2011 Thinning Project
Upper Willamette Resource Area
BLM Eugene District
Environmental Assessment
DOI-BLM-OR-E060-2010-0001-EA

1.0 INTRODUCTION

The Upper Willamette Resource Area, Eugene District BLM proposes to implement commercial thinning and density management projects on approximately 1500 acres in the Calapooya, Mohawk River and Lower McKenzie 5th field watersheds. The locations are as follows:

- T. 14 S., R. 1 W., Section 31
- T. 15 S., R. 1 W., Sections 9, 17, 21, 22, 27, and 29
- T. 15 S., R. 2 W., Sections 1 and 11
- T. 16 S., R. 1 W., Section 31
- T. 16 S., R. 2 W., Sections 21 and 29
- T. 16 S., R. 3 W., Section 13

The Land Use Allocations for these acres are Matrix and Riparian Reserve. Project actions would include timber harvest, snag and coarse wood debris creation, road construction, improvements, and road decommissioning.

2.0 PURPOSE AND NEED

The need for action in Matrix and Riparian Reserves has been established through the results of field reviews and stand examinations, which indicate that stands (ages 30-70 years) would benefit from thinning or density management release. Currently, the stands are dense and uniform in structure. This results in reduced tree growth and stand vigor. Treatment would increase stand vigor, growth rates, crown differentiation and stand complexity.

The purposes of the actions in Matrix are to (1) Produce a sustainable supply of timber (1995 ROD/RMP p. 34); (2) Provide habitat for a variety of organisms associated with both late-successional and younger forests and maintain valuable structural components, such as down logs and snags (1995 ROD/RMP, p. 34). Additional direction for road management directs us to provide and manage the road system to serve resource management needs (1995 ROD/RMP, p. 98).

The purposes of the actions in Riparian Reserves are to provide habitat for Special Status Species and other terrestrial species, and to maintain and restore water quality (1995 ROD/RMP, p. 23).

2.1 CONFORMANCE

All alternatives are in conformance with 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 {NSO-ROD}) (USDA Forest Service and USDI Bureau of Land Management,

April 1994), and the Eugene District Resource Management Plan (RMP)(1995) and all plan amendments in effect on the day of completion of this EA.
This project is consistent with court orders relating to the Survey and Manage mitigation measure of the Northwest Forest Plan, as incorporated into the Eugene District Resource Management Plan. On December 17, 2009, the U.S. District Court for the Western District of Washington issued an order in *Conservation Northwest, et al. v. Rey, et al.*, No. 08-1067 (W.D. Wash.) (Coughenour, J.), granting Plaintiffs' motion for partial summary judgment and finding a variety of NEPA violations in the BLM and USFS 2007 Record of Decision eliminating the Survey and Manage mitigation measure. Previously, in 2006, the District Court (Judge Pechman) had invalidated the agencies' 2004 RODs eliminating Survey and Manage due to NEPA violations. Following the District Court's 2006 ruling, parties to the litigation had entered into a stipulation exempting certain categories of activities from the Survey and Manage standard (hereinafter "Pechman exemptions").

Judge Pechman's Order from October 11, 2006 directs: "Defendants shall not authorize, allow, or permit to continue any logging or other ground-disturbing activities on projects to which the 2004 ROD applied unless such activities are in compliance with the 2001 ROD (as the 2001 ROD was amended or modified as of March 21, 2004), except that this order would not apply to:

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

Following the Court's December 17, 2009 ruling, the Pechman exemptions are still in place.

The 2011 Thinnings project file contains additional information compiled by the Interdisciplinary Team (ID Team) to analyze effects and is available for review at the Eugene District Office.

2.2 SCOPING

Scoping information about the 2011 Thinning Project was first provided in the September 2009 *Eye to the Future*. An additional letter was sent concerning treatments around the Horse Rock Ridge Area of Critical Concern (ACEC). Letters discussing the project were also sent to adjacent private landowners. Eight total comment letters were received. The comments were taken into consideration during the planning of this project.

Issues

Scoping and the ID Team brought forward concerns related to resources that had potential of being affected by the proposed actions. The resource concerns related to the issues are analyzed in Section 4.0: Affected Environment and Environmental Consequences.
Issues identified:

1. How would project road construction and yarding affect soil compaction and displacement?
2. How would project activities affect water quality and aquatic resources?
3. How would thinning in the Riparian Reserve affect the habitat of terrestrial and Special Status Species?
4. How would project activities affect northern spotted owl nesting, foraging and roosting habitat?
5. How would commercial thinning at the project level affect greenhouse gas emissions?

3.0 ALTERNATIVES

This section describes alternatives identified by the ID Team. Please refer to Appendix A for maps of the project proposal.

3.1 ALTERNATIVE 1: NO ACTION

Under this alternative no project activities would take place. Commercial thinning, road management, and aquatic habitat restoration actions would not occur within the proposed project area.

3.2 ALTERNATIVE 2: MANAGEMENT ACTION

Under this alternative, commercial thinning, road management and aquatic habitat restoration actions would occur within the proposed project area. Actions are listed below by Land Use Allocation (as designated by the Eugene District Resource Management Plan 1995) and design features for the project are detailed in Appendix C.

Matrix Management

This alternative consists of seven commercial thinning areas of approximately 1073 upland acres. They are delineated into areas as follows:

• All Lalone	T. 16 S., R. 1 W., Sec. 31	164 acres
• Allison Creek	T. 16 S., R. 2 W., Secs. 21 and 29	156 acres
• Quarry	T. 16 S., R. 3 W., Sec. 13	45 acres
• Horsepower	T. 15 S., R. 2 W., Secs. 1 and 11, T. 14 S. R 1 W., Sec 31	465 acres
• Drury Creek	T. 15 S., R. 1 W., Secs. 9, 17, 21, 27, and 29	350 acres

Stands would be thinned from below. Trees selected for harvest would be the suppressed, intermediate, and co-dominant conifer trees, leaving the larger trees. This prescription would result in a stand with variable spacing, between 15 and 35 feet between remaining conifers and hardwoods. After all harvest activities, including snag and down log creation (as discussed below in Riparian Reserve Management), trees per acre would range from 60 to 120 and basal area would range from 120 to 160 feet squared depending on existing stand conditions. All hardwoods and Pacific yew would be retained, except where necessary to accommodate logging systems and for safety.

Riparian Reserve Management

Silvicultural treatments would occur in the outer edges of the Riparian Reserve and would be treated the same as the uplands. Areas of no harvest, in close proximity to streams and wetlands, would vary between 25 feet and 400 feet. The approximate riparian acres proposed for treatment for each section are as follows:

- All Lalone 30 acres
- Allison Creek 54 acres
- Quarry 4 acres
- Horsepower 107 acres
- Drury Creek 135 acres

Five additional acres in Allison Creek would have a special silvicultural prescription to release select oak trees. Some individual conifers currently shading oak trees would be felled.

An average of 160 linear feet per acre of down logs (approximately 2 trees/acre) and an average of 3 snags per acre would be created within portions of treated Riparian Reserves.

Logging Systems

Thinning would be accomplished with a combination of cable and ground-based yarding systems. Cable yarding would be proposed for approximately 730 acres and ground-based yarding would be proposed for approximately 650 acres (see maps in Appendix A). There would be an additional 20 special yarding acres in the project area to mitigate impacts to *Eucephalus vialis* in All Lalone and reduce soil impacts on Drury Creek and Horsepower. Specifications on special yarding areas are provided in the project design features of Appendix C (design feature #12).

Roads

Construction, Maintenance, Renovation, and Improvements

Approximately 32 miles of existing BLM controlled roads would be utilized as part of the project. Of that, approximately 10 miles of road would need maintenance (Table 1 of Appendix B). There would be approximately 3 miles of proposed new temporary road construction and approximately 3 miles of new permanent road construction (Table 1 of Appendix B).

Approximately 3 miles of Weyerhaeuser Company controlled road would be used for timber and rock haul.

Culvert Replacements and New Installations

Between 5 and 8 stream crossing (non-listed fish) culverts have been identified for replacement. In addition, between 11 and 15 cross drain culverts have been identified for replacement. Approximately 4 new stream crossing (non-listed fish) culverts would be installed in addition to the replaced stream crossing culverts. Approximately 35 cross drain culverts would be installed in addition to the replaced cross drain culverts.

Road Decommissioning

Approximately 3.6 miles of road would be decommissioned and not expected to be needed for future management actions in the next 5 years or longer (Table 2 of Appendix B). Decommission may include entrances barricaded, slopes water-barred, stream and cross drain culverts removed, stream channels and banks restored to a more natural condition, and drain dips installed. Approximately 3.0 miles of road would be permanently and fully decommissioned, (Table 2 of Appendix B). Roads to be fully decommissioned are not expected to be required for future management needs. Some unauthorized OHV trails that run along these road segments would also be fully decommissioned. Actions to fully decommission a road, in addition to those above, may include tilling the road bed and/or adding slash or brush, and mulching and planting native species of disturbed areas.

3.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

Commercial Thinning Adjacent to the Horse Rock Ridge ACEC

This alternative would have thinned approximately 30 acres of matrix lands east and south of the ACEC boundary in addition to those acres thinned in Alternative 2. It would have opened and utilized the currently closed BLM roads 15-2-1 and 15-2-1.2 and placed a few cable corridors through the ACEC to uphill yard timber from matrix lands. Comments and concerns brought up in scoping focused on the possible risk of harvest actions increasing noxious weeds along roadways as well as increasing direct access to the ACEC, which may put populations of Special Status Plants at risk. Though thinning the 30 matrix acres was consistent with the purpose and need for the project, opening roads 15-2-1 and 15-2-1.2 was not found compatible with the management goals of the Horse Rock Ridge Plan as outlined in the Final Horse Rock Ridge Area of Critical Environmental Concern (ACEC)/Research Natural Area Management (RNA) Plan.

No Treatment or Modified Treatment in Riparian Reserves

This alternative would have addressed coarse woody debris and snag recruitment in the Riparian Reserves by eliminating thinning treatments in Riparian Reserves and/or increasing tree retention in the reserves. Both would have increased acres having short term small snag and coarse woody debris recruitment due to competition-related mortality that naturally occurs in dense stands. Not treating the Riparian Reserves was not further analyzed because the effects are analyzed through both the No Action Alternative and the approximately 450 adjacent acres of untreated stream buffers of the Proposed Action Alternative. Initial modeling through the Forest Vegetation Simulator (FVS) did not suggest there would be notable variation in long-term large snag (>30” dbh) retention between the No Action and Proposed Action Alternatives. The modified treatment (harvesting fewer trees in the Riparian Reserves than in the Upland Matrix) was not analyzed in detail because the prescriptive differences did not consistently meet other Riparian Reserve management objectives (such as the development of deep crowns, large branches, understory growth, hardwood maintenance, etc.), did not show significantly different variation in coarse wood and snag recruitment and were not always logistically feasible.

4.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

4.1 ISSUE 1: HOW WOULD ROAD CONSTRUCTION AND YARDING AFFECT SOIL COMPACTION AND DISPLACEMENT?

4.1.1 Soils Affected Environment

Soil quality varies in response to different treatment histories and soil types in the various sections. Since the area was logged previously, it is reasonable to assume that there are areas of residual compaction and displacement. The full extent of the compaction and displacement is unknown. In the past harvesting was done by cat and tractor logging (ground based) on the gentler slopes and by cable logging systems in the steeper areas. Many roads at close spacing and heavy soil disturbance were common. Historic aerial photos, particularly the 1964 and 1969 sets, show an extensive system of skid trails and roads. Many abandoned roads from tractor skidding remain evident in these units from the initial old-growth entries.

There is evidence that the remnants of the original road system are being used by off-highway recreational vehicles (OHV), particularly in Drury Creek sections 17, 21, and 29. OHV use in these areas have created gullies, parallel and braided trails, and multiple sets of deep tracks over two feet deep and 15 feet wide in places.

In the project area, overall compaction is estimated at less than two percent in the Quarry, Horsepower and Allison sections, approximately five percent in All Lalone sections, and up to 10% in Drury Creek. The 1995 RMP/ROD directs planning for less than 2 percent compaction after amelioration practices (page 166).

Field inspection during sale planning provided verification of the Lane and Linn County Soil Surveys. Soils in Lalone, Quarry, and the Drury units are moderately deep and deep, well drained, gently sloping to very steep, silty clay loam and clay loam that formed in material weathered from sandstone or mixed sedimentary and igneous rock. These soils occupy the broader, more stable ridges and sideslopes. Slope is usually less than 45 percent, but short slopes can be as steep as 60 percent. Peavine and Blachly series' represent this group of soils.

Soils in the Horsepower units and Allison, section 29 are moderately deep and deep, well drained, gently sloping to very steep stony loam, cobbly loam and gravelly loam weathered from basic igneous rock. These soils are on the more rugged, hilly uplands and narrow ridges. Kinney and Klickitat series' represent this group of soils.

Drury, section 21 contains soils that are moderately deep, well drained, gently sloping to steep silty clay loam and cobbly silty clay loam. These soils occupy low foothills adjacent to the Willamette Valley. Nekia and Ritner series' represent this group of soils.

Peavine silty clay loam, Blachly silty clay loam, Kinney cobbly loam, and Nekia silty clay loam are classified as high resiliency. Klickitat stony loam, and Ritner cobbly silty clay loam are classified as intermediate resiliency.

4.1.2 Soils Environmental Effects

No Action Alternative

No additional compaction or displacement would occur as a result of proposed harvest and road management activities. The legacy compaction and loss of topsoil associated with past harvest activities would persist for the long term, as would the associated soil productivity losses. Time to recover soil function and productivity would vary from decades to centuries, depending on depth of excavation. Erosion and the transport of fine sediment may also continue on existing eroded trails and roads due to unauthorized OHV use within the project area.

Proposed Action Alternative:

The bulk of the thinning is proposed on sites with intermediate and high resiliency soils. These soil types can sustain substantial manipulation and still maintain nutrient capital, inherent physical and chemical properties, hydrologic function and natural rates of erosion. Project design features would minimize the potential for accelerated erosion throughout all phases of operation.

Compaction and Yarding Effects:

Compaction reduces porosity, which is an essential component of site productivity. It is instrumental for water infiltration, water storage, and gas exchange. Soils with good porosity create favorable conditions for root growth, water movement, nutrient uptake by roots, and mychorrizal growth (Amaranthus et. al. 1996).

Approximately 740 acres, or 53 percent of the total acres planned for harvest would be yarded with cable systems. Direct effects of cable yarding are displacement of surface soils and organic matter, and discontinuous localized compaction within yarding corridors. These effects tend to be confined to narrow corridors less than 12 feet wide. Compaction would be deeper and more continuous for areas harvested in the winter when clay soils are wet. Design features would limit the extent and severity of these impacts and the potential for prolonged accelerated erosion. After operations, bare soil exposure and compaction in corridors and associated landings would temporarily occupy about three percent of the cabled portions, or 22 acres. Full vegetative recovery is expected within five years for the highly resilient soils. Vegetative cover on the coarse textured intermediate resiliency soils is expected in less than 10 years except for segments with severe compaction.

Ground based harvest is planned where suitable soils occur and slopes are less than 35%. This constitutes approximately 660 acres, or 47 percent of the total acres proposed for harvest. These logging systems have the potential for more extensive compaction than cable systems because the compaction extends deeper and covers more area within the 12 foot skid trails. Organic matter and topsoil on skid trails would be bladed off or displaced which would reduce long term site productivity on the skid trails. Severity of effects would vary considerably depending on the types of ground based systems employed by the operator and the number of trips on any given trail segment. Studies indicate that after six trips all soil textures would become compacted to the point that soil function is impaired (Steinfeld, 1997). A suite of Best Management Practices and design features would be employed to reduce the spatial extent and the duration of these effects.

The physical and chemical properties of the on-site silty clay soils mark them as higher risk for compaction using ground based harvesting systems. The major soil type contained in ground based portions of Drury Creek (sections 17 and 29), All Lalone and a lesser component in Quarry, have high clay contents between 40 and 50 percent. These acres have been analyzed for ground based

systems, but even with delayed felling of trees, there is a reasonable possibility that soil moisture may not reach the RMP BMP of 25% (RMP, page 166). If operations were allowed to proceed, at soil moistures beyond 25%, correspondingly deeper compaction would be expected on these soil types.

After harvest, about fifteen percent of the ground based portions, or approximately 100 acres total, would be occupied by skid trails and landings. Compacted skid trails used by the operator would be tilled to restore infiltration and hasten vegetative recovery. Some of the existing OHV and old skid trails would be reused. Utilizing old routes reduces new adverse impacts and provides the opportunity to treat residual effects in some areas. The unused existing OHV and skid trails would remain compacted and continue to route water during winter rains.

Road Construction Effects:

Due to the proposed construction of rocked roads, long term soil productivity would be irreversibly lost on 6 acres of productive forested land. Construction of approximately 3 miles of temporary native surface road and associated landings would result in the loss of topsoil, and severe deep compaction on about 6 acres of productive forest land. In general, these temporary roads are planned on gradual grades and tillable soils. Decompaction with an excavator modified for tillage would improve infiltration and reduce the potential for prolonged erosion. Root growth in the loosened soil areas would be better distributed and more vigorous, resulting in an accelerated improvement of soil structure and recovery back to a forested condition as compared to leaving untreated compacted surfaces. However, soil function and long term soil productivity would still be impaired for 50 to 100 years largely due to the loss of topsoil.

4.2 ISSUE 2: HOW WOULD PROJECT ACTIVITIES AFFECT WATER QUALITY AND AQUATIC RESOURCES?

4.2.1 Water quality and Aquatic Resources Affected Environment

All streams within the planning area were reviewed for inclusion on Oregon DEQ Water Quality Assessment Database. Owl, Drury, Log, Allison, Solomon, Bickmore, and West Brush Creeks were not included in the database. The Table 1 lists the streams within or near the project area that are on the 303(d) Water Quality Limited list, as determined by Oregon DEQ, the temperature standard given, and the time frame this water quality standard applies.

Table 1. Streams near the project area on the 303(d) Water Quality Limited List.

