



File Code: 1950

Date: June 20, 2006

Dear Interested Citizens:

The Cowlitz Valley Ranger District proposes to commercially thin and harvest approximately 4.2 million board feet of timber from approximately 212 acres of the Cispus Valley Adaptive Management Area, and Upper Cowlitz River Watershed. The project is located approximately 6 miles south of Packwood in Sections 15, 21, 22, 27 and 28, T 12 N, R 9 E, Willamette Meridian, Lewis County, Washington. This notice announces the availability of this EA for a 30-day comment period. Copies may be downloaded from the Gifford Pinchot National Forest website: <http://www.fs.fed.us/gpnf/04projects/pinchotprojects/>. The EA is also available on compact disk as well as a very limited number of printed copies. These alternate formats are available upon request at the address listed below.

Comments to the EA will be considered by the Responsible Official when making the decision whether to implement the proposed action or one of the alternative actions, whether to defer action, or whether there will be significant impacts, which would require the development of an environmental impact statement. Written comments are accepted by mail:

The Dry Burton Thin Team Leader
USFS, Cowlitz Valley Ranger Station
PO Box 670
Randle, WA 98377

Comments will also be accepted electronically in a format such as an email message, plain text (.txt), rich text format (.rtf), or Word (.doc) to the following email address: comments-pacificnorthwest-giffordpinchot-cowlitzvalley@fs.fed.us. Individuals and organizations wishing to comment must provide the following: 1) name and address, 2) title of the proposed action, and 3) specific substantive comments on the proposed action, along with supporting reasons that the Responsible Official should consider in reaching a decision. For further information, please contact Karen Thompson, North Zone Planning Team Leader by phone (360) 497-1136, or by email: karenmthompson@fs.fed.us. The comment period ends July 21, 2006.

Thank you for your interest in the Gifford Pinchot National Forest.

Sincerely,

/s/ Karen M. Thompson (for):
KRISTIE L. MILLER
Cowlitz Valley District Ranger





United States
Department of
Agriculture

Forest
Service

June 2006



Environmental Assessment

Dry Burton Thin

**Cowlitz Valley Ranger District
Gifford Pinchot National Forest
Lewis County, Washington**

T 12 N, R 9 E Sections 15, 21, 22, 27, and 28; Willamette Meridian

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1.0 SUMMARY

The Cowlitz Valley Ranger District of the Gifford Pinchot National Forest is proposing for sale during fiscal year 2006 the Dry Burton Thin Timber Sale, which is located approximately 6 miles south of Packwood in T 12 N, R 9 E, Sections 15, 21, 22, 27 and 28, Willamete Meridian, Skamania County, Washington. The Dry Burton Thin is located within Cispus Adaptive Management Area (AMA).

The purpose of this project is to

1. Thin and harvest wood fiber from approximately 212 of a total 253 acres,
2. Thin and harvest a portion of 82 acres of riparian reserves,
3. Enhance growth and vigor of managed stands,
4. Enhance, restore and protect Riparian Reserves,
5. Retain key structural elements of late-successional forests within managed stands.

The action is needed (a) to meet Forest timber targets assigned through the Forest budgeting process and (b) to treat densely stocked managed stands to enhance vigor and growth.

The Forest Service evaluated the no-action alternative and action alternatives, which vary by logging method and riparian width treatment. The proposed action harvests thinned trees using helicopter yarding methods, and attempts to retain and restore structural elements that characterized late-successional and riparian forests. It reduces the amount of soil disturbance that would occur with ground-based logging systems, with the goal of minimizing the potential effects to existing legacy features. Additional proposed projects would stabilize roads, improve drainage conditions and restore instream habitat.

2.0 INTRODUCTION

2.1 Document Structure

The Forest Service has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into the following parts:

- *Introduction:* This section includes the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- *Alternatives:* This section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on issues raised by the public and other agencies. This discussion also includes design criteria and Best Management

Practices. Finally, this section provides a comparison of the environmental consequences associated with each alternative.

- *Environmental Consequences:* This section describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource. Within each section, the existing situation is described first, followed by the effects of the alternatives. The No-action Alternative provides a baseline for evaluation and comparison of the other alternatives.
- *Consultation and Coordination:* This section provides a list of preparers and agencies consulted during the development of the environmental assessment.
- *References and Appendices:* The appendices provide more detailed information to support the analyses presented in the environmental assessment.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Cowlitz Valley Ranger Station located in Randle, Washington.

2.2 Background

In 1997 a planning effort was undertaken for the Dry Burton Timber Sale. The current effort for the Dry Burton Thin includes five commercial thinning units identified in the previous planning effort.

The Dry Burton Thin is located in the Cispus Adaptive Management Area (AMA). The Cispus AMA is the only AMA on the Gifford Pinchot National Forest, and is one of ten such areas identified in the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (USDA, USDI 1994), commonly referred to as the Northwest Forest Plan (NFP). AMA's are landscape units designated to encourage the development and testing of technical and social approaches to achieving desired ecological, economic, and other social objectives (Cispus AMA).

The Dry Burton Planning Area is located entirely within the 10,347 acre Smith Creek sub-watershed (sixth-field Hydrologic Unit Code (HUC) 17080040301). Smith Creek is located within the Upper Cowlitz Watershed (HUC 170800403). Ninety-eight percent of the Smith Creek sub-watershed and planning area is National Forest. Smith Creek is located northeast of Randle, Washington, and discharges into the Cowlitz River at river mile (RM) 122. The planning area is located in Township 10 North, Range 9 East, Sections 15, 16, 21, 22, 27 and 28. Elevations range from 1,000 feet near the Cowlitz River confluence to 4,600 feet to a small pond west of Jackpot Lake.

The Upper Cowlitz River Watershed was in a contiguous forest of grass/pole and small tree forest as of 1880. Between 1880 and 1997, forest vegetation structure shifted from grass-pole forest and small tree forest to a mix of small tree forest and large tree forest. During this period the forest became highly fragmented due to timber harvest and wildfire, the two primary disturbance factors that influenced forest vegetation structure within the watershed.

Extensive harvest activity in the watershed resulted in the loss of structural elements, including snags, large down coarse woody debris, and reduced duff layers. Young stands are considered overstocked, are believed to have the potential to benefit from stand treatments that not only enhance growth, but are designed to increase stand diversity and retain late-successional characteristics in previously managed stands.

2.3 Purpose of and Need for Action

The purpose of this initiative is to:

- Increased health and vigor and enhanced growth that results in larger trees, while protecting structural elements of late successional forest land that was previously subjected to regeneration harvest (see Amendment 11, AMA objectives).

This action is proposed because historically managed stands are experiencing a slowing of growth and mortality due to overcrowding. This overstocked condition results in reduced vigor, increased mortality, reduced diversity and increased wind damage susceptibility. While stands may differentiate over time, the process of thinning is expected to accelerate this process (see Section 4.3). Alternatives and design features are intended to increase stand diversity and retain late-successional characteristics that are lacking in previously managed stands.

- Provide forest products

The Dry Burton Thin would be a commercial thin timber sale that would supply forest products consistent with the Northwest Forest Plan goal of maintaining the stability of local and regional economies. The project would result in healthy productive forests, and would provide forest products in a way that is sustainable, and preserves options for the future. The employment opportunities created by the harvest of this timber sale are important to local and regional economies (see Section 4.10). The project would provide forest products in a way that achieves the additional objectives listed below.

- Enhance riparian reserves

Riparian reserves in managed stands can be enhanced by thinning to accelerate the development of mature and late-successional stand conditions. Most of the stands and riparian reserves proposed for thinning have a limited capability to produce the size and quantity of coarse wood sufficient to sustain physical complexity and stability of the riparian reserves and associated streams in the near term (see Sections 3.4, 4.4 & 4.5).

Management Direction

The proposed action has been designed to meet the goals and objectives documented in the *Gifford Pinchot National Forest Land and Resource Management Plan (LRMP, USDA 1990)*, as amended by the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (Northwest Forest Plan, USDA and USDI 1994, amended 2004)*. The LRMP was amended in response to the NFP in a document referred to as *Amendment 11*, which applies the NFP Record of Decision to the local conditions of the Gifford Pinchot National Forest.

This assessment is tiered to the following Environmental Impact Statements and plans, which are incorporated by reference:

- The Gifford Pinchot National Forest Land and Resource Management Plan and Environmental Impact Statement, as amended (LRMP, USDA 1990).
- The Northwest Forest Plan and Record of Decision and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl (USDA, USDI 1994) (hereafter referred to as the Northwest Forest Plan or NFP).
- The Gifford Pinchot National Forest Land and Resource Management Plan Amendment 11 (USDA 1995).
- The Forest Plan as amended by the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USDA and USDI, 2001).
- The Forest Plan as amended by the 2004 Record of Decision to Clarify Provisions Relating to the Aquatic Conservation Strategy (USDA, USDI 2004).
- The Forest Plan as amended by the 2004 Record of Decision and Standards and Guidelines to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines (USDA and USDI 2004b).
- The Environmental Impact Statement and Record of Decision for Preventing and Managing Invasive Plants (USDA 2005).
- Memorandum declaring the protection of known sites for 57 former survey and manage species. (USDA and USDI 2005).

The Gifford Pinchot National Forest LRMP as amended provides management direction through the designation of specific management areas, and standards and guidelines specific to these designations. The following management areas have been applied to the portions of the Upper Cowlitz River Watershed within which the Dry Burton Thin is located.

Cispus Adaptive Management Area. As previously mentioned, the Dry Burton Thin is contained within the Cispus AMA. The primary objective the AMA is to learn how to manage on an ecosystem basis in terms of both technical and social challenges, and in a manner consistent with applicable laws. The AMA is intended to contribute substantially to the achievement of objectives for the NFP standards and guidelines, including the

provision of well-distributed late-successional habitat outside of reserves, the retention of key structural elements of late-successional forests on lands subjected to regeneration harvest, the restoration and protection of riparian zones, and the provision of a stable timber supply (Amendment 11, USDA 1995).

Management Area Category T, General Forest (TS). Within the AMA designation, Dry Burton Thin units lie in an area categorized as General Forest in the LRMP (see Amendment 11, p. 6-25) where the goal is to produce a predictable and sustainable level of timber (and other resources) for sale where such activities do not degrade the environment.

Riparian Reserves. Portions of Dry Burton Thin units are within Riparian Reserves, where riparian dependent resources receive primary emphasis and special standards and guidelines apply (see Amendment 11, pages 2-4 to 2-10). Riparian Reserves are applied along all streams, wetlands, ponds, lakes and unstable and potentially unstable areas, and are a key component of the Aquatic Conservation Strategy provided in the NFP. The proposed action treats 82 acres of Riparian Reserves.

Other Natural Resource Management Guidance Documents

The Upper Cowlitz River Watershed Analysis (1997) is incorporated by reference. This watershed analysis represents one of the key components of the Aquatic Conservation Strategy as described in the NFP and also provides a detailed reference to historical and existing conditions within the watershed.

The Gifford Pinchot National Forest Roads Analysis (2002) provides recommendations regarding Forest road maintenance objectives, and identifies long-term objectives in order to manage forest transportation system facilities that provide user safety, convenience, and efficiency of operations in an environmentally responsible manner and to achieve road related ecosystem restoration with the limits of current and likely funding levels. The Roads Analysis recommends a variety of possible treatments including decommissioning, closing and stabilizing roads, improving road drainage systems and reconstructing crossings to protect aquatic and riparian resources.

2.4 Proposed Action

The action proposed by the Forest Service to meet the purpose and need is a timber sale that would commercially thin and harvest trees from approximately 212 of 253 acres. Riparian no-cut buffers within and adjacent to unit boundaries reduce the acreage. The outer two-thirds of riparian reserves (total 82 acres) would also be commercially thinned.

The preferred method of harvest is to yard with helicopters to landing locations adjacent to units. The project would also create snags, down wood, and provide trees for future in-stream projects. Associated projects to be done with additional funding as available would treat noxious weeds, stabilize roads, place instream wood, and remove fish passage barriers. Thinning would be designed to enhance or restore diversity (see

Alternatives section for additional detail). The proposed action is expected to be advertised in 2006, and implemented as early as fiscal year 2007.

2.5 Public Involvement

After considering the issues and objectives to be achieved by this project, a project proposal was developed. Scoping letters describing the proposed action and issues identified by the interdisciplinary team were sent to the public to solicit comments. Public comment on the proposed action was also solicited through the Gifford Pinchot's quarterly Schedule of Proposed Action (SOPA) website.

Representatives of the Gifford Pinchot Task Force and Conservation Northwest have visited the project area, and have provided recommendations related to proposed silvicultural treatments and potential restoration activities.

Two responses were received during the scoping period for the proposed Dry Burton Thin. Comments within the scope of the Project and not covered by previous environmental review or existing regulations were reviewed for substantive content related to the Project. It was determined that concerns regarding existing legacy features (large snags and down wood) should be given further consideration. The helicopter logging practice proposed in Alternative 4 addresses the issue of reducing logging impacts to legacy down wood, and project design criteria common to all alternatives would further protect legacy features.

2.6 Issues

Issues are separated into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues are identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, "...identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)..." The following issues raised during the scoping process were considered significant because all are affected by implementation of the proposed action, and potential effects may vary between alternatives.

Issue #1: Disturbance to legacy features. Legacy features, including large snags and coarse wood are present in all units, and most abundant in Unit 4. Alternatives 3 and 4 address the issue of legacy features by avoiding harvest, or proposing harvest methods that minimize disturbance to legacy features. This issue can also be addressed in mitigation measures and best management practices or design criteria that limit disturbance. Portions of units that contain live legacy trees and old growth were eliminated from units.

Issue #2: The potential presence of Northern spotted owls and disturbance to potential nesting pairs is of concern. Mitigation measures have been implemented that minimize disturbance to spotted owl habitat. These measures are applied to all alternatives. The potential effects to the Northern spotted owl are discussed in Chapter 4, Environmental consequences. No alternative results in adverse effects to spotted owls; however, different logging methods potentially have different impacts related to noise disturbance, and disturbance to habitat features that support prey species. The total area treated by logging method, or the potential for disturbance to legacy features (habitat for prey species) may be used as comparative measures to compare alternatives relative to potential effects to spotted owls.

Issue #3: Potential effects to water quality and riparian-dependent species as a result of riparian thinning. Logging systems, riparian reserve no cut buffers and limits to ground disturbance in riparian reserves are used to compare alternatives. Project design criteria, best management practices and mitigation measures designed to limit or eliminate effects to water quality are applied to all alternatives.

The following issues were considered non-significant:

Issue #4: Slope stability. Areas of slope instability have been eliminated from the sale, and riparian reserves with no cut buffers have been established.

Issue #5: Logging systems and potential for damage to residual trees. Alternatives consider different logging methods that vary in their potential to damage residual trees. This issue was considered insignificant because units were modified to reduce the need for downhill yarding to a few locations. Most portions of units that would have been downhill logged have been eliminated from the sale, or added to alternatives that would helicopter log the units or utilized limited instances of downhill yarding.

Issue #6: Continued use of roads within riparian reserves and reopening of closed roads on steep slopes. The original proposal included the reopening of Forest Road 2010 to access the top of Unit 17. Because this portion of Unit 17 has been eliminated from consideration due to soil stability concerns and lack of silvicultural need, FR 2010 would not be opened. Forest roads 2010, 2020 and 2020028 would be stabilized following harvest activities depending on the availability of funding. The segment of Forest Road 2020 adjacent to logging units would be improved for harvest and haul, then subsequently stabilized, following harvest. The proposed road treatments are consistent under all alternatives.

3.0 ALTERNATIVES

This chapter describes and compares the alternatives considered for the Dry Burton Thin project. It includes a description of each alternative considered and provides maps for each. This section also presents the alternatives in comparative form, defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public.

3.1 Alternative 1 – No Action

Under the No-action alternative, current management plans would continue to guide management of the area. No timber harvest or other associated actions would be implemented to accomplish project goals at this time. If allowed to proceed without further management, self-thinning would occur over time, resulting competition-induced mortality. Tree mortality would not be captured and utilized as wood products. Natural mortality and stand differentiation would result in the natural accumulation of snags, down wood and the creation of openings in the stand, or gaps.

Restoration and road-related treatments would not occur in association with this analysis; however may be pursued under a separate analysis. Harvest-related transportation activities or ground disturbance would not occur, such as the creation and subsequent rehabilitation of skid trails and landings, hauling along Forest Road

3.2 Action Alternatives 2, 3 and 4

All alternatives have many design features in common. Snags and down-wood would be created, trees would be set aside for in-stream projects, and minor species such as western red cedar, red alder, black cottonwood, big leaf maple would be favored and retained to promote and increase species diversity. Unit prescriptions are consistent between alternatives, and slash treatments are common to all alternatives. All alternatives would treat riparian reserves (Table 1).

All temporary roads, landings would be rehabilitated. Many remnant skid trails (from first logging entry) are apparent on the landscape, and would be utilized to the degree possible unless it is determined that such use is more detrimental to the environment. Skid trails would also be rehabilitated. See Section 3.x for a detailed listing of project design criteria and mitigation measures common to all alternatives.

Table 1. Total acres and treated acres of riparian reserve by Unit. Alternative 2 proposes thinning of the outer third of riparian reserves, Alternative 3, 4 and 4.1 propose treatment of the outer two thirds of riparian reserve units.

| Unit | Acres of Riparian Reserves in Unit | RR outer 1/3 acres treated (Alt 2) | RR outer 2/3 thinned (Alts 3, 4 and 4.1) |
|--------------|------------------------------------|------------------------------------|--|
| 4 | 37 | 0 | 22.6 |
| 5 | 22 | 6.7 | 13.8 |
| 6 | 25 | 9.2 | 18.6 |
| 8 | 34 | 7.2 | 23.8 |
| 17 | 6 | 0 | 3.7 |
| Total | 84 | 23.1 | 82.2 |

Unconnected actions including restoration project proposals within the project action area would be similar under all alternatives, and implemented as funding becomes available.

Alternative 2 – Ground-based Harvest

Alternative 2 would treat only those units which are accessible with ground-based harvest systems. This alternative was driven by concerns related to the issue of downhill yarding, and is conservative in its treatment of Riparian Reserves.

Harvest units include 5, 6, and a portion of Unit 8 (Table 2, Figure 2). 113 acres would be treated with ground-based logging systems. One unnamed spur would be reopened as a temporary road and subsequently rehabilitated. Ground-based systems would utilize existing skid trail remnants from past logging practices and rehabilitated them following harvest.

Unit 5 would be thinned using a “designation by description” (DxD) method of selection that would result in an average spacing of 21 x 21 feet. Units 6 and 8 would be thinned utilizing a diameter distribution DxD method designed to result in variable spacing across all acres by cutting a range of diameters. Stands would be thinned to a target canopy closure of approximately 60%. This alternative would yield approximately 2.2 mmbf.

Slash would be left on skid trails and scattered throughout the unit. There would be no other fuels treatment except the piling and burning of incidental quantities of slash and debris at landings.

In order to increase and promote species diversity, minor species such as western red cedar, red alder, black cottonwood, big leaf maple and other minor species would be retained. Snags and down wood would be created in all units as specified in the wildlife mitigation measures.

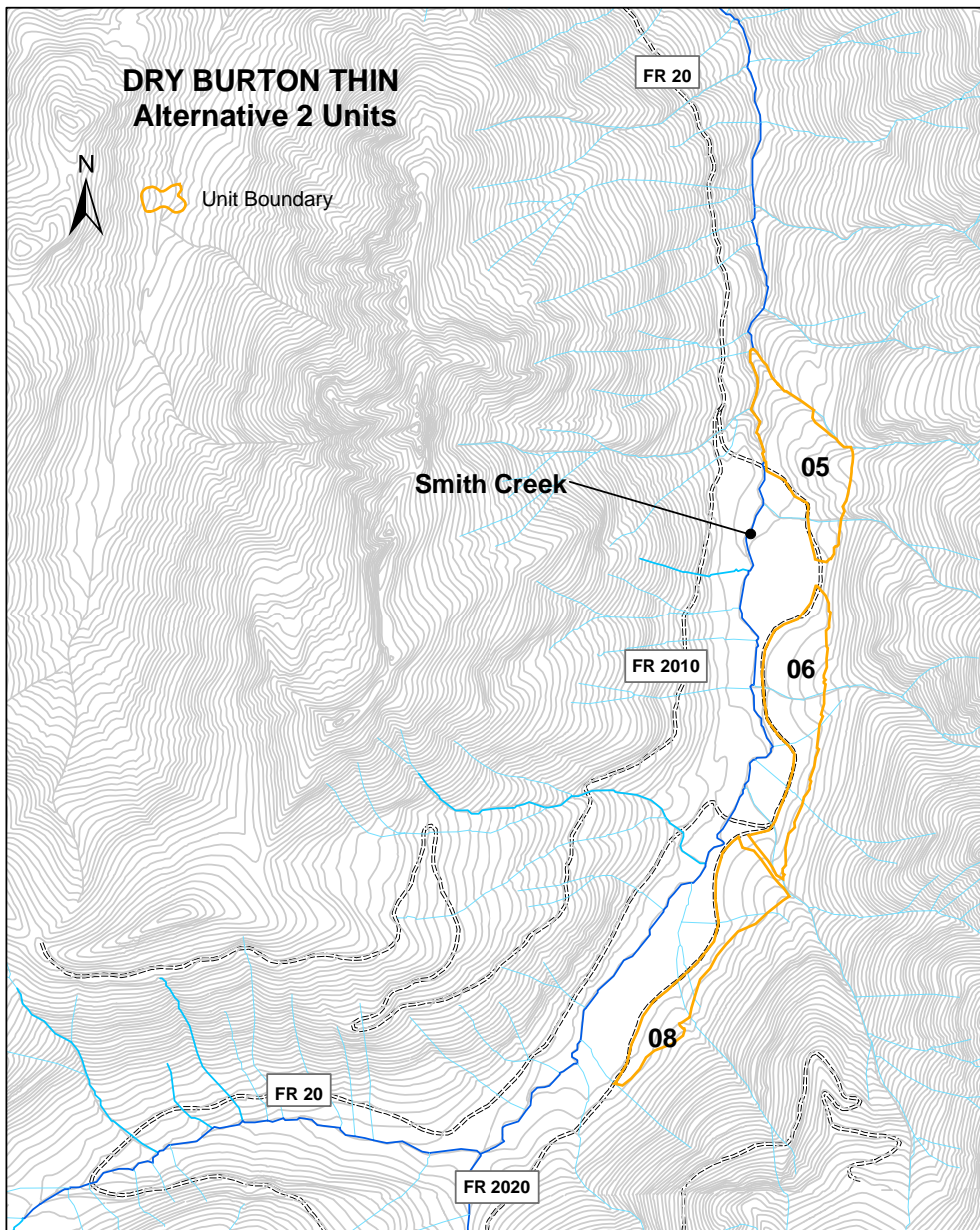


Figure 1. Location of Alternative 2 Dry Burton Thin Units.

Table 2. Alternative 2 unit summary. One-third of Riparian Reserves would be thinned, and all units would be harvested via ground-based logging systems. Unit 5 would require 1000 feet of temporary road construction.

| Unit | Total unit acres | Actual area thinned (acres) | Riparian Reserves treated | Unit Volume (mbf) |
|--------------|------------------|-----------------------------|---------------------------|-------------------|
| 5 | 48 | 33 | 6.7 | 495 |
| 6 | 52 | 36 | 9.2 | 612 |
| 8 | 50 | 44 | 7.2 | 1078 |
| Total | 150 | 113 | 23.1 | 2,185 |

Under Alternative 2 the outer one third of riparian reserves would be treated (Table 1). Riparian Reserve widths are 170 feet for non-fish-bearing streams and 340 feet for fish-bearing streams in the project area. Class III and IV streams would have a minimum no-cut buffer of 113 feet; Class II streams (Smith Creek) would have a no cut buffer of 226 feet (Unit 5). Approximately 8 acres of Unit 6 would be set aside to provide trees for an in-stream restoration project for Smith Creek.

Alternative 3 – Ground-based and Skyline Harvest

Alternative 3 would treat all of units 4, 5, 6, and 8 totaling approximately 199 of 239 acres with a combination of ground based logging and cable logging systems (and Table 3, Figure 2). Two-thirds of Riparian Reserves would be harvested.

Unit 4 would be thinned using a DxD method of selection to achieve a spacing of approximately 19 by 19 feet. Units 5, 6, & 8 would be treated as described in Alternative 2. As in Alternative 2, mitigation measures and design criteria universal to all alternatives would protect legacy down wood and snags.

