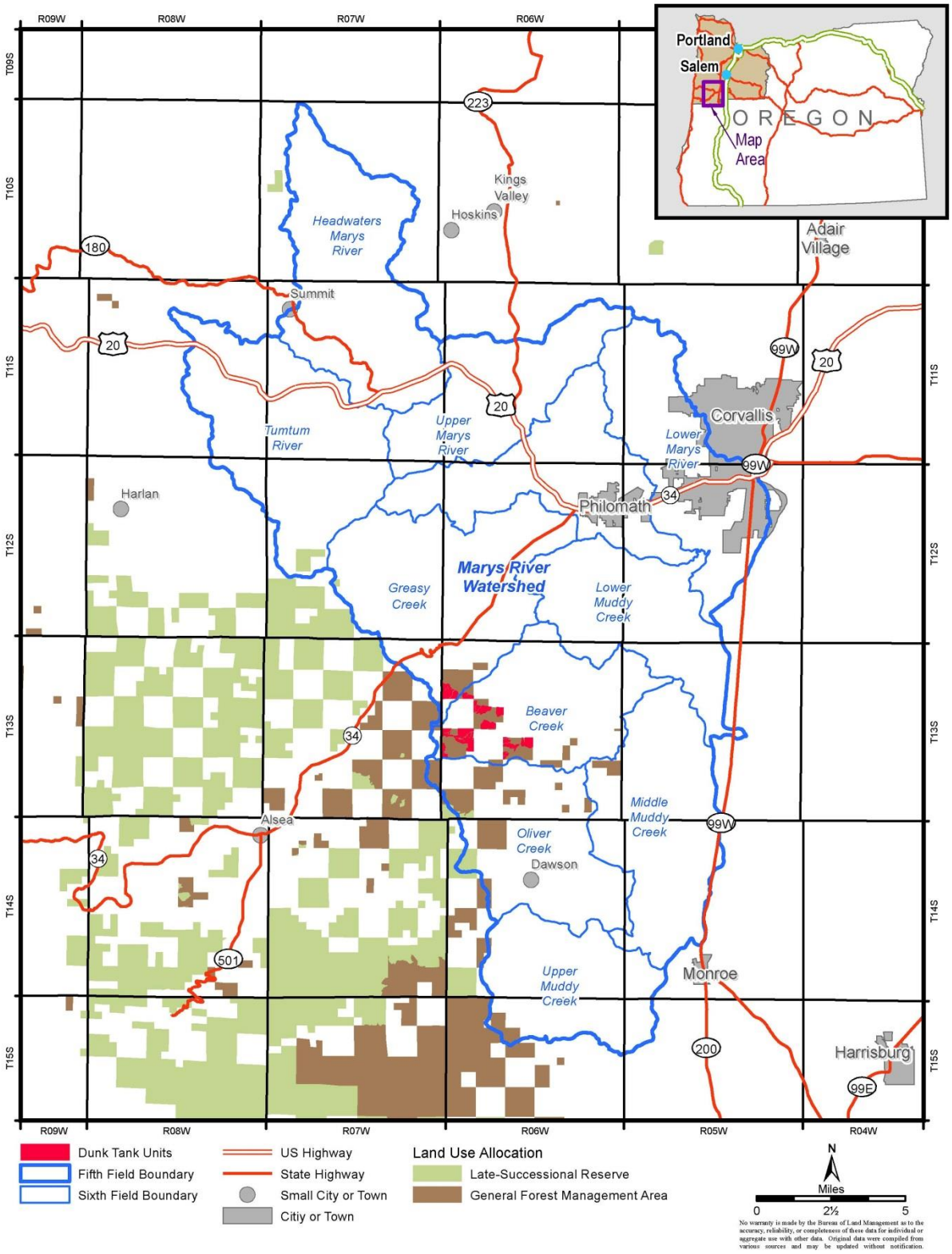
**Weed** – A plant considered undesirable and that interferes with management objectives for a given area at a given point in time.

**Windthrow** – Trees uprooted or blown over by natural events.

**Wolf tree** – A live conifer tree which likely developed in an open stand, usually in full sunlight and larger in diameter and older than the stand average. These trees often have multiple tops or upper stems and larger diameter branches often extending downward to over three-quarters the height of the tree or otherwise described as having a complex live-crown structure.

**Yarding Corridors** – Corridors cut through a stand of trees to facilitate skyline yarding. Cables are strung in these corridors to transport logs from the woods to the landing.

# APPENDIX B – Watersheds in the Project Area



# APPENDIX C – Marking Guide for the Dunk Tank Timber Sales

| EA Unit Number | Stand Exam Unit | Total Acres[1] | Post-Treatment Target Basal Area (Ft.$^2$/Acre)[2] | Comments |
|---|---|---|---|---|
| 7-1 | M709 | 85 | 140 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 7-2 | M1501 | 43 | 130 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 7-3 | M1502 | 35 | 130 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 17-1 | M710 | 24 | 140 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 17-2 | M1504 | 6 | 130 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 17-3 | M712 | 20 | 140 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 17-4 | M712 | 38 | 140 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 17-5 | M713 | 36 | 150 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 17-6 | M711 | 36 | 150 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 17-7 | M1503 | 9 | 180 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 17-8 | M711 | 23 | 150 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 17-9 | M1506 | 4 | 160 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 19-1 | M1418 | 42 | 140 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 19-2 | M717 | 35 | 150 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 19-3 | M718 | 61 | 160 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 19-4 | M1508 | 4 | 150 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 19-5 | M716 | 132 | 150 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 21-1 | M714 | 12 | 150 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 21-2 | M714 | 28 | 150 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 21-3 | M1507 | 44 | 130 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 21-4 | M715 | 23 | 150 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 21-5 | M1505 | 23 | 130 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |
| 21-6 | M1509 | 17 | 130 | Species preference for removal: Douglas-fir then western hemlock. Retain minor species. |

## Boundaries

Unit boundaries will be marked by orange paint and Boundary Timber Reserve posters. Boundary between riparian and upland, and skyline and ground-based harvest systems will be flagged in orange prior to marking.

## Commercial Thinning and Density Management

Thin from below leaving healthy dominant and co-dominant trees with the largest crowns.

