BARNYARD SOUTH SHEEP

ENVIRONMENTAL ASSESSMENT

North Fork Ranger District
Nez Perce/Clearwater National Forests

March 2015

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Clearwater County, Idaho

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Abstract: *This Environmental Assessment documents the analysis of four alternatives, including a "no action" alternative, that were developed for the Barnyard South Sheep analysis. The Barnyard South Sheep project proposes timber harvest and watershed improvement activities within 17,570 acres of National Forest lands.*

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CHAPTER 1
PURPOSE AND NEED FOR ACTION

This chapter discusses current and desired conditions, purpose and need for action, proposed action, management direction, scope of the analysis, and availability of project files.

I. Introduction

The North Fork Ranger District of the Clearwater National Forest is proposing the Barnyard South Sheep project that is located primarily within the Washington Creek watershed that drains into the North Fork Clearwater River (see vicinity map below).

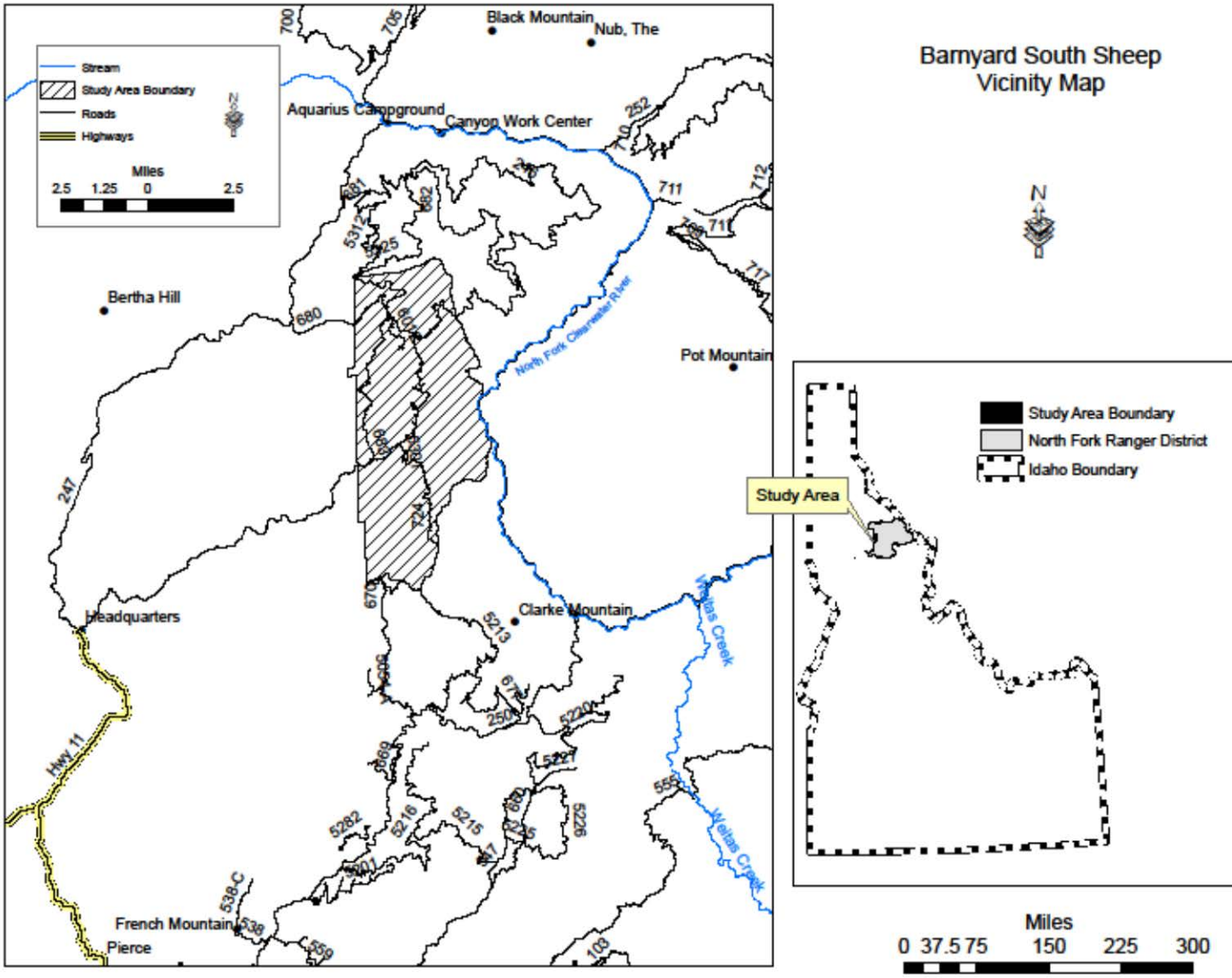


Figure 1 –Vicinity Map

A. Current Conditions

The following resource descriptions are the result of the review of past records and the collection of field survey data:

Vegetation: There has been a substantial reduction in long-lived, early seral tree species (white pine and western larch) due to fire suppression, white pine blister rust, and increases in species such as Douglas-fir and grand fir. Areas of past timber harvest were regenerated primarily with Douglas-fir and grand fir, since little western larch or blister rust resistant white pine stock was available. Current stands of Douglas-fir and grand fir are overstocked with low vigor. These vegetative conditions have created a very homogenous forest that lacks structural and tree species diversity. The white pine and western larch cover types are essentially absent, compared to a historical range of 45% for white pine and 8% for larch.