Table 3. Alternative 3 unit summary. Two-thirds of Riparian Reserves would be thinned, and all units would be harvested using a combination of skyline and ground-based logging systems.

| Unit | Total unit acres (actual treated) | Total acres treated by system | Riparian Reserves treated by system | Unit Volume (mbf) |
|--------------|-----------------------------------|-------------------------------|-------------------------------------|-------------------|
| 4 | 43 (28) | Ground: 0 Sky: 28 | 0.0 22.6 | 448 |
| 5 | 48 (40) | Ground: 33 Sky: 7 | 6.7 7.1 | 600 |
| 6 | 52 (45) | Ground: 36 Sky: 9 | 9.2 9.4 | 765 |
| 8 | 96 (86) | Ground: 44 Sky: 42 | 7.2 16.6 | 2107 |
| Total | 239 | 199 | 78.8 | 3,920 |

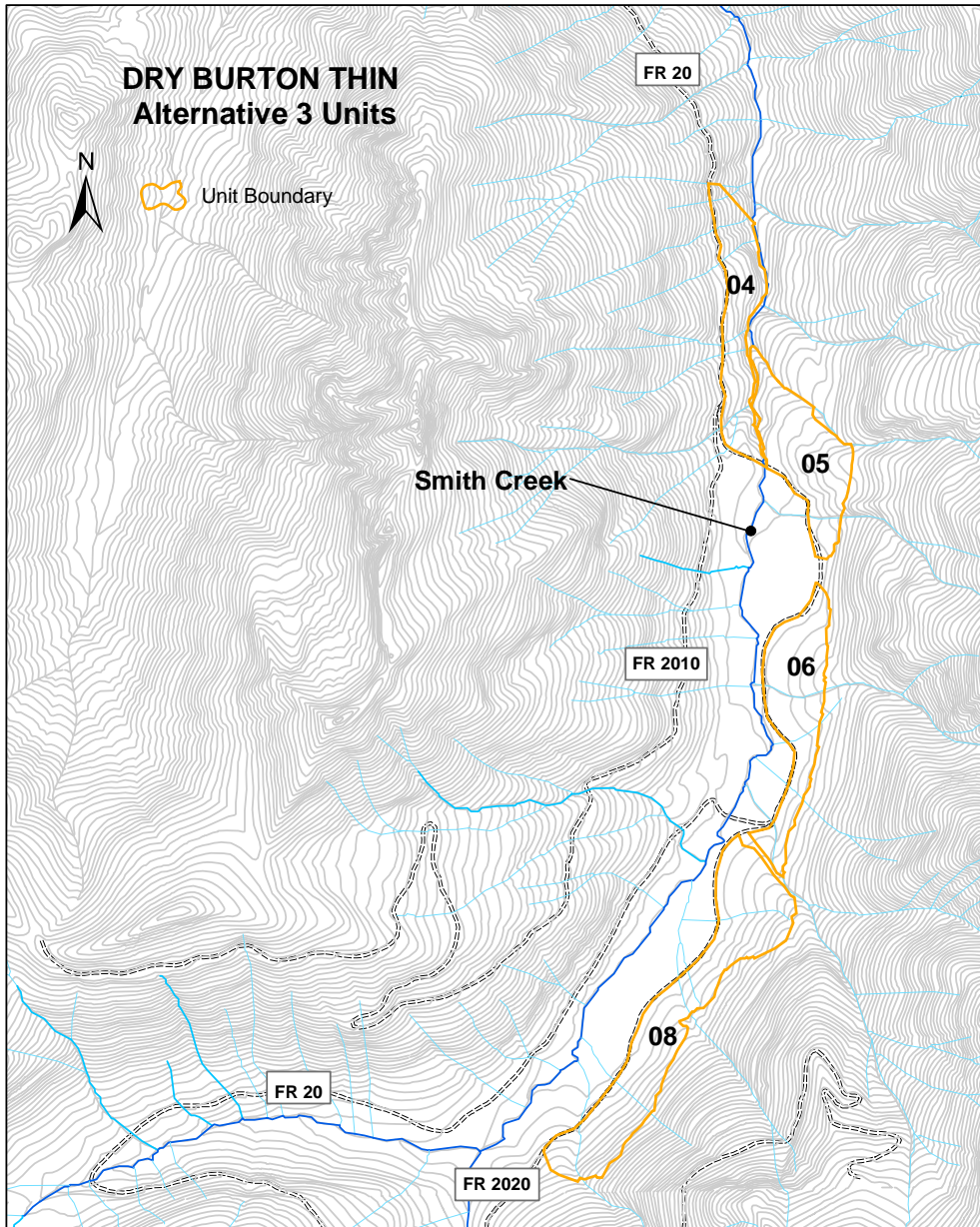


Figure 2. Alternative 3 units.

Skyline corridors under Alternative 3 would be placed to minimize disturbance to existing features, and at least three skips would be placed around large accumulations of down wood and other legacy features. Unit 5 would require 1000 feet of temporary road.

Alternative 4 - Ground-based and Helicopter Harvest

Alternative 4 would treat approximately 212 of 253 acres using a combination of ground-based and helicopter logging systems. Helicopter logging would replace skyline yarding, and enable the harvest of unit 17. All other aspects of the proposal are identical to Alternative 3. Helicopter logging was considered to address issues related to the disturbance of legacy down wood features, and eliminates the need for downhill yarding systems.

There would be fewer landings and no skyline corridors associated with cable yarding activities. Two helicopter landings would be constructed, one in Unit 6 and one in Unit 8 (see soils discussion in Chapter 4). Unit 17 would be thinned using a prescription similar to Unit 5, resulting in an average spacing of 21 feet by 21 feet.

Table 4. Alternative 4 units, roads and logging method.

| Unit | Total unit acres (actual treated) | Total acres treated by system | Riparian acres treated by system | Unit Volume (mbf) |
|--------------|--------------------------------------|----------------------------------|-------------------------------------|----------------------|
| 4 | 43 (28) | Ground: 0 Heli: 28 | 0.0 22.6 | 448 |
| 5 | 48 (40) | Ground: 33 Heli: 7 | 6.7 7.1 | 600 |
| 6 | 52 (45) | Ground: 36 Heli: 9 | 9.2 9.4 | 765 |
| 8 | 96 (86) | Ground: 44 Heli: 42 | 7.2 16.6 | 2,107 |
| 17 | 14 (13) | Ground: 0 Heli: 13 | 0.0 3.7 | 309 |
| Total | 253 (212) | | 78.8 | 4,229 |

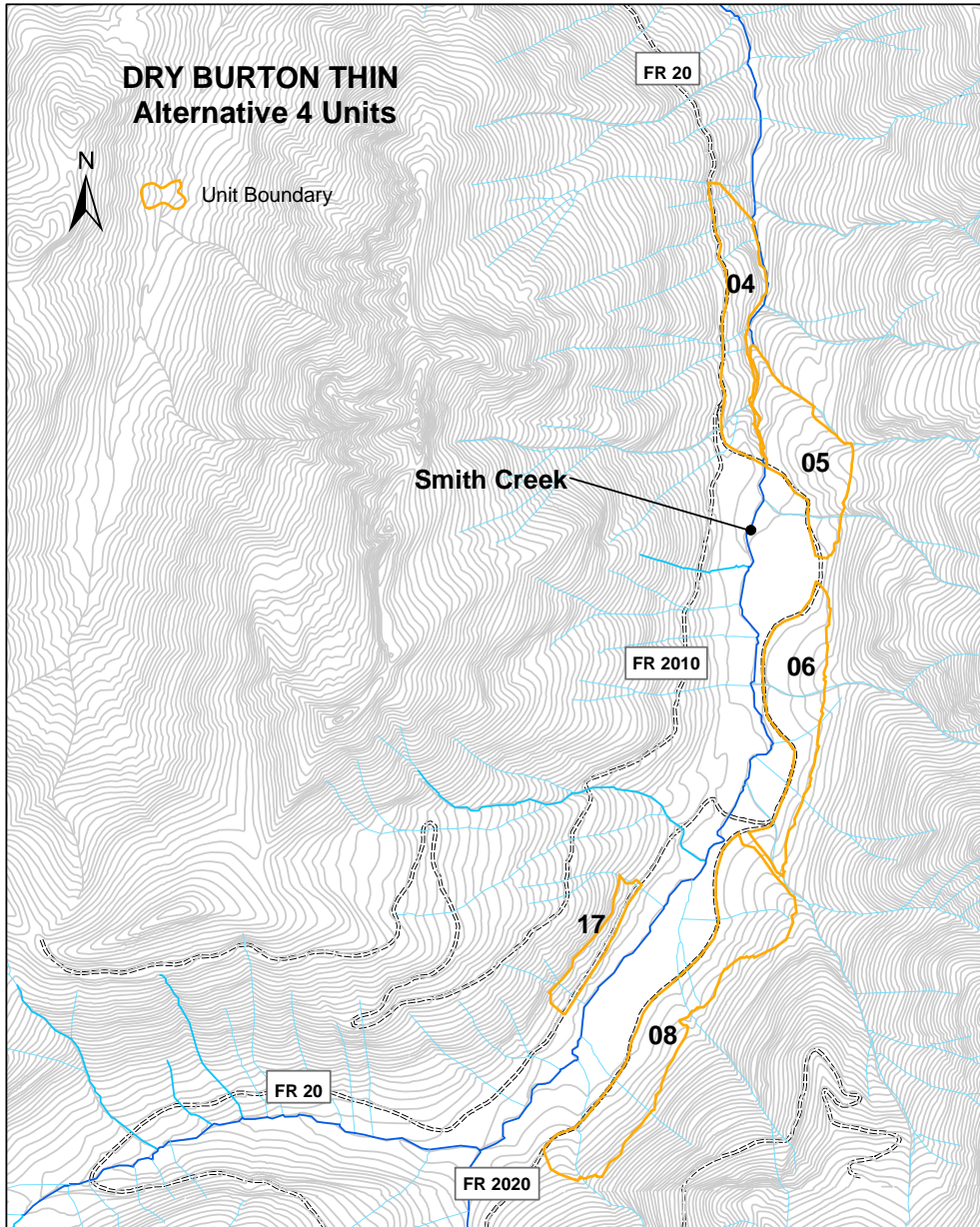


Figure 3. Alternative 4 and 4.1 units. Under Alternative 4 units 5, 6 and a portion of 8 would be harvested using ground-based systems, and units 4, 17 and a portion of 8 would be helicopter logged. Under revised Alternative 4.1, all units would be helicopter logged.

Table 5. Alternative 4.1 units, logging methods and roads.

| Unit | Total unit acres | Actual area thinned (acres) | Riparian Reserves treated | Unit Volume (mbf) |
|--------------|------------------|-----------------------------|---------------------------|-------------------|
| 4 | 43 | 28 | 22.6 | 448 |
| 5 | 48 | 40 | 13.8 | 600 |
| 6 | 52 | 45 | 18.6 | 765 |
| 8 | 96 | 86 | 23.8 | 2,107 |
| 17 | 14 | 13 | 3.7 | 309 |
| Total | 253 | 212 | 78.8 | 4,229 |

3.3 Alternative 4.1 – Preferred Alternative

Alternative 4.1 units and treatments are identical to Alternative 4, except that all units would be helicopter logged (Table 5). Temporary road construction or skid trails would not be required, and all volume would be yarded using helicopters. The number of landings would be reduced to two, and located in units 6 and 8. Landings would be rehabilitated, and replanted with trees. As with Alternative 4, helicopter logging would be restricted to certain time periods as specified in the Wildlife Mitigation Measures and biological assessment.

3.4 Project Design Criteria and Mitigation Measures

To minimize the effects of the proposed action on aquatic and terrestrial resources, all alternatives would include the following project design criteria and mitigation measures prescribed for the Dry Burton Thin. Sometimes operating conditions may be expanded due to dry weather and the opportunity to operate on snow. Such changes would require documentation and approved by the District Ranger, provide an option more protective of the resource, and comply with Forest Plan Standards and Guidelines.

Aquatic and Soils Mitigation Measures or Project Design Criteria

The following denotes a comprehensive list of Aquatic and Soils mitigation measures which have been factored into the effects analysis.

1. Prohibit further ground equipment travel where rutting exceeds Region 6 Standards and Guidelines (Forest Service 1998); defined as 6 inches in depth for a length of ten feet or more. Deviations from this measure should involve consultation with the appropriate resource specialist and documentation in daily diaries. The objective is to limit the degree of soil compaction, rutting, and puddling as well as reduce the potential for offsite stream sedimentation. Alternative 2, Units 5, 6 and 8. Alternative 3 and 4, Units 4, 5, 6, and 8.

Applicable Best Management Practices:

T-13. Erosion Prevention and Control Measures During Timber Sale Operations

2. To minimize soil compaction and displacement during wet conditions, the use of ground-based yarding equipment or other equipment on and off roads or landings will be restricted from October 1 through June 15, or during periods when soils are excessively wet or saturated. This requirement is provisional depending on site conditions to be determined by the timber sale contract administrator in consultation with the District aquatic specialist and approved by the District Ranger. All units.

Applicable Best Management Practices:

T-13. Erosion Prevention and Control Measures During Timber Sale Operations

3. Trees will be felled away from streams or other riparian features. Exceptions would be trees which are leaning towards the creek, or when conditions would not allow safe felling. Any portion of a felled tree that land in the no cut buffer (inner 1/3) will be left on the ground. The objective of this measure is to prevent damage to riparian vegetation and soils within Riparian Reserves. Alternatives 2, Units 5, 6, and 8. Alternative 3, Units 4, 5, 6, and 8, Alternative 4, Units 4, 5, 6, 8, and 17.

Applicable Best Management Practices:

T-6. Protection of Unstable Lands

T-13. Erosion Prevention and Control Measures During Timber Sale Operations

4. One end log suspension will be required for ground-based and cable yarding systems (except during winching or lateral yarding). This would reduce the risk of soil compaction and displacement from dragging entire logs along the ground. The objective of this measure is to minimize erosion and potential sedimentation. Alternatives 2, Units 5, 6, and 8. Alternative 3, Units 4, 5, 6, and 8. Alternative 4, Units 4, 5, 6, 8, and 17.

Applicable Best Management Practices:

T-13. Erosion Prevention and Control Measures During Timber Sale Operations

5. To minimize the extent of areas subject to soil compaction and displacement, all equipment will be confined to approved temporary roads, skid trails and landings during yarding and brush disposal operations. Landings, temporary roads, skid trails and skyline corridors will be approved by the sale administrator prior to timber felling. All skid trails will be restricted to the outer-third of riparian reserves (see riparian reserve prescriptions). Temporary roads will not be constructed within Riparian Reserves. Winching would be employed in ground-based yarding units as well as felling trees to lead in all units regardless of yarding system.

Applicable Best Management Practices:

T-11. Tractor Skid Trail Location and Design

Ability to Implement: High

Effectiveness – High

6. In areas of past harvest, temporary roads and skid trails would be reestablished on previous locations rather than constructing new ones. These trails and roads will be treated to restore hydrologic function as needed. The Forest Plan requires losses in soil productivity be limited to 20 percent or less of the activity area, including the transportation system in and adjacent to a unit. If a logging system other than described above is used, it must first be approved by a logging systems specialist to ensure that less than 20% of the activity area is impacted. The objective of this measure is to minimize the extent of areas subject to soil compaction and displacement, and to allow infiltration of runoff, and sediment filtration. Alternatives 2, Units 5, 6, and 8. Alternative 3, Units 4, 5, 6, and 8. Alternative 4, Units 4, 5, 6, 8, and 17.

Applicable Best Management Practices:

T-11. Tractor Skid Trail Location and Design

Ability to Implement: High

Effectiveness – High

7. Temporary roads and landings will be subsoiled to a depth of 18 inches (minimum). Subsoiling and the subsequent application of seed and mulch must be done immediately following logging activities. Subsoiling must strive to create an uneven, rough surface without furrows. Proposed alternative methods to subsoiling must be approved by the Zone aquatic specialist or earth scientist in consultation with the sale administrator. To prevent re-compacting of the treated roadways and landings, no ground-based equipment will be operated on subsoiled portions of roads and landings after subsoiling is completed. Plan harvest and slash disposal activities to maximize use of pre-designated skid trails prior to sub-soiling to minimize the creation of new skid trails. Crossdrains or water bars will be installed every 50 to 150 feet depending on slope. Available logging slash will be placed across the subsoiled road landing surface.

Applicable Best Management Practices:

T-13. Erosion Prevention and Control Measures During Timber Sale Operations

T-14. Revegetation of Area Disturbed by Harvesting Activities

T-16. Erosion Control on Skid Trails

Ability to Implement: High

Effectiveness – High

8. Acceptable grass seed mix, type of weed free mulch, and application rates will be specified by the Zone botanist in consultation with the Zone aquatic specialist.

Subsequent vehicular access to these areas will be prevented (e.g., by construction of a 4-foot high earth berm at the entrance to the road or landing). Closure to vehicles is required to prevent these areas from being re-compacted and to allow vegetation to develop. The objectives of this measure includes the rehabilitation of areas compacted during management activities, the acceleration of the recovery of compacted soils, the facilitation of water infiltration and revegetation on those disturbed areas, the maintenance of organic matter in amounts sufficient to prevent short or long-term nutrient deficits, and the prevention of the establishment of invasive weeds. This treatment is also intended to provide ground cover for exposed soils in order to reduce the potential for surface erosion and avoid long-term detrimental physical and biological soil conditions. Alternatives 2 and 3, Units 5 and 8, Alternative 4, Units 5, 8 and 17.

Helicopter landings would be planted to trees, species specified by the zone botanist. Alternatives 4 and 4.1, Units 5, 6 and 8.

Applicable Best Management Practices:

T-13. Erosion Prevention and Control Measures During Timber Sale Operations

T-14. Revegetation of Area Disturbed by Harvesting Activities

T-16. Erosion Control on Skid Trails

Ability to Implement: High

Effectiveness – High

9. The following measures will minimize the routing of water and sediment to streams. Prior to any expected seasonal period of precipitation and runoff, cross drains and grade breaks will be installed in all temporary roads, skid trails, landings and skyline corridors. After sale activities are complete, impacted areas on landings, temporary roads and skid trails will be outsloped and sub-soiled (or comparable treatment) to a depth of 20 inches, and the surface will be seeded with a Forest Service designated mix and fertilized. (An impacted area is generally where greater than 60 feet of continuous soil compaction or displacement, identified by 6-inch deep ruts, has occurred.) In special cases (i.e. stream crossings, contributing areas near streams, or other sensitive areas), mulch, erosion matting or re-contouring may be used as needed to prevent or reduce sedimentation. Where designated by the timber sale contract administrator, impacted areas of skyline yarding will be waterbarred, seeded and fertilized as above. The expectation of this mitigation measure is the maintenance of soil permeability and soil productivity and near elimination of increased channelization of surface flows in harvest units near streams from temporary roads and harvest related activities. All Units.
10. All drainage structures will be designed to accommodate peak-flow flood events, consistent with NFP Standards and Guidelines (ROD, USDA 1994). Temporary drainage structures would be utilized one season and removed prior to the fall rainy season. If new structures are to weather through fall and winter, they must comply

with standards and guidelines as if a permanent structure. Forest Road 2020, all Alternatives.

Applicable Best Management Practices:

T-13. Erosion Prevention and Control Measures During Timber Sale Operations

11. All currently closed permanent roads used by the sale will be reclosed after sale activities have been completed. The roads will be left in a self-maintaining condition by removing temporary culverts (prior to rainy season), constructing cross-ditching on steep-gradient sections and adjacent to culverts or other drainage locations deemed necessary by an aquatics specialist. This measure will prevent chronic ground disturbance. Alternative 2, 3, and 4, Unit 5.

Applicable Best Management Practices:

T-13. Erosion Prevention and Control Measures During Timber Sale Operations

T-14. Revegetation of Area Disturbed by Harvesting Activities

T-16. Erosion Control on Skid Trails

12. The following measures are prescribed to minimize the amount of sediment delivered to streams along the haul route and from reconstructed and obliterated roads. Dispose of soils 100 feet from any perennial or intermittent stream at a location approved by the Sale Administrator. In addition, place sediment barriers (straw bales, slash filter windrow and/or sediment fence) in ditchlines along the haul route or in areas where the ground is disturbed and sediment has the potential for delivery to streams. Sediment filters should be left in place where possible to naturally degrade. If non-biodegradable filters are used, precautions should be followed to minimize transport of trapped sediment material during removal, including the following: a) work during the dry season, and/or b) relocate captured sediment to a stable location.
13. Streams and piping located during pre-sale or harvest will be managed as riparian reserves. The District aquatic specialist is to verify stream types and Riparian Reserve widths. Alternative 2, 3 and 4.
14. To minimize the amount of sediment entering the stream and possible damage to stream banks and channel bottoms, stream crossings and activities in the stream are prohibited except as prescribed for instream projects.
15. To reduce the potential for damage to the stream and floodplains as a result of a hazardous material spill, fueling and equipment will be located outside of riparian reserves. A Hazardous Material kit will be on site, and would contain materials to control/contain a spill of fuel, oils, and/or hydraulic fluid. All service work on

heavy machinery and refueling will be done on an established system road at a site approved by the Forest Service. All action alternatives.

Applicable Best Management Practices:

T-4. Use of Sale Area Maps for Designating Water Quality Protection Needs

T-7. Streamside Management Unit Designation

T-17. Meadow Protection during Timber Harvesting

T-22. Modification of the TSC (Timber Sale Contract)

R-12. Control of Construction in Streamside Management Units

16. For instream projects: To minimize the amount of sediment reaching the stream and to accelerate the re-vegetation process, rehabilitate areas compacted during management activities, and accelerate recovery of compacted soils, subsoil the compacted areas and plant native vegetation to restore any areas used as access points by equipment. Alternatives to subsoiling will involve consultation with the appropriate resource specialist. To minimize the amount of sediment entering the stream channel during instream activities, the operation period would be limited to low flow and within seasonal windows as permitted in the MOU with the WDFW. All action alternatives, “other projects”.
17. For instream projects: To reduce the potential for damage to the stream and flood plain as a result of a hazardous material spill, Spill-Booms will be placed downstream of the work site. A Hazardous Material kit will be on site, and would contain materials to control/contain a spill of fuel, oils, and/or hydraulic fluid. All service work on heavy machinery and refueling will be done on an established system road at a site approved by the Forest Service. Alternative 2, 3 and 4.
18. To minimize effects to fish and other aquatic organisms the project will follow Washington State Laws (WAC 220-110-070) and conform to provisions of the Hydraulic Project Approval including the USDA Forest Service – Washington State Memorandum of Understanding. Alternative 2, 3 and 4.
19. Native seed provided by the Gifford Pinchot National Forest should be used for revegetation of the disturbed roadside areas. The following prescription is recommended: A mix of 65% *Elymus glaucus* with 35% *Deschampsia elongata* (by weight) applied at a rate of 100 lbs/acre, with fertilizer @ 200 lbs/acre and enough mulch that the seed is covered 2 to 3 inches. Alternative 2, 3 and 4. Variations from this prescription must be issued by the Zone Botanist. Use weed free straw as mulch. The application of mulch may be substituted in consultation with the project Hydrologist/Aquatic Specialist.

Additional Soil Mitigation Measures

20. Skid trails will be pre-designated for all ground-based equipment operations, and new skid trails will be spaced a minimum of 120 feet apart for ground-based units.

Use of existing skid trails and roads must be used if possible rather than creating new ones. Timber will be felled to lead to the skid trail locations. Skidders will remain on skid trails and winch logs as necessary. Feller-bunchers, preferably track-mounted, operating off designated skid trails must operate over slash beds that are as thick and continuous as practicable. The objective of this measure is to limit the extent and the degree of soil damage, displacement, and disturbance.

21. Rock will be used only when necessary on landings and temporary roads, and applied only where needed (“spot rocking”). Rock will be incorporated into the roadbed by ripping or scarification following harvest activities (see following mitigation measure). The objective is to allow better substrate for vegetative growth and water infiltration following management activities with ground based equipment. Harvest during the dry season will prevent excessive use of rock.
22. If partial suspension logging systems gouge the surface greater than 12 inches deep for a length of 10 feet or more, the log skid trails would be rehabilitated with cross drains that have outlets and erosion seeded or have slash piled over them. This measure would minimize soil erosion and avoid stream sedimentation. BMP T-16.
23. Slopes steeper than 30 percent will be cable or helicopter yarded. Machinery will not be permitted on slopes steeper than 30 percent. This measure will limit the amount of soil compaction and displacement associated with tractor yarding on steep slopes.

Traffic Control Measures

24. Traffic warning signs will be placed at all sites where the roadway line of site distance has changed as a result of construction activities.
25. Detour signs will be placed at the intersection of Forest Roads 2300 and 2500, Forest Roads 2300 and 2800, Forest Roads 2800 and 2700, and Forest Roads 2700 and 2500, as well as along Forest Roads 2300, 2800, and 2700, to direct traffic during construction activities. This mitigation measure addresses issues 6. Alternative 2, 3 and 4.

Noxious and Invasive Weed Mitigation Measures

In order to reduce the risk of introducing and spreading weeds in the project area, prevention and control activities should be implemented before, during and after project activities. The following mitigation measures apply:

26. To prevent the introduction of noxious weeds into the project area, all heavy equipment, or other off- road equipment used in the project is to be cleaned to remove soil, seeds, vegetative matter or other debris that could contain seeds. Cleaning shall be done before entering National Forest Lands, and when equipment moves from project sites or areas known to be infested into other areas, infested or

otherwise. An inspection will be required to ensure that equipment is clean before work can begin. This is the responsibility of the COR (Equipment cleaning clause Wo-C6.35).