- Conifer leave trees will be marked using orange paint. Only Douglas-fir and western hemlock will be thinned. All grand fir, western hemlock and western red cedar will be marked to leave and count toward BA targets. Hardwood trees of all species are reserved and do not count toward BA target.
- Leave all snags. In addition, protect snags that are ≥15" dbh and ≥30' height by leaving surrounding closest adjacent trees.
- Leave trees less than seven (7) inches DBH (do not mark). Where significant stocking of under-story conifers occurs, retain overstory BA at lower end of prescribed range.
- In skyline harvest area and riparian reserves (density management), retain fewer trees where the trees are more widely spaced, and retain more trees where the trees are more closely spaced in order to maintain existing variability.
- Retain "unique" trees –leave trees >18 inches DBH that are full-crowned, large-limbed, "wolf" trees, broken-top, forked, deep crowns, evidence of wildlife use, and contain cavities or visible nests.
- Matrix: In areas infected with *Phellinus weirii*, symptomatic trees and all Douglas-fir trees (the most susceptible species) will be removed within 50 feet of dead or symptomatic trees. If openings greater than approximately 0.5-acre are created, the need for planting will be evaluated. If planting is determined to be needed, seedlings of non-susceptible or immune species will be planted.
- Any tree found to have a stick or ball nest, regardless of size (tree or nest) will be protected, unless it is a safety hazard.
- All live trees with damage (hollow, cavities, dead or broken tops, etc.) will be reserved.
- Additional trees will be cut around the largest diameter trees with the fullest live crowns to maintain their open-grown, wolf- tree structure.
- Existing snags and CWD will be reserved, except where they pose a safety risk or affect access and operability. Any snags or logs felled, or CWD moved for these purposes will remain on site within the project areas. Additional trees will be reserved around snags greater than 15 inches DBHOB and 30 feet in height to protect them from logging operations and to reduce the necessity of falling them for safety reasons.

## Select Trees to Retain Using the Following Guidelines:

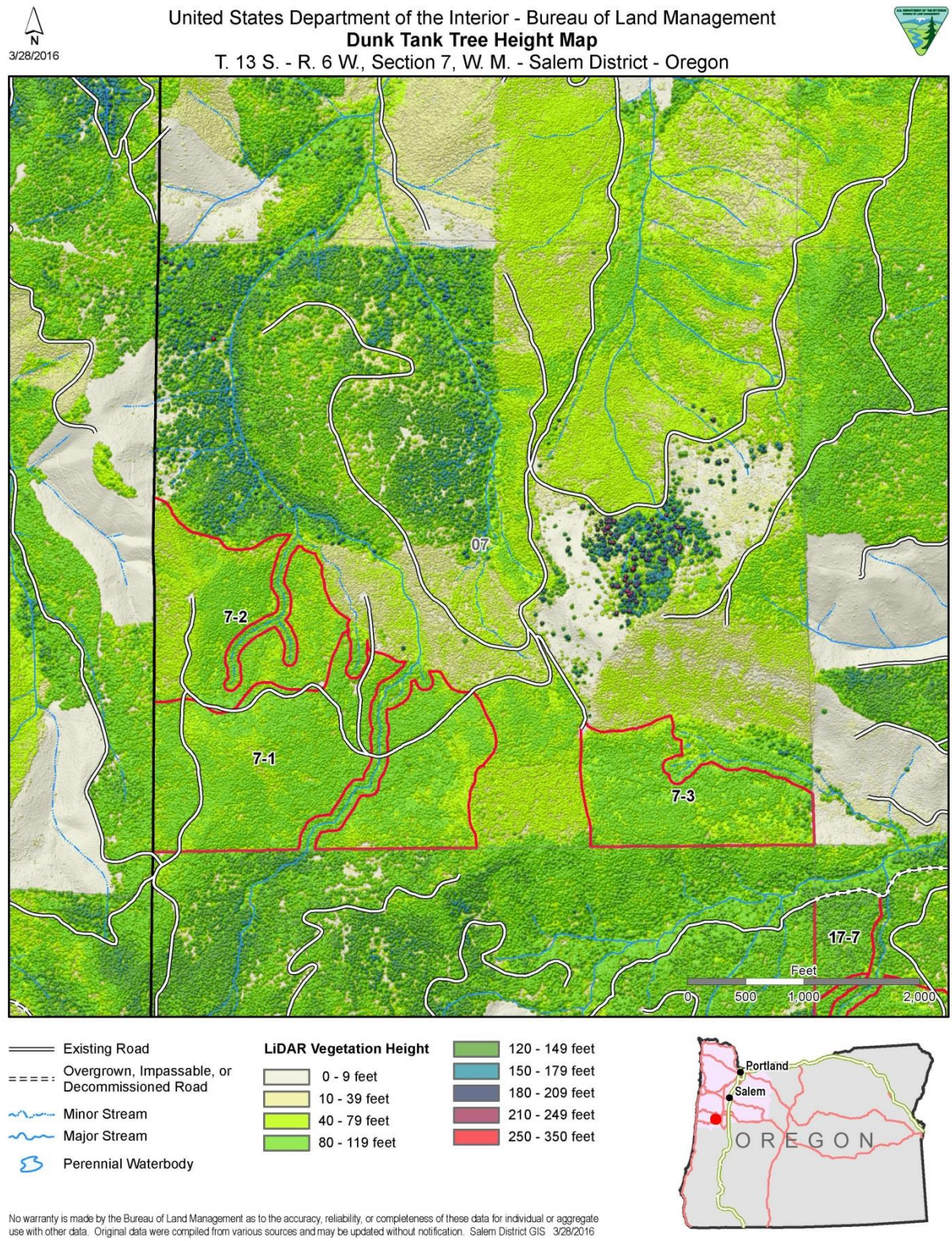
- Not located immediately adjacent to roads, landing locations and areas vulnerable to prescribed burning (upper steep slopes, head of draws).
- Located near downed log concentrations or large snags (leaving surrounding closest adjacent trees to the snag).
- Select trees of largest diameter that have wide crowns and large branches.