Watershed: Area streams have been moderately impacted from past wildland fires, timber harvest, and associated road construction. The occurrence of landslides and other erosional events have increased as a result of these past activities.

Although there is evidence of an improving trend in watershed condition, there remain many roads and user created routes that are contributing sediment into area streams. According to the BHROWS Ecosystem Assessment at the Watershed Scale (1999), road densities in the Washington Creek area average 6.83 mi/mi^2, with many of these roads being of old construction techniques (side cast and log culverts).

B. Desired Future Conditions

The desired future conditions (DFCs) have a 50-year planning horizon and are based on those found in the Forest Plan, plus Forest-wide goals and objectives. Each DFC has been further modified, as necessary, to account for actual on-the-ground conditions within the Barnyard South Sheep area. The DFCs for each resource area are as follows:

Vegetation: A diverse and healthy forest covers the landscape. Forest cover types approach pre-European settlement values; western white pine, western larch, and ponderosa pine cover types are gaining prevalence on the landscape and grand fir and Douglas-fir cover types have decreased in prevalence. Incidence of insect and disease damage is low, and stand conditions that are resilient allow for rapid recovery.

There is a balance of successional stages; early-successional (30 – 50%); young-mid-successional (20 – 40%); mature-mid-successional (30 – 45%); and late-old forest (15 – 40%). Sufficient old-growth stands have been identified and protected to meet established goals and provide habitat for old-growth dependent species (Forest Plan DFC, page II-18).

Watershed: The Forest Plan (FP) Desired Future Water Conditions maintain integrity of all streams (FP, page II-27), manage water quality and stream conditions so management activities do not cause permanent or long-term damage to beneficial uses (FP, page II-27), and develop prescriptions on a case by case basis to ensure desired multiple use outputs while recognizing domestic water supply needs in public supply watersheds (FP Water Quality Standard, page II-29). Management Area direction includes meeting water quality standards through the use of best management practices (Forest Plan Management Area E1 standard, page III-58).

Essentially, watersheds should maintain a dynamic equilibrium context so they may respond to climatic and tectonic events. Instream sediment, woody debris, and stream and riparian structure

should function within natural reference ranges. Precipitation should be absorbed and released in a manner securing favorable water flows for stream channel maintenance, riparian function, and the protection of beneficial uses.

II. Purpose and Need for Action

A. Vegetation

Existing condition: Past events of the early 1900s (i.e. large scale industrial timber harvest, white pine blister rust, and to some extent fire suppression) greatly reduced the presence of western white pine and other seral species. With these tree species greatly reduced, the stands reforested naturally to higher percentages of grand fir and Douglas-fir, which are less resilient to disturbance agents, in particular, insects and diseases.

Purpose (desired condition): Restore white pine and larch to improve stand vigor and species diversity across the landscape to create stand conditions that are resilient and allow for rapid recovery after disturbances.

Need: There is a need to restore tree species composition consistent with making these stands more resilient to change agents, such as insects and disease.

B. Watershed Improvement

Existing condition: Area streams have been moderately impacted from past wildland fires, timber harvest, and associated road construction. The occurrence of landslides and other erosional events have increased as a result of these past activities. Although there is evidence of an improving trend in watershed condition, there remain many roads and user created routes that are contributing sediment into area streams. Many of roads are of old construction (side cast), with some having log culverts. Some areas of previous harvest have detrimental soil damage and reduced soil productivity, mostly from compaction, displacement and mixing of soil.

Purpose (desired condition): Improve water quality conditions (i.e. reducing stream sediment) and soil productivity to initiate recovery of watershed function (Forest Plan, p. II-3).

Need: There is a need to improve water quality and restore soil productivity on areas with past disturbance from harvest activities, road construction and off-route motorized use. Roads and their associated culverts, excavations and fills have increased surface erosion and mass wasting risk (landslides or road fill failures). Watershed improvements aimed at decreasing surface runoff, restoring stream flow patterns, and reducing the risk of surface erosion would reduce sedimentation to streams. Also, improving water infiltration, nutrient cycling, and root penetration processes in disturbed areas would result in increased soil productivity and improved native plant growth.

C. Goods and Services

Existing Condition: Within the analysis area boundaries, the Clearwater National Forest Plan allocates 77.6% within Management Area E1, timber producing lands, and 17% within Management Area C4, which is also suitable for timber production. This landscape is important to local communities, as well as national needs for timber production.

Purpose (desired condition): Manage the landscape to provide for goods and services (Forest Plan p. II-2).

Need: There are needs to contribute timber products to the economy, maintain quality fish habitat, and provide public recreational opportunities.

III. Proposed Action

The original proposed action that went out in the Scoping Letter has since been reviewed in the field and analyzed against various resource concerns. The evolution of the original proposal into the current proposal follows:

A. Original Proposal

The following activities were proposed in the Scoping Letter, dated December 6, 2012:

1. Vegetation

The following activities address the *vegetation* and *goods and services* purpose and need statements:

- Regeneration harvest and reforestation on approximately 1,040 acres.
- Commercial thin approximately 930 acres.
    - Construct 0.8 mile of new system road.
    - Construct 9.2 miles of temporary road to be decommissioned after use.
    - Reconstruct up to 23.0 miles of existing roads.
    - Recondition up to 31.0 miles of existing roads.
    - Opportunity for up to 460 acres of precommercial thinning.