27. In order to prevent the spread of weeds that currently exist on Forest Roads into newly disturbed sale activity areas Class B and C noxious weeds are to be removed, through hand pulling and/or weed wrenching (or other appropriate means) along roadsides adjacent to harvest units, and extending 200 feet along the road beyond the unit boundary. If funding or personnel time is available to treatment will occur prior to project activities. KV funds will be sought to revisit weedy sites in the sale area to control ensuing infestations.
28. Temporary roads, landings and other areas of heavy disturbance shall be revegetated with a native seed mix and application prescription developed by the Forest. Guidelines for site preparation shall also be followed (see Gifford Pinchot Native Species Policy, 2000). This information will be provided by the Gifford Pinchot National Forest North Zone Botanist prior to project implementation.
29. There is a large, continuous population of meadow knapweed at the junction of Forest road 20 and spur road 2010. It appears to have been isolated in the past, judging from the mono-culture at the road-side landing site, but it is actively spreading from various vectors. This project will be implemented after the growing season, but soil from and adjacent to this site should not be spread to other un-infested areas. Of particular notice is the need to thoroughly clean vehicles after operating in this area. If funding or personnel time is available, treatment of this population will occur prior to project activities.
30. There are no special recommendations for St. John's wort and oxeye daisy. These species are common through the planning area and adjacent area. They also propagate via under ground root-stems (rhizomes). Pulling and cutting is not recommended since each piece of plant matter has the capability to reproduce a new plant. Chemical treatment of these species is the one way to eliminate existing plants, with out the risk of compounding the problem the following season.

Wildlife Mitigation Measures

The following mitigation measures apply to all proposed sale units and post-sale projects in alternatives 2, 3, 4 and 4.1, except where otherwise noted:

31. No project activities that exceed ambient noise levels will occur between March 1 to June 30 to minimize harassment to northern spotted owls that may be nesting adjacent to sale units, unless surveys to protocol standards are conducted, and no spotted owls are detected within a) 35 yards of the proposed activity for heavy machinery use, or b) 65 yards for chainsaw use, or c) one mile for large (logging) helicopter use, or blasting (USFWS 2004).

32. No sale activities that exceed ambient levels will occur between May 15 to July 1, to limit disturbance to deer and elk during the fawning and calving period.
33. Helicopter logging operations under alternative 4 will include a provision that helicopters will avoid flying within .25 miles of the upper elevations of Smith Ridge and South Point (i.e. open, rocky, subalpine and alpine areas) during the duration of the sale, to avoid unnecessary disturbance to mountain goats.
34. Existing old-growth, legacy down trees, and old-growth, legacy snags will be protected from disturbance to the extent feasible by placing unthinned patches around them, or otherwise minimizing impacts to these sites during yarding, provided that they do not present a logging safety hazard. In unit 4, a minimum of three unthinned patches (“skips”) of approximately one-half acre in size, will be placed around old-growth, legacy snags and accumulations of old-growth, legacy down trees outside of riparian reserves to provide protection for these habitat features. Unthinned patches should be utilized in other sale units if it is not possible to protect large, legacy snags and down trees without them.
35. Create an average of 2.8 snags per acre in each sale unit following harvest with post-sale funding, to meet AMA/Matrix and Riparian Reserve (i.e. LSR) goals. Created snags should be greater than 17 inches in diameter, unless this results in the largest trees in the unit being selected for snag creation. In that case, the average size trees in a unit will be selected for snag creation, however all created snags will exceed 15 inches in diameter.
36. Fall 10 trees per acre in units 5, 6, 8, and 17 for down wood with post-sale funding following sale completion, unless contract provisions allow for it to occur in association with the sale. As with snag creation, the size of the felled down wood trees will reflect the average sized tree in each unit; the largest trees will not be preferentially selected for down wood creation. All down wood trees will exceed 15 inches in diameter, however. Due to the large amount of down wood already existing in unit 4, no down wood creation will occur in this unit, unless post-sale surveys indicate a need for it due to the disturbance of significant quantities of existing down wood.
37. Identify and protect “wildlife trees”, large old legacy trees and legacy snags where such trees would not pose safety hazards. Large-diameter trees with broken tops, significant defect, large amounts of dwarf mistletoe, etc. are examples of potential wildlife trees. Provide specific criteria in contract clauses to identify such trees using DxD prescriptions.

Recreation Management

38. Pull slash 50 feet from the trailhead and trail located in Unit 5. Scatter slash to eliminate accumulations. Do not use ground-based equipment on the trail or trailhead, and do not use the trailhead as a landing location.

Riparian Prescription

The silvicultural treatment in the riparian reserve will follow a prescription to optimize structural development and plant species diversity to benefit water quality and old growth dependent fauna including native salmonids. The riparian silvicultural prescription will be broken into three riparian management zones including the following components.

1. **Inner zone:** A no-harvest buffer will cover the first 1/3 of the riparian reserve. Class I and II stream riparian reserves are two site-potential tree heights and Class III and IV streams are one site-potential tree height measured horizontally from the ordinary high water mark on each side of the stream. Riparian vegetation is an important source of both stream shade and input of foliar debris providing favorable stream temperatures and source of food for aquatic organisms. All units.
2. **Middle zone:** In ground based units, loaders will be allowed to travel no more than 40 feet inside of the Riparian Reserves on approved skid trails. For example, riparian reserves in ground based units are 132 feet wide. Loaders will be able to access the middle zone from the outer zone, which is 40 feet wide, measured from the edge of the riparian reserve. Trees will be felled to lead, and loaders will retrieve what can be reached from designated skid trails.
3. **Outer zone:** Selective thinning will be used in the outer 80-85 feet of the riparian reserve with average canopy closure retained at 50-60 % percent with silvicultural treatment and consistent with the rest of the unit. If currently below this target, riparian reserve canopy closure will remain at existing condition. Alternative 2, Units 5, 6, and 8.
 - a. Canopy closure will be retained at 50-60 % percent with silvicultural treatment.
 - b. Riparian plant diversity, density and vigor will be maintained by retaining all western red cedar (*Thuja plicata*), red alder (*Alnus rubra*) and broadleaf maple (*Acer macrophyllum*) and other species.
 - c. Downed large woody debris should be evenly dispersed in the flood prone area. The goal is to provide 10 percent cover in logs greater than 6 inches. Two percent should be sound (class I and II) logs and 8 percent in decayed logs (class III, IV and V). The down wood should be consistent with Late Seral Reserve (LSR) guidelines for Western Hemlock and Pacific Fir plant communities (USDA 1997). Large wood will serve to moderate high flows and provide future source of instream wood.
 - d. Apply downed large wood to riparian reserves and add surface roughness adequate to prevent the delivery of anthropogenic sediments. Down wood is

abundant, > 5 trees per acre (>75 feet long and in decay class I-III), and providing ample sediment trapping opportunities.

Applicable Best Management Practices:

- T-4. Use of Sale Area Maps for Designating Water Quality Protection Needs
- T-7. Streamside Management Unit Designation
- T-17. Meadow Protection during Timber Harvesting
- T-22. Modification of the TSC (Timber Sale Contract)
- R-12. Control of Construction in Streamside Management Units
- W-3. Protection of Wetlands.

Applicable Units: All

- e. Riparian reserve widths and surface roughness will be maintained to prevent delivery of sediments resulting from management activities. Excessively wet and unstable areas will be avoided in sale layout and/or identified on sale area map. (Units 4,5,6,8).
- f. Silvicultural treatment will maintain combined trees, shrubs, grass, and forbs cover on more than 90% of the ground. Small openings will be evenly dispersed. The silvicultural treatment will maintain a variety of species and age classes that represent the potential site community. Result of treatment will optimize ground cover; promote necessary growth, density, vigor and reproduction to develop root cohesion and surface roughness to help provide hill slope stability.
- g. Silvicultural treatment will retain and promote growth of the largest trees to provide future large wood recruitment in streams. Retain all trees measuring >20 inches in diameter at breast height (dbh) in Riparian Reserves. Units 4,5,6,8 and 17.

Applicable Best Management Practices:

- T-4. Use of Sale Area Maps for Designating Water Quality Protection Needs
- T-7. Streamside Management Unit Designation
- T-17. Meadow Protection during Timber Harvesting
- T-22. Modification of the TSC (Timber Sale Contract)
- R-12. Control of Construction in Streamside Management Units
- W-3. Protection of Wetlands.

Alternatives 2, 3 and 4, All units.

3.5 Other Projects

Additional projects that have been considered for implementation include road work, culvert replacement and instream structure placement. The following actions are unconnected to the project, but are proposed to address concerns related to riparian condition. Projects would be funded via other sources, such as authorized through the Knutsen-Vandenburg Act, or other appropriations. The following proposals may require heritage surveys, survey-manage and fisheries and wildlife review and documentation to complete NEPA. They would fit under typical categories that are covered under programmatic consultation biological opinions.

1. Snag creation (mitigation measure 35): Create an average of 2.8 snags per acre in each sale unit following harvest with post-sale funding, to meet AMA/Matrix and Riparian Reserve (i.e. LSR) goals. Created snags should be greater than 17 inches in diameter, unless this results in the largest trees in the unit being selected for snag creation. In that case, the average size trees in a unit will be selected for snag creation, however all created snags will exceed 15 inches in diameter. This project is fully addressed in this analysis.
2. Down-wood creation (mitigation measure 36): Fall 10 trees per acre in units 5, 6, 8, and 17 for down wood with post-sale funding following sale completion, unless contract provisions allow for it to occur in association with the sale. As with snag creation, the size of the felled down wood trees will reflect the average sized tree in each unit; the largest trees will not be preferentially selected for down wood creation. All down wood trees will exceed 15 inches in diameter, however. Due to the large amount of down wood already existing in unit 4, no down wood creation will occur in this unit, unless post-sale surveys indicate a need for it due to the disturbance of significant quantities of existing down wood. This project is fully addressed in this analysis.
3. Noxious weed treatment (mitigation measure 27): In order to prevent the spread of weeds that currently exist on Forest Roads into newly disturbed sale activity areas Class B and C noxious weeds are to be removed, through hand pulling and/or weed wrenching (or other appropriate means) along roadsides adjacent to harvest units, and extending 200 feet along the road beyond the unit boundary. If funding or personnel time is available to treatment will occur prior to project activities. KV funds will be sought to revisit weedy sites in the sale area to control ensuing infestations. This project is addressed in this analysis.
4. Rehabilitate old and existing logging spurs and landings in Units 5, 6 and 8. This project is proposed to treat areas that are not utilized by the timber sale purchasers. This project is addressed in this analysis through the mitigation measure that requires rehabilitation of skid trails that utilize remnant spurs.
5. Stabilize-close the 2010 Road. This road is currently “stabilized-closed”, and the last one mile was decommissioned in 1993. The proposal would remove existing culverts at

mileposts 0.6 and 1.4. The road would be re-closed with an effective closure berm at the junction with Forest Road 20. While the road is currently “closed”, it is being used by all terrain vehicles (ATV’s). Illegal ATV activity has reduced effectiveness of the closure and cause road surface erosion.

6. Stabilize the 2020 and 2020028 roads. The last three of six miles of the 2020 road was decommissioned in 1993. 10 existing culverts may be removed or stabilized by adding cross drains, dips, etc. Currently 2 culverts are plugged and not functioning properly. Past flows at these locations have overtopped the road fill and have caused road surface erosion. The first approximately 1.2 miles may be stabilized by the purchaser (improve drainage, stabilize by placing cross drains, etc.) and addressed in this analysis; the road surface beyond Unit 8 would require additional funds and additional surveys/documentation.

A closure would change the 2020 and 2020028 roads from Level 2 (open to high-clearance vehicles) to Level 1 (and close-stabilize) road maintenance category. The objective of both categories is to create a stable condition so the road bed is left in a self-maintaining condition; however the Level 2 category allows access. This action would require additional scoping and analysis, in addition to the required surveys listed above.

7. The Smith Creek instream restoration project would place instream log structures along a 0.5 mile reach adjacent to and south of Unit 17 and the 20 Road. The proposed instream project is located in T 12 N, R 9 E, Sections 21 and 29. The EA includes provision of trees from Unit 6 for this project; the instream structure locations would require finalization and subsequent surveys.

8. Replace the culvert at the Smith Creek crossing on Forest Road 2000 near units 5 and 17. This project would replace an undersized culvert with a bottomless stream simulation structure and add two ditch relief culverts. This project would require additional surveys.

9. Identify and culture large trees in uncut riparian buffers. This project would be implemented to treat the inner third of riparian reserves that may benefit from This action would require additional analysis.

3.7 Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives. Table 6 displays comparative factors that may be used to address issues outlined in Chapter 2.

Responsiveness to Issue 1 (legacy features) may be evaluated by comparing acres of ground disturbance, type of logging system, and acres distributed between logging systems. In general, ground based systems are potentially more impacted depending on the skill of the equipment operator. Cable yarding systems can avoid accumulations of down wood by carefully locating corridors, but this option is limited by topography and limited flexibility of the system. Helicopter logging is potentially least disturbing to downed legacy features, but has the potential to be more disturbing to snags that may present hazards to workers.

Table 6. Comparison of alternatives.

| | Alternative 1 | Alternative 2 | Alternative 3 | Alternative 4 | Alternative 4.1 |
|---|---------------|---------------|----------------------|---------------------------|-----------------|
| Total Unit Acres | 0 | 150 | 239 | 253 | 253 |
| Acres Treated (minus RR, skips) | 0 | 113 | 199 | 212 | 212 |
| Acres of RR Thinned | 0 | 23 | 79 | 82 | 82 |
| Logging Systems | 0 | Ground Based | Ground Based & Cable | Ground Based & Helicopter | Helicopter |
| Volume Harvested | 0 mmbf | 2.2 mmbf | 3.9 mmbf | 4.2 mmbf | 4.2 mmbf |
| Acres logging system (ground/sky/heli) | 0 0 0 | 113 0 0 | 113 86 0 | 113 0 99 | 0 0 212 |
| Net Value | \$0 | \$1,105,610 | \$1,897,122 | \$1,920,846 | \$1,670,613 |
| Benefit/Cost Ratio | 0 | 4.51 | 3.91 | 3.32 | 2.55 |

Table 7. Summary of anticipated effects and benefits from the Dry Burton timber sale alternatives related to the northern spotted owl and CHU issue.

| Alternative # | Noise Disturbance rating | Legacy habitat features (snags, down wood) disturbance rating | Potential long-term habitat benefit rating from thinning* |
|---------------|---|---|---|
| 1 | 0 | 0 | 0 |
| 2 | Least noise due to scope of disturbance | Moderate potential to disturb legacy features | 113 |
| 3 | Moderate noise | Highest potential to disturb legacy features | 199 |
| 4 and 4.1 | Highest noise rating | Least impact to down wood features | 212 (both alternatives) |

Issue 2 (Northern spotted owls) is evaluated by looking at potential impacts to legacy features, potential impacts from noise disturbance, and potential long-term benefit to habitat from thinning. In general, helicopter harvest produces the most noise, but is least disturbing to down legacy features, which provides habitat for prey species. The long-term benefit from thinning is derived from the total acres treated, and assumes that thinning prescriptions would improve existing habitat conditions in the long-term.

Issue 3 (water quality and riparian dependent species) is addressed by considering potential ground disturbance and likelihood of sediment delivery to streams. In general, Alternatives that utilize ground-based logging methods create more ground disturbance. Cable logging also contributes to ground disturbance due to the construction of landings and the establishment of skyline corridors. Helicopter logging methods (Alternatives 4 and 4.1) limit ground disturbance to landing construction. The amount of riparian reserves treated and total acres treated also reduce the potential for ground disturbance within riparian reserves, and may be used as evaluation criteria.

Table 8. Alternative ranking and summary of effects based on eight evaluation criteria indicators for Dry Burton Thin.

| Alt | Alt Rank ¹ | Riparian and Stream Habitat | | Water Quality and Quantity | | | | | |
|-----|-----------------------|-----------------------------|---------------------------------------|----------------------------|-----------------------------|------------------------|---------------------------|-------------------------------|-----------------------|
| | | RR Treatment (Ac) | Fine Sediment Increase (Stream count) | Surface Soil Erosion (Ac) | Mass Wasting Potential (Ac) | Road Crossing. (count) | Water Yield Increase (Ac) | Log Systm Disturbed Soil (Ac) | Temp Rd Landings (Ac) |
| I | I | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | II | 23.1 | 9 | 13.4 | 13 | 0 | 13.39 | 5.36 | 4.0 |
| 4.1 | III | 86.1 | 21 | 49.9 | 46.3 | 0 | 47.1 | 0 | 2.0 |
| 4 | IV | 86.1 | 21 | 49.9 | 46.3 | 0 | 47.1 | 5.36 | 5.5 |
| 3 | V | 78.8 | 19 | 26.3 | 26.2 | 0 | 15.7 | 7.6 | 5.5 |

¹ Rank is ordered I-IV with I being the least impact, based professional judgment of impacts to aquatic resources based on identified Issues and eight relevant evaluation criteria.

4.0 ENVIRONMENTAL CONSEQUENCES

This section summarizes the physical, biological, social and economic 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 chart above. This analysis is organized by resource area.

4.1 Disturbance History

The Dry Burton Planning Area is located entirely within the 10,347 acre Smith Creek sub-watershed, which is located within the Upper Cowlitz Watershed (HUC 170800403). The watershed has a history of wildfire, and was in a contiguous forest of grass/pole and small trees prior to the 1880's. The Smith Creek subwatershed was considered relatively diverse in terms of structural stages, with a mix of grass/pole, small tree, large tree and non-forest.

One large wildfire occurred in portions of Dry, Johnson and Smith Creek sub-watersheds in 1910. The wildfire consumed approximately 10,000 acres in Smith Creek sub-watershed. 2% of the Upper Cowlitz Watershed has had a stand replacing fire event since 1910, which has contributed to the loss of meadows due to conifer encroachment (1997 Upper Cowlitz River Watershed Analysis pages 4-7, 4-11, and 4-12).

Fire suppression and regeneration harvest, which began to shape the watershed during the 1930's and 1940's became the two most important disturbance agents in the Cowlitz Watershed. The Smith Creek subwatershed was one of the most extensively harvested. Harvest activity in the watershed resulted in the loss of structural elements, including snags, large down coarse woody debris, and reduced duff layers.

Approximately 24,324 acres of the Upper Cowlitz Watershed have been harvested during the last 50 years. At least 52% of the watershed was in the grass-pole development stage as of 1997 (Upper Cowlitz Watershed Analysis, USFS 1997). Stands in this category originated from clearcut harvest practices, and are now fully stocked plantations. Most of the private lands were harvested during the 1970's. Additional biological and physical information regarding the planning area can be found in the *Upper Cowlitz Watershed Analysis* (USFS 1997).

4.2 Future Planned Harvest Activities

Future planned activities within the Upper Cowlitz Watershed include the Cowlitz Thin Timber Sale, which is located to the north and east of the Cowlitz River and the town of Packwood, Washington. Planning of the Cowlitz Thin is in progress, and planned for sale in 2007. This sale is also a commercial thinning sale, which would be conducted in LSR and Matrix lands. The Cowlitz Thin would commercially thin up to approximately 1200 acres. While it is expected that the Dry Burton Thin would occur within one season and earlier than the Cowlitz Thin, it is possible that harvest and haul periods would overlap.

The Pinchot Partners Restoration Thin is a commercial thinning sale that is being planned by the Pinchot Partners, a collaborative working group that actively participates in the planning of various projects in the Cowlitz Valley. The Plantation Thin would also be located in the Upper Cowlitz Watershed, and is expected to be implemented beginning in 2008.

Simultaneous hauling activities would occur along Highway 12 if harvest and haul timelines overlap.

4.3 Stand Growth and Productivity

The proposed Dry Burton timber Sale consists of 5 units planned to be sold during fiscal year 2006. This prescription documents the goals and objectives identified within the Dry Burton Thin Environmental Assessment, treatment alternatives to meet these goals and objectives and the operational prescription for the alternative selected. This sale proposes to thin (HTH) 253 acres. There will be an estimated net volume of 8200 ccf (4.2 mmbf).

All of the proposed units will emphasize meeting overall objectives identified within the Environmental Assessment. It will provide treatments that emphasize sustainability of ecosystems and foster characteristics such as long term site productivity, horizontal diversity in stand structure, species diversity, coarse woody debris (snags and down wood), and riparian protection.

Based on field reviews, stand inventories, and analysis of vegetation, the areas proposed for harvest are suitable for silviculture treatments that remove timber volume while providing benefits selected stands following treatment. These lands are suitable for timber harvest as defined in the Gifford Pinchot National Forest LRMP. Using even aged management systems is appropriate to meet the objectives and requirements of the LRMP, the Northwest Forest Plan, and other resource management objectives

Description of Stand Conditions and Prescriptions

Table 9 describes the basic physical conditions that exist within the proposed sale units. Site index for these stands ranges from 90 to 110 for Douglas-fir (McArdle, 1961). Site productivity classes range from III to V which is high to low productivity for timber production.

All units within the Dry Burton Thin project occur within the transition zone from western hemlock plant association zone to the Pacific silver fir plant association zone. The elevation range lies between 2700 to 3200 feet. Generally the site conditions are cool and mesic.

Table 9. Average conditions for Dry Burton Thin units

| Unit # | Rx | Acres | Elevation | Aspect | Slope % | Site Index |
|--------|-----|-------|-----------|--------|---------|------------|
| 4 | HTH | 43 | 2700 | E | 10-60 | 130 III |
| 5 | HTH | 48 | 2800 | W | 5-35 | 120 IV |
| 6 | HTH | 52 | 2900 | W | 5-35 | 130 III |
| 8 | HTH | 96 | 2900 | W | 5-70 | 130 III |
| 17 | HTH | 14 | 3000 | E | 40-70 | 130 III |

Unit 4: Unit 4 was logged in 1946. Trees in this stand are 70-80 years old, consisting of a mix of species including Douglas-fir (*Pseudotsuga menziesii*), Pacific silver fir (*Abies amabilis*), western hemlock (*Tsuga heterophylla*) and western red cedar (*Thuja plicata*). Stocking levels are high. Relative density ranges from 60 up to 110 with density related mortality widespread throughout stand. The average height of the stand, which is a single cohort, is approximately 105 to 135 feet. There are scattered remnant old growth trees (<1/acre) in this stand. Due to the high density and closed canopy, regeneration within this stand is minimal to non-existent.

Height-to-diameter ratios are high in this stand, which presents concern. This stand has many instances of trees 10” DBH that are over 100 feet tall. Some possible wind throw was observed in the stand.

Snags within the unit are varied in size and numerous. Of particular note are the larger snags which are class 5 snags and 10 to 70 feet in height. This stand has an abundance of snags in all size classes (<20”) and all decay classes. There is not much of a shrub layer in the stand. Insect and disease concerns were relatively minor in the stand.

Thinning prescription (all alternatives): Unit 4 would be commercially thinned from below to 120 trees per acre (Table 10). Spacing would average 19 x 19 utilizing designation by description to achieve thinning objectives. Black cottonwood (*Populus trichocarpa*), red alder (*Alnus rubra*) and other minor species would be protected under all alternatives.

Table 10. Unit 4 current and expected post stand conditions (5 inches and greater).

| Unit 4 | QMD | TPA | Average Height | Relative Density | Species composition* | Canopy Cover |
|--------------------------|------|-----|----------------|------------------|---------------------------------------|--------------|
| Current Condition | 13.4 | 303 | 106 | 81 | PSME, ABAM, TSHE, THPL | 86 |
| Post Treatment Condition | 16.8 | 120 | 106 | 45 | 30% PSME, 8% ABAM, 32% TSHE, 23% THPL | 60 -65% |

* PSME: *Pseudotsuga menziesii* (Douglas-fir); ABAM: *Abies amabilis* (Pacific silver fir); TSHE: *Tsuga heterophylla* (western hemlock); THPL: *Thuja plicata* (western red cedar)

Logging Systems: Unit 4 would be cable logged under Alternative 3, and helicopter logged under Alternative 4 and 4.1 in order to protect down-wood and aquatic features. It would not be harvested under Alternative 2. Skidding in the unit or winching logs from the road would not be allowed to minimize potential effects to down wood.

There is a large down wood component to this stand that does not occur in the other units. A minimum of three un-thinned patches (“skips”) of approximately one-half acre in size would be placed around old-growth, legacy snags and accumulations of old-growth, legacy down trees outside of riparian reserves to provide protection for these habitat features. Large old remnants and potential “wildlife trees” would be protected.

Riparian Reserve Treatments: Riparian reserve widths are 170 feet along Class III and IV streams, and 340 feet along Smith Creek (Class II). The inner one-third of riparian reserves would not be thinned. The riparian reserves would be thinned to the same prescription as the rest of the stand; Alternative 2 would treat only the outer-third of reserves, the other alternatives would treat the out two-thirds. Riparian reserve no cut boundaries would be 57 feet from Class III and IV streams and 114 feet from Smith Creek (Class II). Instances of ‘piping’ were observed in the stand, and when encountered during layout should be protected as a Class III/IV stream.

Snags and Down-wood: Due to the large amount of down wood already existing in unit 4, no down wood creation will occur in this unit, unless post-sale surveys indicate a need for it due to the disturbance of significant quantities of existing down wood.

Slash: No treatment of slash in the stand. The helicopter landing is located in Unit 5 and slash will be treated at that landing.

Post Thinning Stand Conditions: After thinning, down wood felled and snags created, it is expected that the stand will retain approximately 120 trees per acre. An average of 2.8 snags per acre will be created in the unit. Snags will be created from trees larger than 17 inch DBH. The majority of the trees left will be the dominant and co-dominant trees with the largest diameters. There is very little if any regeneration in the unit.