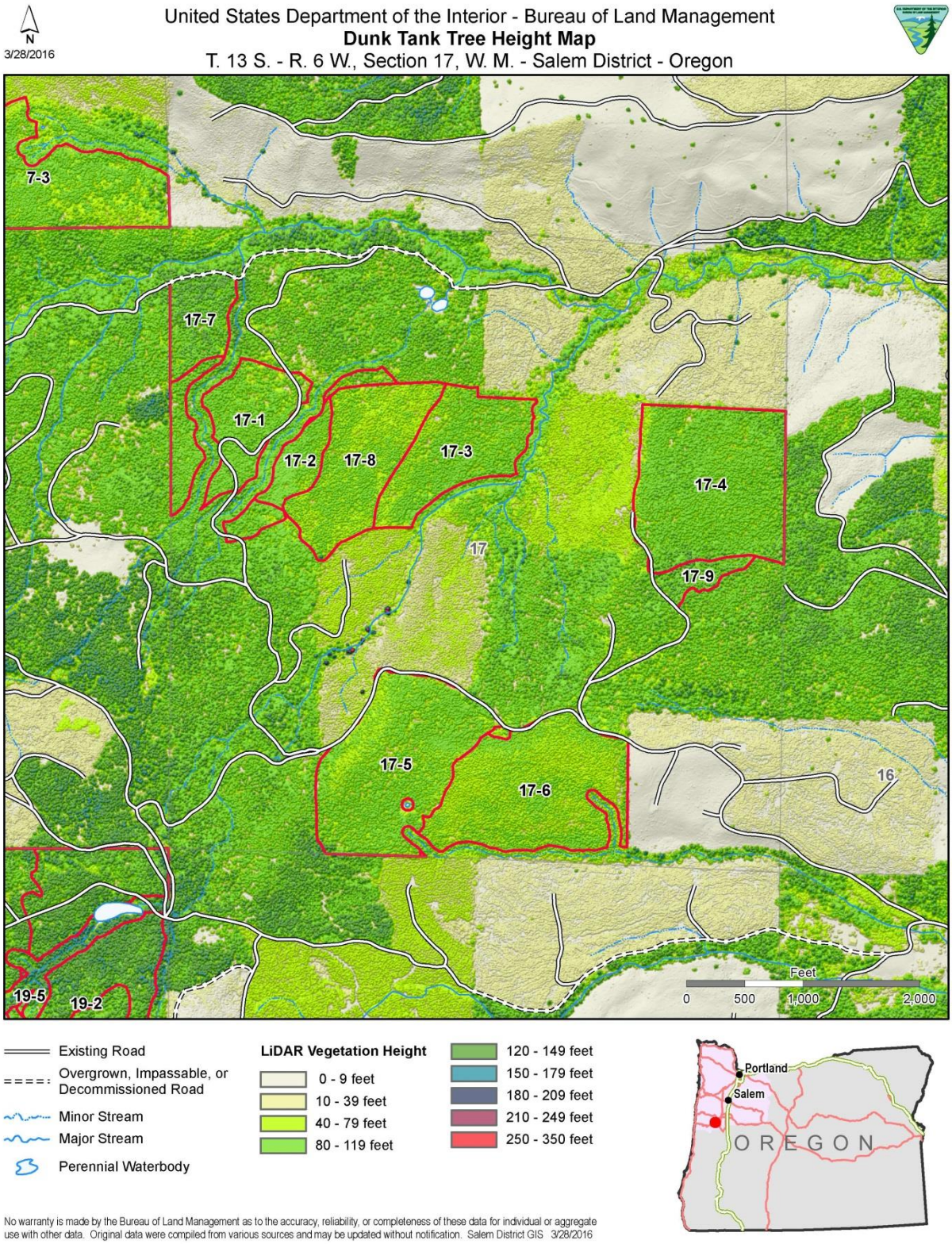
- Mark leave trees with butt marks using orange paint.
- Any plus trees (trees selected for genetic traits) and their reference trees, and bearing trees would be reserved from harvest (Plus Tree #DFB1302007 located in NE corner of Dunk Tank unit 19-2; Plus Tree #DFB1302006 located in northern portion of Dunk Tank unit 19-3; Plus Tree #DFB1301301 located in SW portion of Dunk Tank unit 21-4).

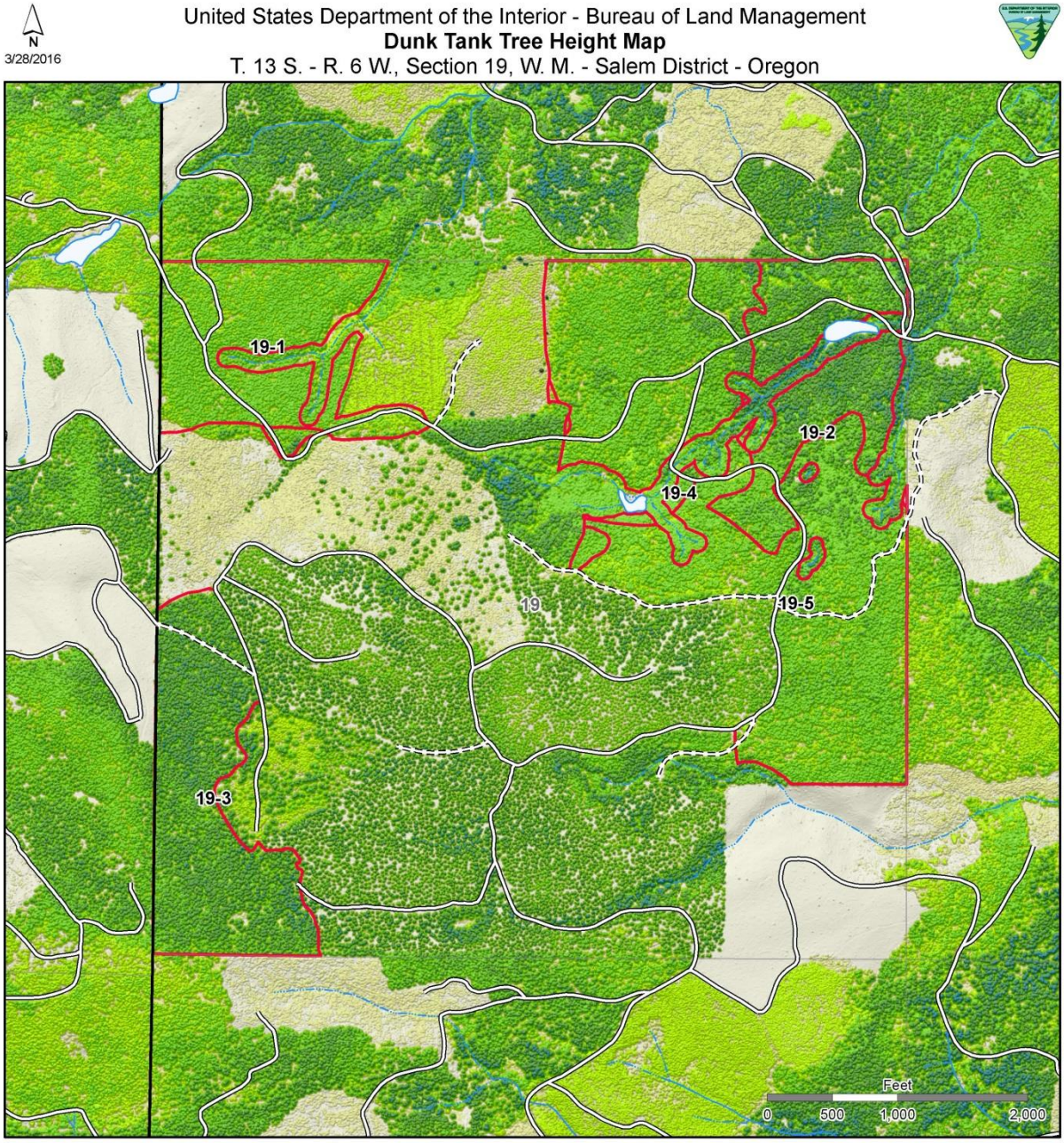
**Select Trees to Remove Using the Following Guidelines:**

- Tree species to be removed include Douglas-fir and western hemlock.
  All Douglas-fir trees will be removed in areas affected by *Phellinus weirii* (laminated root rot).