2. Watershed

The following activities address the *watershed* purpose and need statement:

- Decommission approximately 46.0 miles of system roads and 90.0 miles of non-system roads.
- Place into intermittent storage 37.1 miles of existing roads.
- Improve and/or reconstruct up to 10.0 miles of existing roads to fix erosion problems associated with these roads.
- Replace undersized and/or deteriorated culverts to be identified later.
- Restore soil productivity and native vegetation on old landings, user-created routes, and/or inactive disperse campsites to be identified later.

Changes to the Proposal: During field review of the units, boundaries were adjusted to meet resource concerns that resulted in slight acreage changes for most units. Opportunities for precommercial thinning were dropped, to be analyzed in future NEPA analyses. Some of the watershed or soil productivity improvements were not found on the ground, and were therefore dropped from further consideration.

On a Forestwide scale, old growth habitat has been analyzed using Forest Inventory and Analysis (FIA) data. This is further discussed in Chapter 2 under the issue Old Growth Habitat. In order to insure that the Forest is moving towards meeting the 10% standard, current Forest direction (Dec. 2006) is to retain stands that meet the following guidelines: 130+ years old and having 10 or more trees per acre over 21” diameter breast height (dbh) for non-lodgepole pine habitat types. Stands originally proposed for regeneration harvest that met the FIA guidelines were removed from the proposed action.

B. Current Proposal

After applying the above changes, the current proposal consists of the following activities and is further described in Chapter 2 as Alternative 2:

A. Vegetation

- Regeneration harvest and reforestation on approximately 860 acres.
- Commercial thin approximately 730 acres.
    - Construct 7.8 miles of temporary road to be decommissioned after use.
    - Reconstruct up to 21.0 miles of existing system roads.
    - Reconstruct up to 9.1 miles of existing non-system roads.

B. Watershed Improvement

- Decommission approximately 44.6 miles of system roads and 31.0 miles of non-system roads.
- Place into intermittent storage 28.4 miles of system roads and 20.6 miles of non-system roads.
- Improve numerous stream crossings by replacing or adding culverts (refer to Appendix B).

IV. Management Direction

A. Clearwater National Forest Plan

The analysis area encompasses approximately 17,570 acres of National Forest System lands. The Clearwater National Forest Plan (September 1987) allots most of this area (77.6%) within Management Area E1, timber producing lands. Approximately 17% of the project area is allotted to Management Area C4, big-game winter range, which is also suitable for timber production. Management Area M2 consists of riparian areas found in all management areas. The following table briefly summarizes the distribution and direction of each management area:

Table 1.1 – Forest Plan Management Areas

Management Areas	Acres	%	Direction
C4	3,000	**17.0**	**Big-Game Winter Range w/Timber –** Manage to provide sufficient forage and cover for existing and projected big-game populations and achieve timber production outputs (Clearwater Forest Plan, page. III-47).
E1	13,640	**77.6**	**Timber Producing Lands** – Manage to provide optimum, sustained production of wood products and viable elk populations while providing adequate protection of soil and water quality (Clearwater Forest Plan, page. III-57).
M2	Inclusions		**Riparian Areas** – Manage under the principles of multiple use as areas of special consideration, distinctive values, and integrated with adjacent management areas to the extent that water and other riparian dependent resources are protected (Clearwater Forest Plan, page. III-69).
US	930	**5.3**	**Unsuitable Lands** – Manage to maintain and protect soil and watershed values and vegetative cover.

Forest Plan Lawsuit Stipulation of Dismissal: On September 13, 1993, the Forest Service signed a settlement and agreed to: (1) an annual timber offer not to exceed 80 million board feet per year; (2) prepare an EIS for new roads and timber sale projects which directly affect verified old-growth stands 100 acres or larger; (3) not complete any final road or timber sale decisions in areas covered by the proposed "Idaho Wilderness, Sustainable Forest and Communities Act of 1993," HR-1570; and (4) proceed only with projects, which would result in "no measurable increase" in sediment production in drainages currently not meeting Forest Plan standards. These agreements remain in effect until a Forest Plan revision is completed.

Clearwater Forest Plan Water Quality Standards are found in the Clearwater National Forest Plan on pages II-27 through II-29 and are also described in the Watershed Report for this project. The Clearwater Forest Plan was amended in 1995, following a joint decision (commonly called INFISH) by the U.S. Forest Service and Bureau of Land Management for managing inland native fish on Federal lands, including the Barnyard South Sheep project area.

Interim direction provided by INFISH:

- identifies and defines Riparian Habitat Conservation Areas (RHCAs),
- establishes Riparian Management Objectives (RMOs), and
- applies standards and guidelines to RHCA to meet the RMOs.

INFISH default RHCAs include those areas within 300 feet of fish bearing streams, within 150 feet of non-fish bearing streams, within 50 feet of intermittent streams and wetlands, and 150 feet from the edge of wetlands larger than one acre. INFISH buffer widths exceed State best management practice standards (BMPS).

B. Clean Air Act

The Clean Air Act, passed in 1963 and amended numerous times since then, is the primary legal authority governing air quality management. This Act provides the framework for national, state, and local efforts to protect air quality. The Montana/Idaho State Airshed Group was formed to coordinate all prescribed burning activities in order to minimize or prevent impacts from smoke emissions and ensure compliance with the National Ambient Air Quality Standards (NAAQS) issued by the Environmental Protection Agency (EPA), the federal agency charged with enforcing the Clean Air Act. The USDA Forest Service, including the North Fork Ranger District, is a member of this Airshed Group. The Barnyard South Sheep project area is in North Idaho Airshed Unit 12A. All post-harvest site preparation and fuel reduction treatments would be conducted according to the requirements of the Montana/North Idaho Smoke Management Unit guidelines.