The distribution of species would be maintained among the 4 main species: Douglas-fir (30% of stocking), Pacific Silver Fir (8% of stocking), and Western Hemlock (32% of stocking) and Western Red Cedar (23% of stocking). It is also expected that the increased light levels will allow for development of the shrub layer which includes species such as swordfern, dwarf Oregon grape and red huckleberry. It is expected that some, though limited regeneration may develop within the stand. Relative density in this stand in the 7 inch plus size class is expected to be in the high 40’s.

Unit 5: Portions of unit 5 were logged in 1946 and the remainder in 1953. Trees are 50 - 80 years old, and consist of a mix of species including Douglas-fir, Pacific silver fir, western hemlock and western red cedar (Table 11). Stocking levels in many areas of the stand are dense, with 5 inches and greater diameter classes averaging 287 trees per acre with a mean diameter of 13 inches. Relative density ranges from 30 up to 130 with

density related mortality widespread throughout stand. The average height of the stand, which is a single cohort, is approximately 105 to 135 feet. Due to the high density closed canopy, regeneration in this stand is minimal to non-existent.

There is a high occurrence of dwarf mistletoe in the western hemlock. There are large patches in the unit with little to no shrub cover due to very high canopy closure (90% +). The shrub layer in the stand is patchy. The shrub layer is dominated by sword fern and dwarf Oregon grape. There is one Southern exposure in the stand that is covered in salal.

Thinning Prescription: Unit 5 would be thinned to approximately 100 commercial-sized trees per acre. Spacing would average 21 x 21 feet. Trees would be selected using a Designation by Description method. Pacific silver fir, western red cedar, red alder, black cottonwood and other minor species would be protected.

Logging Systems: This stand would be logged with ground based logging systems under all action alternatives but Alternative 4.1, which would helicopter thin the stand. There would be about 0.2 miles of existing temporary road opened up into the unit under all alternatives except Alternative 4.1. At the end of this temporary road, a large landing would be established, which would also be used as a helicopter landing under Alternative 4. This temporary road (an existing unnamed spur originating off of Forest Road 20) and landing would be subsoiled and treated as described in the mitigation measures.

Riparian Reserve Treatments: Riparian reserve widths are 170 feet along Class III and IV streams, and 340 feet along Smith Creek (Class II). The inner one-third of riparian reserves would not be thinned, nor would any skid trails be allowed for any reason. The riparian reserves would be thinned to the same prescription as the rest of the stand; Alternative 2 would treat only the outer-third of reserves, the other alternatives would treat the out two-thirds. Riparian reserve no cut boundaries would be 57 feet from Class III and IV streams and 114 feet from Smith Creek (Class II).

Table 11. Unit 5 current and expected post stand conditions (5 inches and greater).

| Unit 5 | QMD | TPA | Average Height | Relative Density | Species composition | Canopy Cover |
|--------------------------|------|-----|----------------|------------------|--|--------------|
| Current Condition | 12.3 | 332 | 109 | 79 | PSME, ABAM, TSHE, THPL | 84 |
| Post Treatment Condition | 13.2 | 144 | 109 | 38 | 59% PSME, 13% ABAM, 11% TSHE, 18% THPL | 50 – 60 |

Snags and Down-wood: An average of 10 trees per acre would be left or created for down wood. Down wood trees should be 15 inches or larger, but not taken from the

largest trees in the stand. After thinning, surveys will be done to determine the number of additional down wood trees that will need to be felled. An average of 2.8 snags per acre would be created in the unit. Most snags created should be 17 inches dbh or larger; however some areas of this stand may not have an adequate supply of 17 inch plus trees, in which case snags can be created from trees as small as 15 inches dbh. There is an area of approximately 5 acres in the southwest corner of the stand that contains several legacy trees, which would be excluded from the unit.

Slash: No treatment of slash in the stand would occur. Where possible, slash would be felled and left in skid trail corridors to protect the soil from disturbance. Slash at landings would be piled and burned.

Post Thinning Stand Conditions: After thinning, with down wood felled and snags created, it is expected this unit would average approximately 145 trees per acre in all sizes. For trees 7 inches and above there would be an average of approximately 100 trees per acre after snags and down-wood have been created. Opening up the stand would promote the growth of shrubs and other herbs that are in the stand.

The seven-inch and under size class component would consist primarily of shade tolerant species, which would continue to grow and form the second cohort of the stand. The distribution of species would be better weighted among the four main species: Douglas-fir (59% of stocking), Pacific silver fir (13% of stocking), western hemlock (11% of stocking) and western red cedar (18% of stocking). Relative density in this stand in the 7 inch plus size classes is expected to be about 35.

Unit 6: Unit 6 was clearcut in 1950 or 1953 and replanted the following year (Table 12). The stand was replanted to Douglas-fir. Abundant natural regeneration of western hemlock, Pacific silver fir and western red cedar was apparently left following harvest, which is reflected in the current stand conditions. This unit was pre-commercially thinned in the late 1970's. Trees in this stand are 50 to 60 years old, which consists of a mix of species including Douglas-fir, Pacific silver fir, western hemlock and western red cedar. Stocking in the stand is dense, with trees in the 5 inches and greater diameter classes averaging 290 trees per acre and a mean diameter of 13.2 inches. Throughout the stand there is a wide range of diameters ranging from 5 inches to 20+ inches. This range occurs in Douglas-fir, western hemlock, and Pacific silver fir. Relative densities average approximately 76 trees per acre with density related mortality widespread throughout stand. The average height of the stand, which is a single cohort, is approximately 118 feet. Bear damage has been observed in the northern part of the stand, with as many as ten to fifteen trees per acre observed in some areas. Small hard snags in this area are abundant.

Table 12. Unit 6 current and expected post stand conditions (5 inches and greater).

| Unit 6 | Mean dbh | TPA | Average Height | Relative Density | Species composition | Canopy Cover |
|--------------------------|----------|-----|----------------|------------------|---------------------------------------|--------------|
| Current Condition | 13.2 | 290 | 118 | 76 | PSME, ABAM, TSHE, THPL | 78 |
| Post Treatment Condition | 14.4 | 132 | 118 | 40 | 30% PSME, 8% ABAM, 32% TSHE, 23% THPL | 50 – 60 |

Thinning Prescription: Unit 6 would be thinned to approximately 100 commercial-sized trees per acre. This would be achieved by cutting trees from select species that range from 7 to about 14.5 inches dbh. The result would be a creation of gaps where there are clumps of trees ranging between 7 and 14.5 dbh, and the creation of skips where clumps of trees larger than 14.5 inches dbh are left. It is also expected that there would be areas of the stand that may be lightly thinned and other areas that would be heavily thinned. Due to the nature of this type of prescription the spacing of trees would be highly variable across the entire stand. Trees would be selected using a Designation by Description prescription.

Logging systems: Unit 6 would be logged using ground-based equipment under alternatives 2, 3 and 4. Some short pitches are steeper than 30% and would require application of mitigation measures (Chapter 2).

Riparian Reserve Treatments: Riparian reserve widths are 170 feet along Class III and IV streams, and 340 feet along Smith Creek (Class II). The inner one-third of riparian reserves would not be thinned, nor would any skid trails be allowed for any reason. The riparian reserves would be thinned to the same prescription as the rest of the stand; Alternative 2 would treat only the outer-third of reserves, the other alternatives would treat the out two-thirds. Riparian reserve no cut boundaries would be 57 feet from Class III and IV streams and 114 feet from Smith Creek (Class II).

Snags and Down-wood: An average of 10 trees per acre would be left or created for down wood. Down wood trees should be 15 inches or larger, but not taken from the largest trees in the stand. After thinning, surveys will be done to determine the number of additional down wood trees that will need to be felled. An average of 2.8 snags per acre would be created in the unit. Most snags created should be 17 inches dbh or larger; however some areas of this stand may not have an adequate supply of 17 inch plus trees, in which case snags can be created from trees as small as 15 inches dbh.

Slash: There would be no treatment of slash in the stand. Where possible, slash would be felled and left in skid trail corridors to protect the soil from disturbance. Slash at landings would be piled and burned.

Post Thinning Stand Conditions: After thinning, down wood felled and snags created, it is expected this unit would average approximately 145 trees per acre. Due to the type of thinning (diameter distribution) it is estimated that 7 inch plus trees would vary over a wide range (from 50 to 150 trees per acre). The majority of the commercial trees left would be the dominant and co-dominant trees with the largest diameters. The seven inch and less diameter component would consist primarily of shade tolerant species, which will continue to grow and form the second cohort of the stand. Relative density in this stand in the smaller diameter classes is expected to be in the low 30's; however overall density including all size classes would be approximately 40.

The distribution of species would be better weighted among the 4 main species: Douglas-fir (30% of stocking), Pacific silver fir (8% of stocking), western hemlock (32% of stocking) and western red cedar (23% of stocking). It is expected that the increased light levels would allow for development of the shrub layer, which includes sword fern, dwarf Oregon grape and red huckleberry. It is also expected that additional regeneration would develop in the stand.

Unit 8: Unit 8 was clearcut in 1950 or 1953 and replanted the following year (Table 13). The stand was replanted to Douglas-fir. Abundant natural regeneration of western hemlock, Pacific silver fir, and western red cedar became established post harvest as in Unit 6, and is reflected in the current stand conditions. This unit was pre-commercially thinned in the late 1970's. Trees in this stand are 50-60 years old. This stand has a mix of species including Douglas-fir, Pacific silver fir, western hemlock and western red cedar. Stocking levels in most parts of the stand are high, with diameter classes greater than 5 inches in diameter averaging approximately 471 trees per acre. The mean diameter is 11.3 inches. Relative density averages approximately 97 with density related mortality widespread throughout stand. The average height of the stand, which is a single cohort, is approximately 99 feet. A wide range of diameters ranging from 5 inches to 20+ inches is distributed throughout the stand. This range occurs in Douglas-fir, western hemlock, and Pacific silver fir.

Table 13. Unit 8 current and expected post-stand conditions (5 inches and greater).

| Unit 8 | QMD | TPA | Average Height | Relative Density | Species composition | Canopy Cover |
|--------------------------|------|-----|----------------|------------------|--|--------------|
| Current Condition | 11.3 | 471 | 99 | 97 | PSME, ABAM, TSHE, THPL | 90 |
| Post Treatment Condition | 13.7 | 130 | 100 | 36 | 27% PSME, 11% ABAM, 26% TSHE, 35% THPL | 50 – 60 |

Thinning Prescription: This unit would be thinned to leave approximately 100 commercial sized trees per acre. This would be achieved by selecting species that range from 7 to about 14.5 inches dbh. The result would be a creation of gaps where there are clumps of trees ranging between 7 and 14.5 dbh, and the creation of skips where clumps of trees larger than 14.5 inches dbh are left. It is also expected that there would be areas of the stand that may be lightly thinned and other areas that would be heavily thinned. Due to the nature of this type of prescription the spacing of trees would be highly variable across the entire stand. Trees would be selected using a Designation by Description prescription.

Logging systems: Unit 8 would be logged using a combination of ground-based equipment and helicopter in Alternative 4. All areas over 30% would be logged by helicopter. Logs would be yarded to a landing within Unit 8.

Riparian Reserve Treatments: Riparian reserve widths are 170 feet along Class III and IV streams, and 340 feet along Smith Creek (Class II). The inner one-third of riparian reserves would not be thinned, nor would any skid trails be allowed for any reason. The riparian reserves would be thinned to the same prescription as the rest of the stand; Alternative 2 would treat only the outer-third of reserves, the other alternatives would treat the out two-thirds. Riparian reserve no cut boundaries would be 57 feet from Class III and IV streams and 114 feet from Smith Creek (Class II).

Snags and Down-wood: An average of 10 trees per acre would be left or created for down wood. Down wood trees should be 15 inches or larger, but not taken from the largest trees in the stand. After thinning, surveys will be done to determine the number of additional down wood trees that will need to be felled. An average of 2.8 snags per acre would be created in the unit. Most snags created should be 17 inches dbh or larger; however some areas of this stand may not have an adequate supply of 17 inch plus trees, in which case snags can be created from trees as small as 15 inches dbh.

Slash: There would be no treatment of slash in the stand. Where possible, slash would be felled and left in skid trail corridors to protect the soil from disturbance. Slash at landings would be piled and burned.

Post Thinning Stand Conditions: After thinning, down wood would be felled and snags created. This unit would be expected to average approximately 132 trees per acre. Due to the type of thinning (diameter distribution) it is estimated that of 7 inch plus trees per acre could vary over a wide range (from 50 to 150 trees per acre). The majority of the commercial trees left would be dominant and co-dominant trees with the largest diameters. The seven inch and less diameter class components would consist primarily of shade tolerant species that would continue to grow and form the second cohort of the stand. Relative density in this stand (7 inch plus diameter classes) is expected to be approximately 35.

The distribution of species will be well distributed among the 4 main species: Douglas-fir (27% of stocking), Pacific silver fir (11% of stocking), western hemlock (26% of

stocking) and western red cedar (35% of stocking). As in Unit 6, it is expected that the increased light levels would allow for development of the shrub layer, which is dominated by sword fern, dwarf Oregon grape and red huckleberry. It is also expected that additional regeneration would develop in the stand.

Unit 17: Unit 17 was logged in 1953 and replanted the following year (Table 14). Trees in this stand are 50-80 years old. This stand has a mix of species including Douglas-fir, Pacific silver fir, western hemlock and western red cedar. Stocking levels are high, with diameter classes 5 inches diameter and greater averaging 417 trees per acre with a mean diameter of 12 inches. Relative density is 94, with density related mortality widespread throughout stand. The average height of the stand, which is a single cohort, is approximately 105 to 135 feet. Due to the high stocking levels and closed canopy, regeneration within much of this stand is minimal to non-existent.

There is a high occurrence of dwarf mistletoe in the western hemlock. There are large patches in the unit with little to no shrub cover due to very high canopy closure (90% +). The shrub layer in the stand is patchy. The shrub layer is dominated by swordfern and dwarf Oregon grape.

Table 14. Unit 17 current and expected post-stand conditions (5 inches and greater).

| Unit 17 | QMD | TPA | Average Height | Relative Density | Species composition | Canopy Cover |
|--------------------------|------|-----|----------------|------------------|---------------------------------------|--------------|
| Current Condition | 12.0 | 417 | 114 | 94 | PSME, ABAM, TSHE, THPL | 90 |
| Post Treatment Condition | 12.3 | 169 | 114 | 40 | 51% PSME, 4% ABAM, 29% TSHE, 17% THPL | 55 - 65 |

Layout: Unit 17 is bordered by FR20 to the East, a stand break to the North, a slope break to the West and by a patch of old growth to the South.

Thinning Prescription: This unit would be thinned to leave approximately 100 commercial sized trees per acre. Spacing would average 21 x 21 feet. Trees would be selected using a Designation by Description guide, which would protect minor species such as Pacific silver fir, western red cedar, red alder, black cottonwood or other minor species.

Logging systems: Unit 17 would only be harvested under Alternative 4. It would be Helicopter logged due to safety and resource concerns. Logs would be yarded to the landing in Unit 8.

Riparian Reserves: Riparian reserve widths for this project are 170 feet along Class III and IV streams, and 340 feet along Smith Creek (Class II). The inner one third would not be thinned, nor would any skid trails be allowed for any reason. The outer two thirds of

riparian reserves would be thinned with the same prescription for the stand which it occurs. The middle one third of the Riparian reserves would not have any skid trails located within them. Riparian reserve no-cut boundaries would be 57 feet from Class III and IV streams and 114 feet from Smith Creek.

Snags and Down-wood: An average of 10 trees per acre would be left or created for down wood. Down wood trees should be 15 inches or larger, but not taken from the largest trees in the stand. After thinning, surveys will be done to determine the number of additional down wood trees that will need to be felled. An average of 2.8 snags per acre would be created in the unit. Most snags created should be 17 inches dbh or larger; however some areas of this stand may not have an adequate supply of 17 inch plus trees, in which case snags can be created from trees as small as 15 inches dbh.

Slash: There would be no treatment of slash in the stand. The helicopter landing is located in Unit 8 and slash will be treated at that landing.

Post Thinning Stand Conditions: After thinning, down wood would be felled and snags created. This unit is expected to average approximately 168 trees per acre including all size classes. For trees 7 inches in diameter and up the goal is to leave an average of approximately 100 trees per acre after snags and down-wood have been created. Opening up the stand would promote the growth of the shrub and herb layer. The seven inch diameter and below components would consist primarily of shade tolerant species, which would continue to grow and form the second cohort of the stand.

The distribution of species would be distributed as follows among the 4 main species: Douglas-fir (51% of stocking), Pacific silver fir (4% of stocking), western hemlock (29% of stocking) and western red cedar (17% of stocking). Relative density in this stand for trees 7 inches in diameter and above is expected to be in the low 30's. Overall relative density would be approximately 40.

4.6 Soils and Soil Productivity

The degree or intensity of soil productivity losses is variable depending on the nature of the impacting mechanism. Soil productivity losses associated with permanent features of the transportation system, including system roads, are essentially permanent. Restoration by subsoiling, fertilization, and revegetation would initiate recovery of productivity, but is unlikely to return the soil to its original condition and productivity.

Soil productivity affects growth rates of species through the physical, chemical, and biological components of the soil environment. These growth rates are more noticeable in a timber stand several years following changes in these components. Thus, effects to soil productivity are measurable in the long term, whereas soil quality is a better measure of short-term effects.

Under the action alternatives, the standards and guidelines for soil productivity would be achieved in all activity areas. Unit 4 may involve slight soil disturbance due to skyline

logging systems in Alternative 3, but the effects in those units would be insignificant in all alternatives.

Effects of Alternatives 1-4.1 – Within Standards and Guidelines

All the action alternatives would involve ground-based logging of Units 5 and 6, and the effects to soil productivity due to the proposed actions would be the same in the action alternatives. Ground-based logging methods would be employed to yard logs on ground of less than 30 percent side slope. Alternative 4.1 would helicopter log all units and require two landings approximately one acre in size. Landings would be located in units 6 and 8.

Dry Burton Unit 8 is included in all three action alternatives, but with a different logging systems plan for each alternative. Soil Productivity in Dry Burton Unit 8 would be most affected by Alternative 2 due to the ground based logging system, and least affected by Alternatives 4 and 4.1 due to the minimal ground disturbance from proposed helicopter logging.

Direct and Indirect Effects– Locally Concentrated Losses

Changes in soil productivity are a function of the type, timing, and location of disturbances, and of soil properties in the disturbed areas. Direct effects due to soil disturbing activity occur on site and affect only the area where they occur. Off-site effects, such as sedimentation to streams, occur some time after or some distance away from the disturbance.

Potential effects of the proposed activities on soil productivity are due to compaction, puddling, displacement, erosion, and loss of soil organic matter. Irrecoverable losses in soil productivity due to soil disturbing activities are limited to permanent features of the transportation system including National Forest system roads, non-system roads, landings and skid trails that are not subsoiled because they are not part of the proposed action.

Soil impacts would remain less than 20 percent of the project, including existing skid trails. Locally concentrated losses in soil productivity would occur due to additional compaction and displacement. Additional soil damage is expected to be minor with the prescribed logging system design.

The percent area to be affected was calculated based on the proposed action (Table 31). No net loss in soil productivity is predicted in any of the units. The detrimental conditions listed include both the new and existing roads and landings.

Between about 9.7 (Alternative 3) and 18.5 (Alternative 2) acres of new construction would occur within the harvest unit boundaries. As stated in the Forest Plan, all permanent roads adjacent to the Dry Burton Unit boundaries count toward the detrimental acreage and the amount of area left in a detrimental condition.

Table 15. Prediction of cumulative remaining detrimental conditions in the Dry Burton Units due to proposed temporary road and landing construction.

| | Alternative 1, No Action | Alternative 2 | Alternative 3 | Alternative 4 | Alternative 4.1 |
|---|-----------------------------|------------------|------------------|------------------|--------------------|
| New construction: Temporary and skid roads | 0% | 1.1 | 3.7 | 4.8 | 0 |
| New construction: Landings (helicopter and ground) | 0% | 1.7 % | 5.6 % | 7.3 % | 1.7 % |
| Cumulative Disturbance Before mitigation measures | 8% | 15.2% | 10.9% | 11.4% | 11.4% |
| Predicted post- treatment Disturbance (with mitigation measures) | 8% | 4.6% | 4.6% | 4.6% | >4.6%* |

*This outcome depends on availability of funding to implement additional projects, such as road stabilization and rehabilitation of existing skid trails and landings.

Existing landings and skid trails that are not restored would likely remain in a detrimental condition for the long term. Temporary road and landings can be restored to accelerate their recovery and reduce losses in soil productivity.

In general, the losses predicted are relatively minor in intensity, and vary with time. **Error! Reference source not found.** Short-term losses should be low to moderately damaging to soil quality. This should translate to similar effects on soil productivity.

Long Term Effects - more than 50 years

Conditions in disturbed areas would have improved where restored by subsoiling, fertilization and revegetation. Logging slash is an important source of organic matter that supplies sites with nutrients and reduces the potential for surface erosion. Harvesting only the bole of trees does not greatly deplete nutrients, and losses tend to be associated with whole tree harvest and short rotations. Neither whole tree harvest nor short rotations would be employed in this sale.

Table 16. Duration and Intensity of Losses to Soil Quality in the Dry Burton Sale Area

| Duration | Intensity of Soil Productivity Loss |
|-------------------------------|---------------------------------------|
| Short term | Low to moderate |
| Long term, more than 50 years | Insignificant (not measurable) to Low |

Dry Burton Timber Sale
Harvest Units 4 & 5
Proposed Skid Roads,
Landings and
Skyline Corridors

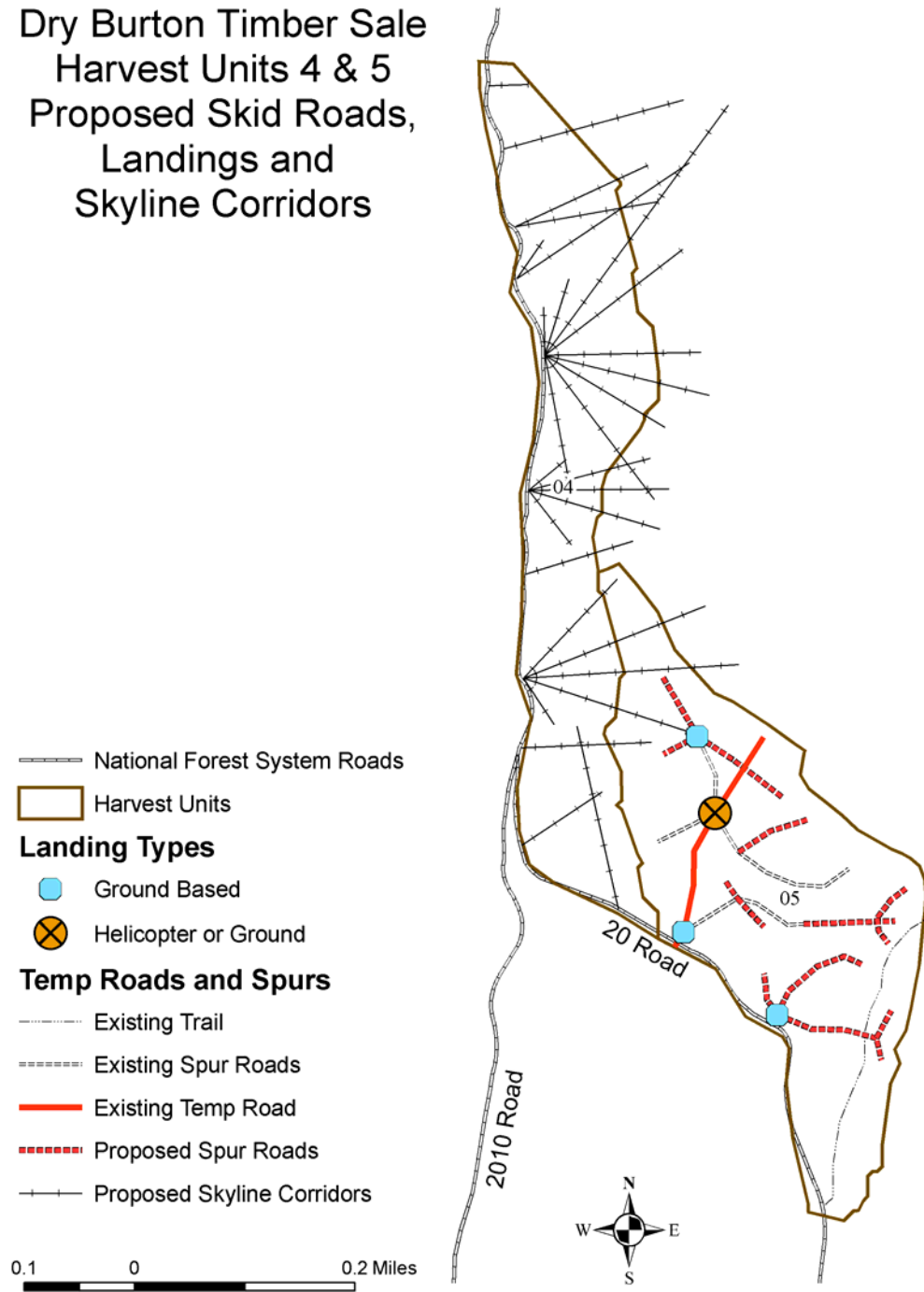


Figure 4. Proposed Temporary Roads, and Landings (All Alternatives), Skyline Corridors (Alternative 3 only), and Helicopter Landing (Alternative 4 only) of Dry Burton Units 4 and 5.