# APPENDIX D – LiDAR-Derived Vegetation Heights




N
3/28/2016
United States Department of the Interior - Bureau of Land Management
Dunk Tank Tree Height Map
T. 13 S. - R. 6 W., Section 17, W. M. - Salem District - Oregon
7-3
17-7
17-1
17-2
17-8
17-3
17-4
17
17-9
17-5
17-6
16
19-5
19-2
Feet
0
500
1,000
2,000
Existing Road
Overgrown, Impassable, or Decommissioned Road
Minor Stream
Major Stream
Perennial Waterbody
LiDAR Vegetation Height
0 - 9 feet
10 - 39 feet
40 - 79 feet
80 - 119 feet
120 - 149 feet
150 - 179 feet
180 - 209 feet
210 - 249 feet
250 - 350 feet
Portland
Salem
OREGON
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources and may be updated without notification. Salem District GIS 3/28/2016




Existing Road

Overgrown, Impassable, or Decommissioned Road

Minor Stream

Major Stream

Perennial Waterbody

**LiDAR Vegetation Height**

- 0 - 9 feet
- 10 - 39 feet
- 40 - 79 feet
- 80 - 119 feet
- 120 - 149 feet
- 150 - 179 feet
- 180 - 209 feet
- 210 - 249 feet

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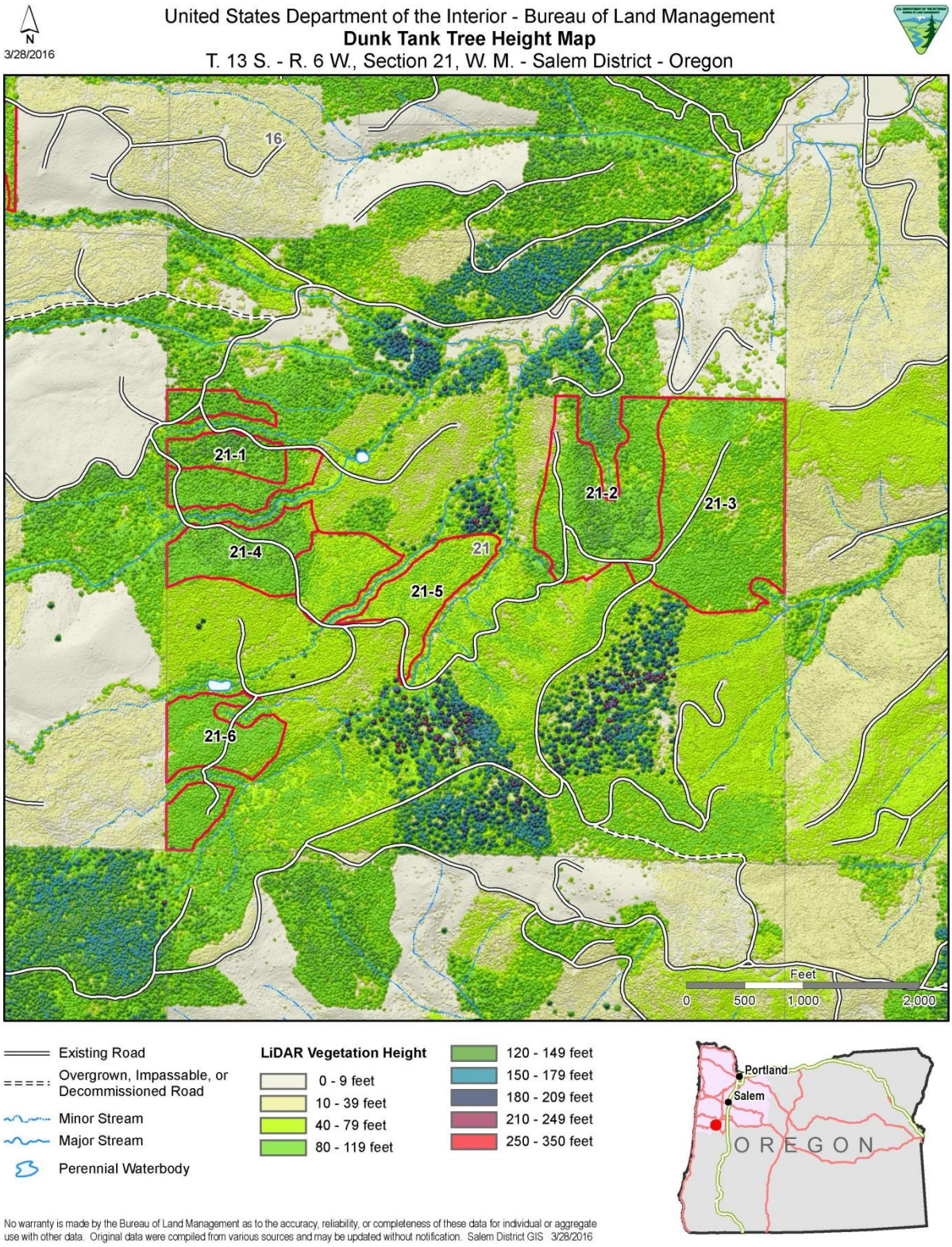
N
3/28/2016
United States Department of the Interior - Bureau of Land Management
Dunk Tank Tree Height Map
T. 13 S. - R. 6 W., Section 21, W. M. - Salem District - Oregon
16
21-1
21-2
21-3
21-4
21
21-5
21-6
Feet
0
500
1,000
2,000
Existing Road
Overgrown, Impassable, or Decommissioned Road
Minor Stream
Major Stream
Perennial Waterbody
LiDAR Vegetation Height
0 - 9 feet
10 - 39 feet
40 - 79 feet
80 - 119 feet
120 - 149 feet
150 - 179 feet
180 - 209 feet
210 - 249 feet
250 - 350 feet
Portland
Salem
OREGON
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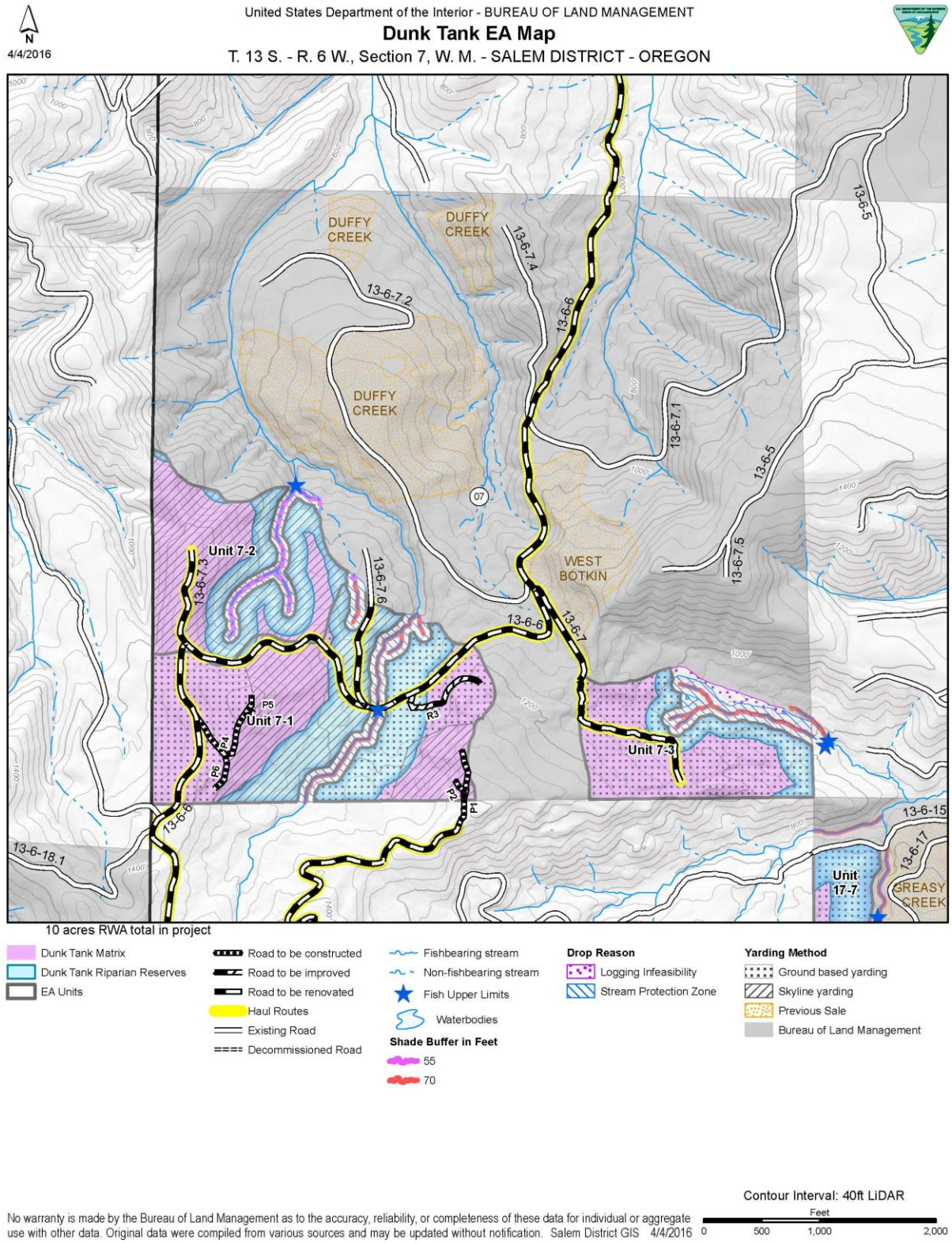
# APPENDIX E – Land Use Allocations in the Project Area