C. Clean Water Act

The Clean Water Act stipulates that states are to adopt water quality standards. Included in these standards are provisions for identifying beneficial uses, establishing the status of beneficial uses, setting water quality criteria, and establishing BMPs to control nonpoint sources of pollution.

Section 313 of the Clean Water Act requires Federal agencies to comply with all Federal, state, interstate and local requirements, administrative authority, and process and sanctions with respect to control and abatement of water pollution. Executive Order 12088 also requires the Forest Service to meet the requirements of this Act. Therefore, all state and Federal laws and regulations applicable to

water quality would be applied. These include 36 CFR 219.27, the Clean Water Act, the Clearwater National Forest Plan, terms and conditions of the Forest Plan Lawsuit Settlement (1993), Idaho state BMPs and Stream Alteration procedures.

Section 303(d) of the Clean Water Act stipulates that states must identify and prioritize water bodies that are water quality limited (i.e., water bodies that do not meet water quality standards). For waters identified on this list, states must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve water quality standards. The Idaho Department of Environmental Quality prepared 2 TMDL planning documents which cover the project area: the *Lower North Fork Clearwater River Sub-basin Assessment and TMDL*, approved by the EPA in 2002; and the *Upper North Fork Clearwater River Subbasin Assessment and Total Maximum Daily Loads*, approved by the EPA in 2003. Additionally a Five Year Review and TMDL Addendum for the Lower North Fork Clearwater River Subbasin were approved by the EPA in 2013.

Section 404 of the Clean Water Act requires permits to dredge or fill within waters of the United States. The U.S. Army Corps of Engineers administers these provisions. Culvert and bridge removal and replacement activities proposed under the Barnyard South Sheep project would comply with the requirements under section 404.

State Water Quality Standards – EPA regulations require each state to adopt an antidegradation policy as one component of its water quality standards. The objective of the Idaho Anti-degradation Policy is, at a minimum, to maintain and protect existing instream water uses and the level of water quality necessary to protect those uses (IDAPA 16.012501.01). Beneficial uses and water quality criteria and standards are identified in the Idaho Water Quality Standards and Wastewater Treatment Requirements (IDAPA 58.01.02, IDAPA 37.03.02, http://adminrules.idaho.gov/rules/current/58/0102.pdf).

Washington and Beaver creeks have designated beneficial uses of cold water biota, salmonid spawning, and secondary contact recreation. All other streams in the analysis area fall under 'Nondesignated Surface Water', where standards for cold water aquatic life and secondary contact recreation apply.

Idaho Forest Practices Act: This legislation regulates forest practices on all land ownership in Idaho. Forest practices on NFS lands must adhere to the rules pertaining to water quality (IDAPA 20.02.01). These rules are also incorporated as BMPs in the Idaho Water Quality Standards.

Idaho Stream Channel Protection Act: This legislation regulates stream channel alterations between mean high water marks on perennial streams in Idaho. Instream activities on NFS lands must adhere to the rules pertaining to the Idaho Stream Channel Protection Act (IDAPA 37.03.07). These rules are also incorporated as BMPs in the Idaho Water Quality Standards.

D. Region 1 Soil Quality Standards

Region 1 FSM Soil Supplement 2500-99-1 updates and clarifies the previous soil quality supplement (FSH 2509.18-94-1, Chapter 2) based on recent research and collective experience. The analysis standards address basic elements for the soil resource: (1) soil productivity (including soil loss, porosity; and organic matter), and (2) soil hydrologic function. These Regional Soil Quality Standards require that detrimental management impacts to the soil resource do not exceed 15 percent of an activity area and that retention of coarse woody material is appropriate for the habitat type. Detrimental impacts include compaction, rutting, displacement, severely burned soil, surface erosion and soil mass movement. In areas where more than 15% detrimental soil conditions exist from prior

activities, the cumulative detrimental effects from project implementation and restoration should not exceed the conditions prior to the planned activity and should move toward a net improvement in soil quality.

V. Scope of the Analysis

The Code of Federal Regulations (40 CFR 1508.25) requires the Forest Service to consider three types of actions (connected, similar, and cumulative) to determine the scope of the analysis.

Connected Actions are those actions that are closely related. In regards to the Barnyard South Sheep proposal, only the timber harvest and associated road activities are connected actions. Overall, the proposed action is not an interdependent part of a larger action.

Similar Actions are those which, when viewed with other reasonably foreseeable proposed actions, have similarities that provide a basis for evaluating their environmental consequences together, but are not necessarily connected. The proposed vegetation treatments and watershed improvements of Barnyard South Sheep are considered similar actions, due to each having similar time frames, geographic areas, and purposes.

Cumulative Actions are those actions, which when viewed with other proposed actions have cumulative impacts and therefore should be discussed in the same analysis. This analysis considers the direct, indirect, and cumulative effects of past, present, and reasonably foreseeable future actions. A table listing all known past, present and reasonably foreseeable future actions that overlap the temporal and spatial bounds of the proposal is located in Appendix A.

The scope of this analysis is limited to the specific management activities described in the proposed action. This proposal is not a general management plan for the area, nor is it a programmatic environmental assessment. If the decision maker selects an action alternative, activities could begin in 2016. The average duration of a project of this size and complexity is three to five years.