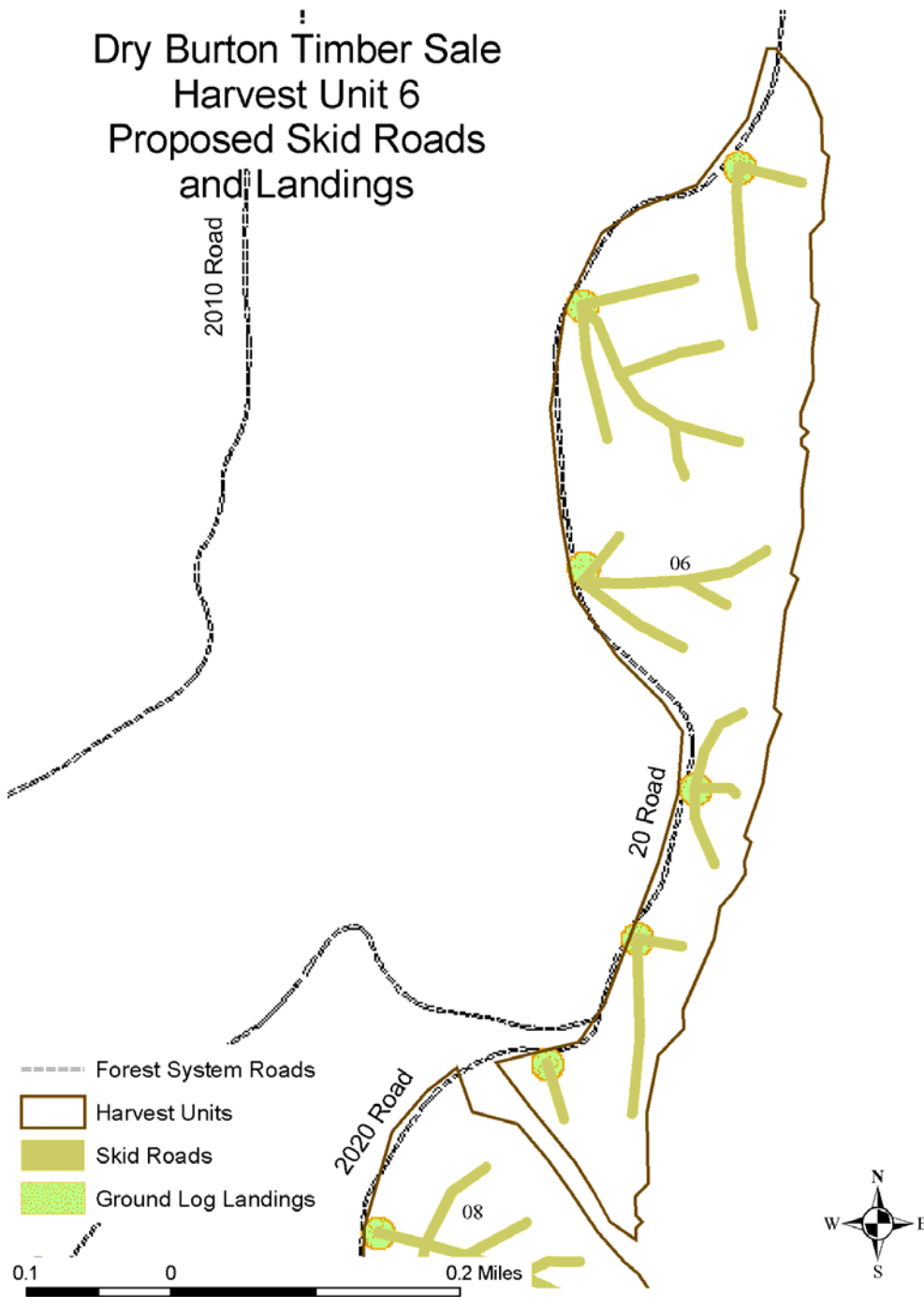


Figure 5. Proposed Temporary Roads and Landings (Alternatives 2-4) of Dry Burton Unit 6. A helicopter landing would be located at the north end of Unit 6, outside of RR's to implement Alternative 4.1, and would replace the landing in Unit 5 under Alternative 4.

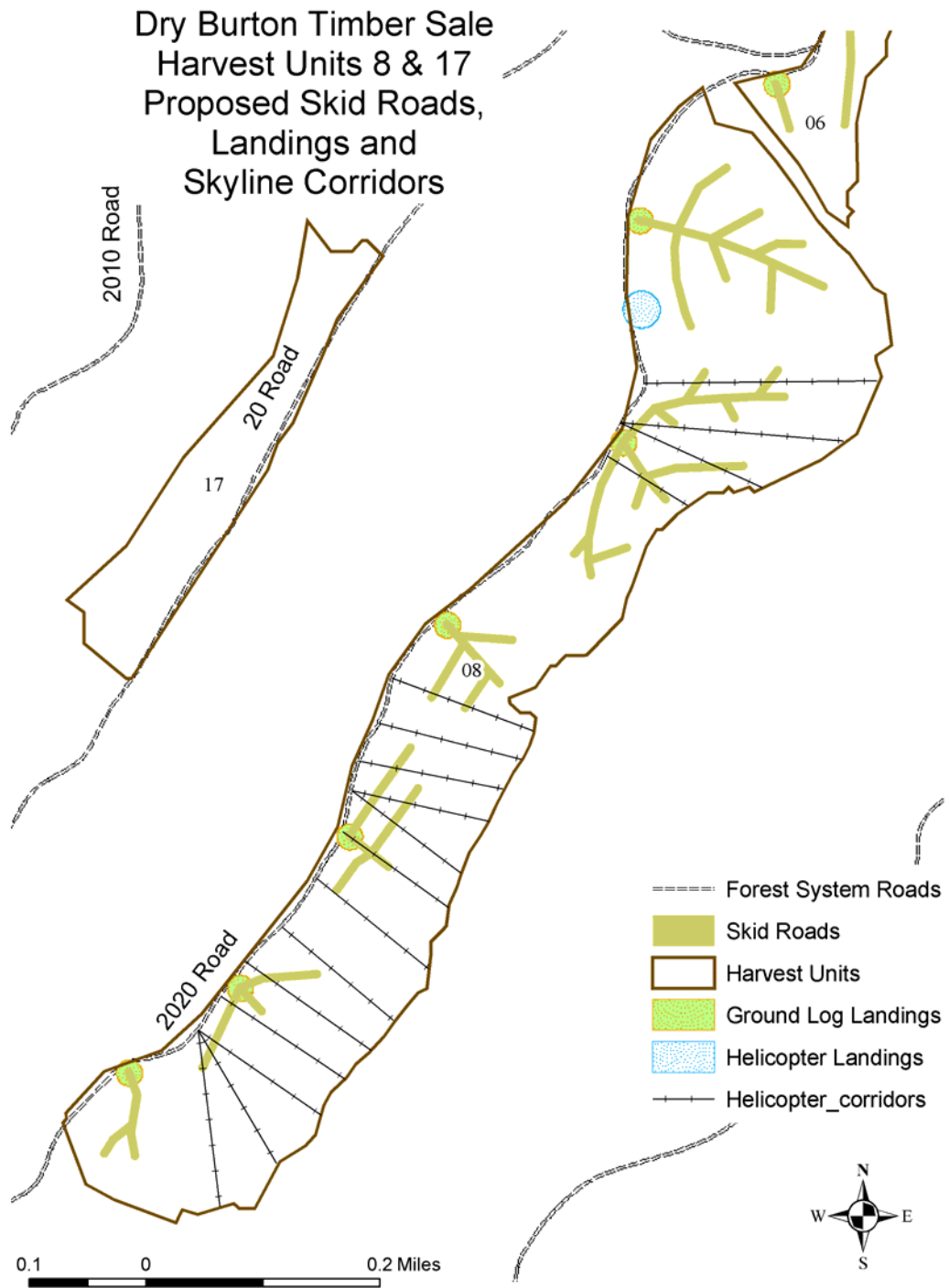


Figure 6. Proposed Temporary Roads, and Landings (Alternative 2 only), Skyline Corridors (Alternative 3 only), and Helicopter Landing (Alternative 4 only) of Dry Burton Units 8 and 17.

Soil Organisms

Soil dwelling organisms are not specifically addressed by standards and guidelines at either Forest or Regional levels.

Direct and Indirect Effects – Locally Concentrated Losses

Logging and site preparation can affect the numbers of species and abundance of soil organisms. Soil compaction, lack of vegetation, or lack of plant litter covering the soil surface tends to reduce the number of soil arthropods (Soil Quality Institute, 2002). The proposed activities may change soil habitats and the food web, and alter soil quality, or the capacity of soil to perform its functions (Tugel, A.J., 2001, Chapter 2).

Some of these organisms, called Mycorrhizae, have been shown to profoundly affect forest growth and productivity. Mycorrhizal fungi assist trees in absorbing water, nutrients and provide protection from pathogen attack. Soil compaction, loss of soil organic matter, and changes in vegetation can effect soil organisms and result in productivity loss.

Limiting the degree and extent of the effects listed above provides protection for the majority of the populations of soil organisms within the activity areas. These effects are assumed to be temporary and recover naturally, after restoration efforts like subsoiling and seeding/planting. Magnitude, duration and intensity of effects, including predicted post treatment disturbance with Mitigation Measures, to soil dwelling organisms are likely to be similar to that of soil quality effects listed in Table 31 **Error! Reference source not found.**

No net loss in populations of soil organisms would be expected in any of the units.

Long Term Effects- more than 50 years

Populations of soil dwelling organisms would have essentially recovered. Restoration by subsoiling, fertilization and revegetation, which was intended to accelerate recovery of soil productivity, would improve conditions in disturbed areas. The organisms then can re-colonize the disturbed areas when conditions become favorable.

Slope Stability, Mass Wasting

A qualified, experienced earth scientist identified unstable and potentially unstable land during field surveys. Revisions to the proposal were made so that no road construction or timber harvest activities were planned in those areas in any of the alternatives, including the upper slopes of Dry Burton Unit 17. The rate, size, or number of mass failure events will not change due to the proposed actions.

4.5 Hydrology: Water Quality and Quantity

Aquatics Resource Analysis Area consideration: The Dry Burton Planning Area is located entirely within the 10,347 acre Smith Creek sub-watershed (Sixth-field Hydrologic Unit Code (HUC) 17080040301), which is located within the Upper Cowlitz Watershed (HUC 170800403). The aquatic analysis is based on an action area expected to be affected directly or indirectly by the proposed action and not merely the immediate area involved in the action. The aquatic effects of the proposed action are expected to be confined to the 10,347 acre sub-watershed. There is a very low risk that any consequences of the proposed action would be manifested outside of Smith Creek sub-watershed. The action area includes the anadromous portion of the Smith Creek sub-watershed below the natural barrier (RM 0.0-1.22) and all of the resident fish bearing portions of Smith Creek (RM 0.0-8.2). Class III and IV tributaries contributing quality and quantity of water to Smith Creek are also evaluated. Table 17 contains a synopsis of some conditions observed in the planning area.

Table 17. Summary of current condition for aquatic resources in Dry Burton Thin, Lewis County, Washington.

| Unit | Acres | Valley Type | Streams (#-Class) | Slope | Aquatic Habitat | Sediment | Rd Concerns | Water Yield |
|------|-------|-------------|-------------------|--------------|---|---|--|-------------------------|
| 4 | 14 | V shape | 7-IV | 0-60% 70% | | Potential mass wasting and surface movement | 20 Rd in riparian reserve | 2 headwalls with piping |
| 5 | 33 | V shape | 2-III | 7% | low LW | | Historic xing washed out (outside of unit) | 2 areas piping |
| 6 | 36 | U shape | 4-IV | 15% | subterranean flow, w:d > 20 heavy bedload | Potential mass wasting, transient channel | undersized pipe FR 20 | |
| 8 | 44 | U shape | 2-III | 0-30% | low LW, wetlands | Debris flows in a Class III stream | FR 2020 undersized pipes, washout | Increase peak flows |
| 8b | | | 1-IV | 30-60% | low LW, wetlands | | | |
| 17 | 11 | U shape | 2-IV | 60%+ | low LW | Soil creep in upper slopes | illegal ORV use FR 2010, undersized pipes | |

Domestic water. There are no known domestic water sources originating in the Smith Creek subwatershed.

Wetlands. There are abundant wetlands located in the Smith Creek watershed. All planning activities are planned to avoid wet areas; however, Forest Road 20 passes through a riparian area that may have wet areas or areas with poor drainage. Additional biological and physical information on the planning area can be found in the *Upper Cowlitz Watershed Analysis* (USFS 1997).

Water Quantity. The planning area is dissected with a high density of intermittent stream courses. The linear arrangement of harvest units along Smith Creek and the frequent occurrence of tributary streams within each unit results in riparian reserve areas ranging from 35-87 percent. Low lying areas tend to hold standing water during the rainy season (Oct – May).

Aggregate Recovery Percentage and roaded densities. Currently 2.5 miles of road are located in riparian reserves immediately adjacent to Smith Creek. with increased risk to adversely impacting to water resources. Much of the past timber harvest area is considered hydrologically recovered. The Aggregate Recovery Percentage (ARP) is 86% percent, which is considered a low risk of peak flow increase, and considered hydrologically mature (USDA 1997a). The elevation of the planning area is between 2000 and 3600 feet and lies almost entirely within the “rain on snow” elevation band (1500 feet – 3500 feet), where the rain-on-snow events are expected and are therefore more prone to peak flow events.

Water quality, stream temperature. Stream temperature in Smith Creek proper tends to be consistently cool, ranging from 10.4 °C to 12.3°C during the summer. Temperatures do not exceed state water quality standards at any point in time during the year (USDA 2003). A network of subsurface water transport likely contributes to the cool water temperatures. Presence of beaver ponds with relatively shallow, standing water do have the potential to warm, but currently are relatively well shaded and protected from solar input.

Table 18. Miles of unpaved road within Smith Creek sub-watershed analysis areas. Lewis County Washington.

| Watershed Name | Road Number | Miles of Unpaved Road | Number of Stream Crossings | Miles of road Within Riparian Reserve |
|----------------|-------------|-----------------------|----------------------------|---------------------------------------|
| Smith Creek | 2000000* | 14.7 | 73 | 1.30 |
| | 2000102 | 0.7 | 3 | 0.03 |
| | 2000118 | 1.5 | 6 | 0.06 |
| | 2010000* | 2.7 | 8 | 0.20 |
| | 2020000* | 3.0 | 59 | 0.90 |
| | 2020028* | 0.5 | 1 | 0.10 |
| | 2020049 | 0.2 | 2 | 0.08 |
| Total Miles | | 23.3 | 152 | 2.67 |

*Roads adjacent to Smith Creek.

Table 19. Area of Riparian Reserves within Dry Burton Thin units. Lewis County, Washington.

| Unit | Total Unit Area (Ac) | Riparian Reserve Area (Ac) | Riparian Reserve (%) |
|-------|----------------------|----------------------------|----------------------|
| 4 | 43.0 | 37.4 | 87.0 |
| 5 | 48.0 | 21.0 | 43.8 |
| 6 | 52.0 | 25.3 | 48.7 |
| 8 | 96.0 | 34.3 | 35.7 |
| 17 | 14.0 | 6.0 | 42.9 |
| TOTAL | 253.0 | 124.0 | 49.0 |

Water quality, sediment. The Smith Creek sub-watershed road density is relatively high, at 2.96 miles/mile². Many are located in close proximity to stream corridors, which have the potential to contribute sediment to adjacent streams. Approximately 27.8 miles of road within the planning area cross Smith Creek drainage a total of 5 times. Approximately 23.3 miles (83 %) of the roads are situated within riparian reserves in the Smith Creek sub-watershed analysis area (Table 19).

Hydrology Effects Analysis

Alternative 1 – No Action

Alternative 1 proposes no action and consequently would have no new impacts to water quality since no additional timber harvest and related ground-disturbing activities would occur. Hydrologic processes would continue to operate at baseline levels. Water temperature and sediment parameters would not be expected to drop below the standards established by the state; however, existing chronic drainage conditions would continue to contribute sediment to aquatic and riparian resources.

Alternative 2 – Ground-based Harvest

Direct and Indirect Effects

Alternative 2 proposes ground logging of 113 acres within Units 5, 6, and 8. The outer one-third of the riparian buffer in all units would be thinned reducing canopy closure from an existing 80-90 % down 50%-65%. 0.2 miles of an existing logging spur built during the first entry would be reopened to access Unit 5. Sixteen landings would be constructed to harvest three units. Total disturbed area is approximately 7.8 acres. There is one Class II, a Class III and 10 Class IV streams within this alternative. Upper bank vegetation is rated from poor to fair adjacent to Unit 5 and Unit 8. Upper bank vegetation adjacent to Unit 6 is rated as good. Water quality and water quantity may move slightly above baseline conditions in the short-term.

Timber harvest and related temporary road and skid trail construction would result in a low to moderate potential risk of increased peak flows due to soil compaction. Subsequent rehabilitation, including subsoiling and revegetation of compacted areas and stabilization of local roads would reduce this potential.

Short-term effects

A network of shallow subsurface water flow with periodic vents (eg. piping) is present in sections of the northern and southern boundaries of Unit 5. Disturbance from ground based logging equipment may result in subsurface flows moving to the surface thereby increasing the rate of runoff. Precautions to identify these areas and limit ground disturbance would minimize these effects. Riparian reserves would be implemented where piping or subsurface streams exist.

Runoff has the potential to increase due to a reduction in stand density and vegetation water uptake through evapotranspiration; however retention of the canopy as proposed in the prescription is considered to be hydrologically stable, and not contribute to increased peak flows during flood events. The resulting vegetation condition is expected to maintain the snow pack and moderate the potential effects of rain-on-snow events (GPNF Cumulative Effects Assessment Process, 1988).

Harvest within Riparian Reserves along Class III and Class IV streams within Unit 8 has the potential to increase localized areas of bank instability. Resulting bank instability increases the risk of sediment delivery. The Class III stream has a history of debris flows during flood events. Both streams lack adequate bank vegetation and mass wasting is common within the steep reaches of the Class IV stream. Ground based logging operations may disrupt shallow subsurface flows in Unit 5 and result in short term scour, increased sediment and localized turbidity above baseline conditions. Limiting travel of ground-based equipment to the outer-third of riparian reserves would minimize this potential.

Long-term effects

Sedimentation increases are expected to remain slightly above baseline conditions for two years after ground disturbance and the timber sale is completed. Following two years rehabilitated skid trails and stabilized roads would result in a decrease in sedimentation and improved filtration of runoff due to the establishment of vegetation and drainage improvements along stabilized roads.

Alternative 3 – Ground-based and Skyline Harvest

Direct and Indirect effects

Alternative 3 proposes ground based logging of 131 acres within Units 5, 6, and 51% of Unit 8 will take place; Skyline logging of 68 acres in Unit 4 and 49% of Unit 8. The

outer two-thirds of the riparian buffer in all units would be thinned to canopy closures of 55-65%. Thirty-nine landings will be constructed. Total disturbed area is approximately 18.3 acres. Skyline logging would create 3.0 acres of open canopy in Units 4 and 8. A Class II, a Class III and 18 Class IV streams lie adjacent to or within units under this alternative. Units 4, 6 and 8 have slopes ranging from 30-60% with smaller sections of 60%+. Upper bank vegetation along streams is rated as *poor* to *fair* adjacent to Units 4, 5 and 8. Upper bank vegetation adjacent to Unit 6 is rated as *good*.

Timber harvest and related temporary road and skid trail construction would result in a low to moderate potential risk of increased peak flows due to soil compaction. This potential would be higher under Alternative 3 because of a higher number of landings due to skyline harvest. Subsequent rehabilitation, including subsoiling and revegetation of compacted areas and stabilization of local roads would reduce this potential.

Short-term effects

Water quantity. Potential effects to water quantity are similar to Alternative 2; however, more area within Riparian Reserves would be treated, potentially contributing to a slight localized increase in water quantity. No-cut buffers in the inner third of riparian reserves, and restriction of ground-based equipment to the outer third of reserves would allow infiltration of runoff to occur. Treatment of skid trails, landings and the temporary spur would limit the potential for increased runoff in the short-term.

Water quality. As with Alternative 2, harvesting within riparian reserves adjacent to streams of concern may increase the potential for localized areas of bank instability. Ground disturbance may increase risk of sedimentation and turbidity above baseline conditions and result in short term scour, increased sediment and localized turbidity above baseline conditions. Alternative 3 would treat more area and two-thirds of Riparian Reserves. Limiting travel of ground-based equipment to the outer-third of riparian reserves will minimize this potential, as do harvest prescriptions that maintain cover, limiting the potential for higher rates of runoff and potential contributions to peak flows.

Long-term effects

As with Alternative 2, sedimentation increases are expected to remain slightly above baseline conditions for two years after ground disturbance and the timber sale is completed. Following two years rehabilitated skid trails and stabilized roads would result in a decrease in sedimentation and improved filtration of runoff due to the establishment of vegetation and drainage improvements along stabilized roads.

Alternative 4 – Ground-based and Helicopter Harvest

Direct and Indirect effects

Alternative 4 proposes ground based logging of 131 acres within Units 5, 6, 70% of Unit 8; Units 4, 17 and 30% of Unit 8 would be helicopter logged. The outer two-thirds of the riparian buffer in all units would be thinned. Twelve landings would be constructed; the total disturbed area is approximately 21.8 acres. There is a Class II, a Class III and 20 Class IV streams adjacent to or within units under this alternative. Units 4, 8 and 17 have slopes ranging from 30-60% with small sections of 60%+. Upper stream bank vegetation is rated from *poor* to *fair* adjacent to Units 4, 5, 8 and 17. Upper bank vegetation adjacent to Unit 6 is rated as *good*.

This alternative would enable Unit 17 to be harvested, which would add to the total number of acres that would be thinned. Potential indirect and direct effects are similar to Alternatives 2 and 3 for units 4, 5, 6 and 8 except that the area harvested would increase, though less area would be disturbed due to the creation of landings and skyline corridors. Unit 5 would not require reconstruction of an unnamed spur. There would be reduced opportunities to rehabilitate old logging spurs within units through the timber sale contract; however, such activities would be alternatively proposed as restoration projects to be funded via other sources, such as KV.

Short-term effects

Effects to water quality and quantity would be similar to or less than those described in Alternatives 2 and 3 for Units 4, 5, 6 and 8. The addition of Unit 17 increases the area to be thinned, with the potential to increase runoff in the near term. Ground-based logging impacts would be the same as for Alternatives 2 and 3. Skyline units or portions of units would be helicopter logged, reducing the disturbance area and therefore the potential for increase runoff due to soil compaction, and sedimentation due to the creation of skyline corridors and landings. Helicopter landings would be reduced to 2.

Long-term effects

As with the other alternatives, sedimentation increases are expected to remain slightly above baseline conditions for two years after ground disturbance and the timber sale is completed. Following two years rehabilitated skid trails and stabilized roads would result in a decrease in sedimentation and improved filtration of runoff due to the establishment of vegetation and drainage improvements along stabilized roads.

4.6 Fisheries

Fish distribution. Anadromous fish distribution in the Upper Cowlitz extends up Smith Creek to river mile 1.2 where the first natural permanent fish migration barriers preclude passage (USDA 1991, USDA 1994). Anadromous species documented as present in Smith Creek include Chinook salmon (*Onchorynchus tshawyscha*), coho salmon (*O. kisutch*), and steelhead trout (*O. mykiss*). Of these fish, the National Marine Fisheries Service (NMFS) has listed Lower Columbia River steelhead trout, Lower Columbia River Chinook salmon and coho salmon as threatened under the Endangered Species Act (Table 20). Chum salmon (*O. keta*) populations have never been documented above the Cowlitz River Dams and are not expected to be included in salmon reintroduction efforts above the mainstem Cowlitz River dams. Steelhead trout, Chinook and coho salmon are transported (trucked) around the three dams on the Cowlitz River making the Cowlitz River and its tributaries accessible to these species.

Resident salmonids present in Smith Creek include cutthroat trout (*Onchorynchus clarki*) and rainbow trout (*O. mykiss*) (USDA 1991). There are approximately 3.0 miles of resident fish habitat in the planning area. Subterranean flow disrupts the channel connectivity and seasonally prevents fish passage to the upper 1.5 miles of stream during the low flow period. Bull trout (*Salvelenus confluentus*) have not been documented in the planning area.

Fish Habitat. As previously discussed, timber harvest and natural disturbance has resulted in a shift in riparian seral stage from large old trees to a mid-seral condition (USDA 1997, USDA 1991). Smith Creek hydrology has also been influenced by road building associated with forest land management activities. The Upper Cowlitz River Watershed Analysis provides a detailed description of habitat conditions in the sub-watershed. A summary is provided in this report.