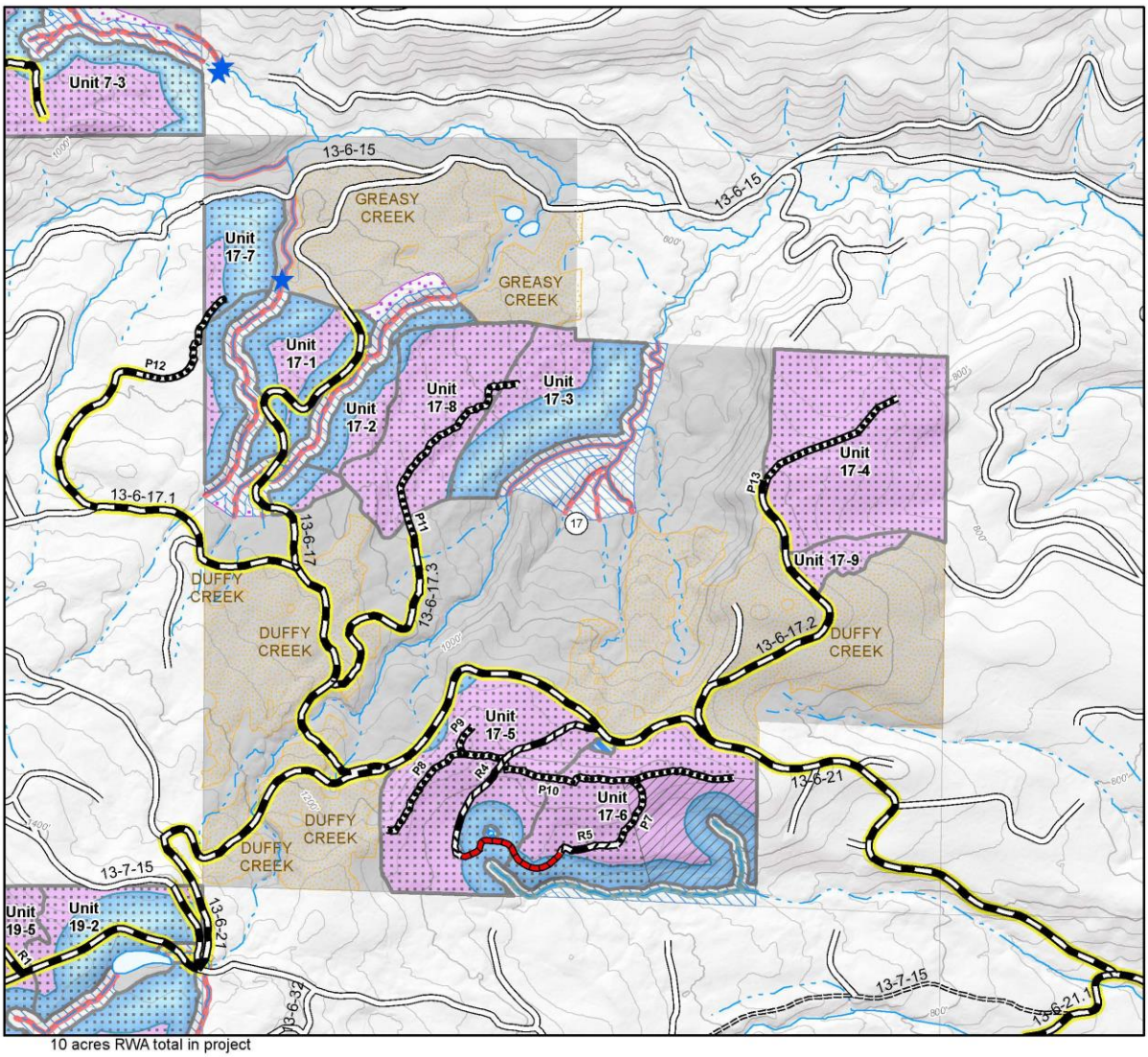
United States Department of the Interior - BUREAU OF LAND MANAGEMENT