Stream	Temperature standard[1]	WQ limited time frame	Notes
Brush Creek	16.0° C	year around	Below the project area
McGowan Creek	13.0° C	1/1 to 6/15	Within project area
	16.0° C	year around	
Mohawk River	13.0° C	9/15 to 6/15	Listed for iron as well; below the project area
	16.0° C	year around	
Shotgun Creek	16.0° C	year around	Below project area
Camp Creek	16.0° C	year around	Below project area

[1] Seven Day Average Maximum (7-DAM)

Temperature:

Optimum temperatures for coho salmon, steelhead, and cutthroat trout are 13 to 16 degrees Celsius and temperatures over 29 degrees Celsius are considered lethal (Meehan 1991). The absorption of solar radiation is the largest cause of increasing stream temperatures. Timber harvest in riparian areas that removed shade trees has been shown to increase stream temperatures (Beschta et al. 1987). Other factors, such as climate, stream size, topography, elevation and groundwater flows also influence stream temperatures.

Water quality monitoring for temperature was conducted by the BLM at five sites within project area watersheds, most recently between 1998 and 2003. Temperature monitoring focused on larger streams, and all sites are well below the project area. Water quality recovery goals from the Eugene and Salem BLM Willamette Basin Water Quality Restoration Plan support the overall goal of achieving compliance of water quality criteria on all land administered by the BLM. The following table 2 shows the results of the BLM monitoring.

Table 2. Streams within the planning area watersheds monitored by the BLM between 1998 and 2004.

Watershed	Temperature monitoring		
	Stream	Years	Maximum 7-DAM[1]
Calapooya River	No BLM monitoring in this basin		
Mohawk River	Shotgun Creek #1	2000-2002	17.8°C
	Shotgun Creek #2	2000-2003	18.4°C
	McGowan Creek	1998-2004	19.0°C
	Owl Creek	2001-2002	17.0°C
Lower McKenzie	Camp Creek	2000-2002	16.5°C

Sediment:

Fine sediments (sand, silt, and clay at less than 2 millimeters) enter and leave river channels naturally, but increased suspended sediment, turbidity, and sedimentation can adversely affect fish behavior, physiology and growth (Anderson et al. 1996). Forest management activities can lead to accelerated rates of erosion and sediment yield (FEMAT 1993, V-6). Landslides occur on a small percentage of forest lands, over a variety of forest types, whether managed or unmanaged (USDI BLM, 2008).

The effects of fine sediment on fish habitat are generally expressed as the percent of embeddedness at reach scales. Embeddedness is defined as the degree to which larger particles (such as boulders, cobble, and gravel) are surrounded and/or covered by smaller particles (silt, sand). Increases in sedimentation or embeddedness can reduce fish-spawning and rearing habitat, fish egg and fry survival, and food availability (Chamberlin et al. 1991, Hicks et al. 1991). Increased concentrations of suspended sediment and turbidity can also have direct effects on fish behavior, physiology, and growth (Anderson et al. 1996). Oregon Department of Fish and Wildlife (ODFW) considers properly functioning substrates to have <20% fines, sands or sediment. In general, the entire watershed has high levels of sediment. Table 3 shows estimated percent of silt, organics, and sand in each stream within the project area. These estimates are from ODFW Aquatic habitat surveys and show that levels of sediment are greater than 20%.

Table 3. Estimated percent of silt, organics and sand.

Stream Name	Percent Silt/ Organics/ Sand	Year of Survey
McGowan Creek	24%	1999
Drury Creek	66%	1999
Cash Creek	33%	2003
Shotgun Creek	21%	2003
Owl Creek	33%	2007
Alison Creek	35%	2008

Road runoff and landslides are the primary routes of sediment delivery to stream channels (BLM WQRP, 2008). The analysis contained within the Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans described the process, travel distances, and current amount of sediment entering stream channels from the existing road network (pages 343-347).

Road Impacts to Streams:

In watersheds in the planning area, roads and skid roads from past timber harvesting have impacted the stream network. Skid roads and log culverts were constructed over stream channels or on soils susceptible to compaction. Erosion of the road bed has occurred over time which mobilized and increased the delivery of fine sediment to stream channels. Disturbance to stream banks from stream crossings led to undercut, eroded stream banks. At some locations, stream channels were buried with road related debris when the road was constructed. A few of these old roads now carry water during winter storm events, extending the natural stream system.

Some stream crossings and ditch relief culverts on existing roads in this project area are not functioning properly due to rust, mechanical damage, being undersized, or other factors that increase the risk of culvert failure. A few road segments lack ditch relief culverts, increasing flow and sediment delivery to stream crossings and increasing the risk of road or culvert failure. A road inventory was conducted in the planning area that included an assessment of road and culvert conditions. Numerous cross drain and stream culverts were assessed and found to be at risk of failure and preventing fish passage. Out of 91 culverts, 55 were ranked as a high replacement priority due either to risk of failure or blocking fish passage. A few roads have degraded surface aggregate, resulting in excessive fines running on the road surface. Some roads run parallel to streams, so fine sediment is delivered to streams by way of runoff in wet winter months and dust in dry weather. Table 4 outlines some road issues currently affecting streams within the planning area.

Unauthorized Off-Highway Vehicle (OHV) Access Impacts to Streams:

Unauthorized OHV use occurs adjacent to and within the thinning areas on rarely used or abandoned roads, skid roads, and flat areas with little understory. OHV use has the potential to result in contaminant and sediment delivery to streams (USDI BLM 2008; pp 4-777). The unauthorized OHV trails within the project area tend to be eroded chronic sources of sediment to streams and roadside ditches.

Stream-side Slope Stability:

Unstable headwalls, cracked sidecast fill, and bank erosion currently deliver sediment to streams. In some cases, this is process is a function of underlying geologic processes. In other cases, human action caused the instability. Concentrating water flow off roads has saturated and destabilized slopes. Failure to properly compact fill material on the sides of roads has resulted in fill failure. Log culverts covered by fill material have destabilized stream banks above and below the crossing as streams adjust to the addition of this material.

Peak Flow:

An analysis completed for the Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans (USDI BLM, 2008; pp. 4-753 to 4-758) indicates watersheds in the planning area would not be susceptible to an increase in peak flows due to timber harvest. This analysis was based on timber harvest assumptions on both BLM-administered lands and non-BLM administered lands.

Table 4. Road impacts to streams within project area and haul routes.

Impacts to streams	Examples
Log culvert in stream crossings	• Drury Section 17, Road 15-1-17.1 • Horsepower Section 11, Road 15-2-2
Skid roads over stream channels	• Drury Section 9, on Brush Creek and tributaries
Rusty, damaged, or degraded culverts	• Road 16-2-25 • Road 15-2-13 • Road 15-1-21 • Road 16-2-29
Undersized stream crossing culverts	• Road 16-1-31.1 • Road 16-2-29 • Road 16-2-25 • Road 15-2-13
Inadequate or lacking ditch relief culverts	• Road 16-2-29
Degraded surface aggregate	• Road 16-3-13.5
Road runs parallel to streams	• Road 16-1-5 parallels Shotgun Creek • Road 15-2-13 parallels Owl Creek • Brush Creek Road parallels Bruch Creek
Old roads used as unauthorized OHV trails	• Road 15-1-17.1 (decommissioned) • Drury Section 29
Skid roads used as unauthorized OHV trails	• Drury Section 17 • Quarry
Flat areas with little understory used as unauthorized OHV trails	• Drury Section 21 • Drury Section 29
Unstable headwalls	• Horsepower Section 11 above TPCC areas
Cracked fill on roads	• Road 15-2-13 • Road 16-2-29
Active bank erosion	• Drury Creek, Drury Section 17 • Brush Creek, Drury Section 9

4.2.2 Water quality and Aquatic Resources Environmental Effects

No Action Alternative:

Stream Temperature:

No short term changes to existing shade would be expected since trees would not be removed in the primary and secondary shade zones. Over time, riparian vegetation would continue to grow and stream shade would remain unchanged or increase slightly along streams, but would not contribute to an overall decrease in stream temperature since the riparian areas are near or at site capacity (BLM WQRP, 2008).

Sediment Delivery and Sedimentation:

Fine sediment delivery to streams from road related sources would continue due to undersized stream crossing and ditch relief culverts would continue to deteriorate, and lead-off ditches or relief culverts would not be maintained or replaced. These culverts could plug, blocking or diverting stream or ditch flow, resulting in road failure, sediment delivery to streams, and channel scouring. No additional aggregate would be placed on haul routes, so sediment delivery to streams by way of connected ditch lines would continue.

During a 2009 road inventory, about 55 culverts were identified at risk of failure because they are undersized, plugged, rusting, or otherwise failing. It is estimated up to 2,500 cubic yards of material could be delivered to streams from these culverts upon failure, though the timing of failure is unpredictable. The following assumptions were used to calculate the amount of sediment available to deliver to streams if these culverts fail:

- Average road prism width is 40 feet;
- Active channel width is about 3 times culvert size; and
- Average fill depth is 10 feet.

Depth of fill(ft) X active channel width(ft) X average road prism width(ft) X $1yard^3/27\ feet^3$ X 0.5(formula constant) = volume of sediment ($yard^3$)

Based on these assumptions and calculations, it is estimated that the amount of sediment that would enter the stream channel from failure of existing culverts would range from 25 cubic yards for a 12-inch culvert to 180 cubic yards for a 96-inch culvert.

Existing unauthorized OHV trails would not be treated under this alternative. Conditions on these unauthorized trails are expected to continue, contributing to chronic sediment delivery.

Peak Flow:

Peak flows would be maintained on BLM lands in the watershed since no harvest or road work would occur.

Cumulative Effects:

This alternative is expected to maintain current watershed conditions. The opportunity to improve aquatic habitat conditions and water quality would be lost or postponed. Further, water quality degradation and impacts to fish habitat may continue as several road or undesignated OHV trail-

stream crossings further deteriorate due to the lack of maintenance. Road conditions and unauthorized OHV trails would maintain or increase annual sediment delivery and surface runoff to streams without additional aggregate surfacing, relief drainage, or other treatment.

The 55 culverts identified as being at risk of failure would continue to pose a risk. Many stream crossing culverts were designed to pass water and not bed load and associated debris, as required under the Northwest Forest Plan) and Best Management Practices which were incorporated in the Eugene Area Resource Management Plan (BLM, 1995; p. 25). This has resulted in culverts plugging due to large wood transport, sediment deposition at the inlet due to water backing up behind culverts, and channel scour downstream of culverts due to high velocity flow. During high flows, plugged culverts can result in overtopping roads and road failure. Road fill material is directly delivered to a stream channel, eroding stream banks and increasing fine sediment downstream.

Unauthorized OHV trails are a chronic source of fine sediment delivery to streams, regardless of level of use, particularly during winter storm events. The timing of road and culvert failure is unpredictable; up to 2,500 cubic yards of fine sediment could be delivered at over 55 locations over three watersheds. Up to 100 cubic yards of fine sediment from unauthorized OHV trails at four stream crossings could be delivered to Drury Creek annually. An eroding log culvert would continue to add fine sediment to Drury Creek on Road 15-1-17.1, contributing up to 90 cubic yards of sediment to Drury Creek. A degrading log culvert on Road 15-2-2 would fail at an unpredictable future time, contributing up to 90 cubic yards of sediment to a tributary of Shotgun Creek. In the long term, chronic fine sediment delivery to stream channels from roads and unauthorized OHV trails adjacent to Drury Creek Sections 29 and 17 would be greatest under the No Action Alternative because road decommissioning and culvert removal and replacement would not occur.

No actions would occur on BLM administered lands that would contribute to an increase in stream temperatures. However, no accelerated improvement to stream temperatures due to addition of large wood, deeper pools, and increased channel complexity would be expected under the No Action alternative. Streams flowing onto BLM administered lands may exceed stream temperature standards and solar loading TMDL, due to forestry, agriculture, or urban activities on lands not administered by the BLM.

Stream channel complexity would improve at a slower rate, therefore the quality of fish habitat, overall biotic production of the system, and the reduction of water temperature due to deeper pools and reduced velocities would take longer to achieve.

Fish production within the project areas would continue to be hindered by the following:

- Poor road drainage would increase fine sediment delivery to area streams;
- Unauthorized OHV trails would continue to provide chronic sources of fine sediment;
- Decreased movement of fish would continue to limit production within basin due to fish passage barriers; and
- Riparian areas would continue to be overstocked, slowing and reducing quality and quantity of large wood inputs, and would slow riparian development and function (multi canopy layers, etc.).

No change to peak flows or factors that affect the timing and magnitude of flows is would occur under the No Action Alternative. The opportunity to improve conditions through road drainage and unauthorized OHV trail treatment would be lost, though the extent of this impact is unknown.

Table 5. Summary comparison of effects between alternatives on water quality and aquatic resources

Comparison of effects between alternatives		
Water Quality Parameter	**No Action**	**Proposed Action**
Temperature	• Unchanged from existing condition • Slowed restoration of factors (shade, channel complexity) affecting temperature	• Unchanged from existing condition • Slightly accelerated restoration of factors affecting temperature
Sediment	• Chronic sources would remain and increase • High risk of sediment pulse due to failure at 55 culvert sites	• Some chronic sources would be treated • Risk of sediment pulse reduced from high to low or moderate at up to 23 sites
Peak Flows	• Unchanged conditions affecting timing and magnitude of flows • Opportunity to improve conditions postponed • Extent of impacts unknown	• Improved conditions affecting timing and magnitude of flows • Extent of improvement unknown

Proposed Action Alternative

Stream Temperature:

Under the Proposed Action, commercial thinning within Riparian Reserves would not contribute to an increase in stream temperature. Riparian thinning as a restoration project was included in the Water Quality Restoration Plan for both 8th field (formerly 4th field) watersheds (BLM WQRP, 2008).Trees would not be removed within the primary shade zone (25 feet on either side of seeps and springs; 75 feet on first and second order perennial, non-fish-bearing streams; and 100 to 400 feet on fish-bearing or larger order streams). An estimated 50 to 75 percent canopy closure and up to 85 percent angular canopy density would be maintained in the secondary shade zone. Although thinning in the secondary shade zone may slightly increase solar radiation penetrating the primary shade zone, the primary shade zone would provide sufficient shade to maintain stream temperatures. Stream crossing culvert removals or replacements may result in the loss of some overstory vegetation, but not to the extent of affecting stream temperature. The long-term potential addition of large wood to streams would result in increased or maintained quantity and quality of backwater and scour pool habitat, thus increasing the availability of thermal refuges for salmonids during summer low flows.

Sediment Delivery and Sedimentation:

Vegetation treatment in riparian reserves would maintain no-harvest buffers of 25 to over 400 feet. These buffers provide protection to unstable stream banks and headwalls, filtering out soil displaced by yarding, thus preventing sediment delivery to streams. Cable yarding landings are generally placed on ridge tops, outside the stream influence zone. Implementation of project design features minimizes sediment delivery effects to water quality and fish habitat due to timber harvest activities.

Removal and replacement of existing stream crossing culverts, placement of a new culvert in Allison Creek 21, placement of approximately 39 new cross drain culverts, placement of 4 new stream crossing culverts and road decommissioning requires the operation of heavy equipment within and adjacent to stream channels. These activities would disturb riparian vegetation and expose soil to erosion, temporarily increasing turbidity and fine sediment delivery to streams while equipment is operating in streams and during rainstorms after project completion. These effects depend on factors such as project proximity to surface water, quantity and intensity of subsequent rainstorms,

effectiveness of the erosion control methods, extent of ground disturbance, and speed of germination of replacement vegetation.

Project design features and Best Management Practices such as sediment control structures, working in the dry months, and project timing provide for erosion control at stream crossing sites after culvert placement or removal for decommissioning. Turbidity levels would decrease and return to background levels within 2 to 24 hours after cessation of stream channel disturbance (NOAA, 2008; p. 74). These sites would be short term (one to two years) sources of fine sediment. Long term sediment delivery would decrease due to improved road drainage.

Up to 23 culverts that have been identified as a risk to public safety or water quality would be replaced, with the potential to produce up to 1,200 cubic yards of sediment if they fail. By contrast, up to 75 cubic yards of fine sediment would be delivered during the replacement of stream crossing culverts. Another 2 culverts would be removed in conjunction with road decommissioning or weatherization, with the potential to produce up to 80 cubic yards of sediment if they fail. By contrast, up to 5 cubic yards of sediment would be delivered during or after removal. About half of these projects would occur on or near a fish bearing stream channel.

The proposed new and temporary road construction would occur predominantly on ridge tops, with no stream crossing locations, so there would be negligible opportunity for fine sediment delivery to fish bearing stream channels as a result of road construction. For example, the longest new permanent road, Spur DC17A, has no new stream crossings, so there would be no mechanism for fine sediment delivery. Tilling where feasible would help restore water infiltration and reduce the risk of surface runoff and fine sediment reaching nearby streams.

Increased road use from timber hauling and related activities would result in short-term increases in fine sediment delivery. This project allows for year-round timber haul where impacts vary by season of use. Existing haul routes are predominately gravel surfaced roads leading to paved roads for the majority of the log haul. Dry season use typically results in less sediment production. A road-related inventory identified that some roads within the project area do not have adequate relief drainage or road surfacing aggregate. Road segments with the potential for delivery would receive additional relief culverts or replacements and all stream crossings on the haul route would receive road surfacing aggregate that would further reduce any road-related sediment delivery to streams. Implementation of project design features would further minimize sedimentation impacts to project area streams. No log haul routes would cross over listed fish habitat on gravel or native surface roads with the exception of road the 15-2-13 road which crosses over Shotgun Creek. This road is a gravel surfaced road with very flat approaches on both sides of the stream. In general the road work would improve (decrease) sediment delivery on the existing haul routes.

Peak Flow*:*

Commercial thinning and road work are not expected to measurably impact current peak flows because most of the area is in the rain dominated hydroregion, protective no-harvest buffers would be retained next to all streams, and road improvements would reduce runoff to streams. The longest new road, Spur DC17A, would have no new stream crossings and appropriate frequency and placement of ditch relief (or cross-drain) culverts, and is not expected to increase peak flows in Drury Creek or tributaries. A much shorter new road segment in Allison Creek 21 crosses a tributary of Allison Creek, and is not expected to increase peak flows in this tributary, due to Best Management Practices including disconnecting road surface drainage from the stream. Removing culverts, such as the one at the end of Road 15-2-13 in Horsepower 11, is expected to restore hydrologic processes by disconnecting road drainage from the stream.