Table 20. The Evolutionarily Significant Units (ESU), proposed critical habitat, and candidate ESUs in the Cowlitz River Basin and the Dry Burton Thin analysis area.

| Species | ESU | Species Acronym | ESA Status | Federal Register Notice and Date of Listing |
|----------------|---|-----------------|---------------------------------------|---|
| Chinook Salmon | Lower Columbia River | LCRC | Threatened, proposed critical habitat | 64 FR 14308 3/24/99 |
| Steelhead | Lower Columbia River | LCRS | Threatened, proposed critical habitat | 63 FR 13347 3/19/98 |
| Coho Salmon | Lower Columbia River/ Southwest Washington | LCRSW C | Proposed threatened | 60 FR 38011 7/25/95 |

Currently, early seral stages dominate approximately 3.6 miles of Smith Creek riparian vegetation. Sapling pole seral stage (9-20 inches dbh) and reproduction/shrub (< 9 inches dbh) seral stage make up a combined 91% of the inventoried riparian area (RM 4.3-8.7). Large trees (21-32 inches dbh) and mature timber (>32 inches dbh) are uncommon and found in less than 10% of the surveyed riparian area (USDA 1991). Riparian vegetative species consists of early successional species including red alder (USDA 1991 and USDA 2005). A source of large wood recruitment is infrequent in immature riparian vegetation stands. Preferred lasting sources of large wood including western red cedar (*Thuja plicata*) are under represented in the planning area (USDA 2005).

Existing conditions of instream wood consists of primarily *small* piece size class that are moveable during high flow events. *Large* pieces of wood are uncommon following the 1996 flood when much of the woods was swept out of the system or buried under massive landslide (USDA 2005). Watershed analysis identified Smith Creek as “functioning at risk” with respect to large wood.

Channel stability. Channel stability and risk of sediment input is, in part, a function of underlying geology and physical processes that shape the valley form. Valley segment forms (USDA 1989) and channel types (Rosgen and Silvey 1989) are summarized in Table 21 below.

Table 21. Summary of Smith Creek Stream_channel physical characteristics. Lewis County, WA. (USDA 1991 and USDA 2005).

| Reach No ¹ . | River Mile | | Grade (%) | Valley Configuration ² | Channel Type ³ | LW ⁴ |
|-------------------------|------------|------|-----------|--|---------------------------|-----------------|
| | Start | Stop | | | | |
| 1 | 4.3 | 4.72 | 2-3 | Moderate slope bound valley | B3 | Mod |
| 2 | 4.72 | 4.99 | 2-3 | U-Shape glacial trough | B3 | Mod |
| 3 | 4.99 | 5.40 | 2-3 | U-shape glacial trough | E5 | Low |
| 4 | 5.40 | 5.67 | 2 | U-shape glacial trough | C5 | Low |
| 5 | 5.67 | 6.08 | 2-3 | U-shape glacial trough | C4 | Low |
| 6 | 6.08 | 6.18 | 3 | U-shape glacial trough | E4 | Low |
| 7 | 6.18 | 6.49 | 3 | U-shape glacial trough | E3 | Low |
| 8 | 6.49 | 6.68 | 9 | Incised glacial till | A2 | Low |
| 9 | 6.68 | 6.86 | 9 | Steeply incised valley (moderate channel gradient) | A1 | Low |
| 10 | 6.86 | 7.27 | 5 | Alluviated mountain valley | A2 | Low |
| 11 | 7.27 | 7.40 | 5 | Alluviated mountain valley | A2 | Low |
| 12 | 7.40 | 8.27 | 6-7 | U-shape glacial trough | A2 | Low |

¹ Reach 1 starts at the FR 20 bridge

² Valley Configuration based on Gifford Pinchot Stream Survey protocol (USDA 1989)

³ Channel Type = Rosgen Channel Type (Rosgen and Silvey 1989)

⁴ LW = Large Wood > 24 inches (USDA 2005),

Low = < 25% of a feature is affected by large wood

Moderate = > 25% of a feature is affected by large wood

Note Only Smith Creek RM 4.3-8.27 is show, several Class III and IV channels are not represented in this table.

The lowest reach on private land is flat, wide alluvial fan ranging into a moderate slope bound valley in the first 1.2 miles. River miles 1.2-4.3 miles are a steeply incised boulder and bedrock controlled steep gradient system. Following this narrowly constrained transport reach, the valley opens for 0.4 miles into moderate slope bound valley and then expands into a very wide to a U-shaped glacial trough for the next 1.77 miles. The channel constricts once again through 0.3 mile of very steep incised valley moderate grade ranging into a widening alluviated mountain valley and glacial trough in the remaining 0.8 miles of survey channel (Table 21).

The Smith Creek channel stability as described by Phankuch (1977) is predominately (60%) *poor* to *fair* due to upper and lower bank instability (USDA 1991). Substrate is *course* ranging from cobble to large boulders. Unstable, steep avalanche chutes and sparse hillside vegetation contribute to the *poor* channel stability rating (USDA 1987). The low gradient alluviated channel (Rosgen C and E channel types) are most prone to conditions contributing to inherent instability including high bank to width ratio, heavy bedload deposition and unstable lower banks with fragmented or incompetent rock content. Approximately 40% of the Smith Creek channel has *good* stability attributed to high bedrock boulder bank content and sufficient vegetative cover. The channel reaches with *poor* stability and most prone to failure are located adjacent to proposed timber harvest units 4, 5, 6 and 8.

Fisheries Effects Analysis

Timber harvest proposed to treat riparian areas in all action alternatives to a varying degree. Riparian harvest acreage ranges between 69.6 acres and 123.5 acres (31- 66%).

Alternative 1- No Action

Under the No Action Alternative (Alt 1), no new ground disturbance is proposed. Stream habitat and water quality conditions would not move above the baseline conditions due to management. There would be No Effect to aquatic PETS species or non-listed species.

Existing stream structure will continue to function below desired conditions. Most notable, deficits in large wood and channel connectivity (subterranean flow and impassable culvert crossing) will persist.

Because of no proposed harvest activity existing water quantity and quality (see previous section), channel forming processes and flow timing would continue to operate at baseline levels. No work is proposed in the riparian reserves and therefore the riparian area structural development and species diversification will proceed at a relatively modest rate.

Table 22. Riparian reserve acres treated in the Dry Burton Thin. Lewis County Washington.

| Alternatives | Log Systems | Riparian Reserve Acres | | | | Treated (%) |
|--------------|-----------------------|------------------------|-----------|---------|-------|-------------|
| | | Units treated | Untreated | Treated | Total | |
| 1 | No Action | None | 124.7 | 0 | 0 | 0 |
| 2 | Ground | 5,6,8 (partial) | 47.7 | 21.95 | 69.6 | 33% |
| 3 | Ground and Cable | 4,5,6,8 | 40.1 | 78.8 | 118.9 | 66% |
| 4 | Ground and Helicopter | 4,5,6,8,17 | 41.5 | 82.0 | 123.5 | 66% |
| 4.1 | Helicopter | 4,5,6,8,17 | 41.5 | 82.0 | 123.5 | 66% |

Alternative 2 – Ground-based Harvest

Short-term effects

Alternative 2 timber management would result in neutral direct effects to fish and/or their habitat. Because no management will occur inside the inner 2/3 of the riparian reserve there is only a very slight risk of direct impact to fish or aquatic species.

Short term indirect effects of Alternative 2 may slightly increase the risk of disturbance to stream channel form and/or functional processes due to increased fine sediment. Approximately 13.4 acres of soils sensitive to surface soil erosion may be impacted by proposed ground based harvest activities. Additionally, skidding over shallow subsurface flows (Units 5 and 8) may generate surface erosion in harvest units. Temporary roads and logging systems are expected to disturb approximately 9.36 acres or 8.2 % of the treated area (based on logging system drawings 11/21/05).

Alternative 2 slightly increases the short term risk to stream habitat features influenced by stream channel substrate including; pool formation and channel width-depth ratio. With the increased risk to increased fine sediment production, there is a commensurate increased risk to fish egg to fry development. Additionally, the channel connectivity will continue to function at risk due to excess bedload material; subterranean flow is a condition which developed following the 1996 flood. This effect is expected to be short duration and low magnitude due to maintenance of 2/3 of the riparian reserve. Alternative 2 will thin approximately 13.4 acres of riparian reserves that may increase risk to water yield. This area represents 11.8 % of the harvest area and poses a slight risk to water quantity (see previous section). Channel forming process and flow timing will continue to operate near a baseline level.

Table 23. Alternative 2 estimated ground disturbance generated by logging system for harvest units in the Dry Burton timber sale. Lewis County Washington.

| Alt | Unit | Log System | Treated Acres | Habitat Conditions | | Water Quality and Quantity | | | | | |
|--------------------|------|------------|---------------|-----------------------------|---------------------------------------|----------------------------|-----------------------------|------------------------|---------------------------|-------------------------------|------------------------|
| | | | | Riparian and Stream Habitat | Fine Sediment Increase (Stream count) | Surface Soil Erosion (Ac) | Mass Wasting Potential (Ac) | Road Crossing. (count) | Water Yield Increase (Ac) | Log Syste Disturbed Soil (Ac) | Temp Rd Landin gs (Ac) |
| 2 | 5 | Ground | 33 | 6.7 | 2-CI. III | 6.5 | 6.5 | 0 | 6.4 | 1.36 | 1.0 |
| | 6 | Ground | 36 | 9.2 | 4-CI IV | 4.6 | 4.6 | 0 | 4.69 | 1.64 | 1.5 |
| | 8 | Ground | 44 | 7.2 | 2-CI III 1-CI IV | 2.3 | 1.9 | 0 | 2.3 | 2.36 | 1.5 |
| Alt 2 TOTAL | | | 113 | 23.1 | 9 | 13.4 | 13 | 0 | 13.39 | 5.36 | 4.0 |

* Estimates derived from the Logging Plan, numbers used to present relative differences as actual logging system is likely to change.

Proposed actions will not likely affect any life stage of PETS fish including downstream PETS species and their critical habitat. Approximately 7 miles separate the action ground disturbing actions from PETS distribution.

Long-term effects

In the long-term, Alternative 2 activities would have minor positive impact on aquatic habitat including riparian stand development and or future recruitment of LW. Localized sediment delivery potential and water yield is expected to return to natural conditions and remain consistent with base level. Minor upward adjustments to water yield will not be recognizable in terms of fish habitat.

Cumulative Effects

No cumulative effects are expected to impact aquatic species including PETS species resulting from the action alternative. Mitigation measures focused on restoring hydrologic function and form would provide habitat for all life stages.

Alternative 3 – Ground-based and Skyline Harvest

Short-term effects

There is a low risk that Alternative 3 timber management will result in negative direct effects to fish and/or their habitat. Approximately 78.8 acres of riparian timber management is proposed in the outer 2/3 of the reserve area. There is a low risk of direct impact to fish or aquatic species.

Short term indirect effects of Alternative 3 increase as ground disturbing actions increase relative to the no action alternative. Alternative 3 proposed to treat 78.8 acres (66%) of the riparian reserve area. The more extensive treatment of riparian reserves will increase

short term risk of disturbance to stream channel form and/or functional processes due to increased sediment generated from ground based and skyline harvest activities. Areas with shallow subsurface flows (Units 8 and 5) pose a risk to water quality (see previous section). Ground based yarding systems is expected to disturb approximately 4.5 acres or 4.7 % of the ground (based on logging system drawings 11/21/05).

Alternative 3 increases the indirect risk to habitat features influenced by stream channel substrate including pool formation and channel width-depth ratio. With the increased risk to increased fine sediment production, there is a commensurate increased risk to fish egg to fry development. Additionally, the channel connectivity will continue to function at risk due to excess bedload material; subterranean flow is a condition which developed following the 1996 flood. This effect is expected to be short duration and moderately low magnitude due to provisions of riparian reserve size and structure.

Alternative 3 includes approximately 15.7 riparian acres of soil sensitive to increase water yield. Alternation to water yield may increase water quantity or modify timing of flows which may disrupt early life history of fish development. Response is expected to short in duration and moderately low magnitude due to relative small scale disturbance.

Riparian harvest will have a short term negative impact on available wood recruitment. Structural development of riparian stands benefit from the treatment and decrease the response time for LW recruitment over the current condition. Extensive riparian harvest may have an increased short-term risk of destabilizing the hill side due to loss of root cohesion and/or increase water yield as evapotranspiration is diminished.

Table 24. Alternative 3 estimated ground disturbance generated by logging system for harvest units in the Dry Burton timber sale. Lewis County Washington.

| Alt | Unit | Log System | Treated Acres | Habitat Conditions | | Water Quality and Quantity | | | | | |
|--------------------|------|------------|---------------|--------------------|---------------------------------------|----------------------------|-----------------------------|------------------------|---------------------------|-------------------------------|------------------------|
| | | | | RR Treatment (Ac) | Fine Sediment Increase (Stream count) | Surface Soil Erosion (Ac) | Mass Wasting Potential (Ac) | Road Crossing. (count) | Water Yield Increase (Ac) | Log Syste Disturbed Soil (Ac) | Temp Rd Landin gs (Ac) |
| 3 | 4 | Skyline | 28 | 22.6 | 7-CI IV | 17.7 | 8.7 | 0 | 2 | 2.67 | 1.1 |
| | 5 | Ground | 33 | 13.8 | 2-CI. III | 12.7 | 12.9 | 0 | 2 | 1.36 | 1 |
| | 6 | Ground | 36 | 18.6 | 4-CI IV | 9.3 | 9.3 | 0 | 9.2 | 1.64 | 1.5 |
| | 8a | Ground | 44 | 23.8 | 2-CI III 1-CI IV | 4.3 | 4.0 | 0 | 4.5 | 2.36 | 3.0 |
| | 8b | Skyline | 42 | | 2-CI III 1-CI IV | | | 0 | | 2.24 | |
| Alt 3 TOTAL | | | 199 | 78.8 | 19 | 26.3 | 26.2 | 0 | 15.7 | 7.6 | 5.5 |

* Estimates derived from the Logging Plan, numbers used to present relative differences as actual logging systems is likely to change

Long-term effects

In the long-term, Alternative 3 timber management activities would have minor positive impact on riparian stand development and or future recruitment of LWD. Localized sediment delivery potential and water yield is expected to return to natural conditions and remain consistent with base level.

Alternative 4 – Ground-based and Helicopter Harvest

There is a low risk that Alternative 4 timber management will result in negative direct effects to fish and/or their habitat. Approximately 82 acres of riparian timber management is proposed in the outer 2/3 of the reserve area. The low cut buffer will spatially separate proposed harvest activities from the to the river therefore reducing the risk of direct impact to fish or aquatic species

Short term indirect effects of Alternative 4 increase as ground disturbing actions increase relative to the no action alternative. Alternative 4 proposed to treat 82 acres (66%) of the riparian reserve area in units 4, 5, 6, 8, 17 using ground based logging systems along with helicopters. Although this alternative treats the acres the most combined area inside and outside of the riparian reserve, the use of helicopter transportation results in a slight relative reduction over Alt 3 in ground disturbance resulting from logging systems. An estimated 8.86 acres log roads and yarding systems. The ground base units will present increased risk to sediment production where shallow subsurface flows are sensitive to ground disturbance.

Table 25. Alternative 4 estimated ground disturbance generated by logging system for harvest units in the Dry Burton timber sale. Lewis County Washington.

| Alt | Unit | Logging System | Treated Acres | Habitat Conditions | | Water Quality and Quantity | | | | | |
|--------------------|------|----------------|---------------|--------------------|---------------------------------------|----------------------------|-----------------------------|------------------------|---------------------------|------------------------------|------------------------|
| | | | | RR Treatment (Ac) | Fine Sediment Increase (Stream count) | Surface Soil Erosion (Ac) | Mass Wasting Potential (Ac) | Road Crossing. (count) | Water Yield Increase (Ac) | Log Symb Disturbed Soil (Ac) | Temp Rd Landin gs (Ac) |
| 4 | 4 | Helicopter | 28 | 22.6 | 7-CI IV | 17.7 | 8.7 | 0 | 17.8 | 0 | 0 |
| | 5 | Ground | 40 | 13.8 | 2-CI. III | 12.7 | 12.9 | 0 | 12.9 | 1.36 | 1.75 |
| | 6 | Ground | 45 | 18.6 | 4-CI IV | 9.3 | 9.3 | 0 | 9.2 | 1.64 | 1.5 |
| | 8a | Ground | 44 | 23.8 | 2-CI III 1-CI IV | 4.6 | 4.0 | 0 | 4.5 | 2.36 | 2.25 |
| | 8b | Helicopter | 42 | | 2-CI III 1-CI IV | | | 0 | | 0 | |
| | 17 | Helicopter | 13 | 3.2 | 2-CI IV | 5.6 | 11.4 | 0 | 2.7 | 0 | 0 |
| Alt 4 TOTAL | | | 212 | 82 | 21 | 49.9 | 46.3 | 0 | 47.1 | 5.36 | 5.5 |

A neutral impact to soil displacement would be expected resulting from helicopter cable logging on sensitive soil in unit 4, 6 and 8. Alternative 4 proposes approximately 25 acres of ground-based logging that may moderately low increases risk to instream habitat features influenced by stream channel substrate including; pool formation and channel width-depth ratio. With the increased risk to increased fine sediment production, there is a commensurate increased risk to fish egg to fry development. Additionally, the channel connectivity will continue to function at risk due to excess bedload material; subterranean flow is a condition which developed following the 1996 flood. The effects to sediment are expected to be short duration and low magnitude due to retention of 1/3 interim riparian reserve width.

Because the proposed harvest activity may increase water quantity (see previous section), issues with flows and timing may disrupt early life history of fish development. Response is expected to short in duration and low magnitude due to relative small scale disturbance and retention of 50 to 65% canopy cover.

Riparian harvest will have a short term negative impact on available wood recruitment. Structural development of riparian stands should benefit from the treatment and decrease the response time for LW recruitment compared the current condition. Moderate riparian harvest may have a slight increased short term risk of destabilizing the hill side due to loss of root cohesion and/or increase water yield as evirotranspiration is diminished. Short term LW loss will be unrecognizable due to measures to maintain riparian structure.

Table 26. Alternative 4.1 estimated ground disturbance generated by logging system for harvest units in the Dry Burton timber sale. Lewis County Washington.

| Alt | Unit | Logging System | Treated Acres | Habitat Conditions | | Water Quality and Quantity | | | | | |
|----------------------|------|----------------|---------------|--------------------|---------------------------------------|----------------------------|-----------------------------|------------------------|---------------------------|-------------------------------|------------------------|
| | | | | RR Treatment (Ac) | Fine Sediment Increase (Stream count) | Surface Soil Erosion (Ac) | Mass Wasting Potential (Ac) | Road Crossing. (count) | Water Yield Increase (Ac) | Log Systm Disturbed Soil (Ac) | Temp Rd Landin gs (Ac) |
| 4.1 | 4 | Helicopter | 28 | 22.6 | 7-CI IV | 17.7 | 8.7 | 0 | 17.8 | 0 | 0 |
| | 5 | Helicopter | 40 | 13.8 | 2-CI. III | 12.7 | 12.9 | 0 | 12.9 | 1.36 | 0 |
| | 6 | Helicopter | 45 | 18.6 | 4-CI IV | 9.3 | 9.3 | 0 | 9.2 | 1.64 | 1.0 |
| | 8a | Helicopter | 44 | 23.8 | 2-CI III 1-CI IV | 4.6 | 4.0 | 0 | 4.5 | 2.36 | 1.0 |
| | 8b | Helicopter | 42 | | 2-CI III 1-CI IV | | | 0 | | 0 | |
| | 17 | Helicopter | 13 | 3.2 | 2-CI IV | 5.6 | 11.4 | 0 | 2.7 | 0 | 0 |
| Alt 4.1 TOTAL | | | 212 | 82 | 21 | 49.9 | 46.3 | 0 | 47.1 | 0 | 2.0 |

Long-term effects

In the long-term, Alternative 4 timber management activities would have minor positive impact on riparian stand development and or future recruitment of LWD. Localized sediment delivery potential and water yield is expected to return to natural conditions and remain consistent with base level.

Alternative 4.1 – Helicopter Harvest and Preferred Alternative

Alternative 4.1 is identical to Alternative 4, except that all units, including ground-based would converted to helicopter-based harvest methods. Effects related to vegetation changes, the creation of two landings, haul and stabilization of roads is identical to Alternative 4. Ground disturbance caused by ground-based and skyline harvest systems would not occur under alternative 4.1. Table 26 summarizes effects of implementation of Alternative 4.1.

Effects common to all alternatives

The Northwest Forest Plan Final Supplemental Environmental Impact Statement (NWFP FSEIS) includes a watershed restoration component to help accelerate recovery rates and bridge the time gap in natural restoration by proactively addressing priority restoration needs. The NWFP FSEIS (Appendix B-121) describes watershed restoration designed to restore currently degraded habitat conditions in key watershed (USDA, USDI 1994).

The Dry Burton planning process identified several restoration opportunities that are consistent with the NWFP including the most important category of opportunities 1) control and prevention of road erosion and sedimentation; 2) riparian silvicultural and 3) stream channel improvements (FEMAT V-J). These additional projects are listed in Chapter 2.

Stream restoration and road stabilization activities*Short term effects*

Proposed Smith Creek stream restoration, road stabilization and/or closure on Forest Roads 2020, 2010 and 2010.028 and the 2000 Road culvert replacement proposal would result in short term impacts to water quality. Increased sediment production would result from ground disturbing actions in and around stream. Proposed mitigation to limit timing and magnitude would reduce the risk to fish and other aquatic life. Limited operating period will minimize the impacts to the vital egg-fry life stage.

Long term effects

The proposed restoration actions are expected to have a positive impact on the channel process and function in the long term. Increased channel structure will have a positive impact on channel stability and add complexity for fish hiding and holding habitat.

Cumulative Effects

The net benefits of a restoration program will help offset the cumulative effects ongoing land management activities. The proposed projects would restore

Proposed Endangered and Threatened Species

Dry Burton Activities may affect - - Not Likely to Adversely determination (NLAA) for PETS species and critical habitat is based on the grounds that the Dry Burton proposed action is physically removed from the critical habitat as determined by the USDI Fish and Wildlife Service and NOAA Fish. No suitable habitat is within the planning area and no individual TES species been found within in the planning area based on ground reconnaissance and stream surveys. The project area is outside of the “Bull Trout Consultation Area” prescribed by the Level I Team and there is no effect to all projects in the upper Cowlitz watershed. (Perez-Rose, D person. comm. 2003).

This determination is based on the rational that the proposed action meets the following criteria:

1. Proposed management actions are consistent with and/or will not prevent the attainment of Aquatic Conservation Strategy Objectives (USDA, USDI 1994),
2. The Gifford Pinchot Land Resource Management Plan (LRMP) employs the four Aquatic Conservation Strategy components including watershed analysis, riparian reserves, watershed analysis and key watersheds designation intended to maintain species viability,
3. Proposed management actions are consistent with the Gifford Pinchot Land Resource Management Plan (LRMP) Standards and Guidelines,
4. Proposed management action is considered minor and determined to pose a low risk to maintaining proposed species viability as per Consideration of Extinction Risk for Salmonids (Reimans et. al., 1993),
5. Proposed mitigation measures to: improve drainage, maintain stand structure to maintain stream cover and large woody debris recruitment potential, and reduce sediment transport and erosion potential
6. No new roads would be constructed with the Dry Burton Timber Sale and all portions of a temporary road, and skid trails and landings would be rehabilitated following logging activity.

Table 27. Summary of effects determination for PETS species listed in the Dry Burton planning area.

| Species | Distinct Population Segment | Status | Effects Determination | |
|---|---|------------|-----------------------|-------------------------------|
| | | | Individuals | Critical Habitat ¹ |
| Steelhead trout (Onchorynchus mykiss) | Lower Columbia River Southwest Washington | Threatened | No Effect | NLAA |
| Spring Chinook (Oncorhynchus tshawytscha) | Lower Columbia River | Threatened | No Effect | NLAA |
| Coho (Oncorhynchus kisutch) | Columbia River | Threatened | No Effect | NLAA |
| Chum (Onchorynchus keta) | Lower Columbia River Southwest Washington | Threatened | No Effect | No Effect |
| Bull trout (Salvelinus confluentus) | Lower Columbia River Bull Trout | Threatened | No Effect | NA |
| ¹ NLAA – May affect – not likely to adversely affect | | | | |

4.7 Wildlife

The following report details the effects of the proposed Dry Burton timber sale and associated projects to the wildlife resource.

Spotted Owl Critical Habitat Unit WA-37

The proposed Dry Burton timber sale occurs within the boundary of designated northern spotted owl Critical Habitat Unit (CHU) WA-37. There are two historic northern spotted owl pairs that occur within one mile of the proposed sale units (the Lower Smith pair #434, and the South Point pair #423), as well as one additional historic pair within the Smith Creek sub-watershed. Critical Habitat Unit WA-37 provides important nesting, roosting, foraging and dispersal habitat for spotted owls, and provides connectivity between CHU blocks and (non-CHU) suitable habitat patches to the south, CHU WA-36 to the west, and Mt. Rainier National Park to the north.

The proposed Dry Burton sale units are classified as northern spotted owl “dispersal habitat” due to their age, size and habitat condition. They do not contain the habitat components or structure that would allow for use by spotted owls for nesting, roosting, or foraging, but could be used by dispersing juvenile owls for cover, and procuring some small mammal prey. Nesting, roosting and foraging habitat is in good supply in the surrounding late-successional and old-growth stands, and accounts for the presence of the

above two identified spotted owl pairs. This late-successional and old-growth forest habitat has, however, been fragmented by past timber harvest and road construction.