**Dunk Tank EA Map**

T. 13 S. - R. 6 W., Section 17, W. M. - SALEM DISTRICT - OREGON

N

4/4/2016




10 acres RWA total in project

- Dunk Tank Matrix
- Dunk Tank Riparian Reserves
- EA Units
- Road to be constructed
- Road to be improved
- Road to be renovated
- Road to be decommissioned
- Haul Routes
- Existing Road
- Decommissioned Road
- Fishbearing stream
- Non-fishbearing stream
- Fish Upper Limits
- Waterbodies

**Shade Buffer in Feet**

- 50
- 70

**Drop Reason**

- Logging Infeasibility
- Stream Protection Zone
- Wet

**Yarding Method**

- Ground based yarding
- Skyline yarding
- Previous Sale
- Bureau of Land Management

Contour Interval: 40ft LiDAR

Feet 0 500 1,000 2,000

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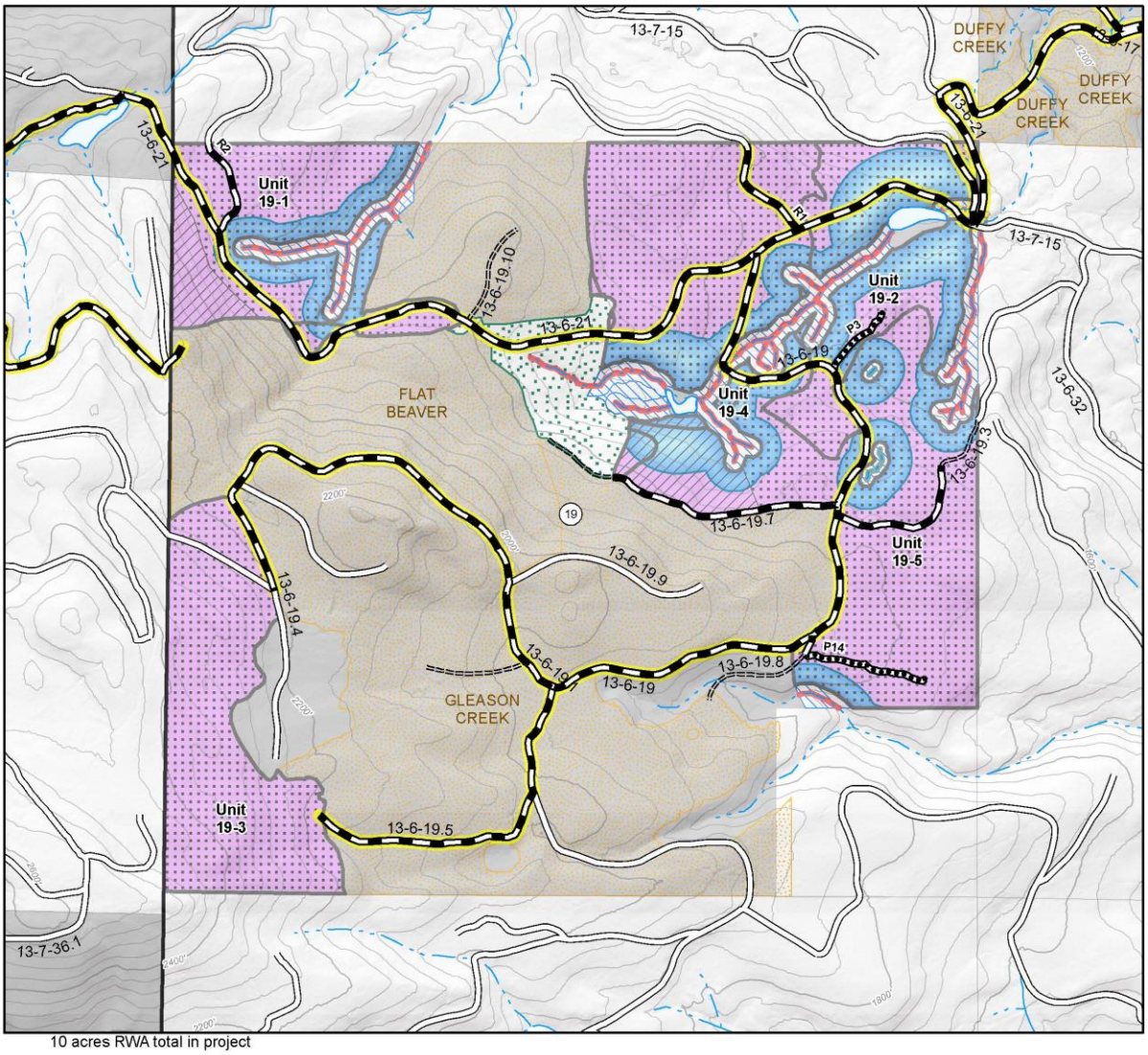
United States Department of the Interior - BUREAU OF LAND MANAGEMENT

**Dunk Tank EA Map**

T. 13 S. - R. 6 W., Section 19, W. M. - SALEM DISTRICT - OREGON

N

4/4/2016




10 acres RWA total in project

- Dunk Tank Matrix
- Dunk Tank Riparian Reserves
- EA Units
- Road to be constructed
- Road to be renovated
- Haul Routes
- Existing Road
- Decommissioned Road
- Fishbearing stream
- Non-fishbearing stream
- Waterbodies