Cumulative Effects*:*

Implementation of Alternative 2, combined with on-going and planned road renovation on BLM-administered and non-BLM administered lands, would result in a long-term reduction of road-related sediment and surface water runoff delivery to streams and fish bearing habitat. No measurable impacts to stream flow are expected due to timber harvest or road projects, though tilling compacted surfaces, removing road-stream crossings, disconnecting road side ditches from streams, and improving road-stream crossing culverts are expected to improve factors affecting magnitude and timing of stream flows and reduce sediment delivery.

Several unauthorized OHV trails would be impacted by logging activities. The decommissioning of Spur HP11L and Spur DC29A would impede OHV traffic on existing trails that follow these roads. Also, ground-based logging may use existing OHV trails as skid roads where operationally efficient. After use, the skid trails would be tilled and brush and slash would be left on the trail to impede OHV use and help filter overland water flow. If these actions successfully reduce or eliminate unauthorized OHV trail use, factors affecting fine sediment delivery may improve in these areas.

No harvest stream buffers and Best Management Practices (BMP's) would maintain existing sediment rates to streams. The addition of potential large wood to the system would help regulate the sediment regime and add to hydraulic complexity, developing higher diversity of riffle and pool habitat over time, thus influencing the physical and biological characteristics of the stream system and creating productive habitats for salmonid fish. Large woody debris entering the stream system from BLM lands (either naturally or stream channel enhancement) would be distributed downstream over time by natural processes, thereby providing benefits beyond the project area.

Replacement of fish passage barrier culverts would result in an increase in the amount of suitable spawning and rearing habitat available for salmonids within the watershed. In addition, replacement of deteriorated or undersized stream crossing culverts and decommissioning roads would reduce the risk of mass wasting, chronic erosion, fine sediment delivery, and sedimentation, providing benefits to the overall health of the aquatic ecosystem within the watershed.

Maintaining primary shade zones and fifty percent canopy closure in secondary shade zones along streams would protect water temperatures on BLM land. Such standards are not consistently used on private timberland; therefore temperature increases elsewhere in the watershed are expected to occur at the current rate.

4.3 ISSUE 3: HOW WOULD THINNING IN THE RIPARIAN RESERVE AFFECT THE HABITAT OF TERRESTRIAL AND SPECIAL STATUS SPECIES?

4.3.1 Special Status Species Affected Environment

Special Status wildlife species, migratory birds, and habitat features that may be impacted by the proposed Alternatives are discussed below. Species eliminated from consideration due to no potential impacts are listed in Table 3 of Appendix D.

Special Status Species:

Bald eagles are a migratory species that would both overwinter and nest on the District. Bald eagles typically choose to nest in large trees with open canopies near large bodies of water, and are sensitive to disturbance while nesting (Buehler 2000, Isaacs and Anthony 2003). Horsepower 1 is adjacent to potential bald eagle winter roost stands. However, the likelihood of eagle roosting within

disruption distances of proposed treatment areas is low given the unit's location on the east side of the Coburg Divide. All currently known bald eagle winter roosts are on the west side of the Divide, with direct access and lines of sight into the Willamette Valley.

The Purple Martin is the largest North American swallow. Snags with woodpecker cavities are thought to be the most important habitat features for populations that nest in tree cavities (Brown 1997). Purple martin nests are typically found in open areas near water (Brown 1997, Horvath 2003). The project area could provide nesting opportunities for purple martins where large snags or trees with woodpecker holes are present, particularly in Allison Creek 21 and Drury Creek 29.

Two Special Status bat species may be affected. The Fringed Myotis is an insectivorous bat species found throughout the western U.S. Townsend's Big-Eared Bat is an insectivorous species is found throughout the western U.S. and the Ozark and Appalachian Mountains. Large remnant trees in the proposed treatment areas could provide foraging and roosting opportunities for these bat species, particularly in Allison Creek Section 21 and Drury Creek Section 29. Suitable habitat features include cavities, stovepipes, and sloughing bark.

Little is known about the life history and habitat requirements of the Salamander Slug. Specimens have been found in the Oregon Coast Ranges and Western Cascades; it is suspected to occur on the District, but has not been detected. Sites where salamander slugs have been found included moist conditions and large coarse woody debris. Similar mollusk species require leaf litter, fungus, and/or detritus as food sources, as well as refugia from desiccation during dry periods. Possible refugia include interstices in rock habitat, soil fissures, or the interior of large woody debris. The salamander slug likely uses herbaceous vegetation, ferns, leaf litter, or moss mats in moist, shaded areas near refugia when active. Potential habitat for the salamander slug exists throughout the project area, although habitat quality is difficult to assess due to lack of detailed knowledge of habitat requirements.

The Oregon Slender Salamander is associated with cool, moist habitats and refugia such as large CWD, bark piles, or rock habitat. Limited surveys on the District suggest that the species is locally uncommon and associated with mature and old-growth stands.

Migratory Birds:

Guidance for Federal agencies whose actions could impact migratory birds was issued in Executive Order 13186 (2001), which directs agencies to ensure that environmental analysis considers the effects of agency actions and plans on migratory birds, with emphasis on species of concern.

Additional guidance for migratory birds was issued in BLM Instruction Memoranda Nos. 2008-050, Migratory Bird Treaty Act – Interim Management Guidance (USDI 2008) and 2009-018, Migratory Bird Treaty Act—Clarification of WO IM 2008-050 for Western Oregon. These memos identify "Birds of Conservation Concern" and "Game Birds Below Desired Condition," as defined by the Service (2008), as species to be addressed in project-level NEPA documents. Six of these species (bald eagle, harlequin duck, marbled murrelet, peregrine falcon, streaked horned lark, and vesper sparrow) are addressed above and in Appendix D as Special Status Species. Habitat for five other species (black swift, mourning dove, rufous hummingbird, wouldow flycatcher, and wood duck) would not be affected by the proposed action. The remaining four species that could potentially be affected by the proposed modification of mid-seral habitat are discussed below.

The band-tailed pigeon is a fruit- and seed-eating bird that is widely distributed across North and South America. Nesting in Oregon is generally in mature, closed canopy conifer stands, while more open forest stands and agricultural lands are used for foraging. Band-tailed pigeons travel widely in

search of food, giving the species a nomadic nature. Mineral springs and deposits are also thought to be key habitat features.

Northern Goshawks are large forest-dwelling hawks found throughout temperate forested regions of the northern hemisphere. Goshawks forage below the forest canopy for a variety of birds and small mammals. Stands used for foraging and nesting in the northwest are generally mature with large trees, a closed canopy, and a relatively open understory, but goshawks do use mid-seral habitat as well. A goshawk was observed in All Lalone in July 2009 but further investigation found no evidence of nesting.
The olive-sided flycatcher is an aerial insectivore associated with edge habitats between mature and early-seral stands, and large openings in late-seral habitat. It uses tall trees and snags for singing and foraging perches.

Purple finches are widely distributed, breeding in the Pacific states, the northeastern US, and Canada. The species typically uses early- to mid-seral coniferous habitat, but may also be found in agricultural and suburban settings. Purple finches' main diet is seeds, supplemented by fruit and insects. Competition with the house finch is thought to be reducing purple finch numbers.

Coarse Woody Debris and Snags:

Coarse Woody Debris (CWD) is an important habitat feature for many wildlife species including the special status species listed above. CWD provides refugia, foraging sites, and travel corridors for species with low mobility and small home ranges (*e.g.* invertebrates, small mammals, and amphibians). Additionally, CWD provides important basic ecological function like moisture retention, nutrient cycling, and microclimate buffering. Stand exam data show CWD distributed across a variety of diameters and decay classes; most CWD is either recent suppression mortality (small diameter/low decay class) or residue from the previous harvest (large diameter/high decay class). Field review of the proposed treatment areas indicates that CWD is generally more abundant in Riparian Reserves and irregularly distributed in upland areas.

The total linear feet per acre of CWD vary widely among the proposed harvest areas with similar levels at All Lalone and Drury Creek Section 21 (161-326 lf/ac); at Allison Creek Section 21, Drury Creek Sections 9, 21, 27, Horsepower Sections 1 and 31, and Quarry (515-931 lf/ac), and at Allison Creek Section 29, Drury Creek Section 17, and Horsepower Section 11 (1123-1270 lf/ac).

Large, decayed down logs provide the best currently available habitat features; proposed harvest areas contain from 11-221 lf/ac of down logs $\geq$ 20 inches diameter in decay classes 3, 4, and 5. Hard CWD (especially small diameter) provides less function for wildlife but represents l future wildlife habitat after further decay. Large, low decay class CWD must bridge the gap until stands begin recruiting new pieces of similar size, but such pieces were removed from the proposed units during previous harvest. Most of the low decay class CWD present has been recruited in the past few decades and is of small diameter. Proposed harvest areas contain an average of 56 lf/ac of decay class 1-2 CWD with 8"-19" DBH and 5 lf/ac with 20"+ DBH. Unmanaged stands of similar age in western Oregon have, on average, 383 lf/ac of decay class 1-2 CWD with 20"+ DBH (USDI 2002), far more than the proposed units.

Snags are especially important to primary and secondary cavity nesting birds (passerines, woodpeckers, owls) and roosting bats. Stand exam data show a range of 0-10 snags per acre in the proposed treatment areas. However, more than 90% of these snags are in small diameters (8-15 inches) that provide fewer wildlife life history needs due to their small size and short lifespan. Larger moderately decayed snags are most important to wildlife. Stand exam data show an average of only

0.01 snag per acre (0.5% of the average) that are 16 inches diameter or greater.

Approximately 350 snags were created in both Allison Creek treatment areas within 200' of streams 1, 11, and 22 (Section 21) and 40, 44, and 49 (Section 29). These snags were created 1996 by blasting and/or inoculating live trees and are small-diameter and low decay class. However, there is evidence of their use (excavations, cavity starts) and they are important habitat features because they occur in an otherwise snag-poor landscape.

4.3.2 Special Status Species Environmental Effects

No Action Alternative

Special Status Wildlife Species and Migratory Birds:
No direct or indirect effects to any Special Status Species or migratory birds would occur under this alternative. Habitat would be unaffected and would continue to provide for wildlife use at current levels. No potential for noise disturbance would occur. Habitat development would continue on its current trajectory and the development of late-successional features would depend on the release of overstory trees by competition mortality or natural disturbance.

Coarse Woody Debris and Snags:

Existing CWD and snags would not be physically degraded or removed, nor would their quality or function change due to alteration of surrounding microclimate. Stands would continue to recruit small to medium-sized CWD and snags, primarily through suppression mortality. Although the numbers recruited would be higher than in treated stands, average diameters would be smaller than in stands where tree growth was accelerated by thinning. Existing large-diameter CWD and snags would continue to decay and disappear from the stand within 50 years. These features would not be replaced until natural processes created the necessary growing space for the development of large-diameter trees. Under the Eugene District Resource Management Plan (1995), matrix lands of the treatment areas would be available for final regeneration harvest in 30-60 years. Snag and CWD recruitment would cease at this time, except for management required by the RMP during regeneration harvest.

Proposed Action Alternative

Special Status Wildlife Species:

Noise disruption would be the only potential effect to Bald Eagles. Surveys of potential winter roosts would be conducted in winter 2010. If eagle roosting is detected, seasonal restrictions may be necessary to avoid noise disruption depending on distances, topography, and other site-specific factors.

Large remnant trees and snags that are suitable for Purple Martin or bat use would be retained whenever possible. However, these species could be affected by the removal of such trees for safety, operational needs, or road building. Such limited effects to these species would not cause measureable impacts at the population or regional scales, nor would it contribute to the need to list these species under the Endangered Species Act.

Retention/protection of large CWD, and buffering of riparian areas, wetlands, and rocky areas would protect most suitable habitat features and microclimate for the Salamander Slug and Oregon Slender

Salamander. Some large CWD would be damaged during operations, and the construction of roads, landings, and yarding corridors would fragment habitat and lead to warmer, drier conditions in adjacent habitat. These limited negative effects would not be expected to preclude use of proposed treatment areas by these species.

Migratory Birds:

The proposed thinning could have direct and indirect effects on migratory birds and their habitats. Partial removal of overstory trees would reduce canopy cover and volume, and operations would remove or damage understory vegetation, snags, and some large remnant trees. This would reduce nesting and foraging opportunities for the species listed above in the short term, particularly the olive-sided flycatcher. Thinning would also stimulate growth in residual trees, understory trees, shrubs, and herbaceous vegetation over the course of several decades. These effects would benefit these and other migratory bird species that use mature and late-successional habitat.

Project design features from Appendix C that are intended, in part, to mitigate effects on migratory birds include: favoring a diverse residual tree species mix, retention of large remnant trees where possible, retention of snags where not prevented by operational and safety concerns, retention of existing Decay Class 3, 4 and 5 coarse woody debris, and creation of snags and coarse woody debris.

Northern goshawk surveys would be conducted in All Lalone in spring 2010 and mitigations (seasonal restrictions, harvest buffers) would be developed if nesting goshawks are found within 0.25 miles of the unit.

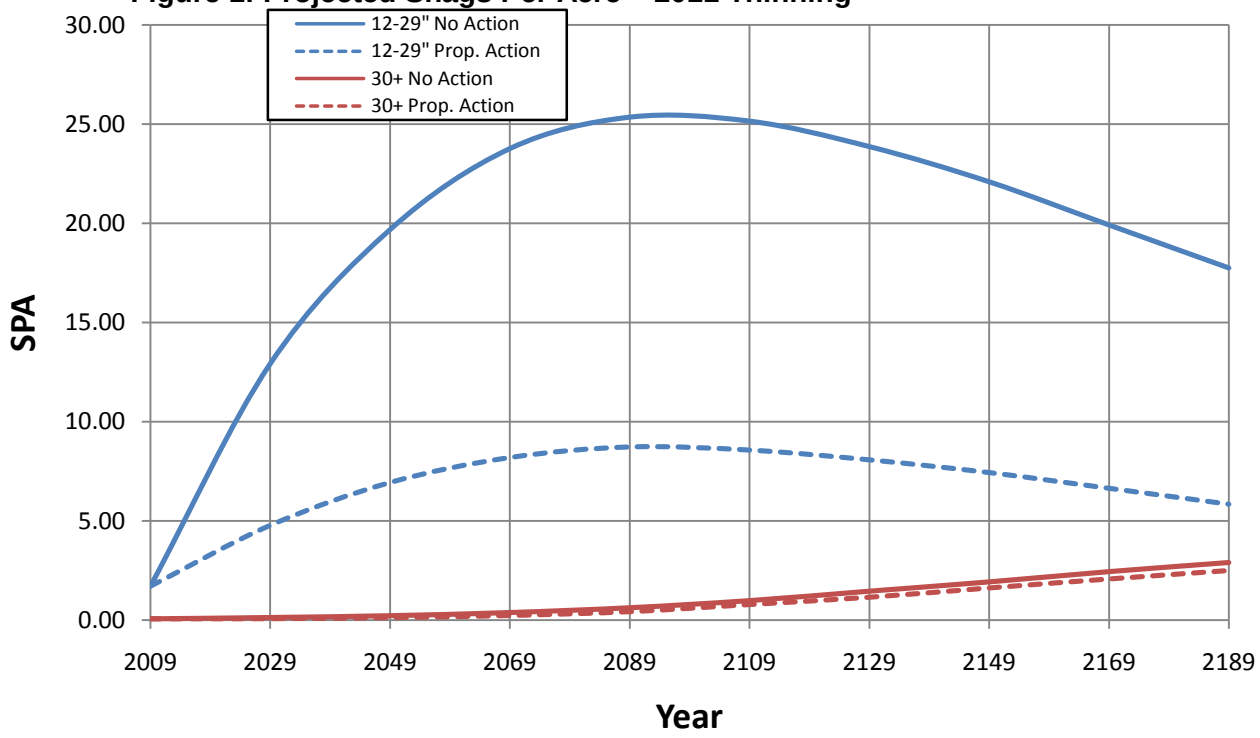
Coarse Woody Debris and Snags:

The project design features in Appendix C would physically retain most existing CWD and snags in proposed treatment areas. However, harvest operations would damage some down logs (particularly those in decay class 4-5), and some snags could felled for safety reasons or be inadvertently knocked over. Changes in microclimate due to overstory removal could also adversely affect CWD and snag function and quality until stand canopy conditions recover in 5-15 years.

Fewer small-diameter CWD and snags would be recruited into the project area when compared to the No Action Alternative because these smaller, less competitive trees would be harvested as part of the thinning. Additionally, existing large-diameter CWD and snags would continue to decay and disappear from the stands. Consequently, thinned stands would experience a reduction in total number of CWD and snags compared to the No Action Alternative for several decades. However, Forest Vegetation Simulator (FVS) modeling suggests that thinning would maintain the same levels of recruitment of large (• 30" DBH) CWD and snags in the Riparian Reserves over the long-term compared to the No Action Alternative (Figure 1). Under the Eugene District Resource Management Plan (1995), upland portions of the treatment areas would be available for regeneration harvest in 30-60 years, and therefore would lack the time to develop large diameter CWD and snags. These areas would remain depauperate in CWD and snags compared to the No Action Alternative and typical unmanaged stands until final harvest.

Approximately 450 of acres immediately around the treatment areas would be untreated Riparian Reserves. These untreated Riparian Reserves would recruit snags and CWD at the same rates as the No Action Alternative. Retention of untreated buffers, snag and CWD creation, and the eventual natural conversion of created snags to down logs would lessen the impacts of CWD and snags reduction in the treated portion of the Riparian Reserves.