Impacts to CHU WA-37, and the spotted owls that occur therein, from the proposed Dry Burton sale could occur from a) direct disturbance to the above two historic pairs from project-related activities (felling, yarding, etc.) that produce noise above ambient levels, and from b) impacts to important, legacy habitat components found in the dispersal habitat that comprise the proposed sale units, including breakage or loss of coarse woody debris, forked top or other “defective” trees, and legacy snags. Also, thinning will affect the future development of these stands over time as spotted owl habitat, including canopy heterogeneity, understory development, and stand layering.

Environmental Consequences

Alternative 1 (No action)- Under this alternative, ambient noise levels in the project levels would remain at low levels, restricted to infrequent vehicle traffic, or sporadic road maintenance (culvert cleaning, brushing, etc.). Occasional firewood cutting may also occur, although firewood harvest is infrequent in the Smith Creek drainage compared to other, more accessible sites on the Cowlitz Valley District. It is very unlikely that ambient noise levels that occur at present in the project area are adversely affecting spotted owls (or other wildlife species) due to their infrequent occurrence and low intensity.

Due to the absence of commercial thinning under this alternative, there would be no disturbance to existing down wood, legacy (old-growth) snags, or other habitat features within the sale units. There would also be no short-term reduction in stand canopy closure, which would maximize the stand’s present value as spotted owl dispersal habitat. Understory vegetation would remain sparse in the proposed units for the short-term, gradually increasing as stand age increases and the canopy differentiates, producing gaps and more canopy heterogeneity.

The determination in a Biological Assessment for alternative 1 would be that the project would have “**no effect**” to the northern spotted owl, and that it would have “**no effect**” to designated northern spotted owl Critical Habitat Unit WA-37.

Alternatives 2, 3, 4 and 4.1- The four “action alternatives” would produce noise above ambient levels, with the amount of disturbance, and potential effects dependent on the total number of acres harvested, and the timber harvest methods utilized. Under all action alternatives, noise effects would be partially mitigated with a no activity, Limited Operating Period (LOP) restriction of March 1 to June 30, which would prevent disturbance to any nesting spotted owls adjacent to the harvest units during the early nesting season; the restriction ends at the point where juvenile owls would have fledged from active nests, and would have the ability to move away from logging-created disturbance.

Considering the three action alternatives, the helicopter logging in alternative 4 would have the greatest potential adverse noise effects to northern spotted owls in and adjacent to the planning area. The current LOP restriction distance for large helicopters, such as the type used for commercial logging, is one mile (USFWS 2004). This compares to 35 yards for heavy equipment use, and 65 yards for chainsaw operation, and is reflective of

the much greater noise (and potential disturbance) intensity associated with large helicopter operation. The potential effects of alternative 3 would be greater than alternative 2 due to the larger number of acres harvested. Noise-related disturbance impacts during the post-fledging period, mitigated by the above Limited Operating Period restriction, would result in a Biological Assessment determination of **“may affect, but not likely to adversely affect”** the northern spotted owl from all four “action alternatives”.

Table 28 displays the acres of spotted owl dispersal habitat that would be temporarily degraded in each alternative within CHU WA-37, as well as the acres of “high quality” dispersal habitat degraded. “High quality” dispersal habitat occurs in proposed unit 4, and is distinguished by the much greater amounts of down wood, presence of legacy, old-growth snags and legacy old-growth trees than are found in the other proposed units. This is an artifact of the selective logging that occurred in unit 4, and resulted in many legacy features being retained compared to the other units.

Alternatives 4.1, 4 and 3, respectively, would have the largest, short-term adverse effects to designated spotted owl CHU WA-37 because they temporarily degrade the greatest number of total acres, as well as the greatest number of acres of “high quality” dispersal habitat. Adverse, short-term effects to CHU WA-37 are considerably reduced in alternative 2 compared to alternatives 3, 4 and 4.1. The impacts to the “high quality” dispersal habitat in unit 4 are partially mitigated by the placement of no-thin “skips” within the unit, located in (non-riparian) patches of concentrated residual down wood and legacy snags. The largest direct impacts would come from the breakage or destruction of existing down wood, including legacy, old-growth down trees from yarding damage within unit 4, as well as the loss of legacy, old-growth snags due to falling for logging-related safety requirements in areas outside of the no-thin “skips” and riparian reserve buffers (see Table 29, below).

Table 28. A comparison of spotted owl dispersal habitat acres impacted by alternative, Dry Burton Thin.

| Alternative # | Total acres of spotted owl dispersal habitat temporarily degraded* | Acres of “high quality”* spotted owl dispersal habitat temporarily degraded** |
|---------------|--|---|
| 1 | 0 | 0 |
| 2 | 150 | 0 |
| 3 | 239 | 43 |
| 4 | 253 | 43 |

* includes all acres within unit boundaries, including riparian reserve buffers and no-thin “skips”

** all “high quality” dispersal habitat is located within proposed unit 4

Extensive breakage and destruction of existing down wood has the potential to reduce habitat capability for small mammals (i.e. spotted owl prey) such as northern flying squirrels and bushy-tailed woodrats, due to the loss of cover and reproductive habitat. The down wood loss and breakage impacts would be reduced in alternative 4, both due to both the reduced number of total dispersal acres impacted, and also due to the helicopter logging system, which does not involve the extensive dragging of harvested trees that would occur in alternative 3. Alternative 2 would result in the least amount of short-term impacts because it harvests the fewest total number of total acres, including zero acres of “high quality” dispersal habitat in unit 4.

The temporary reduction in canopy closure in all action alternatives would reduce the canopy closure in the proposed harvest units from approximately 80-90% at present, to 50-65% following harvest. This will lower the quality of the harvest units as cover for dispersing owls for 10-20 years, when the tree canopy closure will succeed to its pre-harvest condition. This short-term reduction in canopy closure is not expected to have a limiting effect to spotted owl dispersal capability within the Smith Creek sub-watershed; 67% of the Smith Creek sub-watershed is presently available as dispersal habitat (see table 29, below), including large, unfragmented, roadless areas- of which a maximum of 3% (in alternatives 3 and 4) would be temporarily degraded by the proposed timber sale.

These degraded acres would still function as dispersal habitat, albeit at a reduced quality in the short-term. Therefore, dispersal habitat for northern spotted owls in the Smith Creek sub-basin will be in adequate supply for the foreseeable future, barring large-scale natural disturbances such as wildfire.

Anticipated, long-term benefits to spotted owl habitat within CHU WA-37 would occur from the increase in average tree size and vertical stand structure resulting from the commercial thinning, including the stimulation of forest understory vegetation from increased light levels as a result of the more open tree canopy. These long-term benefits are directly related to the number of acres treated, although breakage or destruction of legacy snag and down wood habitat within unit 4 may negate these structural-related benefits in alternatives 3 and 4, at least in the short-term. Helicopter logging in alternatives 4 and 4.1 may reduce the amount of down wood breakage or destruction due to the minimal amount of surface dragging of harvest trees compared to cable logging.

Table 29. Acres of spotted owl dispersal habitat by forest type and riparian reserve occurrence within the Smith Creek sub-basin*

| Forest type* | Acres |
|--|------------|
| Small tree | 4806 |
| Large tree within riparian reserves | 564 |
| Large tree outside of riparian reserves | 1409 |
| (Total dispersal habitat acres and % of total acres) | 6780 (67%) |
| (Total Smith Creek sub-basin acres) | 10,174 |

* Source= Upper Cowlitz Watershed Analysis, July, 1997

Table 30. Summary of anticipated effects and benefits from the Dry Burton timber sale alternatives related to the northern spotted owl and CHU issue.

| Alternative # | Noise Disturbance rating | Legacy habitat features (snags, down wood) disturbance rating | Potential long-term habitat benefit rating from thinning* |
|---------------|--------------------------|---|---|
| 1 | 0 | 0 | 0 |
| 2 | + | ++ | ++ |
| 3 | ++ | +++ | ++ |
| 4 and 4.1 | +++ | + | +++ |

0= no effects/benefits expected + - least impact/benefit expected +++ - largest impact/benefit expected

Due to the short-term degradation of northern spotted owl dispersal habitat, including the breakage or loss of legacy down wood and snags due to logging damage or safety requirements, and the short-term reduction in canopy closure, the determination in a Biological Assessment is that the action alternatives 2, 3, 4 and 4.1 would result in a determination of “**may affect, but not likely to adversely affect**” designated spotted owl Critical Habitat Unit WA-37. *Indirect effects-* There are no known indirect effects from the implementation of the Dry Burton timber sale alternatives.

Cumulative effects- Cumulative effects would occur from post-sale projects that are connected to the Dry Burton timber sale proposal and mitigations. These projects include snag and down wood creation, instream structure placement in Smith Creek, close/stabilization road work at FR 2010 and 2020, and culvert replacement on FR 20. Additional noise disturbance- partially mitigated by the spotted owl Limited Operating Period nesting restriction cited above- would occur in connection with all of the above projects due to the need to utilize heavy machinery and/or motorized equipment for them.

These noise disturbance impacts during the latter part of the spotted owl nesting season would extend the total duration of noise disturbance impacts from the timber sale, as these post-sale projects are projected to occur within 1-5 years following the completion of commercial thinning operations. Most of these projects are of short duration and intensity compared to the timber harvest operation, and localized in nature. The exception is snag and down wood creation, which would occur in all sale units, although the duration of these projects are short (i.e. approximately 2 months total).

The above projects would not produce any measurable additional spotted owl habitat effects (other than increasing the amount of habitat components like snags and down wood), as they are not removing standing trees, and any other vegetation manipulation would be localized and very limited.

The above cumulative effects are not judged to be large enough to change the “not likely to adversely effect” determinations listed above for the northern spotted owl, and spotted owl critical habitat.

New spotted owl demographic information- Recent spotted owl demographic data indicates that owl populations are still in decline, particularly in the state of Washington (Anthony et. al. 2004). The causes of this decline are not clear, but competition with

barred owls (Pearson and Livezey 2003), habitat changes, and possibly weather extremes are possible reasons. It is not known if spotted owl populations will stabilize or if extinction thresholds have been crossed (Courtney et al. 2004). Barred owl competition is a major concern in Washington, where this species is now common and widespread, including at least some Late-Successional Reserve areas (Pearson and Livezey 2003). The long-term effects to spotted owls and spotted owl habitat of commercial thinning- which has become the primary forest management technique on the Gifford Pinchot National Forest in recent years- is unclear. It is assumed that commercial thinning of suitable spotted owl habitat, which would result in short-term degradation of existing suitable habitat conditions, presents greater risks than thinning owl dispersal habitat such as occurs in the Dry Burton project, particularly when dispersal habitat conditions are not limiting, as in the case of the Smith Creek sub-watershed. Anticipated, long-term benefits to the northern spotted owl from commercially thinning younger, managed forest stands (i.e. owl dispersal habitat) include accelerated tree growth, stimulation of forest understory, and the additions of coarse woody debris and snags to these sites from post-sale projects.

The new spotted owl demographic information does not change the “not likely to adversely affect” determinations displayed above because the Dry Burton sale units are a) not in presently suitable spotted owl nesting, roosting, or foraging habitat, b) do not result in incidental take of any historic spotted owl pairs, and c) are expected to improve long-term owl habitat conditions with relatively small, short-term, adverse effects.

Proposed, Endangered, and Threatened Wildlife Species

Affected Environment- Proposed, Endangered and Threatened (PET) species that **occur**, or potentially occur, in the project area are displayed in Table 31.

Both the northern spotted owl, and designated northern spotted owl Critical Habitat Unit WA-37 were addressed under the spotted owl issue analysis above. The following section therefore only references the gray wolf, as the remaining listed species above are either absent from the project area, or would only be expected as rare transients or visitors to the area, and would not be impacted by the Dry Burton sale.

Environmental Consequences

Alternative 1 (No action)- There would be no potential adverse effects to the gray wolf from either direct disturbance, or secondary impacts to their big game prey species, deer and elk, from this alternative. Although suitable habitat for the gray wolf exists in the project area due to the presence of deer and elk and large patches of unroaded forest habitat, wolves are considered to be rare on the Forest. Survey activity has been very limited for this species; however, they may be more common than generally assumed. The presence of mountain goats and beaver (i.e. additional prey items) in the Smith Creek drainage may make it potentially more attractive to gray wolves than other areas that do not contain these additional prey species.

Both the northern spotted owl, and designated northern spotted owl Critical Habitat Unit WA-37 were addressed under the spotted owl issue analysis above. The following section therefore only references the gray wolf, as the remaining listed species above are either

absent from the project area, or would only be expected as rare transients or visitors to the area, and would not be impacted by the Dry Burton sale.

Environmental Consequences

Alternative 1 (No action)- There would be no potential adverse effects to the gray wolf from either direct disturbance, or secondary impacts to their big game prey species, deer and elk, from this alternative. Although suitable habitat for the gray wolf exists in the project area due to the presence of deer and elk, and large patches of unroaded forest habitat, wolves are considered to be rare on the Forest. Survey activity has been very limited for this species, however, and they may be more common than generally assumed. The presence of mountain goats and beaver (i.e. additional prey items) in the Smith Creek drainage may make it potentially more attractive to gray wolves than other areas that do not contain these additional prey species.

Table 31. Evaluation and occurrence of proposed, threatened and endangered species and Critical Habitats that may potentially occur in the Dry Burton sale vicinity.

| Species | Listing status | Occurrence in project area | Comments |
|--|----------------|--|---|
| Northern spotted owl (<i>Strix occidentalis caurina</i>) | Threatened | Documented | Two documented historic owl pairs known in project area. |
| Gray wolf (<i>Canis lupus</i>) | Threatened | Suspected | Historic sightings on CVRD, including Upper Cowlitz Watershed, although none verified as gray wolves. |
| Northern spotted owl Critical Habitat Unit WA-37 | Designated | Occurs | CHU WA-37 includes entire project area. |
| Marbled Murrelet (<i>Brachyramphus marmoratus</i>) | Threatened | Not within nesting range of species | Project area occurs greater than 55 miles from saltwater. |
| Marbled Murrelet Critical Habitat | Designated | Does not occur in or near project area | |
| Northern bald eagle (<i>Haliaeetus leucocephalus leucocephalus</i>) | Threatened | Not expected to occur | No historic sightings of bald eagles in upper Smith Creek drainage. May be rare visitor or transient to the project vicinity. |
| Grizzly bear (<i>Ursus arctos</i>) | Threatened | Not expected to occur | No documented, historic sightings of grizzly bears in Smith Creek, or on the Cowlitz Valley RD. |

Alternatives 2, 3, 4 and 4.1 (Action Alternatives)- The three action alternatives would not increase road densities in the project area, as no new permanent roads would be constructed, and temporary roads would be closed following harvest. It is very unlikely that any wolf dens in the planning area would be impacted, as all harvest units are adjacent to open roads where wolf denning would not be expected.

Potential impacts to deer and elk, the primary wolf prey species, would be similar to those described under the spotted owl issue analysis. Noise disturbance from project activities would displace deer and elk from the immediate vicinity of proposed units during harvest operations, although these effects would be mitigated with a Limited Operating Period (LOP) restriction during the elk calving season. This may cause any gray wolves that are present to change their use of the project area and vicinity during the duration of the sale, and also avoid the project area.

Adverse impacts to the gray wolf from all three action alternatives are considered to be very low because a) there will be no increase in road densities from the proposed sale, b) it is very unlikely that wolf dens would be impacted due to the location of the sale units along open roads, c) big game reproduction will not be adversely impacted by the sale due to the LOP for calving and fawning, and the sale area is not within big game winter range, and d) there is abundant displacement habitat in the drainage where wolves can avoid project activities while the sale is operational. Based on the above analysis, alternatives 2, 3, 4 and 4.1 would result in a Biological Assessment determination of **“may affect, but not likely to adversely affect”** the gray wolf. Informal consultation with the U.S. Fish and Wildlife Service would be required as a result of this determination.

Indirect effects- There are no known indirect effects from the implementation of the Dry Burton timber sale alternatives to the gray wolf.

Cumulative effects- As with the northern spotted owl, noise disturbance from post-sale projects would extend the length of potential disturbance effects to deer and elk, and consequently gray wolves. All of these projects would be mitigated with an LOP per the timber sale itself, and all projects are of limited scope and intensity compared to the sale. Therefore, the cumulative impacts from these projects would not change the above determination for the gray wolf.

Sensitive Animal Species: BIOLOGICAL EVALUATION

Sensitive animal species from the April, 2004 update of the R-6, Regional Forester’s Sensitive species list that are known or suspected to occur in the Dry Burton units and their vicinity are displayed in Table 32. Occurrence data is based on a pre-field review of District and Regional observation databases, aerial photographs, personal knowledge from previous field reconnaissance, field surveys, relevant literature, and other sources.

Environmental Consequences

Alternative 1 (No Action)- Due to the absence of ground disturbance or vegetation manipulation, no impacts would occur to sensitive species under this alternative. Over the long-term, the gradual accumulation of snags and down wood in the Dry Burton units may make them more suitable as habitat for some of the species above such as the

Malone jumping-slug and blue-gray tail-dropper, however the occurrence of most of the species above is very localized on a landscape level, and their presence or absence in any particular area cannot be predicted or anticipated as the result of habitat suitability alone. There would be “no impact” to Sensitive species from the implementation of alternative 1.

Table 32. Sensitive animal species documented or suspected to occur in the Dry Burton project area, or its vicinity. * suspected, but not located during project surveys (see below).

| Species | Status | Comments |
|--|------------|--|
| Malone jumping-slug (<i>Hemphillia malonei</i>) | Suspected* | Very rare species on Cowlitz Valley District (3 known locations), all north of Cowlitz River. Coarse woody debris is an important habitat feature for this species. |
| Blue-gray tail-dropper (slug) (<i>Prophysaon coeruleum</i>) | Suspected* | Very rare species on CVRD (3 known sites), closest is in Iron Creek drainage, four miles west of Dry Burton. Habitat is coarse woody debris and deciduous leaf litter. All known sites are in classic, old-growth stands with large deciduous trees. |
| Van Dyke’s salamander (<i>Plethodon vandykei</i>) | Suspected | Very rare species on CVRD and elsewhere; suitable habitat is bedrock-controlled, high-gradient splash zones, also caves, seeps, springs. |
| Cope’s giant salamander (<i>Dicamptodon copei</i>) | Suspected | Predominately aquatic species that rarely transforms into terrestrial adults. Rare-to-uncommon on CVRD based on surveys performed to date |
| Cascade torrent salamander (<i>Ryacotriton cascadae</i>) | Suspected | Semi-aquatic species that is relatively common in cold stream edges at higher elevations, but limited in distribution. Rare north and east of Cispus River confluence. |
| Townsend’s big-eared bat (<i>Corynorhinus townsendii</i>) | Suspected | Rare on CVRD, has been occasionally documented roosting under concrete bridges |

| | | |
|--|-----------|--|
| California wolverine <i>(Gulo gulo)</i> | Suspected | Very few historic sighting records on the District. More likely to occur in higher-elevation, alpine habitats and wilderness, but possible during winter at lower-elevation sites. |
|--|-----------|--|

Alternatives 2, 3, 4 and 4.1- Surveys to established protocol standards (Duncan et al. 2003) were conducted for sensitive mollusk species in Dry Burton units 4 and one-half of unit 5 (subsequently dropped) during fall, 1998 and 2001, and October, 2005, due to the presence of suitable habitat conditions within these two sites; specifically large quantities of down wood in various decay classes. The remaining units in the proposed sale (6, 8, and 17) did not contain the large amounts of down wood so prevalent in units 4 and part of unit 5, and therefore one “inventory” survey visit was conducted in these units during fall, 1998.

Due to the absence of bigleaf maple trees in the project area, the most common Sensitive mollusk species on the Cowlitz Valley Ranger District- the Puget Oregonian snail (*Cryptomastix devia*)- is not expected to occur in the Dry Burton project area. This species is never found far from maples, or in mixed maple/cottonwood/alder stands, and is therefore considered to be absent in the planning area.

No Sensitive mollusk species were detected during the field surveys. A variety of relatively common snail and slug species were located, including numerous detections of the dromedary jumping-slug (*Hemphillia dromedarius*)- a down wood associate- as well as the papillose tail-dropper [slug] (*Prophysaon dubium*) and the scarlet-backed tail-dropper (*Prophysaon vannatta*). Snails included the omnivorous *Haplotrema vancouverense* and *Ancotrema sportella*, and *Vespericola columbiana*, which is another down wood-associated gastropod. Salamanders located incidentally to mollusks included *Ensatina* (*Ensatina eschscholtzii*) at bark piles or other accumulations of down wood, and one Northwestern salamander (*Ambystoma gracile*).

The proposed sale units do not contain suitable habitat for the Sensitive Larch Mountain salamander (*Plethodon larselli*), and there will be “no impact” to Sensitive aquatic or semi-aquatic species such as Van Dyke’s salamander (*Plethodon vandykei*), Cope’s giant salamander (*Dicamptodon copei*), or Cascade torrent salamander (*Ryacotriton cascadae*)-all of which would be most likely to occur in or adjacent to Smith Creek itself- due to the retention of “no cut” riparian buffers in all sale units in all alternatives. The slight alteration in ambient microclimate in riparian reserves from commercial thinning is not expected to adversely affect these salamanders, if present.

The determination is that action alternatives 2, 3, 4 and 4.1 will have “no impact” to the blue-gray tail-dropper (*Prophysaon coeruleum*) or the Malone jumping-slug (*Hemphillia malonei*), neither of which was located during the mollusk project surveys, and assumed to be absent from the site due to a) the negative survey results, b) overall rarity and spotty distribution on the Cowlitz Valley Ranger District, including the lack of any documented

locations in the Upper Cowlitz watershed and c) lack of documented occurrence to date in similar, mid-seral forest stands in the Cowlitz or Cispus watersheds.

There is the very small potential that the rare Townsend's big-eared bat may roost in the Dry Burton units. No species-specific surveys were conducted for this mammal. The only known occurrence of this species on the Cowlitz Valley District are individual big-eared bats roosting under concrete bridges, although there have been very few bat surveys conducted on the District, so they may be more common than indicated by these few incidental observations. This species (as well as other bats) would be far more likely to occur in late-successional and old-growth stands- such as those that occur adjacent to most of the Dry Burton project units- where roosting sites would be more abundant, or at caves, abandoned mines, or other similar sites elsewhere in the Smith Creek drainage. However, its occurrence within the Dry Burton units cannot entirely be discounted. Due to the very low likelihood that individual Townsend's big-eared bats would be impacted from the felling of roosting sites (i.e. legacy snags within unit 4) within the Dry Burton sale units for logging safety reasons, the determination is that the action alternatives 3 and 4 **“may impact individuals or habitat, but will not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species”**.

The limited size of the Dry Burton project area, combined with its location along a well-used Forest Road, combine to result in an extremely low probability that the rare and wide-ranging California wolverine would occur in the Dry Burton units or vicinity. Any transient wolverines would be far more likely to occur at higher elevation ridges in the Smith Creek drainage, such as South Point or Smith Ridge. The likelihood that the project would result in any measurable effects to transient wolverines is judged to be so low that the determination that the Dry Burton project will have **“no impact”** to the California wolverine.

Indirect effects- There are no known or expected indirect effects associated with the Dry Burton timber sale proposal related to Sensitive animal species.

Cumulative effects- There are no known or expected cumulative effects associated with the Dry Burton timber sale related to Sensitive species.

Management Indicator Species

Affected Environment- Management Indicator Species (MIS), as designated in the Gifford Pinchot NF Land and Resource Management Plan, as amended, are those that are in high demand for consumptive or non-consumptive use, or represent other species with similar habitat requirements.

Within the project area, the species that are known to occur, or likely occur, are Roosevelt elk and black-tailed deer, the pileated woodpecker, the group known as “cavity excavators” (which are mainly woodpeckers), the pine marten, and mountain goat. The northern spotted owl, addressed under PET species above, is also a MIS.

Table 33. GPNF Management Indicator Species that occur, or potentially occur, within the Dry Burton planning area*.

| Species | Occurrence in project area | Reason for MIS selection |
|-------------------------------------|----------------------------|---|
| Northern spotted owl | Documented | Represents species requiring large amounts (2200 acres) of mature and old-growth forest |
| Roosevelt elk and black-tailed deer | Documented | High level of demand for hunting and viewing |
| Pileated woodpecker | Documented | Represents species requiring moderate-sized areas (300 acres) of mature and old-growth forest |
| Pine marten | Suspected | Represents species requiring smaller areas (160 acres) of mature and old-growth forest |
| “Cavity excavators” | Documented | Represents species that use or require snags and down wood. |
| Mountain goat | Documented | High level of demand for hunting and viewing. Sensitive to management activities and illegal hunting. |

* Source: Gifford Pinchot Land and Resource Management Plan, as amended

Environmental Consequences

Alternative 1 (No Action)- No MIS will be adversely impacted from this alternative due to the lack of upland disturbance, as well as the lack of noise disturbance. In the short-term, snag levels in the proposed Dry Burton sale units will remain low, as relatively few new snags will be formed, except locally from root disease mortality or other sources. This will keep habitat for the pileated woodpecker, and “cavity excavators” at low levels within the proposed units until such time as additional snags are formed through natural processes such as mortality from conifer competition, insects and disease, or other factors. The same is true of coarse woody material (down trees), which are also presently at low levels, particularly sound, class I and II “hard” logs, except within unit 4. The amount of coarse woody material will increase slowly over the long-term as existing snags, and ones created in the future from root rot mortality and other factors, fall over. Adjacent old-growth habitat does provide high-quality habitat for pileated woodpeckers, “cavity excavators”, and pine marten, so local populations of these species should remain at relatively high levels under this alternative.