**Shade Buffer in Feet**

- 50
- 70

**Drop Reason**

- Red Tree Vole
- Stream Protection Zone

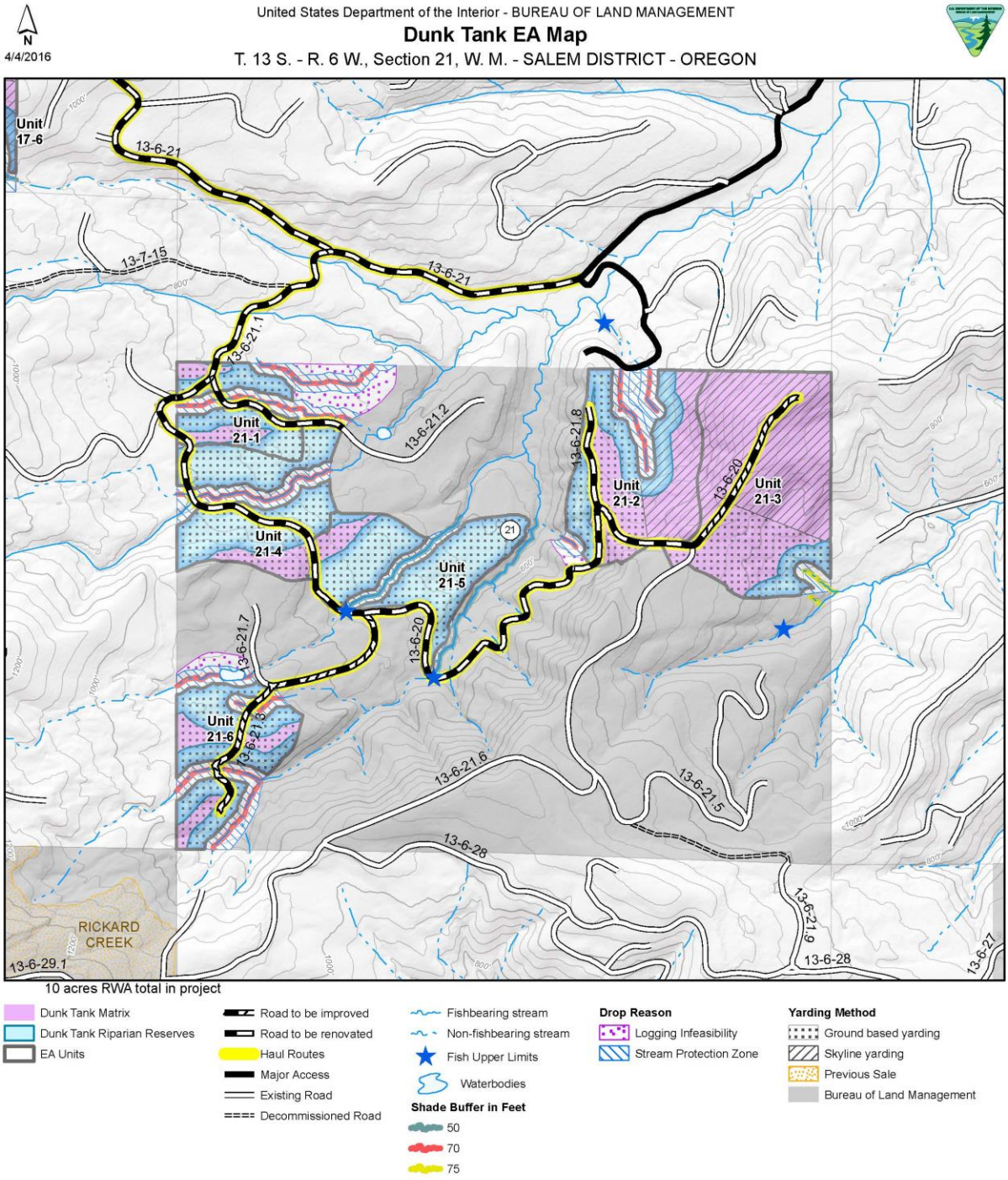
**Yarding Method**

- Ground based yarding
- Skyline yarding
- Previous Sale
- Bureau of Land Management

Contour Interval: 40ft LiDAR

Feet 0 500 1,000 2,000

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources and may be updated without notification. Salem District GIS 4/4/2016


N
4/4/2016
United States Department of the Interior - BUREAU OF LAND MANAGEMENT
Dunk Tank EA Map
T. 13 S. - R. 6 W., Section 21, W. M. - SALEM DISTRICT - OREGON
Unit 17-6
13-6-21
13-7-15
13-6-21
13-6-21.1
Unit 21-1
13-6-21.2
13-6-21.8
Unit 21-2
13-6-20
Unit 21-3
Unit 21-4
21
Unit 21-5
13-6-20
13-6-21.7
Unit 21-6
13-6-21.8
13-6-21.6
13-6-21.5
13-6-28
13-6-21.9
13-6-28
13-6-27
RICKARD CREEK
13-6-29.1
10 acres RWA total in project
Dunk Tank Matrix
Dunk Tank Riparian Reserves
EA Units
Road to be improved
Road to be renovated
Haul Routes
Major Access
Existing Road
Decommissioned Road
Fishbearing stream
Non-fishbearing stream
Fish Upper Limits
Waterbodies
Shade Buffer in Feet
50
70
75
Drop Reason
Logging Infeasibility
Stream Protection Zone
Yarding Method
Ground based yarding
Skyline yarding
Previous Sale
Bureau of Land Management
Contour Interval: 40ft LiDAR
Feet
0
500
1,000
2,000
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources and may be updated without notification. Salem District GIS 4/4/2016

# APPENDIX F – Water Quality Management Plan

## Introduction

Water Quality Management on BLM-administered lands that are covered under the Dunk Tank Timber Sales EA is based on the site specific application of Best Management Practices (BMPs) and disclosed as Project Design Features (PDF).

## Best Management Practices

Best Management Practices are required by the federal Clean Water Act as amended to mitigate the potential for non-point source pollution. Non-point source pollution is pollutants detected in concentrated water (e.g. stream or lake) from a wide range of forest management activities on federal lands administered by the BLM. BMPs are considered the primary methods for achieving Oregon's water quality standards.

The overall goal is not to strictly adhere to the wording of the BMP, but rather to implement the intent of the prescribed BMP. That is to protect, promote, and enhance water quality in order to meet federal and state water quality objectives. In that matter, BMPs are site specific and the implementation of the BMP is tailored to the "on the ground" conditions. The following BMPs are site specific application to forest management activities undertaken by the Dunk Tank timber sales on the Marys Peak Field Office.

| BMP No. | Roads |
|---|---|
| R001 | Locate temporary and permanent roads and landings on stable locations, e.g., ridge tops, stable benches or flats, and gentle-to-moderate side slopes. Minimize construction on steep slopes, slide areas and high landslide hazard locations. |
| R002 | Locate temporary and permanent road construction or improvement to minimize the number of stream crossings. |
| R003 | Avoid locating roads and landings in wetlands, riparian management areas, floodplains and waters of the state. Avoid locating landings in areas that can contribute to dry draws and swales. |
| R006 | Design road cut and fill slopes with stable angles, to minimize erosion and prevent slope failure. |
| R011 | Design culverts, bridges, and other stream crossings for the 100-year flood event including allowance for bed load and anticipated floatable debris. |
| R023 | Effectively drain the road surface by using crowning, insloping or outsloping , grade reversals (rolling dips) and waterbars or a combination of these methods. Avoid concentrated discharge onto fill slopes unless the fill slopes are stable and erosion proofed. |
| R024 | Outslope temporary and permanent low volume roads to provide surface drainage on road gradients up to 6% unless there is a traffic hazard from the road shape. |
| R025 | Consider using broadbased drainage dips and/or lead off ditches in lieu of cross drains for low volume roads. Locate these surface water drainage measures where they won't drain into wetlands, floodplains and waters of the state. |