Figure 1: Projected Snags Per Acre – 2011 Thinning



4.4 ISSUE 4: HOW WOULD PROJECT ACTIVITIES AFFECT NORTHERN SPOTTED OWL NESTING, FORAGING AND ROOSTING HABITAT?

4.4.1 Northern Spotted Owl Affected Environment

The Northern Spotted Owl (*Strix occidentalis caurina*; spotted owl) is a long-lived owl species that ranges from northern California to British Columbia. Spotted Owls prey on a variety of small mammals and typically nest and forage in older forest stands (Forsman et al. 1984). The species was listed as 'Threatened' by the Fish and Wildlife Service in 1990 because of its decreasing numbers. At that time habitat loss from timber harvest was considered the greatest risk; however, competition from barred owls (*Strix varia*) has subsequently developed into an equally pressing concern.

Suitable habitat for spotted owls provides for all of the species' life history requirements, and is also called Nesting/Roosting/Foraging (NRF) habitat. In the project area it is generally described as conifer forest greater than 80 years old with mature or late-seral characteristics such large-diameter trees with nesting structure (broken tops, cavities, or platforms), multiple canopy layers, large down logs and snags, and a somewhat open understory. Stands that show most of these characteristics except nesting structure, and that provide roosting and hunting opportunities, are called foraging habitat. Stands without nesting, roosting, and foraging components but with sufficient canopy cover and sub-canopy space for spotted owl movement are referred to as dispersal habitat. These stands are used to facilitate owl movement at both the site and landscape scale, and may also provide foraging opportunities if the habitat supports prey species. Dispersal habitat is generally found in stands 40 to 80 years old. Forested areas that currently provide no function for spotted owls due to small, dense trees are called unsuitable habitat, and areas that would never provide for spotted owl use (*e.g.* rock outcrops or water bodies) are called non-habitat.

Proposed Treatment Areas:

Generally, the proposed treatment areas show relatively small tree size; high tree density; uniform age distribution, and low amounts of useful large CWD and snags. The treatment areas also lack nesting structure, well-developed understory and shrub layers, sub-canopy flying space, and a variety of roosting choices for thermoregulation. Individual remnant trees with nesting structure are present in the project area in Allison Creek 21 and Drury Creek 29, but because of their location in mid-seral stands they are not expected to provide for spotted owl use. Their crowns are not continuous with the main canopy and any potential nesting structure is unfavorably exposed. However, such trees would provide the earliest nesting opportunities when residual trees grow and provide cover to nesting structure. The proposed treatment areas are considered spotted owl dispersal habitat with limited foraging opportunities due to these stand conditions.

Adjacent Habitat

Approximately 700 acres of suitable habitat exist within 0.25 mile of proposed treatment areas. Most occurs as scattered stands of less than 50 acres. One 130-acre complex of suitable habitat occurs adjacent to Horsepower 1.

Known and Predicted Sites

Information on the location and status of spotted owl sites in the project area is available from surveys conducted beginning in the 1990s. Most spotted owl sites in the project area are thought to have been identified, but survey efforts have been sporadic from year to year. The effects of habitat modification to spotted owl sites in the Western Cascades physiographic province are assessed by assigning generalized nest patches, core areas, and home ranges with radii of 300 meters, 0.5 miles, and 1.2 miles respectively (USDI 2008).The Provincial Home Ranges (PHRs) of 10 known sites and three predicted sites overlap the proposed treatment areas. Harvest would occur in the core areas of five sites: Allison Creek, Georges Knob, South Marcola, West Allison, and West Brush Creek. None of the proposed treatment areas occur within a spotted owl nest patch. Existing habitat conditions, proposed thinning, and past thinning at these sites are detailed in Table 1 of Appendix D. The affected sites have little suitable habitat and none meet the Fish and Wildlife Service take thresholds (40% suitable habitat in PHR and 50% in Core Area; USDI 2008). Brief site histories are found in Table 2 of Appendix D.

Temporary Sites

Temporary sites are designated when owls have been detected in an area, but there is insufficient information to establish a new known site. Temporary site 8217 (Crooked Creek) occurs between Horsepower 1 and 11, and may be using the suitable habitat in Section 1.

4.4.2 Northern Spotted Owl Environmental Effects

No Action Alternative

No direct or indirect effects to spotted owls or their habitat would occur under this alternative. Stands would not be modified and no potential for noise disturbance would exist. The area would continue to provide for spotted owl use at current levels, and habitat development would continue along current trajectories. Within the Riparian Reserves, Allison Creek 21 would develop into suitable habitat in approximately 50 years, given the existing large remnant trees with nesting structure. The development of suitable habitat in the remaining stands would depend on the release of overstory

trees by competition mortality or natural, unpredictable disturbance events (fire, windthrow, disease, or insect attack). This process could take up to 100 years. The project area outside of Riparian Reserves, under the Eugene District Resource Management Plan (1995), would be available for regeneration harvest within 30-60 years. High-quality suitable spotted owl habitat would not develop in this timeframe, and therefore, it is likely that the no action alternative would contribute little to the long-term conservation needs of the spotted owl at the project level.

Proposed Action Alternative

General Habitat Effects:

Approximately 1400 acres of dispersal-only habitat would be affected. Vertical and horizontal cover would be reduced in treated areas through overstory tree removal, with varying levels of residual tree density. Harvest would also damage existing shrub and herb layers, and may also damage or destroy some coarse woody debris and snags. Additionally, up to 10 large-diameter remnant trees could be felled for road building in Allison Creek; these trees would be left on site as CWD. Although these trees currently show late-successional characteristics, their scattered locations in a mid-seral stand limit their utility for spotted owls. However, any loss would represent a qualitative reduction in the potential for future habitat development.

Spotted owls would be expected to continue to utilize treated areas because post-project canopy cover and horizontal cover would continue to allow spotted owls to effectively use stands. Canopy cover after treatment would be greater than 40%, a figure widely used as a threshold for dispersal function (Thomas et al. 1990). However, spotted owls would likely utilize thinned stands less than unthinned stands for approximately 15-20 years until canopy cover and shrub/understory layers recover and develop further. The proposed action would leave untreated riparian buffers that would provide a network of denser canopy cover that could facilitate spotted owl movement through the treated area.

The proposed action would improve or maintain the development trajectory of habitat features used by both spotted owls and their prey, like large (• 30' DBH) trees and snags, deep crowns with large branches, multiple canopy layers, herbaceous and shrub vegetation, and large CWD. These features would develop in varying time frames; for example response from understory vegetation would take only years, while recruitment of large CWD could take hundreds of years. These features would be free to develop in Riparian Reserves, but the majority (1073 acres or 77%) of the project area is outside of Riparian Reserves and under the Eugene District Resource Management Plan (1995), would be available for regeneration harvest within 30-60 years. High-quality suitable spotted owl habitat would not develop in this timeframe, and any habitat improvement realized on these acres would be short-lived. Therefore, at the project level and within the Matrix LUA, it is likely that the proposed action would contribute little to the long-term conservation needs of the spotted owl.

Site-Specific Habitat Effects:

At the home range scale, thinning under the Proposed Action would have varied effects on spotted owl movement and use of affected sites. Due to low amounts of habitat and long-term disuse by spotted owls there is little likelihood of spotted owl occupation at four of the affected known sites: Allison Creek, Buck Mountain, South Marcola, and West Allison. Consequently, the proposed thinning would not be expected to adversely affect the already reduced potential for spotted owl use at these sites.

Proposed thinning would occur at the periphery of some affected home ranges (Drury Butte, McGowan Creek), or would have low relative and absolute effects on home range habitat availability (Mohawk, Shotgun Creek). When the distances from known sites, availability of unthinned riparian areas, and adjacent suitable and unthinned dispersal habitat are considered, it is likely that spotted owl use of these home ranges would be unchanged.

Two sites, Georges Knob and West Brush Creek, would be adversely affected by the proposed thinning. The Georges Knob site has the greatest amount of suitable habitat of any affected site, however harvest has occurred on adjacent private lands and approximately 200 acres of BLM-managed land in the PHR have been previously thinned. Additionally, the proposed thinning would occur as a large unit (Drury Creek 9) adjacent to the nest patch and would likely pose an obstacle to spotted owl use of the eastern portions of the PHR. Therefore, the proposed thinning would adversely affect the potential for spotted owl use at the site. The West Brush Creek PHR would be subject to similar conditions: little available suitable habitat, harvest on adjacent private lands has been high, and approximately 100 acres of BLM-managed land have been previously thinned. Consequently, the proposed unit (Horsepower 31) represents a portion of the available dispersal habitat and thinning would adversely affect the ability of the PHR to support spotted owl occupancy.

Disruption:

No effect to spotted owls from noise disruption would occur from the Proposed Action. All activities would meet the minimum disruption distances established by the US Fish and Wildlife Service (USDI 2009), or operations would be seasonally restricted during the spotted owl critical nesting season (March 1 to July 15). This would ensure that noise disruption would not cause adult spotted owls to abandon nests or juveniles to fledge prematurely. Specifically, Drury Creek 9 would require seasonal restrictions on harvest operations to avoid disruption at the Georges Knob site.

4.5 ISSUE 5: HOW WOULD COMMERCIAL THINNING AFFECT CARBON AND GREENHOUSE GAS EMISSIONS?

4.5.1 Carbon Greenhouse Gas Affected Environment

Carbon and greenhouse gases in this analysis are estimated in the form of carbon tonnes for standing live trees. Cubic feet modeled from stand exam data in the Forest Vegetation Simulator were converted into carbon tonnes. The stands within the 1400 acres of the proposed action treatment currently have an estimated 88,600 carbon tonnes in live trees. The environmental effects analysis below considers net changes in carbon storage from this live tree carbon in the short-term (now and immediately after timber harvest) and in the long-term (30 years post-harvest). The temporal scale of 30 years for long-term analysis would be longer than the anticipated duration of net emissions directly of indirectly resulting from the action.

4.5.2 Greenhouse Gas Environmental Effects

No Action Alternative

Under the No Action alternative, continued forest growth over the next 30 years would result in an increase in live tree stand volume of approximately 39 cubic feet per acre, or 55,113 cubic feet across the project area. This equates to an increase in storage of approximately 438 metric tonnes of carbon per year. Therefore, forest growth under the No Action alternative would result in the storage of an additional 13,152 metric tonnes of carbon over the project area in the long term compared to current conditions.

Proposed Action Alternative:

The proposed commercial thinning would result in carbon dioxide emissions as a result of timber harvest and fuels treatments, after which forest growth would result in storage of carbon.

The proposed action would harvest an average of 13,095 board feet of timber per acre, which across the 1400 acre project area, contains a total an estimated 24,310 metric tonnes of carbon. The carbon within harvested wood is calculated based on factors presented within the Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans (Appendix C, p. 28), which is incorporated here by reference. Of this carbon in harvested wood, 3,396 metric tonnes would be emitted in the short-term and over the long-term (30 years), 6,957 metric tonnes would be cumulatively emitted.

Because the proposed commercial thinning would maintain the forest stand, the carbon storage in forest pools other than live trees (e.g., understory vegetation, forest floor, soil carbon) is assumed for the purpose of this analysis not to change as a result of thinning harvest, except for the pile burning to dispose of slash described below. The Final Environmental Impact Statement for the Revision of the Western Oregon Resource Management Plans (2008, p.540; Appendix C, p. 29) analyzed the changes to carbon storage in forest other than live trees and concluded that the amount of carbon stored in forests (other than live trees) generally reflects the structural stage, and that analysis is incorporated here by reference.

Pile burning to dispose of slash after timber harvest would result in the consumption of 1024 tons for the entire project area, which would emit 465 metric tonnes of carbon in the short-term.

Fuel consumption associated with the proposed action would also result in carbon dioxide emissions. This analysis assumes an average 20 miles haul distance, 2.65 gallons of diesel fuel per thousand board feet to yard and haul logs to the mill, and 6 pounds of carbon per gallon of diesel fuel. The overall emissions associated with yarding equipment and hauling is then estimated at a total of 2,995 tonnes.

In total, the action would result in the emission of 6857 tonnes in the short-term and an additional 3561 tonnes over the long-term, for a cumulative total of 10,418 metric tonnes. This would equate to the emission of approximately 38,199 metric tonnes of carbon dioxide.

Over the next 30 years, continued forest growth following harvest would result in an increase in live tree stand volume of an average 42 cubic feet per acre, or 58,707 cubic feet across the project area. This equates to an increase in storage of approximately 467 metric tonnes of carbon per year. Forest growth would equate to the sequestration of approximately 14,010 metric tonnes of carbon dioxide over the long term. In conclusion, forest growth 30 years following harvest would result in carbon storage which would exceed the carbon directly and indirectly emitted from harvest, resulting in a net storage of carbon compared to current conditions.

Table 6: Summary of effects on carbon for the No Action and Proposed Action Alternatives. All values are in metric tonnes unless otherwise indicated.

	No Action		Proposed Action	
	Short-term	**Long-term (30 yrs)**	**Short-term**	**Long-term (30 yrs)**
Total Live Tree Carbon Storage	438 tonnes per year	13,152	467 tonnes per year	14,010
Harvested Wood Carbon Storage	0	0	24310	
Emissions from Harvested Wood	0	0	-3,396	-6,957
Emissions from Fuels Treatments	0	0	-465	0
Emissions from Operations	0	0	-2,995	
Total Emissions	0	0	-6,857	-10,418

*This analysis did not model carbon stored through competition-related mortality.

5.0 CONSULTATION

Endangered Species Act consultation for potential disruption to the northern spotted owl has been completed for the proposed action (USDA/USDI 2009 and USDI 2009). Consultation on habitat-modifying activities would be completed as part of a forthcoming batched Biological Assessment and Biological Opinion for projects proposed in the Willamette Planning Province for 2011-2012. It is anticipated that this consultation would be complete before a decision for this project is issued; if this project does not meet all requirements of that effort it would require separate consultation.

A biological assessment was completed for Upper Willamette River Chinook salmon and its critical habitat, which concluded in a No Effect determination.

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Appendix A: Maps

Appendix B: Roads

Table 1: 2011 Thinning Roads – Proposed Road Construction, Maintenance, Renovation, and Improvement (miles are approximate numbers)		
Road Construction—Temporary	**Length**	**Comments**
Spur DC 21A	0.02 mile	Native surface
Spur DC 09A	0.04 mile	Landing spur, 8”-10” rock, install one ditch relief culvert
Spur DC 09B	0.06 mile	Landing spur, native/optional rock--8”-10”
Spur DC 09C	0.05 mile	Native surface
Spur DC 09D	0.05 mile	Landing spur, 8”-10” rock
15-1-21 Ext.	0.30 mile	Native surface/optional rock--8”
Spur DC 29A	0.11 mile	Native surface, install one stream culvert
Spur DC 29B	0.28 mile	Native surface
Spur AL 31A	0.30 mile	Native surface/optional rock—8”
Spur AL 31B	0.25 mile	Native surface
Spur AL 31C	0.10 mile	Extension of 16-2-36.1, native surface
Spur AC 21B	0.62 mile	Native surface
Spur AC 21D	0.11 mile	Native surface
Spur AC 21F	0.25 mile	Native surface
Spur AC 21Q	0.16 mile	Native surface
Spur Q	0.35 mile	Native surface/optional rock—8”-10”
Spur HP 1A	0.17 mile	Native surface
15-2-11 Ext.	0.05 mile	Native surface/optional rock—8”
Total	**Approx. 3.3 mi.**	
Road Construction—Permanent		
Spur DC 17A	1.40 mile	Designed road, 8”-10” rock, 8-10 ditch relief culverts
Spur DC 17B	0.06 mile	Landing spur, 8” rock
Spur DC 17C	0.05 mile	Landing spur, 8” rock
Spur AL 31E	0.30 mile	Designed road, 8”-10” rock, approx. 1-2 ditch relief culverts
16-2-21.6	0.21 mile	Designed road, 8”-10” rock, install one stream culvert and approx. 2-3 ditch relief culverts
16-2-29.4	0.11 mile	Designed road, 8”-10” rock, approx. 1 ditch relief culvert
Spur HP 11C Ext.	0.06 mile	Native surface/optional rock—8”
Spur HP 31G	0.34 mile	Designed road, 8”-10” rock, approx. 2-3 ditch relief culverts
Spur HP 31I	0.07 mile	8”-10” rock
Total	**Approx. 2.6 mi.**	
Maintenance by Road Number		
15-1-21.2	0.09 mile	Brushing, grading
15-1-21.3	0.21 mile	Brushing, grading
15-1-9	0.73mile	Brushing, grading
15-1-28	0.50 mile	Brushing, grading
16-1-31.6	0.75 mile	Brushing, grading, spot rock as needed
16-1-31.1	0.65 mile	Brushing, grading, add 4”-6” rock, replace two ditch relief culverts
16-2-21	2.13 mile	Brushing, grading, spot rock as needed
16-2-21.2	0.83 mile	Brushing, grading, spot rock as needed
16-2-35	1.00 mile	Brushing, grading, replace one stream culvert and three ditch relief culverts
15-2-13	2.25 mile	Brushing, grading, spot rock as needed, replace/add approximately five ditch relief culverts

15-2-11	0.21 mile	Brushing, grading
15-2-11.2	0.21 mile	Brushing, grading
Total	**Approx. 9.6 mi.**	
Renovation by Road Number		
15-1-21.2 Seg. 7	0.26 mile	Brushing, grading, native surface/optional rock—8”
16-2-36.1	0.20 mile	Brushing, grading, native surface
14-1-31.3	0.18 mile	Brushing, grading, add 4” rock
Spur HP 1B	0.06 mile	Brushing, grading, add 8” rock
Spur HP 11C	0.07 mile	Brushing, grading, native surface/optional rock—8”
15-2-11A	0.12 mile	Brushing, grading, native surface/optional rock—8”, add one ditch relief culvert
15-2-10.1	0.47 mile	Brushing, grading, replace one culvert
15-2-2	0.49 mile	Brushing, grading, add one ditch relief culvert
Spur HP 11E	0.19 mile	Brushing, widening, native surface, add two ditch relief culverts
15-2-11.1	0.57 mile	Brushing, grading, add 4”-6” rock
Spur HP 11L	0.28 mile	Grading, install temporary stream crossing
14-1-31.4	0.21 mile	Brushing, grading, native surface/optional rock—8”
Spur HP 31B	0.06 mile	Brushing, grading, native surface/optional rock—8”
14-1-31.2	0.13 mile	Brushing, grading, native surface/optional rock—6”
Spur HP 31D	0.09 mile	Grading, native surface
Spur HP 31E	0.13 mile	Grading, native surface
Spur HP 31X	0.03 mile	Landing spur, grading, native surface, optional rock—8”
Total	**Approx. 3.5 mi.**	
Improvement by Road Number		
15-1-21.1	0.70 mile	Brushing, grading, spot rock as needed, add two ditch relief culverts
15-1-27.3	1.50 mile	Add 6’-8” rock, add one ditch relief culvert, replace three ditch relief culverts, replace two stream culverts
Powerline Road	0.13 mile	Add 8” rock, partial realignment, improve drainage
15-1-21	1.50 mile	Add 6” rock, add four ditch relief culverts, replace one stream culvert
16-2-29	0.73 mile	Brushing, add two ditch relief culverts, replace one stream culvert
16-2-29.3	0.29mile	Add 8”-10” rock, install approximately two ditch relief culverts, install one stream culvert
Spur HP 11B	0.19 mile	Add 6”-8” rock
Spur HP 31G	0.09 mile	Add 8” rock
14-1-31	0.42 mile	Add 6’-8” rock, install approximately four ditch relief culverts
Total	**Approx. 5.6 mi.**	