VI. Availability of Project Files

An important consideration in preparation of this EA has been the reduction of paperwork as specified in 40 CFR 1500.4. In general, the objective is to furnish enough site-specific information to demonstrate a reasoned consideration of the environmental impacts of the alternatives and how these impacts can be mitigated. More detailed information is in the project file in the District planning records and is available for public inspection.

The reader may want to refer to the Clearwater Forest Plan and EIS (USDA 1987). The Barnyard South Sheep EA is "tiered" to the Forest Plan EIS and Record of Decision, as encouraged in 40 CFR 1502.20. Copies of the Forest Plan, Forest Plan EIS, and Record of Decision are available at libraries in the Clearwater National Forest locale and at the Forest Supervisor and Ranger District offices.

CHAPTER 2
ALTERNATIVES INCLUDING THE PROPOSED ACTION

This chapter is divided into public involvement, identification of the issues, a discussion of each alternative considered in detail, a listing of the alternatives eliminated from detailed study, and a comparison of the alternatives as to how they address the project purpose and issues.

I. Public Involvement

The Barnyard South Sheep project has appeared on the Forest Schedule of Proposed Action report since 2012. Since then, the following public involvement activities have taken place:

05/07/12 – Presented the project as part of a Nez Perce-Clearwater National Forests Program of Work Presentation to the Clearwater Basin Collaborative.

07/31/12 – Conducted a field trip to the project area with members of the Clearwater Basin Collaborative.

12/06/12 – Scoping letters were mailed to the Nez Perce Tribal Executive Committee. No response was received.

12/06/12 – Scoping letters were mailed to the general public. Six letters were received.

12/07/12 – A legal notice appeared in the Lewiston Morning Tribune (paper of record).

08/08/14 – A legal notice appeared in the Lewiston Morning Tribune, and the draft Environmental Assessment was released for public comment. Five letters were received.

Quarterly – The project was presented and subsequently updated at Nez Perce Tribe and Nez Perce-Clearwater National Forests quarterly staff-to-staff meetings.

II. Issues

Project issues were identified by the interdisciplinary team and through public scoping and are grouped into one of three categories, as follows:

A. Issues used to Develop Alternatives to the Proposed Action

Use of Existing Roads: "Due to existing sediment problems created by new road construction, an alternative should be developed that is based entirely off existing roads." This comment is the basis of Alternative 3 that only uses the existing road system. The same road decommissioning and the placing of some roads into intermittent storage being considered under Alternative 2 (proposed action) are included under this alternative.

Size of Openings: Nine of the treatment units proposed for regeneration harvest by themselves or in combination are over 40 acres in size and are described further in this chapter (Section II, Alternatives Considered in Detail). A 60-day public review period was initiated with the release of the Scoping Letter. Approval to exceed 40 acres is being sought from the Regional Office and will be documented in the Decision Notice. As part of the approval process, Alternative 4 does not exceed the 40-acre opening size and is being considered in detail.

Watershed Improvements Only: "An alternative that does real restoration (watershed improvement through road elimination) and does not engage in more harm (logging an already heavily logged area) needs to be analyzed." This comment was the basis of Alternative 5, which was eliminated from detailed study, as explained in Section IV of this chapter.

B. Issues addressed through Design/Mitigation

Access Management: This issue responds to the effects of proposed watershed improvements and road activities associated with timber harvest on recreation opportunities and the area's transportation system.

Issue Indicators:

- Miles of road decommissioning
- Miles of roads placed into intermittent storage
- Miles of road reconstruction
- Miles of road reconditioning (maintenance)

Economic Feasibility: There are two parts to this issue: (1) providing for a cost efficient timber sale offering; and (2) addressing funding needed to complete the proposed watershed improvements.

Issue Indicator:

- Costs and revenues generated by each alternative.

MIS and TES Species of Fish and Wildlife: Management indicator species (MIS) are designated as surrogates for other species with similar life histories or habitat requirements in order to assess the effects of management activities. For MIS, the 1982 planning rule requires the Forest Service to manage wildlife habitat "to maintain viable populations of existing native and desired non-native vertebrate species in the planning area" (36 CFR 219.19).

Objectives for management of sensitive species, identified on the current Northern Region Sensitive Species List, are to: (1) ensure that Forest Service actions do not contribute to loss of viability of any native or desired non-native plant or animal species; (2) ensure that activities do not cause the status of any species to move toward federal listing; and (3) incorporate concerns for sensitive species throughout the planning process, reducing negative effects to species and enhancing opportunities for mitigation.

The current US Fish and Wildlife Service species list for Clearwater County identifies bull trout and Canada lynx (both threatened species). Section 7 of the Endangered Species Act (ESA) of 1973, as amended, requires Federal agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of threatened, endangered, or proposed species, or cause the destruction or adverse modification of their critical habitats.

Issue Indicators:

- For species with modeled habitats: acres of available habitats.
- For species without modeled habitats: qualitative discussion of habitat trend.
- For all sensitive species: determination statement in a Biological Evaluation.
- For all threatened, endangered, proposed, or candidate species: determination statement in Biological Assessment.

Sensitive Plants: Sensitive plant species that may be affected by proposed project activities include deerfern, green bug-on-a-stick, clustered lady's-slipper, light moss, naked rhizomnium, evergreen kittentail, and Idaho barren strawberry (see Chapter 3). As required by Forest Service policy, specific habitat needs for sensitive plants as defined in the Regional Sensitive Species List has been reviewed, and a Biological Evaluation for the appropriate sensitive species has been completed (refer to Sensitive Plants section in Chapter 4).