| | |
|---|---|
| R026 | Avoid use of outside road berms unless designed to protect road fills. If road berms are used, breach to accommodate drainage where fill slopes are stable. |
| R028 | Divert road and landing runoff water away from headwalls, slide areas, high landslide hazard locations or steep erodible fill slopes. |
| R029 | Design landings to disperse surface water to vegetated stable areas. |
| R034 | Choose cross drain culvert diameter and type according to predicted ditch flow, debris and bedload passage expected from the ditch. Minimum diameter is 18 inches. |
| R037 | Discharge cross drain culverts at ground level on non- erodible material. Install downspout structures and/or energy dissipaters at cross drain outlets or drivable dips where water is discharged onto loose material, erodible soils, fills, or steep slopes. |
| R038 | Cut protruding "shotgun" culverts at the fill surfaceor existing ground. Install downspout and/or energy dissipaters to prevent erosion. |
| R039 | Skew cross drain culverts 45 to 60 degrees from theditchline as referenced in BLM Road Design Handbook 9113-1 and provide pipe gradient slightly greater than ditch gradient to reduce erosion at cross drain inlet. |
| R040 | Use slotted risers, over-sized culverts or build catch basins where floatable debris or sediments may plug cross drain culverts. |
| R041 | Locate waste disposal areas outside wetlands, riparian management areas, floodplains and unstable areas to minimize risk of sediment delivery to waters of the state. Apply surface erosion control prior to the wet season. Prevent overloading areas which may become unstable. |
| R044 | Provide for unobstructed flow at culvert inlets and within ditch lines during and upon completion of road construction prior to the wet season. |
| R046 | Conduct all nonemergency in-water work during the ODFW instream work window. |
| R047 | Utilize stream diversion and isolation techniques when installing stream crossings. Evaluate the physical characteristics of the site, volume of water flowing through the project area and the risk of erosion and sedimentation when selecting the proper techniques. |
| R048 | Limit activities and access points of mechanized equipment to streambank areas or temporary platforms when installing or removing structures. Keep equipment activity in the stream channel to an absolute minimum. |
| R060 | Limit activities and access points of mechanized equipment to streambank areas or temporary platforms when installing or removing structures. Keep equipment activity in the stream channel to an absolute minimum. |
| R073 | Remove and dispose of slide material when it is obstructing road surface and ditchline drainage. Place material on stable ground outside of wetlands, riparian management areas, floodplains and waters of the state. |
| R074 | Do not sidecast loose ditch or surface material where it can enter wetlands, riparian management areas, floodplains and waters of the state. |
| R075 | Inspect and maintain culvert inlets and outlets, drainage structures and ditches before and during the wet season to diminish the likelihood of plugged culverts and the possibility of washouts. |

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| R077 | Blade and shape roads to conserve existing aggregate surface material, retain or restore the original cross section, remove berms and other irregularities that impede effective runoff or cause erosion, and ensure that surface runoff is directed into vegetated, stable areas. |
| R079 | Retain low-growing vegetation on cut-and-fill slopes. |
| R096 | Suspend commercial use where the road surface is deeply rutted or covered by a layer of mud or when runoff from the road surface is causing a visible increase in stream turbidity in the receiving stream. |
| R098 | Do not allow wet season haul on natural surface roads or high sediment producing surfaced roads without praticable and effective mitigation. |
| **BMP No.** | **Timber Harvest** |
| TH2 | Design yarding corridors so as to limit canopy loss in riparian management areas and to meet shade targets. Techniques include limiting the number of such corridors, using narrow widths, and using a perpendicular orientation to the stream. |
| TH5 | Where slopes exceed 60 percent along stream channels, yard with full suspension, or one-end suspension using seasonal restrictions. Yard remaining areas using one-end suspension. |
| TH6 | Implement erosion control measures such as waterbars, slash placement and seeding in cable yarding corridors where the potential for erosion and delivery to waterbodies, floodplains and wetlands exists. |
| TH7 | Exclude equipment from riparian management area retention areas 60 feet from the edge of the active stream channel for fishbearing and perennial streams, lakes and ponds, and 35 feet for intermittent streams, except for road crossings, restoration, wildfire, or similar operational reasons |
| TH9 | Limit width of skid trails, to be less than 12 percent of the harvest area. |
| TH10 | Limit width of skid roads to what is operationally necessary for the equipment. |
| TH11 | Ensure one-end suspension of logs; e.g. integral arch on all conventional ground-based yarding equipment. |
| TH12 | Restrict ground-based harvest and skidding operations to periods of low soil moisture when soils have resistance to compaction and displacement. |
| TH14 | Limit conventional ground-based equipment to slopes less than 35 percent. |
| TH15 | When specialized ground-based mechanized equipment is used on slopes greater than 35%, monitor use, and restrict where water and sediment could channel overland. |
| TH18 | Apply erosion control practices to skid roads and other disturbed areas with potential for erosion and subsequent sediment delivery to waterbodies, floodplains, or wetlands. These practices could include seeding, mulching, water barring, tillage, and woody debris placement. Use guidelines from the road decommissioning section. |
| TH19 | Construct waterbars on skid trails using guidelines in Table I-21. |
| TH21 | Block skid roads that intersect haul roads at the end of seasonal use. |
| **BMP No.** | **Mechanical and Manual Fuel Treatments** |

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| F6 | Avoid mechanical piling in areas that could deliver sediment to waterbodies, floodplains, and wetlands. |
| F7 | No mechanical fuel reduction equipment within 100’ of streams, unless prescribed for restoration. Limit mechanical fuel reduction equipment to slopes less than 35 percent. Restrict non- track mechanized equipment to slopes less than 20 percent. |
| F10 | Maintain and refuel equipment (e.g., drip torches, chainsaws, and a minimum of 100 feet from waterbodies, floodplains, and wetlands. Portable pumps can be refueled on-site within a spill containment system. |
| **BMP No.** | **Silvicultural Activities** |
| S9 | Within Riparian Reserve Areas, design size, shape and placement of restoration areas to maintain as much effective shade as possible. |
| S10 | Within riparian management areas, limit mechanical ground-based equipment to slopes less than 35% and beyond 35 feet from the edge of the active stream channel. |
| **BMP No.** | **Surface Source Water for Drinking Water** |
| SW8 | Avoid loading, or storing chemical, fuel, or fertilizer in sensitive zones in surface source watersheds. |
| SW9 | Conduct equipment maintenance outside site-specific sensitive zones in surface source watersheds. |
| **BMP No.** | **Spill Prevention and Abatement** |
| SP1 | Inspect and clean equipment before it reaches the site. Refuel all equipment a minimum of 100 feet away from streams. Immediately remove waste or spilled materials and contaminated soils near any stream or waterbody in accordance with the applicable regulatory standard. Notify Oregon Emergency Response System of any spill over the material reportable quantities within 24 hours. |