Appendix B continued: Roads

Table 2: Proposed Road Decommissioning (miles are approximate numbers)		
Decommission (long-term > 5 years)	**Length**	**Comments**
Spur DC09A	0.02 mile	Barricade
Spur DC09B	0.06 mile	Barricade
15-1-21.2	0.09 mile	Barricade
15-1-21.3	0.21 mile	Barricade
15-1-21 Seg. 7	0.26 mile	Barricade, install waterbars
15-1-21 Ext.	0.23 mile	Barricade, install waterbars
Spur Q	0.35 mile	Barricade
16-2-29.3	0.29 mile	Barricade
16-2-29.4	0.11 mile	Barricade

Spur HP 11C Ext.	0.06 mile	Barricade
Spur HP 11B	0.19 mile	Barricade, install waterbars
Spur HP 31G	0.34 mile	Barricade
Spur HP 31I	0.07 mile	Barricade
14-1-31.3	0.18 mile	Barricade
Spur HP 1B	0.06 mile	Barricade
Spur HP 11C	0.07 mile	Barricade
Spur HP 11E	0.19 mile	Barricade
14-1-31.4	0.21 mile	Barricade
Spur HP 31B	0.06 mile	Barricade
14-1-31.2	0.13 mile	Barricade, install waterbars
Spur HP 31X	0.03 mile	Barricade
14-1-31	0.42 mile	Barricade, install waterbars
Total	**Approx. 3.6 mi.**	
Full Decommission (permanent)		
Spur DC 09C	0.05 mile	Till
Spur DC 21A	0.02 mile	Till, barricade
Spur AL 31A	0.30 mile	Till, barricade
Spur AL 31B	0.25 mile	Till, barricade
Spur AL 31C	0.10 mile	Till, barricade
16-2-36.1	0.20 mile	Till, barricade
Spur AC 21B	0.62 mile	Till, barricade
Spur AC 21D	0.11 mile	Till, barricade
Spur AC 21F	0.25 mile	Till, barricade
Spur AC 21Q	0.16 mile	Till
Spur HP 1A	0.17 mile	Till, barricade
15-2-11 Ext.	0.05 mile	Till
15-2-10.1	0.23 mile	Till BLM-controlled portion
Spur HP 11L	0.28 mile	Till, barricade
Spur HP 31D	0.09 mile	Till, barricade
Spur HP 31E	0.13 mile	Till, barricade
Total	**Approx. 3.0 mi.**	

Appendix C: Design Features for Proposed Action

Harvest

1) Retain all incense-cedar, grand fir, yew, oaks and other hardwoods, except where necessary to accommodate safety and logging systems.

2) Apply seasonal restrictions, or suspension of all harvest and road activities within 1/4 mile of: known nesting great blue herons, peregrine falcons, bald eagles, spotted owls, great grey owls, accipiter hawks, and other owls, hawks, or raptors if they are located at any time during project activities.

3) Consistent with consultation with the United States Fish and Wildlife Service for spotted owls, disturbance to spotted owl pairs and their progeny would be minimized through seasonal restrictions.

- Road work (including construction and pre-harvest renovation) and harvest operations at Drury Creek Section 09 would be seasonally restricted from March 1 to July 15. Log hauling and post-harvest road decommissioning are not subject to this restriction.
- Although none are currently planned, any quarry operations on BLM land may also require seasonal restrictions depending on location.
- Any of the above restrictions may be waived or modified (reduced or extended) by the Area wildlife biologist based on relevant survey information regarding occupation or nesting activity.

4) All snags, including human created snags in Allison Creek; down logs in decay classes 3, 4 and 5; existing rootwads; and all trees 28” or greater DBH would be retained undamaged when possible and/or would not be cut, except in road construction rights of way, landings, yarding corridors, and those posing a safety hazard. If trees greater than 28” DBH or snags are felled, they would be left on site for CWD. Such CWD may be cut into sections and moved to facilitate operations or safety.

5) Falling and yarding techniques would be utilized for the protection of retention trees, existing coarse woody debris, snags, rootwads, mapped TPCC areas and other reserve areas. Where possible, cable corridors would be placed to avoid these habitat features.

6) Down logs and root wads that present a hazard to logging operations or that are needed to close roads may be relocated within the project area.

7) Limit log lengths to 40' in length where necessary to minimize damage to residual trees, snags and coarse woody debris during yarding.

8) Landings would be place at least 150 feet from streams unless otherwise needed for safety or to reduce impact to the environment.

9) Apply the following requirements to cable yarding areas:

- Require one-end suspension of logs while skidding and cable yarding. Intermediate supports may be required to accomplish this objective.
- To minimize impacts to residual trees and soils, spacing of cable corridors should be kept to

150 feet apart and limited to 12 feet in width.

- As determined by the Authorized Officer, if needed skyline yarding corridors with severe gouging would be left in an erosion resistant condition by the use of hand water barring or placement of wood debris.
- For Drury Creek, at landings cable corridors would be blocked with logging debris post harvest.

10) Mechanized harvesting systems may be approved when:

- Movement of cutting equipment off designated skid trails shall be limited to a single pass.
- Mechanized harvester shall travel on the cushion of slash created by the harvesting process
- Where slopes are less than 45%
- When soil moistures are low (<25%) and provides resistance to compaction (typically July 1st – Oct 1st)

11) Apply the following requirements to ground base yarding areas:

- Require felling of trees to lead of the skid trails and maximize winching distances.
- Placement of skid trails would be avoided within 150 feet of streams where feasible.
- All skidding equipment would remain on the designated skid trails.
- Skid trails should be 12 feet wide or less.
- Average distance between skid trails would be 150 feet or greater where feasible.
- Use existing skid trails or OHV trails, where possible.
- Avoid placing skid trails on rocky soils.
- Restrict yarding to seasonally dry period when soil moisture content provides the most resistance to compaction. This is usually July 1st and October 1st.
- Till, where feasible, compacted skid trails, with an excavator to a depth of 18 inches, when soil moisture is appropriate. Other equipment may be authorized if it can accomplish the required depth, lateral shatter of compacted layer, and place woody debris on the decompacted surfaces. Minimize damage to residual tree roots adjacent to trails.
- To reduce erosion and restore soil productivity, pull slash, logging debris and brush from the adjacent forest floor onto severely compacted skid trails in consult with the Authorized Officer.
- If tillage cannot be accomplished the same operating season, all skid trails and temporary native surface roads would be left in an erosion resistant condition and blocked prior to the onset of wet weather. This would include construction of drainage dips, water bars, lead off ditches, and barriers (rootwads or brush piles) to prevent vehicle access until final blockage and/or tilling.

12) Apply the following requirements to special yarding areas:

- In the northeast portion of Horsepower Section 11, ground based equipment would be restricted to no more than 3 existing skid trails as identified on the ground. Trees would be directionally felled to these trails if used, and trails would be tilled after use.
- In the small special yarding areas in the southern portions of Drury Creek Sec 9 and Horsepower Sec 11, ground base equipment would not be allowed.
- In the special yarding area within All Lalone, trees shall be directionally felled away from *Eucephalus vialis* and felled to the lead of designated skid trails.

13) Keep a Spill Contamination Kit (SCK) on-site during any operation within the project area*; prior to starti*ng work each day, all machinery would be checked for leaks and necessary repairs would be made.

14) Removal, notification, transport and disposal of any diesel, hydraulic fluid, or other petroleum product released into soil and/or water would be accomplished in accordance with U.S. EPA and DEQ Laws, and regulations.

Roads

15) Position fill or waste material from road construction or decommissioning in a location that would avoid direct or indirect sediment discharges to streams or wetlands. Excess excavation and unsuitable material would be placed in designated disposal areas.

16) Limit use of native surfaced roads to the dry season (generally between July 1 and October 1). Waterbars, drain dips, and/or lead-off ditches may be required to create an erosionresistant condition on roads during seasonal closures. Access to such roads shall be blocked during closures.

17) Cut and fill slopes of newly constructed/renovated permanent roads, as well as decompacted native surface roads, would be seeded with native grass/species.

18)Require the following along perennial streams:

- Stream flow would be routed around the construction /decommission activity as much as possible (e.g. temporary flow diversion structure).
- Sediment containment structure placed across the channel below the work section (i.e. straw bales) as needed.
- Work site would be pumped free of standing water.
- Fish and other aquatic species would be removed from the project area and block nets placed above and below the worksite.
- After installation, the disturbed section would be planted with native seed and mulched with native weed free straw or wood mulch before the first rains.

19) Apply Oregon Department of Fish and Wildlife (ODFW) in-water guidelines to all in stream activities. Work would be done between the dates of June 1 to Oct 31st. For permanent roads, construction and renovation would occur during the dry season, typically June 1st through October 15th. Soil stabilization work consisting of seeding and mulching may be performed on some existing roads in accordance with these specifications at the culvert installation sites and cutbanks.

20) Implement the following combination of methods during heavy and/or prolonged rainfall or freezing and thawing periods to minimize sedimentation from the gravel surfaced roads into stream channels:

- keep ditch line, cross drains, and leadoff ditches clean and free to flow, while minimizing disturbance to existing ditch line vegetation.
- Sediment traps may be installed in ditch lines lacking vegetation and having the potential to deliver sediment to streams.
- Prior to and during haul operation, rock surfacing and road maintenance would be assessed throughout the project area and haul route.
- If erosion and road degradation occur after freeze and thaw periods, log haul operations may be discontinued.

Decommissioning

21) Till, where road sub grade conditions warrant, compacted road surfaces with an excavator when soil moisture is appropriate (generally July 1 to October 1). If tillage is not possible then waterbars and lead-off ditches would be constructed to reduce sedimentation to streams and wetlands. Logging debris and brush would be placed along the entire length of tilled roadbed to reduce erosion, maintain soil productivity and block access.

22) Block vehicle access where appropriate with earthen barricades with brush and/or slash additions.

23) Remove and dispose of pulled culverts appropriately.

24) Remove all fill material down to original channel bottom. Shape channel sideslopes to an angle comparable to the natural streambank configuration.

25) Waste material would be positioned in a location that would avoid direct sediment discharge to streams and wetlands.

26) Drainage features would be constructed on either side of restored channels to reduce sediment delivery.

27) Restore streambank sideslopes, where appropriate, with native species, native straw or wood mulch prior to fall rains.

Fuels

28) Cover and burn all landing piles along roads.

29) Pile, cover and burn slash, less than 6" in diameter and greater than 3' in length, within 25 feet of either side of designated (typically permanent) roads within harvest areas.

30) Scatter landing piles, along temporary roads, on top of the road surface to remove the fuel concentrations, deter OHV use and slow erosion. Resulting fuel bed would not be deep and continuous. Piles along temporary roads not scattered on the road surface would be covered and burned.

31) Cover all piles to be burned with plastic in compliance with the Oregon Smoke Management Plan.

Other

32) Prevent the spread of noxious weeds from other locations, by washing logging, road construction, and tilling equipment prior to entry on BLM lands.

33) Snags and CWD would be created from reserve trees in some riparian areas; see the implementation file for specific areas. Within these areas, cut 2 trees per acre as CWD and create 3 snags per acre. Trees to be cut would be from 16-24"DBH. Trees must be live and not contain visible bird or mammal nests, sloughing bark, cavities, broken leaders, or other notable deformities and

should be at least 50' away from streams. Creation would occur between July 1st and February 28th to minimize disturbance to nesting birds and mammals.

Appendix D:Wildlife

Table 1. Acres and types of spotted owl habitat in Home Ranges, Core Areas, and Nest Patches. Figures in parentheses are percentages of analysis area.

Scale[1]	Site Name	Existing Conditions/No Action Alternative Effects			Proposed Action Alternative Effects		
		Dispersal	Suitable	Both	Dispersal Habitat Thinned	Acres Previously Thinned	Total Thinned
Provincial Home Range	64NEWITS	356 (12%)	16 (1%)	372 (13%)	10 (0%)	0 (0%)	10 (0%)
	69NEWITS	277 (10%)	18 (1%)	295 (10%)	85 (3%)	0 (0%)	85 (3%)
	70NEWITS	371 (13%)	87 (3%)	458 (16%)	60 (2%)	63 (2%)	123 (4%)
	Allison Creek	787 (27%)	23 (1%)	811 (28%)	179 (6%)	200 (7%)	379 (13%)
	Buck Mountain	1013 (35%)	111 (4%)	1124 (39%)	14 (0%)	0 (0%)	14 (0%)
	Drury Butte	738 (26%)	0 (0%)	739 (26%)	87 (3%)	91 (3%)	178 (6%)
	Georges Knob	533 (18%)	363 (13%)	896 (31%)	126 (4%)	52 (2%)	178 (6%)
	McGowan Creek	712 (25%)	255 (9%)	968 (33%)	45 (2%)	25 (1%)	70 (2%)
	Mohawk	1003 (35%)	60 (2%)	1063 (37%)	40 (1%)	229 (8%)	269 (9%)
	Shotgun Creek	973 (34%)	214 (7%)	1187 (41%)	25 (1%)	0 (0%)	25 (1%)
	Shotgun Creek	1141 (39%)	140 (5%)	1281 (44%)	67 (2%)	0 (0%)	67 (2%)
	South Marcola	753 (26%)	25 (1%)	778 (27%)	188 (6%)	91 (3%)	279 (10%)
	West Allison	1025 (35%)	16 (1%)	1042 (36%)	137 (5%)	200 (7%)	337 (12%)
	West Brush Creek	681 (24%)	38 (1%)	720 (25%)	221 (8%)	111 (4%)	332 (11%)
Core Area	64NEWITS	8 (2%)	0 (0%)	8 (2%)	0 (0%)	0 (0%)	0 (0%)
	69NEWITS	23 (4%)	1 (0%)	24 (5%)	0 (0%)	0 (0%)	0 (0%)
	70NEWITS	22 (4%)	10 (2%)	33 (6%)	0 (0%)	0 (0%)	0 (0%)
	Allison Creek	365 (73%)	0 (0%)	365 (73%)	71 (14%)	145 (29%)	216 (43%)
	Buck Mountain	159 (32%)	1 (0%)	160 (32%)	0 (0%)	0 (0%)	0 (0%)
	Drury Butte	203 (40%)	0 (0%)	203 (40%)	0 (0%)	21 (4%)	21 (4%)
	Georges Knob	147 (29%)	81 (16%)	228 (45%)	87 (17%)	0 (0%)	87 (17%)
	McGowan Creek	220 (44%)	195 (39%)	415 (83%)	0 (0%)	0 (0%)	0 (0%)
	Mohawk	209 (42%)	54 (11%)	263 (52%)	0 (0%)	52 (10%)	52 (10%)
	Shotgun Creek	204 (41%)	22 (4%)	225 (45%)	0 (0%)	0 (0%)	0 (0%)
	Shotgun Creek	135 (27%)	111 (22%)	246 (49%)	0 (0%)	0 (0%)	0 (0%)

Scale[1]	Site Name	Existing Conditions/No Action Alternative Effects			Proposed Action Alternative Effects		
		Dispersal	Suitable	Both	Dispersal Habitat Thinned	Acres Previously Thinned	Total Thinned
	South Marcola	76 (15%)	8 (2%)	84 (17%)	35 (7%)	21 (4%)	56 (11%)
	West Allison	238 (47%)	0 (0%)	238 (47%)	0 (0%)	65 (13%)	65 (13%)
	West Brush Creek	44 (9%)	0 (0%)	44 (9%)	20 (4%)	0 (0%)	20 (4%)
Nest Patch	64NEWITS	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	69NEWITS	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	70NEWITS	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Allison Creek	62 (88%)	0 (0%)	62 (88%)	0 (0%)	0 (0%)	0 (0%)
	Buck Mountain	13 (18%)	0 (0%)	13 (18%)	0 (0%)	0 (0%)	0 (0%)
	Drury Butte	24 (35%)	0 (0%)	24 (35%)	0 (0%)	0 (0%)	0 (0%)
	Georges Knob	17 (24%)	30 (43%)	47 (67%)	0 (0%)	0 (0%)	0 (0%)
	McGowan Creek	23 (33%)	42 (60%)	65 (92%)	0 (0%)	0 (0%)	0 (0%)
	Mohawk	17 (25%)	24 (35%)	42 (59%)	0 (0%)	0 (0%)	0 (0%)
	Shotgun Creek	19 (27%)	0 (0%)	19 (27%)	0 (0%)	0 (0%)	0 (0%)
	Shotgun Creek	5 (7%)	38 (55%)	44 (62%)	0 (0%)	0 (0%)	0 (0%)
	South Marcola	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	West Allison	49 (70%)	0 (0%)	49 (70%)	0 (0%)	0 (0%)	0 (0%)
	West Brush Creek	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

1: PHR = 2895 acres, Core = 503 acres, Nest Patch = 70 acres

Appendix D:Wildlife Table 2. Northern spotted owl site histories, 2011 Thinning.