Issue Indicators:

- Disturbance due to proposed activities within suitable habitats.
- For all sensitive species: determination statement in a Biological Evaluation.

Soil Stability and Erosion Hazards: Surface erosion (e.g. sheet, rill, gully erosion) and mass wasting erosion events (e.g. landslides, debris torrents/avalanches, rotational slumps) impact soil productivity, water quality and channel morphology. Soil erosion can result in decreased soil productivity at a site due to the loss of surface soils which contain higher organic matter and volcanic ash content compared to the subsurface soils. Removal of vegetation and/or ground disturbance associated with timber harvest, road construction, or prescribed fire can increase erosion on certain landtypes. Six road-related landslides and two landslides with natural origin are known to have occurred in the project area since 1995.

Issue Indicator:

- Acres of proposed activity areas with potentially unstable soils and high erosion hazards.

Soil Productivity: Past management activities (timber harvest, roads, and mining) in the project area have caused soil disturbance (e.g. compaction, displacement, erosion, loss of organic matter) and decreased soil productivity. Surface soils in the project area, and particularly those with intact ash-influenced surface soil (i.e. ash cap), are fundamental in supporting site productivity due to much greater water infiltration rates and moisture- and nutrient-holding capacities than underlying soil horizons. The ash-derived soils common in much of the project area have low bearing capacity and therefore are highly susceptible to compaction, displacement and loss of site productivity. The Region 1 Soil Quality Standards (R1 SQS) (USDA 2014) require that detrimental soil disturbance (DSD) does not exceed 15% of an activity area and that coarse woody debris (CWD) retention is appropriate to the habitat type. In areas that exceed 15% DSD, the combined detrimental effects of the current project (implementation and restoration) should not exceed the DSD levels present before the activity and activities should be directed toward a net improvement in soil quality.

Issue Indicator:

- Number of treatment units requiring unit-specific special design measures measures to meet Region 1 soil standards.

Water Quality and Quantity: Forest management activities alter watershed conditions which may affect water quality and quantity/yield. The primary water quality concerns for forest management activities are excess erosion and resultant sediment delivery to water resources. Water quantity/yield is a concern to water resources because vegetation loss can potentially influence snowmelt and stream runoff timing and magnitude.

Water yield refers to stream flow quantity and timing and is a function of water, soil, and vegetation interactions. When stream flows are outside of normal ranges for long durations, stream morphology is subject to alteration. Changes in amount or distribution of vegetation can affect water yield.

Active erosion of the landscape generates sediment and occurs naturally. When an excess of sediment, over the natural (balanced) amount, is delivered to a stream, the channel's ability to route the sediment out of the system is diminished and water quality is reduced. Vegetation treatments and road-related activities have the potential to increase erosion production and sediment delivery into streams.

Through design and mitigation measures, all project activities should maintain or improve water quality and should not result in increased bacteria, nutrients, oil and grease, inorganics, or temperature in streams. The activities proposed in the project are also expected to produce no measureable increase in sediment delivered to streams.

Issue Indicator for General Watershed Condition:

- Change in road densities.

Issue Indicator for Water Quantity:

- Percent increase in equivalent clearcut area (ECA) and percent of smaller drainage areas proposed for harvest.

Issue Indicator for Water Quality:

- Sediment yield changes (tons), using WEPP:Road and Disturbed WEPP.

C. Issues decided by law or policy, or not affected by the proposal.

These issues will not be considered in detail.

Air Quality: Smoke emissions produced during prescribed fire activities may affect air quality.

All alternatives to be considered will adhere to the Clean Air Act and implementation would occur according to the procedures outlined by the Montana/Idaho Airshed Group.

Old Growth Habitat – The Forest Plan standard for old growth states that 10% across the Forest will be designated as old growth (150+ years of age). In 2006, it was determined that the Clearwater National Forest's old growth designation fell below ten percent and therefore, new direction was given in 2006 that addressed the retention of mature forest (130-150 years of age) in order to meet the 10% forest-wide standard. By following that direction, it was expected that the Forest would exceed the 10% standard in 2012. The Region is currently reassessing the data to determine the level of old growth across the Forest.

The Forest Plan standards for old growth habitat also state that the Forest will manage at least 5% of each 10,000-acre old growth analysis unit (OGAU) as old growth. The Barnyard South Sheep analysis area lies within OGAUs 310 and 314, which currently meet the 5% standard by having 9% and 14% verified old growth habitat and 8% and 13% mature forest, respectively. Since no activities are proposed in verified old growth or mature forest (130-150 years of age), this issue need not be discussed in further detail.

Heritage Resources: Archaeological sites are evident throughout the analysis area that could be affected by proposed activities.

In compliance with the National Historic Preservation Act, heritage surveys will be conducted in the area to identify any significant heritage resources, cultural, archaeological or historical sites. Potential direct and indirect effects to any such sites will be assessed and considered during project planning, plus, the Forest Archaeologist will consult with the Nez Perce Tribe and Idaho State Historic Preservation Offices regarding the project (refer to design measure #18).

Scenic Quality: The project area is outside the nearest sensitive viewshed and is therefore within an area where the Forest Plan visual quality objective (VQO) is maximum modification. However, the OHV trail systems and Camp 60 Trailhead were built after the Forest Plan was written (1987) and were not analyzed for viewshed sensitivity. As such, all of these areas have recommended VQOs, and proposed activities would incorporate specific design measures in order to meet the recommended VQOs (refer to design measure #17).