Alternatives 2, 3, 4 and 4.1 - Under the project action alternatives, deer and elk will be impacted from both project-related habitat effects, and from logging-generated noise disturbance. The primary effect of the action alternatives is that deer and elk will be displaced from the project area during summer harvest operations, and locally during post-sale projects such as down wood creation and culvert replacement. There is abundant “displacement habitat” surrounding the project area for animals to use temporarily, as there are no other concurrent, noise-producing activities currently planned in the Smith Creek sub-watershed. The greatest potential adverse impacts to deer and elk would be from noise-producing activities during the spring fawning and calving seasons; historic survey data indicates that the planning area may be an important reproductive site for elk. Due to the potential for disruption of fawning and/or calving sites, a Limited

Operating Restriction will be used to eliminate noise effects above ambient levels (which are presently very low in the area) from May 15 to July 1 (see Mitigation Measures). Alternative 4 would have the greatest risk of impacting deer and elk outside of the fawning/calving period due to the increased disturbance effects from the helicopter logging system in this alternative.

Over the long-term, the proposed thinning will improve big game habitat within the proposed sale units by allowing additional light to reach the forest floor, and stimulating understory production. This will provide additional forage for deer and elk, although the quantity and quality of this forage will vary depending on site conditions. Overall, all action alternatives are expected to have a long-term, beneficial effect to deer and elk.

The pileated woodpecker is present within the sale area, based on this species' distinctive foraging sign observed during field reconnaissance, as are several other species of "cavity excavators" including the hairy woodpecker. The pileated woodpecker and the "cavity excavator" group would temporarily suffer a reduction in snag habitat from losses incurred during logging operations, as well as adverse effects from noise disturbance, which may lead to temporary displacement from sale units. The reduction in snag habitat would be small, however, as the Dry Burton units presently have low snag levels, except for unit 4, which has low-to-moderate snag levels. The "no-thin" riparian reserve buffers, as well as no-thin "skips" in unit 4 which will be designated in areas with higher snag densities (as well as down trees), will help mitigate the loss of snags in the thinned stands. Following the thinning, post-sale work will include snag creation, which will be create approximately three snags per acre by girdling or topping live, green trees at the crown level. This is a higher density of snags- particularly hard snags- than occurs at present, and will increase the habitat capability of the stands for both the pileated woodpecker and "cavity excavators" over the next 15-30 years. Post-sale down wood creation will also benefit the pileated woodpecker, which often forages on down trees as well as snags.

The wide-ranging pine marten would also suffer short-term habitat degradation from the commercial thinning, as habitat components such as coarse woody debris are disturbed or broken during logging. Again, the riparian reserve buffers, and no thin "skips", which will be situated in areas with higher densities of existing snags and down wood, will help mitigate these impacts by providing habitat patches for marten and their prey. Adjacent old-growth forest habitat will continue to provide high quality denning, resting, and foraging habitat for pine martens. The short-term effects of thinning and an increase in canopy closure to the pine marten is not known- marten are well-adapted to traveling over deep snow- so the impacts during the winter would likely be minimal. Any adverse impacts would be short-term in nature (5-15 years) at which time the canopy closure would return to pre-harvest conditions. Over the long-term, increased tree diameter and crown growth will result in an increased ability to intercept snow, which may benefit pine marten.

An increase in understory vegetation may benefit small mammal populations on which marten prey, although the extent of these benefits is not predictable. An increase in snag and down wood habitat from the sale would benefit the pine marten by providing future resting and denning habitat, as well as habitat for small mammals. Due to the relatively

small size of the Dry Burton project, the retention of patches of undisturbed, higher-quality habitat in unthinned buffers and “skips”, the short-term reduction in canopy closure, and the addition of snags and coarse woody debris in conjunction with the sale, adverse effects to the pine marten from the Dry Burton project are judged to be small and discountable over the short-term, and beneficial effects are anticipated over the long-term.

Mountain goats occur throughout higher elevations in the Smith Creek drainage, including South Point and Smith Ridge, on a year-round basis. They do not occur within or adjacent to the proposed sale units. Mountain goats are sensitive to helicopters, based on avoidance reactions observed during aerial goat surveys, and therefore may be impacted by the proposed helicopter harvest in alternative 4. The sale units themselves do not occur closer than one-half mile to known goat habitat, therefore the greatest potential adverse effects would be from helicopters traveling to and from the sale area, if they pass close to the above goat habitat areas. To reduce the potential for adverse helicopter noise disturbance effects to mountain goats, a mitigation measure has been added that would restrict helicopters from approaching closer than one-quarter mile to the upper elevations of Smith Ridge and South Point during the operation of the Dry Burton sale. The spotted owl and elk calving Limited Operating Period restrictions would also serve to limit any noise impacts to mountain goats during the kidding season, when they are particularly sensitive to disturbance.

No indirect effects are anticipated from this alternative to the above Management Indicator Species.

Cumulative noise disturbance effects from post-sale projects are similar to those addressed under the spotted owl issue analysis. As with the timber sale, the LOP restrictions for spotted owl nesting and elk calving will serve to minimize noise effects to MIS such as deer and elk, pine marten, pileated woodpecker, and “cavity excavators”. The post-sale projects are limited in scope and intensity, and localized in nature, and therefore adverse noise disturbance impacts from them to MIS will be very small, and not result in harm to individuals or a reduction in MIS populations. Adverse, cumulative effects to mountain goats would not occur because the post-sale projects are located too far from goat habitat for noise effects to occur.

Migratory Birds

A diversity of forest age classes, and the presence of adjacent wetlands and riparian habitats in the Dry Burton planning area combine to produce excellent habitat conditions for numerous migratory bird species, including species of warblers, vireos, flycatchers, thrushes and swallows. The Dry Burton action alternatives will have a long-term, beneficial effect to migratory birds by stimulating stand understory development and layering, which will enhance habitat capability for these species. In the short-term, the sale will likely disrupt some migratory bird nesting, although no tree felling or logging will occur before July 1 due to the fawning/calving LOP, which is late in, or following, the nesting season for most low-to-mid elevation migratory bird species. As the sale is

relatively small in size, and surrounded by thousands of acres of forest habitat where nesting will not be disrupted, these short-term adverse effects would be relatively small, and birds will return to nest in the Dry Burton stand in future years following the completion of harvest operations. The expected loss of some habitat features such as snags and down wood from logging operations would have relatively small impacts to migratory birds, which are not typically cavity nesters, or forage on snags or down wood. Tree swallows- who do nest in snag cavities- are an exception, but this species would not be expected to occur within the Dry Burton sale units.

There are no known indirect effects to migratory birds from the proposed Dry Burton timber sale.

Cumulative effects to migratory birds would occur as a result of continuing disturbance from post-sale projects, as addressed in the spotted owl issue analysis. As with the timber sale, the LOP restrictions for spotted owl nesting and elk calving will serve to minimize noise effects to nesting migratory birds, most of whom will have finished nesting by the time the post-sale projects commence. The post-sale projects are limited in scope and intensity, and localized in nature, and therefore adverse noise disturbance impacts from them will be very small and discountable.

4.8 Botanical Resources

Threatened, Endangered, and Proposed species

There are no known current or historical sites of Threatened, Endangered, or Proposed species within the project area.

Sensitive species and Survey results

Based upon the pre-field analysis, intuitive based field surveys of the project area were conducted during the months of July and August, 2005. Due to the seasonal nature of plant identification, it is not always feasible to survey a given area with one entry. Knowledge of plant and habitat relationships, growth habit, and flowering times help the investigator better determine the absence or presence of PETS species. The phenology of Sensitive lichen, bryophytes, and *Bridgeoporus nobilissimus* is such that they can be identified throughout most of the year. Surveys for these species are generally conducted at the same time as other PETS surveys.

In the 2004 Survey and Manage Record of Decision (USDA & USDI 2004, pg.6), the assumption was made that species for which surveys were not considered practical under the Survey and Manage standards and Guidelines (most category B & D species, including most fungi), would not require surveys under the Sensitive Species Program. Rather, other components of pre-project clearances (habitat evaluations etc.) were be utilized to evaluate potential risks to the species resulting from project activities. This

evaluation is then used to prescribe mitigations to address these risks (see discussion in the Determination of Effects section).

Potential Effects on PETS species

Potential effects are documented in this Biological Evaluation in accordance with the formats put forth for listed species in the 1986 Endangered Species Act regulations (50 CFR Part 402) and the March 1998 USFWS/NMFS Endangered Species Consultation Handbook; and for sensitive species, in the Forest Service Manual section 2670 and in a memo issued August 17, 1995 by the Regional Foresters of Regions 1,4, and 6.

Table 34 shows conclusions for effects of proposed actions on sensitive species with respect to each alternative in the Environmental Assessment. More detailed information on potential project effects on PETS species is found in the Environmental Assessment for this project. The rationale for the conclusion of effects is contained in the NEPA document.

Determination of Effects and Impacts

Threatened, Endangered, and Proposed Plant Species: At this time, there are no federally listed (proposed, endangered, threatened) plant species known to occur on the Forest, however one threatened species (*Howellia aquatilis*) is suspected. *Howellia aquatilis* has an extremely narrow habitat tolerance, generally confined to palustrine emergent wetlands with seasonal drawdown. No such wetland habitats will be impacted by implementing this project.

Table 34. Summary of effects, botanical resources, Dry Burton Thin.

| Species | Alt. (common to all) |
|---------------------------------------|----------------------|
| <i>Botrychium lanceolatum</i> | MIIH |
| <i>Cimicifuga elata</i> | NI |
| <i>Corydalis aqua-gelidae</i> | NI |
| <i>Cypripedium fasciculatum</i> | MIIH |
| <i>Euonymus occidentalis</i> | MIIH |
| <i>Pityopus californica</i> | MIIH |
| <i>Polemonium carneum</i> | MIIH |
| <i>Cetrelia cetrariaioides</i> | MIIH |
| <i>Collema nigrescens</i> | MIIH |
| <i>Leptogium cyanescens</i> | MIIH |
| <i>Nephroma occultum</i> | MIIH |
| <i>Peltigera neckeri</i> | MIIH |
| <i>Peltigera pacifica</i> | MIIH |
| <i>Pseudocyphellaria rainierensis</i> | MIIH |
| <i>Usnea longissima</i> | MIIH |
| <i>Schistostega pennata</i> | MIIH |
| <i>Tetraphis geniculata</i> | MIIH |
| <i>Bridgeoporus nobilissimus</i> | NI |

Key to Abbreviations in Table 34

NI No Impact

MIH May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Toward Federal Listing or Loss or Viability for the Population or Species

A “**May Impact Individuals or Habitat (MIH)**” conclusion is made for all action alternatives, with ground disturbance.

Sensitive Species: Surveys performed within and immediately surrounding the project area located **no Sensitive species**. There is potential habitat for a number of Sensitive species, including some fungi species and one lichen species that were not specifically targeted during surveys. As a result, it is unknown whether these Sensitive species occur within the project area of impact. Suitable habitat located adjacent to the project area will presumably continue to provide undisturbed habitat for these species, if they are present in the area.

4.9 Social Sciences – Historical and Present Use

Historical Human Use

The Upper Cowlitz River Watershed Analysis (1997) provides a comprehensive history of the area, but a brief summary is provided here. The upper Cowlitz River valley is historically and culturally rich. Archaeological evidence from sites in the Upper Cowlitz River Watershed reveals human use of the area as early as 7,000 years ago. More recently, during the 19th century, the Taitnapam, or upper Cowlitz Indians lived in settlements scattered along the Cowlitz River and larger tributaries between Mossyrock and Packwood. A cultural shift in human land use occurred between 1880 and 1890 when English-speaking immigrants replaced Sahaptin-speaking indigenous populations.

Homesteaders occupied the area as they took advantage of opportunities to supplement small-scale farming with subsistence hunting and fishing. A shift from an agricultural society to the exploitation of forest products occurred in the 1930’s and 1940’s.

Evidence of past human use in the form of prehistoric and historic archaeological sites and features, standing historic structures, trails, and historic landscapes have been documented in the Upper Cowlitz Watershed. While many sites are documented; many undocumented sites are likely to exist throughout the area.

Trail #123 – the South Point Ridge Trail is a historic trail that appears on maps from 1928 to 1960. An earlier route connected into the Klickitat Trail. The trailhead and a segment of the trail is located adjacent to Unit 5. It is a currently maintained trail that leads to the South Point peak and the site of the former South Point Lookout. Currently there is a radio communications repeater and small prefab building near the old lookout location. Mitigation measures protect the trail and trailhead from ground-based equipment during logging activities, and require that slash be pulled 50 feet from the trail and trailhead within the unit.

Effects to cultural and heritage resources

Heritage surveys were conducted in the Dry Burton Thin project area. Some historical evidence from the last logging entry were noted. It was determined that there were no significant sites, and that the proposed project, including the thinning of units 4, 5, 6, 8 and 17 would have no effect on cultural and heritage resources.

Current Human Use

Recreation. The South Point Trail, Dry Creek Pass and the Klickitat trail may be accessed via the Smith Creek drainage. The Pompey Roadless Area (RARE II) is adjacent to the project area. Forest Road 20 provides access to the Jackpot Lake area, which has relatively high levels of dispersed recreation use primarily defined as hiking, hunting and berry picking).

Scenery. Visual Quality Objectives for the Dry Burton Thin area include Modification, and Roaded Modified. In general, thinning harvest will meet retention objectives. There would be a short-term modification while harvest is active.

Non-timber Forest Products. Generalized information regarding harvest of forest products in the Upper Cowlitz River Watershed and the Smith Creek sub-watershed is based on anecdotal knowledge gleaned from permit administration records, law enforcement, Forest Service employees and forest visitors and harvesters.

The Smith Creek sub-watershed provides opportunities for the collection of Mushrooms, salal, boughs, personal use firewood and Christmas trees. Amounts of product collected within sub-watersheds are not known. Salal is present in portions of west-facing units, 5, 6 and 8. Evidence of commercial harvest of salal was observed in Unit 5.

Effects of the Action Alternatives on Current Uses

Forest visitors who harvest products or recreate in the project vicinity may be impacted by log truck traffic and landing operations adjacent to units. Mitigation measures provide for signage and management of traffic in the project area.

Thinning of units may affect the distribution of non-timber forest products. Chantrelles or other mushrooms and salal are the products most likely impacted from timber harvest activities. The potential effect to supply of products would be direct on site, where thinning and yarding occurs. While it is not know whether the project units have crops of mushrooms such as chantrelles, it is important to consider the potential effects.

Regeneration harvest and burning has the potential to set back production of chantrelles 20 to 30 years; thinning without burning is expected to have much less of an effect on mushrooms. Helicopter logging would likely be the least impacting, with ground-based yarding with the highest. Commercial and recreational harvesters may experience a local

reduction in mushroom crops; this is not known. However, adjacent habitat may provide sufficient sources and crops.

Salal may have a brief, negative response to thinning and harvest; however, most of the unit acreage is characterized as heavily stocked, with little to no understory. Thinning the canopy is likely to promote the production of salal in the long-term. In the short-term, harvesters who currently utilize salal “stands” in Dry Burton Thin units may be displaced to other collection areas.

4.10 Economics – Financial Analysis

Purpose and need discussion

One of the aspects of the purpose and need (Section 2.2) is to provide forest products. In terms of volume outputs, all of the action alternatives would equally meet this objective while the no-action alternative would not. In terms of the economic viability, each alternative would be slightly different as shown below.

One of the dual goals of the Northwest Forest Plan is to provide a sustainable level of forest products for local and regional economies and to provide jobs. The Northwest Forest Plan Final Environmental Impact Statement has an in-depth analysis of the economic basis behind the goal of providing forest products for local and regional economies. It also contains an analysis of the social and economic benefits and impacts of preservation, recreation and other values. To benefit local and regional economies, timber is auctioned to bidders. For contracts to sell they must have products that prospective purchasers are interested in and they must have log values greater than the cost of harvesting and any additional requirements.

There is often a concern about the viability of thinning timber sales that often have small low-valued logs and high logging costs when compared to other types of timber sales. In the future it is likely that timber values would fluctuate with market conditions and logging costs may also change with fluctuations in fuel prices. The purpose of this analysis is to approximate the economic feasibility of timber sales, estimate the potential value generated and to provide a comparison of the alternatives.

Alternative 1 would not contribute to a Northwest Forest Plan goal of maintaining the stability of local and regional economies through the provision of forest products at this time. The action alternatives would provide for jobs associated with logging and sawmill operations and would contribute to meeting the current demand for forest products. The annual incremental contribution of each million board foot of wood harvested from National Forest is expected to provide approximately 8.3 jobs (NFP, p. 3, 4-297).

Table 35 displays a summary of the cost and benefits associated with the timber harvesting only, for each alternative. The table displays present value benefits, cost, and net value, as well as the benefit/cost ratio for each alternative as if it was sold as one timber sale. These

figures display the relative difference between the alternatives. If timber prices or other factors fluctuate in the future, the relative ranking of alternatives would not likely change.

Table 35. Dry Burton Thin costs and benefits

| | Alternative 1 | Alternative 2 | Alternatives 3 | Alternative 4 | Alternative 4.1 |
|---------------------------------|------------------|------------------|-------------------|------------------|--------------------|
| Present Value - Benefits | 0 | \$ 1,420,250 | \$ 2,548,000 | \$ 2,749,110 | \$2,749,110 |
| Present Value - Cost | 0 | \$ 314,640 | \$ 650,877 | \$ 828,264 | \$1,078,497 |
| Present Net Value | 0 | \$ 1,105,610 | \$ 1,897,122 | \$ 1,920,845 | \$1,670,613 |
| Benefit/Cost Ratio | NA | 4.51 | 3.91 | 3.32 | 2.55 |

Present Value - Benefits: This is the present day value based on delivered log prices (estimated at \$650/mbf).

Present Value - Cost: This is the present day value of the cost associated with harvesting (estimated harvesting cost is \$144/mbf for mechanical, \$195/mbf for skyline and \$255/mbf for helicopter).

Present Net Value: This is the present net value of the alternative, which is based on the value of delivered logs to a mill minus the value of cost associated with harvesting.

Benefit Cost Ratio: This is a ratio derived from dividing the “Present Value – Benefits” by the “Present Value – Cost”.

The bidding results of the timber sales sold recently indicates substantial competition for forest products in the Region and high demand for forest products from the Gifford Pinchot National Forest. This demand represents an opportunity to provide forest products consistent with the Northwest Forest Plan goal of maintaining the stability of local and regional economies now and in the future.

Administrative costs are not included in the analysis above. Administrative costs for planning are already spent and would be the same for all alternatives including the no-action alternative. Basic road maintenance costs were not included as it would be similar for the three action alternatives. Other costs for timber sale preparation and sale administration for the action alternatives would be approximately proportional to the acres of each alternative.

4.11 Other Environmental Consequences

This section addresses those effects for which disclosure is required by National Environmental Policy Act regulations, Forest Service policy or regulation, various Executive Orders, or other laws and direction covering environmental analysis and documentation. In some cases, the information found here is also located elsewhere in this document.

Irreversible and Irretrievable Commitment of Resources

Irreversible Commitments

Irreversible impacts result from the use or modification of resources that are replaceable only over a long period of time.

Soil Productivity. Soil productivity would be lost or reduced to some degree on temporary roads and landings due to soil displacement. Full recovery of productivity on temporary roads and landings would not be anticipated despite efforts to reclaim these areas. The losses in productivity from the above would occur on a small part of the planning area. Project design criteria and mitigation measures included with all action alternatives are designed to minimize potential losses in productivity (see Section 4.4, Soils and Soil Productivity).

Rock Resource. The rock that is removed from quarries or rock pits and used during the construction of roads for surfacing and other needs would not be replaceable.

Old Growth. No late-successional (>170 years old) or old growth stands or trees are proposed for harvest in any alternative. Some of the stands proposed for thinning harvest may contain individual old growth trees. They would be included as leave trees in the thinning harvest units.

Irretrievable Commitments

Irretrievable commitments are opportunities for resource uses that are foregone because of decisions to use that land in another way. For example:

Timber Production. Generally, management activities, such as thinning, improve timber production. However, opportunities to increase the net production of timber (for example capturing mortality) would be forgone in those areas not thinned at this time to protect other resources.

Relationship between Short-term Uses and Long-term Productivity

Long-term impacts to site productivity from soil disturbance are discussed above in Irreversible Commitments of Resources.

Relationship to Other Agencies and Jurisdictions

The Washington State Department of Ecology (DOE) is responsible for enforcing the Clean Water Act of 1972. A Memorandum of Agreement (2003) prepared and agreed to by the Forest Service and DOE states that Best Management Practices, used by the Forest Service to control or prevent non-point sources of water pollution, would meet or exceed State water quality standards and other requirements, as outlined in Washington State Forest Practices Rules. The project design criteria and mitigation measures listed in Chapter 2 comply with terms and conditions of the Memorandum of Agreement.

The Washington State DOE is also responsible for enforcing the Clean Air Act of 1977. The State Smoke Implementation Plan provides guidelines for compliance which are intended to meet the requirements of the Clean Air Act. All burning plans for activities associated with this project would comply with this Plan.

The Washington State Department of Fish and Wildlife and the Forest Service entered into an agreement in the form of a Memorandum of Understanding (USFS, WDFW 2005). The MOU provides standard provisions and serves as a Hydraulic Project Approval for instream work. The project design criteria and mitigation measures listed in Chapter 2 comply with terms and conditions of the Memorandum of Understanding.

The United States Department of Interior Fish and Wildlife Service (USFWS) is responsible for the protection and recovery of threatened and endangered species. The effects determination for Northern Spotted Owl is "May Effect and is Not Likely to Adversely Affect". The Forest Service has received a letter of concurrence from the USFWS.

The United States Department of Commerce National Marine Fisheries Service (NMFS) is responsible for the protection and recovery of Threatened and Endangered fish species. The effects determination for Lower Columbia River steelhead, Lower Columbia River Chinook, and Designated Critical Habitat is " May Effect and is Not Likely to Adversely Affect ". Informal consultation was initiated with NOAA-Fisheries; a letter of concurrences is due.

All steps in the cultural resource process are coordinated with the Washington State Historic Preservation Office (USDA, 1990). Cultural Resource Site Reports are filed and approved by the Washington State Historic Preservation Officer. Based on the information documented in the Cultural Resource Report, there would be no adverse effects to cultural resources by the implementation of any alternative.

Effects on Prime Farm Land, Range Land, and Forest Land

There are no prime farm lands or prime range lands within the Tee Timber Sale planning area. Prime forest land is a term used only for non-public lands and does not apply to any land within the planning area.

Effects on Environmental Justice

Executive Order 12898 (February 11, 1994) directs federal agencies to focus attention on the human health and environmental condition in minority communities and low-income communities. The purpose of the Executive Order is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. The principle behind

Environmental Justice is simple: people should not suffer disproportionately because of their ethnicity or income level. While the sale of National Forest timber would create or sustain jobs and provide consumer goods, none of the alternatives is expected to have a disproportionately high and adverse human health or environmental effect on minority populations and low-income populations.

Minority communities may harvest non-timber forest products from the project area (section 4.9). Travel to and from harvest sites along Forest Roads 2000 and 2020 may be affected by log truck traffic. Signage and posting signs communication location and time periods of harvest and haul would mitigate this potential effect.

Effects on Wetlands and Floodplains

There would be no adverse effects to wetlands or floodplains due to the implementation of project design criteria and mitigation measures included with the action alternatives. Forest Road 20 and 2020 pass through wet areas that may or may not be wetlands. Drainage would be repaired to standard pre-haul, and the site would be stabilized post haul using timber sale contract provisions.

5.0 Consultation and Coordination

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

Interdisciplinary Team Members

Karen Thompson: North Zone Planning Team Leader
Andy Stevenson: IDT Leader and Zone Silviculturist
Tom Kogut: Wildlife Biologist
Ken Wieman: Fisheries Biologist/Aquatic Resources Program Manager
Marie Tompkins: Hydrology Technician and Acting Hydrologist
Steve Freitas and Cheryl Mack: Heritage and Cultural Resources
Burt Thomas: Botanist
Aldo Aguliar: Soil Scientist
Patty Bennett: Contract Administration and Logging Systems specialist
Diane Bedell: Recreation Planner
Dave McCullough: Fire Management
Dean Lawrence: Engineering and Transportation Systems

Federal, State and Local Entities

Joe Hiss: U.S. Fish & Wildlife

Tribes

The following Tribal representatives were consulted during the scoping process:

John Barnett, Chairman, Cowlitz Indian Tribe
Lee Carlson, Yakama Indian Nation
Dave Lopeman, Chairman, Squaxin Island Tribe
Karen Lucei, Env. Rev. Coord., Yakama Indian Nation
Joan Ortez, Chair, Steilacoom Tribe
Carrol Palmer, Dir. Natural Resources, Yakama Indian Nation
Dorian Sanchez, Chairman, Nisqually Indian Community Council
Bill Sterod, Chairman, Puyallup Tribal Council

Others

The following representatives of environmental groups and participants of the Pinchot Partners, a local collaborative working group were actively involved and provided comments regarding design and silvicultural prescriptions. In total, comments were solicited from individuals, tribal representatives and other agencies.

Derek Churchill, Conservation Northwest
Ryan Hunter and Lisa Doolittle, Gifford Pinchot Task Force

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