Site Name	Monitoring History	Nesting History	Comments
Allison Creek	Located 1990, yearly monitoring to present. Pairs '90, '91, '93, '94, '96. Last NSO detected '97.	1 fledgling '90	Large portion of site section thinned in '94. High harvest on adjacent private lands. Low probability of occupation.
Buck Mountain	Located 1991, monitored most years since. Pair in '94, male & female (unknown pair status) '93, '97.	Sparred owl fledgling '94.	Recent large clearcut adjacent to site. Low probability of reproduction.
Drury Butte	Located 1989, monitored most years since. Pairs '93-'96, '98-'01. Last NSO detection '01.	Fledglings in '93-'96, '98.	Moderate private harvest in PHR, moderate probability of occupation.
Georges Knob	Located 1996, yearly monitoring since. Pairs '96-'01. Last NSO detection '01.	No fledglings observed, incubation in '96, '98-'01.	Adjacent private land provides moderate amount of dispersal habitat. Moderate probability of occupation.
McGowan Creek	Located 1987, yearly monitoring (except '98-'99) since. Pairs '90, '91, '96. Last NSO detection '05.	Two fledglings 1990	High private harvest in PHR. Moderate/high probability of occupation.
Mohawk	Located 1992, yearly monitoring most years since. Pairs '92, '98; no detections or unsurveyed since.	Two fledglings in '92 and '98.	NRF nest patch and contiguous block of dispersal habitat on BLM. High harvest on private land in PHR. Moderate probability of occupation.
Shotgun Creek	Four nest sites, most recent activity at "A" and "B" sites. Yearly monitoring since 1987. Pairs '89, '92, '94, '95-'02, '04.	Juveniles or fledglings in '94, '96, '97, '00-'02.	Some NRF and large blocks of dispersal habitat on BLM. High probability of occupation.
South Marcola	Single male detected 1989, low survey effort for past 10 years.	None observed.	BLM cut nest patch in 1994. High harvest on private land in PHR. Low probability of occupation.
West Allison	Located 1994, monitored 5 of last 10 years. Pair '94, then single birds or unknown occupancy.	One fledgling in 1994.	Possibly Allison Creek birds displaced by thinning. No NRF available and high harvest on private land in PHR. Low probability of occupation.
West Brush Creek	Located 1988, yearly monitoring to '06. Pairs '89-'96, then single birds or not occupied.	Incubation in '90 and 95.	Little available NRF and moderate harvest on private land in PHR. Low/moderate probability of occupation.

Appendix D:Wildlife. **Table 3.** Special Status Species List.

Common Name	Scientific Name	Status[1]	Occurrence[2]	Reason Eliminated	Habitat/Range	Citations
SPECIAL STATUS SPECIES						
FENDER'S BLUE BUTTERFLY	PLEBEJUS ICARIOIDES FENDERI	FE	D	No Habitat	Associated strongly with Kincaid's Lupine. Meadow/prairie habitat	Applegarth 1995
CALIFORNIA BROWN PELICAN	PELECANUS OCCIDENTALIS CALIFORNICUS	FE	S	No Habitat	Coastal and estuarine habitats.	NatureServe 2008.
MARBLED MURRELET	BRACHYRAMPHUS MARMORATUS	FT, BCC	D	Out of Range	Within 50 miles of coast.	U.S. Fish and Wildlife Service 1997
CRATER LAKE TIGHTCOIL	PRISTILOMA ARCTICUM CRATERIS	SEN	S	Protected by Riparian Reserves & Buffers	Wet habitats above 2000 feet.	Duncan et al. 2003
EVENING FIELDSLUG	DEROCERAS HESPERIUM	SEN	S	Protected by Riparian Reserves & Buffers	Perennially wet meadows or rock gardens	Burke and Duncan 2005
SPOTTED TAIL-DROPPER	PROPHYSAON VANATTAE PARDALIS	SEN	S	Out of Range	Moist Coast Range forest with vegetation and large woody debris.	Frest and Johannes 2000, Duncan 2008b
TILLAMOOK WESTERNSLUG	HESPERARION MARIAE	SEN	D	Out of Range	Moist, mature coastal forest.	Duncan 2008c
HADDOCK'S RHYACOPHILAN CADDISFLY	RHYACOPHILA HADDOCKI	SEN	S	Protected by Riparian Reserves & Buffers	Small, cool mountain streams and adjacent riparian areas.	Brenner 2005a
HOARY ELFIN	CALLOPHRYS POLIOS MARITIMA	SEN	S	No Habitat	Ocean bluffs and dunes.	Ross et al. 2005
MARDON SKIPPER	POLITES MARDON	SEN	S	No Habitat	Grassland, prairie.	Kerwin and Huff 2007
OREGON PLANT BUG	LYGUS OREGONAE	SEN	S	No Habitat	Ocean dunes.	Scheurering 2006
ROTH'S BLIND GROUND BEETLE	PTEROSTICHUS ROTHI	SEN	S	Out of Range	Moist mature Coast Range forest.	Applegarth 1995, Brenner 2005b
SISKIYOU SHORT-HORNED GRASSHOPPER	CHLOEALTIS ASPASMA	SEN	S	No Habitat	Grassland, meadow, open areas. Associated with blue elderberry.	Brenner 2006
SIUSLAW SAND TIGER BEETLE	CICINDELA HIRTICOLLIS SIUSLAWENSIS	SEN	D	No Habitat	Sandy riverbanks and river mouths adjacent to the Pacific Ocean.	Black et al. 2007
TAYLOR'S CHECKERSPOT	EUPHYDRYAS EDITHA TAYLORI	SEN	S	No Habitat	Grassland, prairie.	Black et al. 2005

FOOTHILL YELLOW-LEGGED FROG	RANA BOYLII	SEN	D	No Habitat	Low-gradient streams with bedrock or gravel substrate	Corkran and Thoms 1996
WESTERN POND TURTLE	ACTINEMYS MARMORATA	SEN	D	No Habitat	Ponds, lakes, larger streams with emergent vegetation and basking sites and nearby nesting habitat.	Rosenberg et al. 2009
PAINTED TURTLE	CHRYSEMYS PICTA	SEN	S	No Habitat	Slow water; rivers, marshes, ponds with abundant vegetation and basking sites	Bury 1995.
ALEUTIAN CANADA GOOSE	BRANTA HUTCHINSII LEUCOPAREIA	SEN	S	No Habitat	Pasture, harvested agricultural fields, marshes.	U.S. Fish and Wildlife Service 1991
AMERICAN PEREGRINE FALCON	FALCO PEREGRINUS ANATUM	SEN	D	No Habitat	Cliffs and other sheer vertical structure.	White et al. 2002
DUSKY CANADA GOOSE	BRANTA CANADENSIS OCCIDENTALIS	SEN, GBBDC	D	No Habitat	Willamette Valley agricultural fields and wetlands.	Bromley and Rothe 200 3
GRASSHOPPER SPARROW	AMMODRAMUS SAVANNARUM	SEN	D	No Habitat	Grassland, prairie.	NaureServ e 2008
HARLEQUIN DUCK	HISTRIONICUS HISTRIONICUS	SEN, GBBDC	D	No Habitat	Fast-flowing streams with boulders and logs, adjacent riparian habitat.	Thompson et al. 1993, Robertson and Goudie 1999
LEWIS' WOODPECKER	MELANERPES LEWIS	SEN	D	No Habitat	Open woodlands with ground cover and snags	Tobalske 1997
OREGON VESPER SPARROW	POOECETES GRAMINEUS AFFINIS	SEN, BCC	D	No Habitat	Grassland, farmland, sage. Dry, open habitat with moderate herb and shrub cover	Jones and Cornely 2002
STREAKED HORNED LARK	EREMOPHILA ALPESTRIS STRIGATA	SEN, BCC	S	No Habitat	Prairies, dunes, beaches, pastures; areas with low grassy vegetation.	Pearson and Altman 2005
WHITE-TAILED KITE	ELANUS LEUCURUS	SEN	D	No Habitat	Low-elevation grassland, farmland or savannah and nearby riparian areas	Dunk 1995
FISHER	MARTES PENNANTI	SEN	D	No Habitat	Large contiguous blocks of mature forest with structural complexity	Verts and Carraway 1998
PALLID BAT	ANTROZOUS PALLIDUS	SEN	S	No Habitat	Arid or semi-arid habitat with rock, brush, or forest edge; Roosts in caves, mines, bridges, buildings, and hollow trees or snags	Lewis 1994

MIGRATORY BIRDS						
BLACK SWIFT	CYPSELOIDES NIGER	BCC	S	No Habitat	Nest near waterfalls.	
RUFOUS HUMMINGBIRD	SELASPHORUS RUFUS	BCC	D	No Habitat	Shrubby, early-successional habitat. Nectar-producing plants important	
WOULDOW FLYCATCHER	EMPIDONAX TRAILLI	BCC	D	Protected by Riparian Reserves	Brushy or forested habitat in riparian areas	
MOURNING DOVE	ZENAIDA MACROURA	GBBDC	D	No Habitat	Forest, woodland, shrub habitats.	
WOOD DUCK	AIX SPONSA	GBBDC	D	Protected by Riparian Reserves		

1: FE = Federal Endangered, FT = Federal Threatened, SEN = BLM Sensitive Species, BCC = Bird of Conservation Concern, GBBDC = Game Bird Below Desired Condition

2: D = Detected on District, S = Suspected on District

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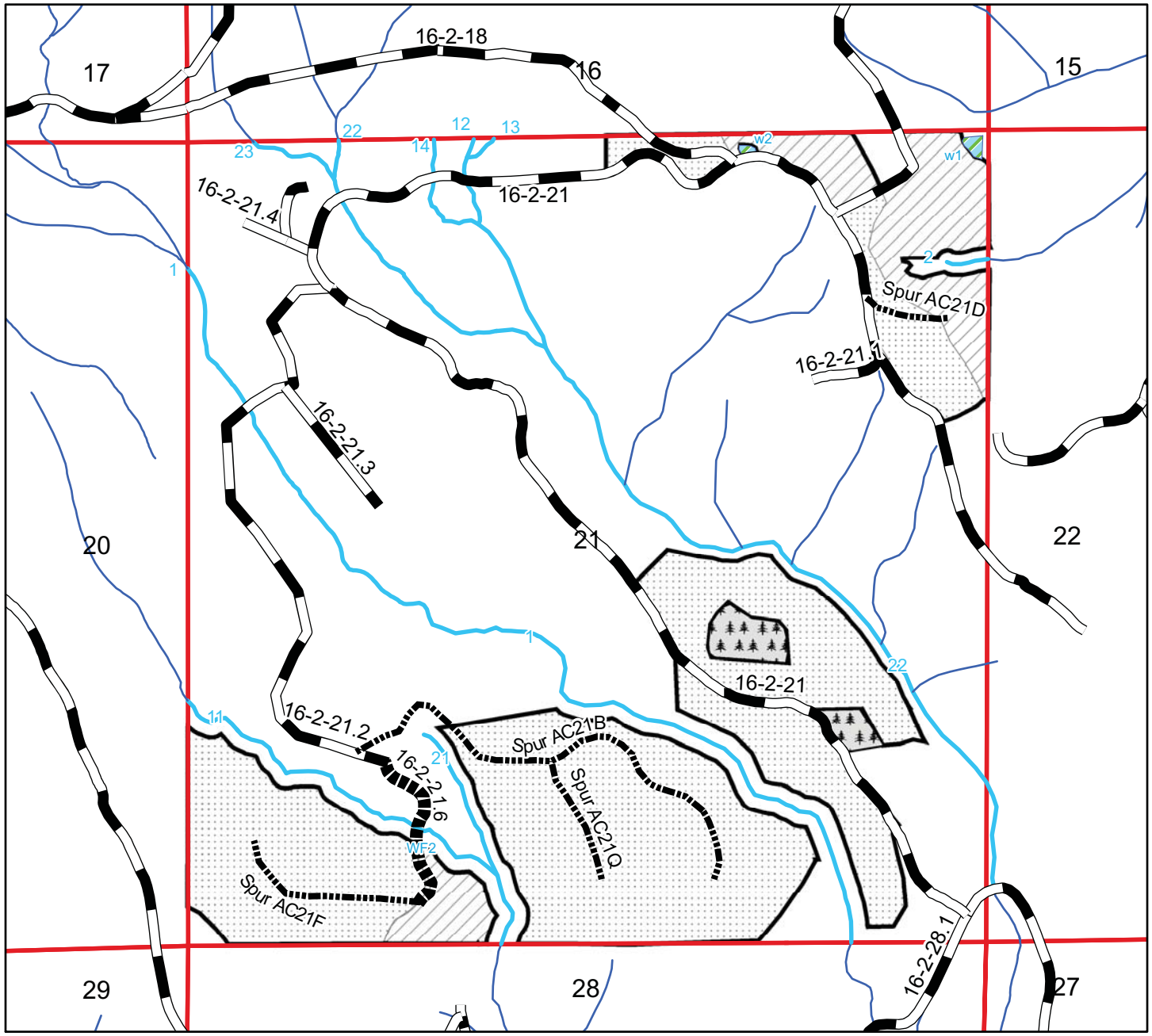

Legend

- Cable Logging
- Groundbased Logging
- Harvest Area Boundary
- Section Line
- OakEnhancement
- Existing Road
- New Construction - Rock
- New Construction - Dirt
- Stream
- Field Checked Stream
- Wetland

N

0 500 1,000 1,500 Feet

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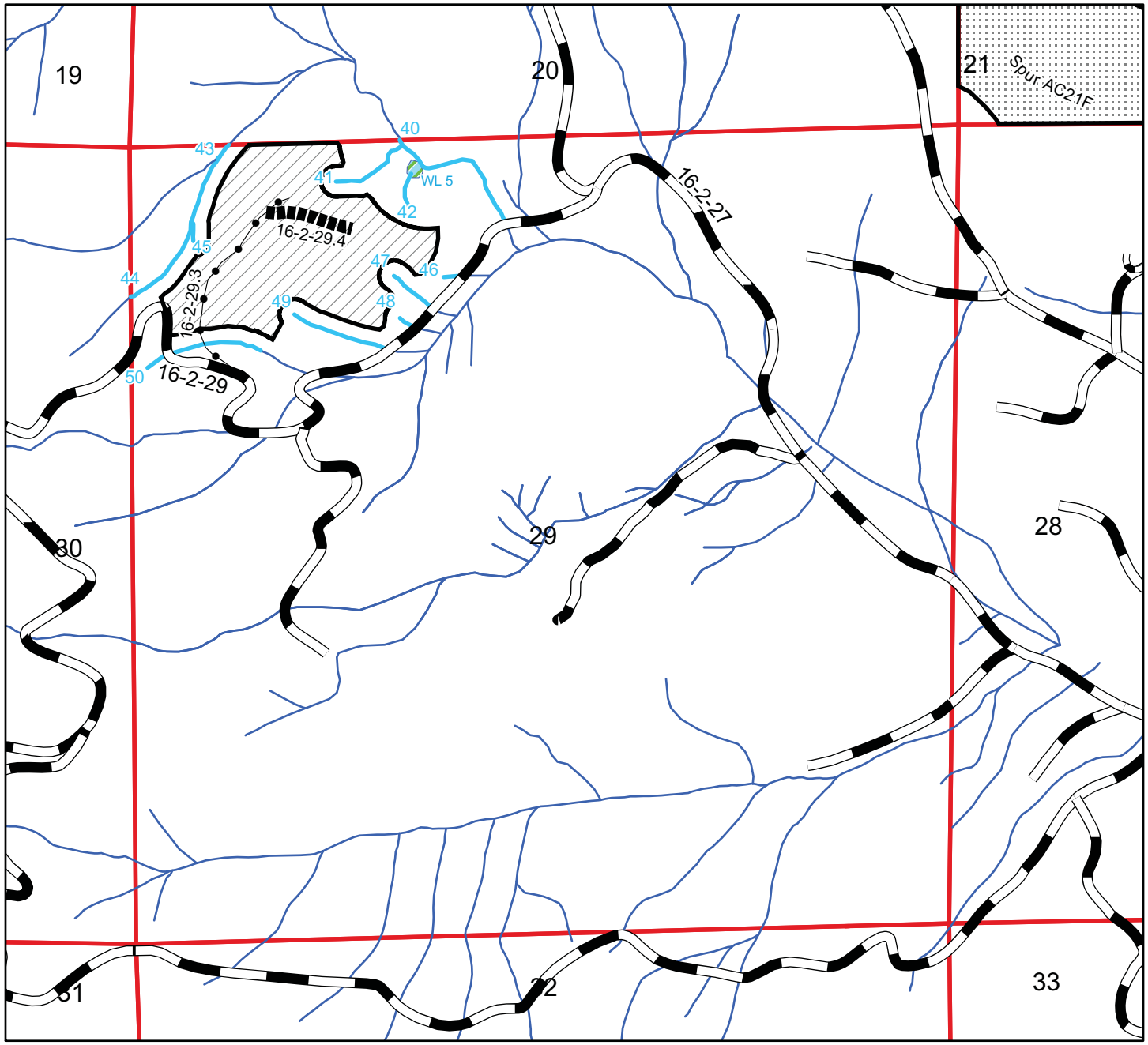
Allison Creek, T16S R2W Sec. 29



Legend

- Cable Logging
- Groundbased Logging
- Harves tArea Boundary
- Section Line
- Existing Road
- New Construction - Rock
- Improvement Rock
- Stream
- Field Checked Stream
- Wetland