Snag Habitat: The primary threats to species using snag and downed wood habitats are the removal of live and dead trees for timber production or firewood. This project would follow Regional snag/live tree retention guidelines within proposed timber harvest units (refer to design measure #15).

Spread of Noxious Weeds: Logging, road and landing construction/reconstruction, and heavy vehicle traffic have the potential to further spread existing weeds and/or introduce new species of weeds.

A decision for the North Fork Noxious Weeds Environmental Assessment (2005) addresses the treatment of noxious weeds on the North Fork Ranger District. It is standard operating procedures to minimize the spread of noxious weeds by requiring logging or construction equipment to be cleaned of loose debris prior to moving on to the timber sale area. Also, raw soils exposed through project activities would be revegetated as soon as practicable, using certified noxious weed free seed mix and fertilizer, as necessary (refer to design/mitigation measures #23, #24, and #25).

Threatened and Endangered Species of Plants: The current US Fish and Wildlife Service species list for Clearwater County also identifies whitebark pine (candidate species). However, whitebark pine does not occur within the Barnyard South Sheep project area, and therefore would not be affected by proposed activities.

Tribal Treaty Rights: The Nez Perce Tribe has specific treaty reserved rights that result in activities that take place on what is now federal land, including the Clearwater National Forest. Article 3 of the 1855 Treaty with the Nez Perce Tribe states: “the exclusive right of taking fish in all the streams where running through or bordering said reservation is further secured to said Indians; as also the right of taking fish at all usual and accustomed places in common with citizens of the Territory; and of erecting temporary buildings for curing, together with the privilege of hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed land.”

Consultation with the Nez Perce Tribe will continue with this project analysis. Nez Perce fishing, hunting, and gathering rights will be protected.

III. Alternatives Considered in Detail

Public input gained from formal scoping was used in the formulation of alternatives to the proposed action (Alt. 2). This included a "no action" alternative (Alt. 1) and two additional action alternative (Alts. 3 and 4) that address the issues of: (1) using existing roads rather than building new ones; and (2) not exceeding the 40 acre opening limitation. Also used in the formulation of alternatives was a Roads Analysis that covered access needs in the area. All alternatives were given equal weight, and the remaining issues considered were used to modify the action alternatives.

A. Treatment Methods Common to all Action Alternatives

In recommending treatments, the ID Team looked at a variety of methods to accomplish watershed, vegetative, fire/fuel, and recreation objectives. A key factor in deciding which tool to use was the treatments ability to move the existing conditions toward desired conditions. The following treatments were recommended:

1. Watershed Improvement

Watershed improvement activities would consist of road decommissioning, putting some roads into intermittent storage, and soil restoration, as follows:

Road Decommissioning[1] – Roads identified as no longer needed for management would be decommissioned either through obliteration or abandonment to: (1) decrease soil erosion and instream sediment deposition; (2) help restore channel structure and function; and (3) restore hillslope hydrologic processes to a more natural condition. There are four levels of road or route obliteration, as follows:

> **Level 1:** Roads of this level were often constructed with shallow culverts, few/no large road fills, and on gentle terrain intersecting few/no live water stream crossings. Undesignated routes are frequently in this category. Practices to obliterate include: (a) road surface decompaction or scarification; (b) removal of all culverts; (c) minor outsloping and cross draining; (d) full recontour or earth barrier construction at road origin (sufficient to prevent motorized access); and (e) revegetation of disturbed soils using native planting in combination with mulches and some fertilizer application.
>
> **Level 2:** Roads of this level were often constructed with a combination of shallow and deeper culverts, larger road fills, and on moderate terrain intersecting some live water stream crossings. These roads may also have small bogs or seeps that may threaten fill slope stability. Undesignated routes occasionally fall in this category, although they rarely have metal culverts, but may have logs or barrels performing similar functions. Practices to obliterate include all practices described for Level 1 obliteration, plus: (a) removing fills at risk of failure; and (b) obvious or frequent outsloping and cross draining.
>
> **Level 3:** Roads of this level were often constructed with numerous deep culverts, larger road fills, and on steep terrain intersecting many water stream crossings. These roads often have small bogs or seeps that threaten fill slope stability. Practices to obliterate include all practices described for Levels 1 & 2 obliteration, plus: (a) removal of all deep culverts; and (b) fill removal and slope restoration to as near to natural contour as feasible on all slopes at risk.

[1] Road decommissioning and placing roads into intermittent storage are proposed to correct existing resource problems and not to mitigate for other elements of this project.

Level 4: Conditions of construction vary widely for roads of this level. They may occur on extremely steep terrain with numerous, deep culverts, or may occur in riparian habitats, often within 300 feet of fish-bearing streams. These roads represent direct and often chronic risk of degrading fish habitat and water quality. Undesignated routes in riparian habitats frequently cause streambank degradation, channel widening, and excessive sedimentation. The only practices appropriate to obliterate is complete fill removal and slope restoration (to as near natural contour as feasible).

Roads proposed for abandonment are often ridge top roads with few if any stream crossings, where road surveys show minimal risk of soil erosion or mass failure. Abandonment would leave the road in place and allow vegetation to reclaim the road surface.