N

0 500 1,000 1,500 Feet

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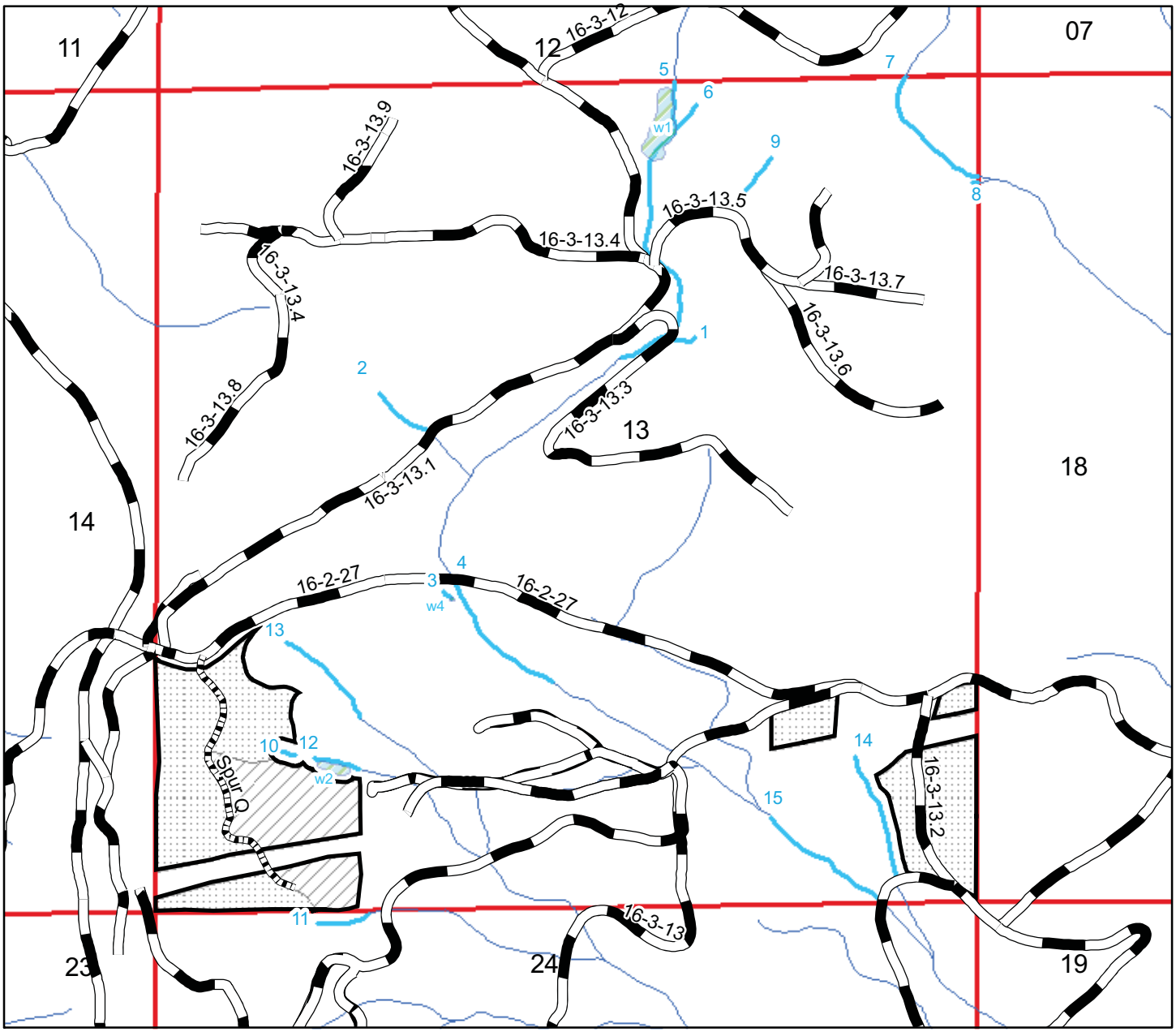
Allison Creek T16S R03W Sec 13



Legend

Logging Unit	Existing Road
Groundbased Logging	New Constuction - Optional Rock
Cable Logging	Improvements
Harvest Area Boundary	Stream
Section Line	Field Checked Stream
	Wetland

N

0 500 1,000 1,500 Feet

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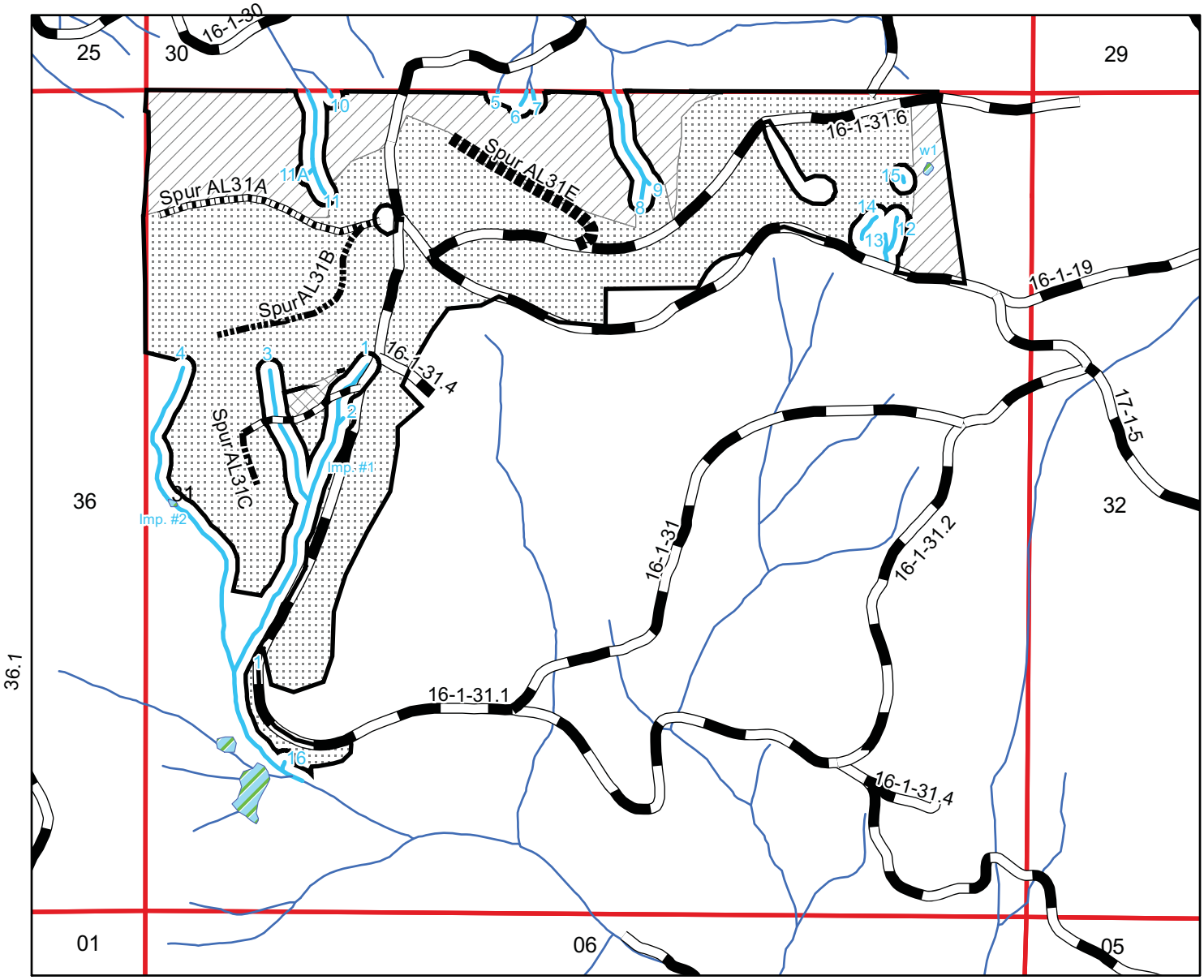
All Lalone, T16S R01W Sec. 31



Legend

- Cable Logging
- Groundbased Logging
- Special Yarding Area
- Harvest Area Boundary
- Section Line
- Existing Road
- New Construction - Optional Rock
- New Construction - Rock
- New Construction - Dirt
- Renovation - Dirt
- Wetland
- Stream
- Field Checked Stream

N

0 500 1,000 1,500 Feet

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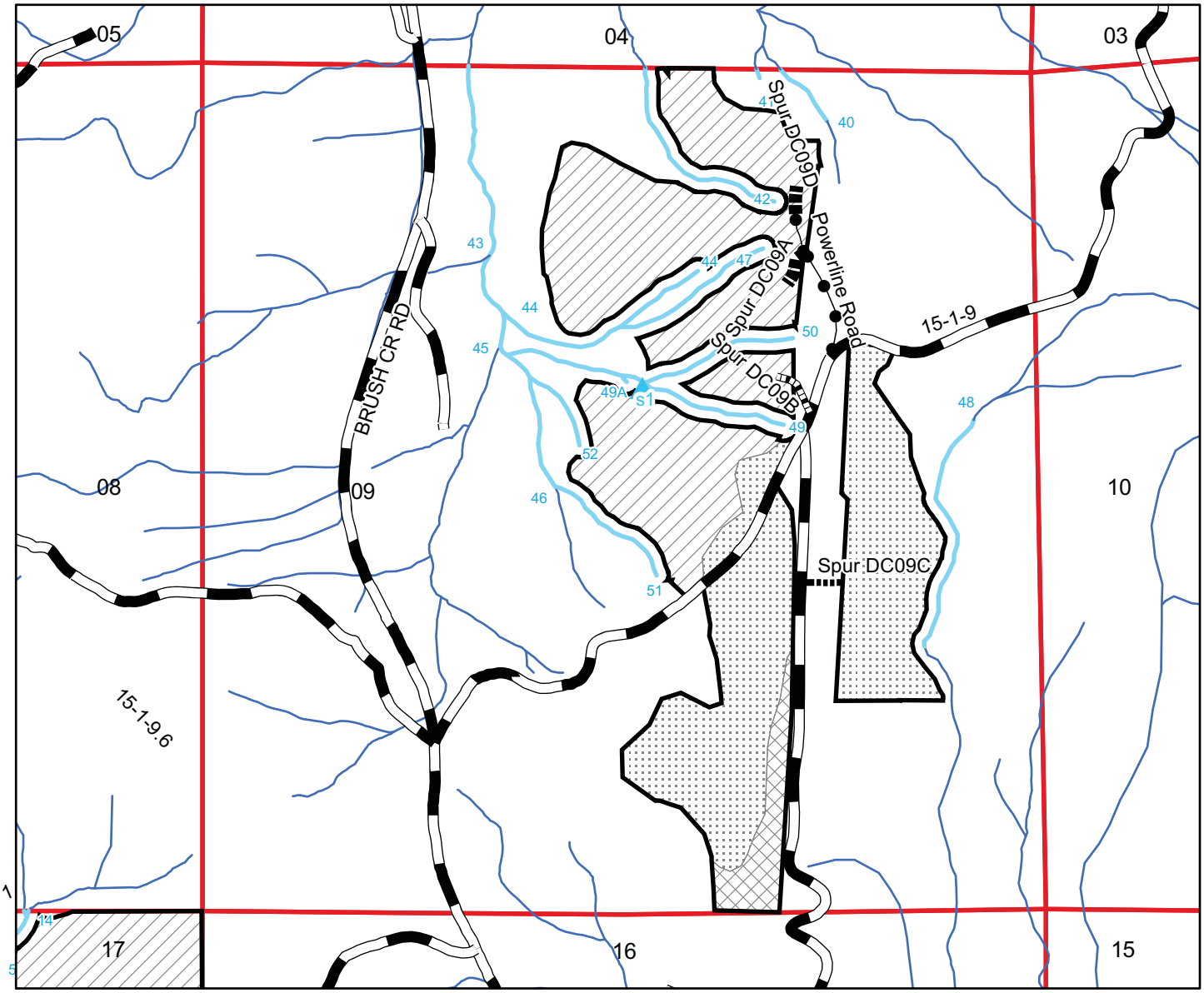
Drury Creek, T15S R01W Sec. 09



Legend

- Cable Logging
- Groundbased Logging
- Special Yarding Area
- Harvest Area Boundary
- Section Line
- Existing Road
- New Construction - Dirt
- New Construction - Optional Rock
- New Construction - Rock
- Improvement - Rock
- Stream
- Field Checked Stream
- Seep

N

0 500 1,000 1,500 Feet

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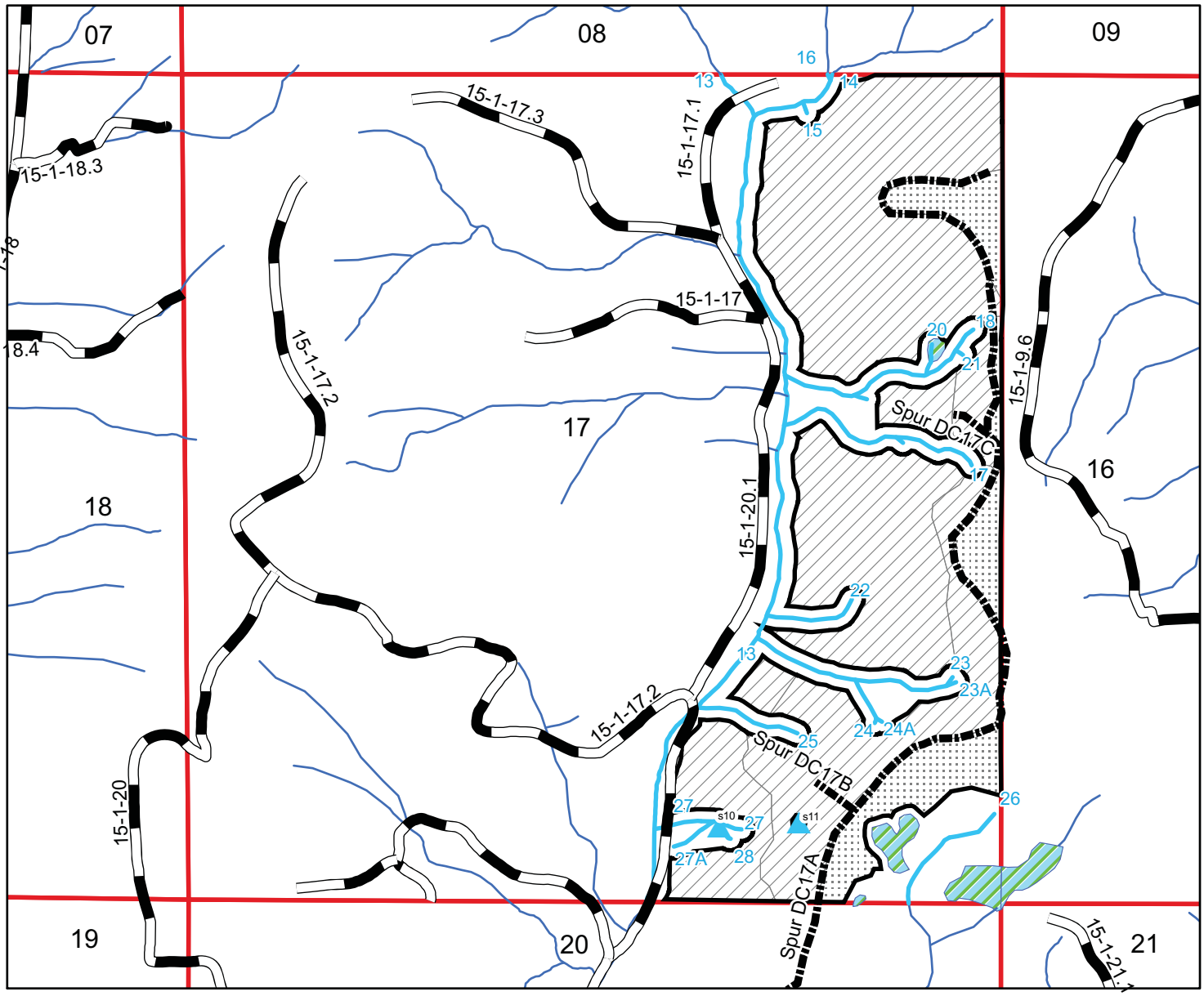
Drury Creek, T15S R01W Sec. 17



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Legend

- Cable Logging
- Groundbased Logging
- Harvest Area Boundary
- Section Line
- Existing Road
- New Construction- Rock
- Stream
- Field Checked Stream
- Seep
- Wetland

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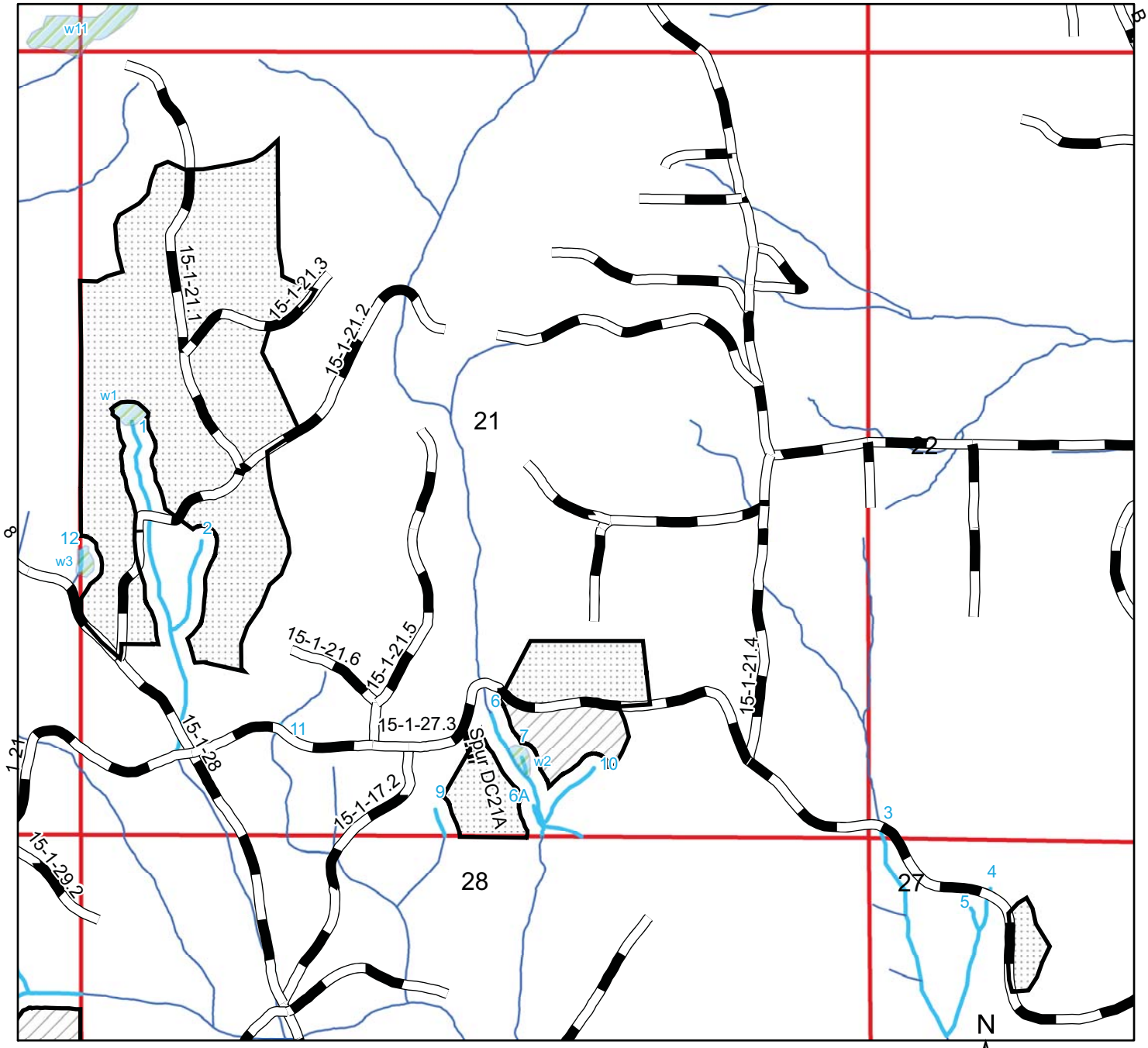
Drury Creek, T15S R01W Secs. 21 and 27



Legend

- Cable Logging
- Groundbased Logging
- Harvest Area Boundary
- Section Line
- Existing Road
- New Construction - Dirt
- Stream
- Field Checked Stream
- HydroPolygons

0 500 1,000 1,500 Feet

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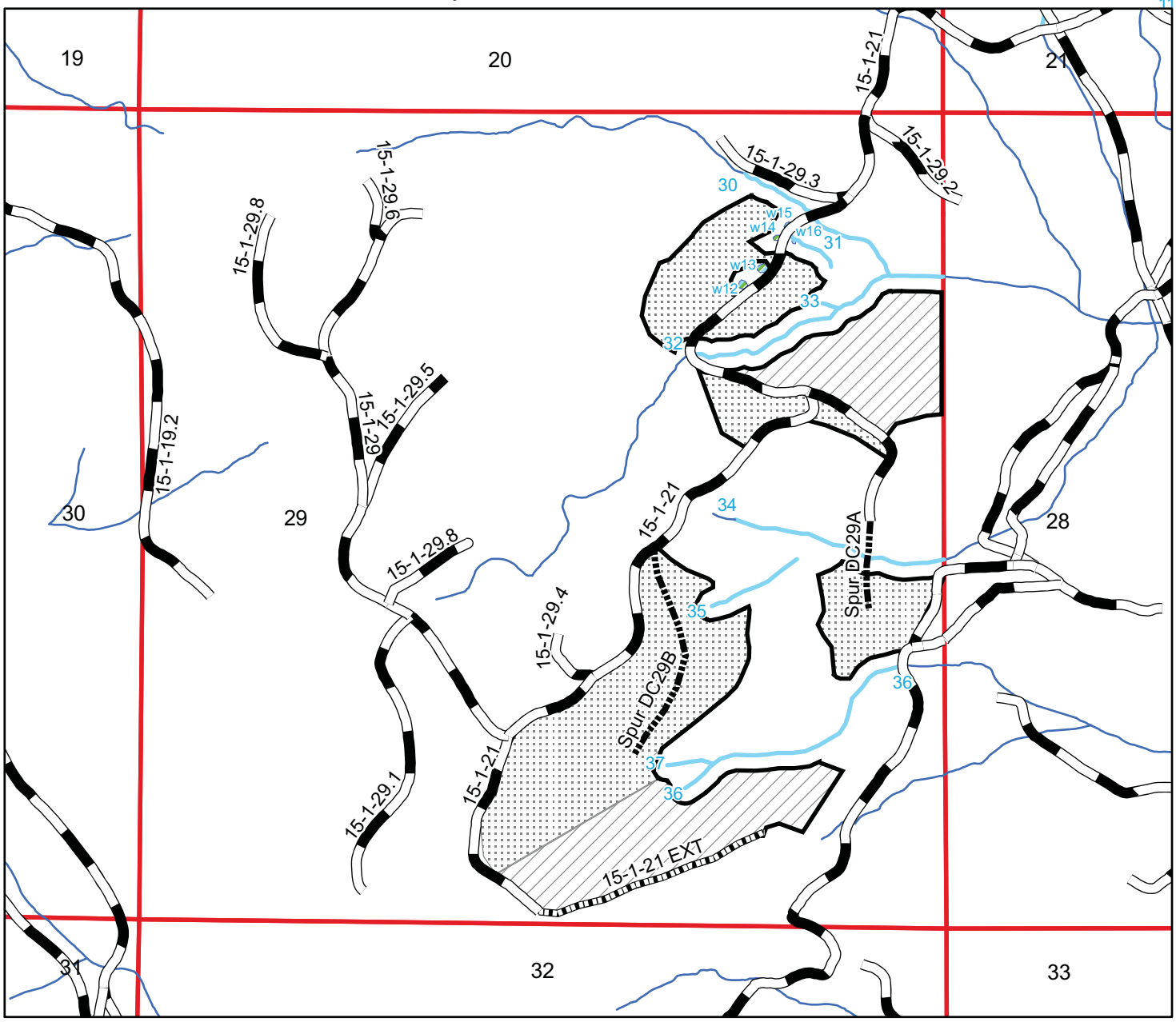
Drury Creek T15S R01W Sec. 29



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Legend

- Cable Logging
- Groundbased Logging
- Harvest Area Boundary
- Section Line
- Existing Road
- New Construction - Dirt
- New Construction - Optional Rock
- Stream
- Field Checked Stream

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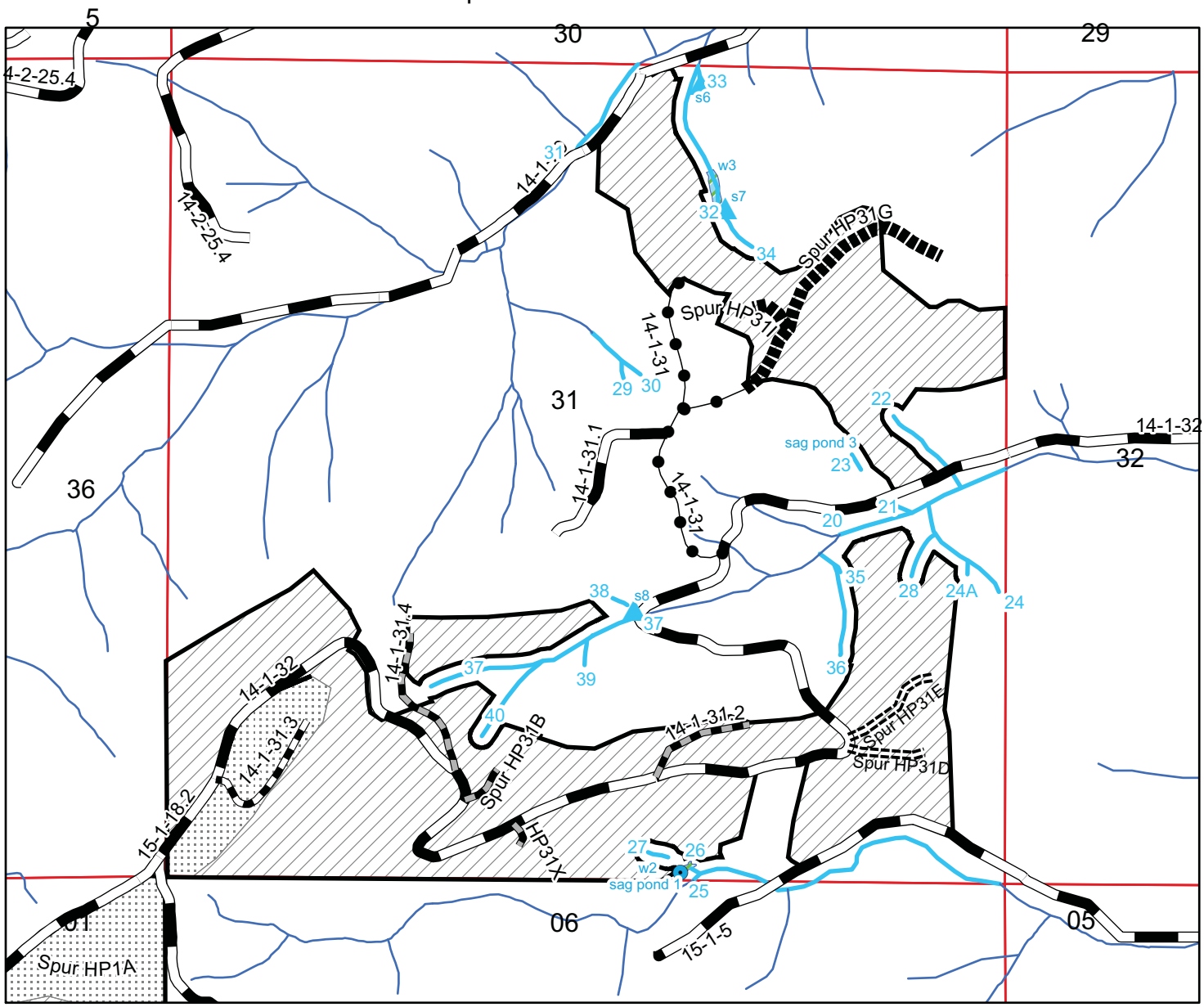
Horsepower T14S R01W Sec 31



Legend

- Cable Logging
- Groundbased Logging
- Harvest Area Boundary
- Section Line
- Existing Road
- Renovation - Dirt
- Renovation - Optional Rock
- Renovation - Rock
- New Construction - Optional Rock
- New Construction - Rock
- Improvement - Rock
- Stream
- Field Checked Stream
- Sag Pond
- Seep
- Wetland

N

0 500 1,000 1,500 Feet

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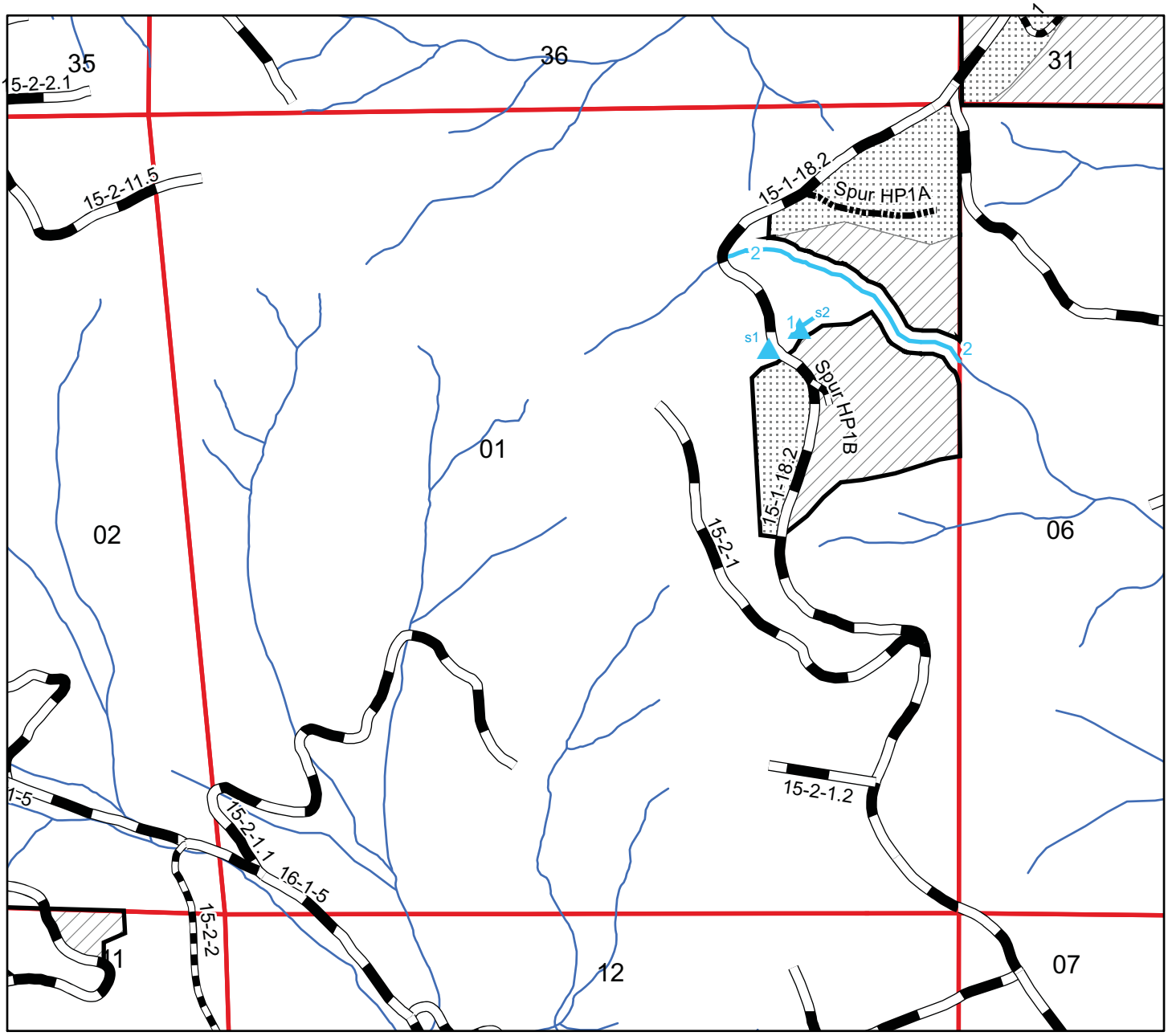
Horsepower, T15S R02W Sec. 01



Legend

- Cable Logging
- Groundbased Logging
- Harvest Area Boundary
- Section Line
- Existing Road
- New Construction - Dirt
- Renovation - Rock
- Stream
- Field Checked Stream
- Seep

N

0 500 1,000 1,500 Feet

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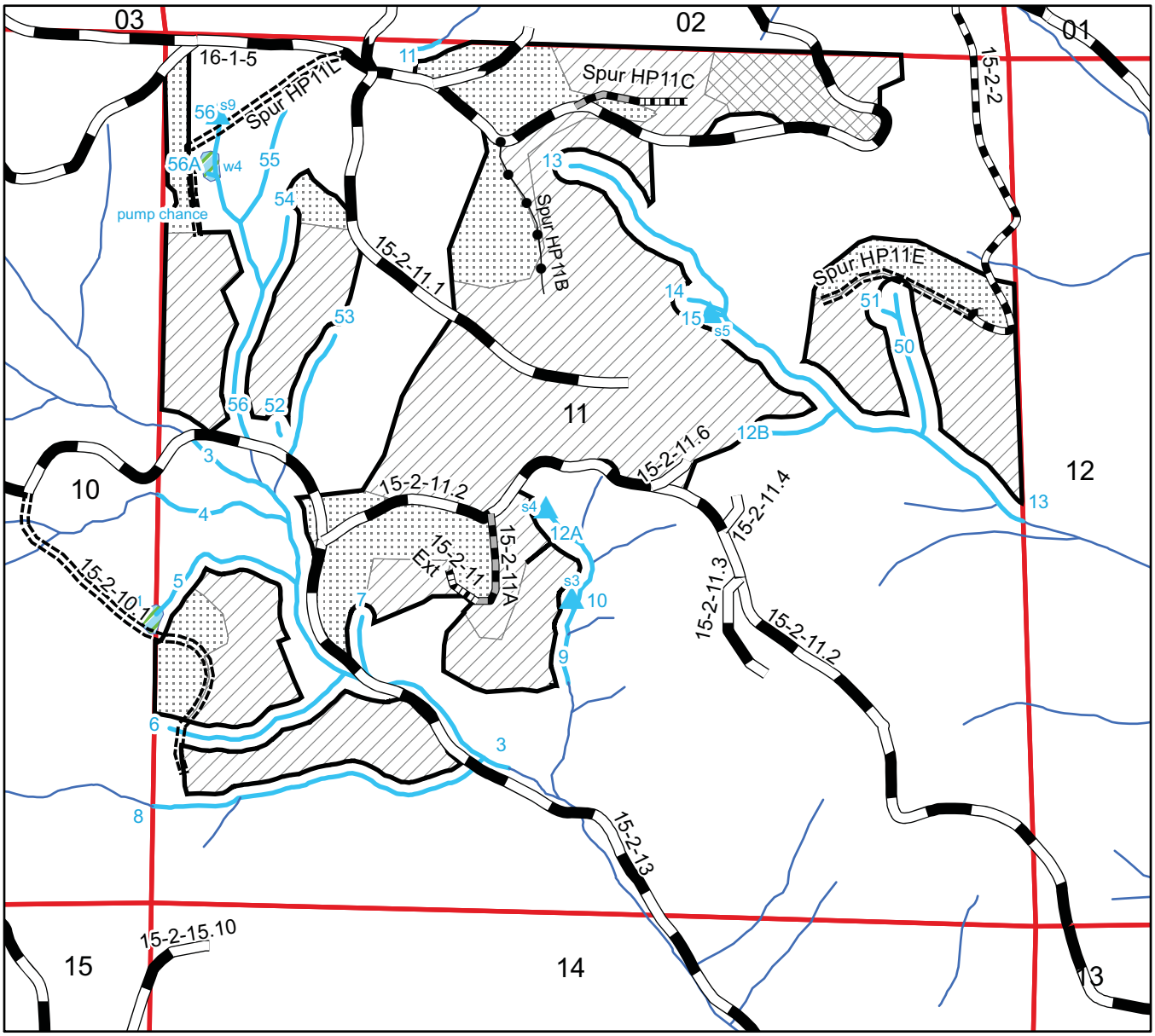
Horsepower T15S R02W Sec 11



Legend

Cable Logging	Existing Road
Groundbased Logging	Renovation - Dirt
Special Yarding Area	Renovation - Optional Rock
Section Line	Renovation - Rock
Stream	Improvement - Rock
Field Checked Stream	New Construction - Rock
Seep	New Construction - Dirt
Wetland	New Construction - Optional Rock

N

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