Intermittent Storage – Existing roads projected not to be used for the next 20 years or longer would be put into intermittent stored service. Practices used are intended to assure that the road is placed into a self-maintaining condition that removes all high risks of failure. Although these roads are to be retained on the transportation system and closed to full-size motorized vehicles, they may or may not be closed to motorcycles and ATVs – depending on future analyses. Depending on site specific conditions, three levels of treatment are available to leave the road in a condition where there is little resource risk if maintenance is not performed. Those treatment levels are as follows:

Level 1: Risk to resources is minimal or acceptable for estimated period of closure with little to no additional work being done. Typical treatments may include little to no treatment to place the road into an acceptable maintenance storage condition and/or installing closure devices, if needed.

Typical applications are on roads located on low relief landforms on or near ridgetops, having: (a) few channel crossings; (b) low resource values (i.e. no ESA-listed or sensitive species significantly affected by the road); (c) little intercepted subsurface flow; (d) low flow diversion, failure history, or risk; and/or (e) a short non-use period.

Level 2: Risk to resources can be managed or reduced to an acceptable level for estimated period of closure with minimal work required. Typical treatments may include: (a) mitigating drainage issues with culverts and other drainage structures that present an unacceptable risk to resources; (b) leaving existing crossings in low risk situations where the culvert is not undersized; (c) constructing drainage dips or waterbars adjacent to remaining culverts to minimize impacts of culvert plugging; (d) outsloping (5% to10%) and waterbarring the road prism to promote drainage; (e) mitigating the risks associated with failures of localized fills in isolated failure zones; and/or (f) installing closure devices, if needed.

Typical applications are on roads located on rolling hills, stable colluvial midslope, or mountain slopeland land forms, having: (a) culverts (if left) in fair or better condition; (b) moderate resource values (i.e. no ESA-listed species significantly affected by the road); (c) few past failures; and/or (d) intercepted flows that can be reasonably drained using waterbars and outsloping.

Level 3: Existing road presents an unacceptably high risk to resources for estimated period of closure, and work is required along much of the road to reduce risk to resources to an acceptable level for the estimated period of closure. Treatments are typically more intensive than under Level 2 and may include: (a) mitigating drainage issues with all road-stream crossings; (b) outsloping (8% to 12%) and waterbarring the road prism to promote drainage; (c) mitigating risks associated with fills in failure zones; and/or (d) installing closure devices, if needed.

Typical applications are on roads often in poor shape located on mass wasting or breakland landforms (high risk landtypes), having: (a) culverts (if left) in reasonably good condition; (b) high resource values (i.e. sensitive and ESA-listed species significantly negatively impacted by road); and/or (c) frequent past or expected road fill failures,

2. Timber Harvest

The objective of this treatment is to manage forest resources for a sustained yield of timber in a variety of age classes while providing for other resources such as wildlife, plants, and soil productivity. Support for these resources is provided through the retention of trees in a variety of amounts and locations. The following provides a brief description of each Silvicultural prescription and the tree retention guidelines:

Regeneration Harvest: This harvest method would remove most of the existing mature stand, producing a site with high sun exposure that would provide optimum growing conditions for the new stand. Restocking of the harvest unit would occur through the planting of western white pine, western larch, and ponderosa pine, with some natural regeneration of Douglas-fir, grand fir, and western red cedar. Varying numbers of trees would be retained for future snag recruitment, wildlife habitat, and soil productivity. This would ensure that snag levels would meet Northern Region Snag Management protocol. Approximately five or more snags greater than or equal to 15 inches in diameter would be left to meet Regional snag guidelines in addition to three live tree snag replacements greater than or equal to 15 inches in diameter would be left per acre (Bollenbacher et al., 2009). Retention objectives are to leave tree structure within the units through a combination of clumps and scattered individual live cull trees. Retention guidelines include:

- Leaving about 10-25% of the gross unit acreage in individual trees, INFISH buffers, and clumps of ¼ to 3 acres in size, where possible.
- Locating clumps within blind (tree yarding) leads, benches, ridges, and interior riparian habitat conservation areas (RHCAs) away from unit boundaries and open roads.
- Locating clumps around broken top larger trees that are desirable for cavity nesting birds.
- Retain live cull trees and logger-safe snags between clumps.

Commercial Thinning: This intermediate harvest method reduces tree density to improve growth and enhance forest health by retaining as many early seral tree species as possible. All commercial thinning units would be thinned to leave an average of 100-140 ft^2/ac of basal area across each treatment unit, resulting in a 16-20-foot spacing between trees. This prescription results in the fairly uniform retention of trees across the unit. Some limbs and tops would be retained in the unit for nutrient retention, but not to the level that would pose a fire hazard. Whole tree yarding would be used in these units to help reduce post-harvest fuels to acceptable levels. Where available, approximately five to nine snags greater than or equal to 15 inches in diameter would be left to meet Regional snag

guidelines for intermediate harvest treatments, as safety guidelines allow. Retention objectives are to leave snag tree structure within the units through a combination of clumps and scattered individual live cull trees.

3. Post-Harvest Fuel Treatments

Fuels in the timber harvest units may be treated with the harvest activity, or following the harvest activity after field review by District Fuels managers.

Fuel Treatments following Timber Harvest

The Forest Service is required by law (Knutson-Vandenberg Act, 16 USC 576b, 6/9/30) to reforest sites and reduce activity slash (Brush Disposal Act, 16 USC 490, 8/11/16) generated from the harvest activity following regeneration harvest activities in which a majority of the overstory is removed. The mandatory slash treatment ensures the Agency will reduce hazard fuels generated from harvest. The mandatory reforestation allows the Agency to plant desired species on a given site. Across Barnyard South Sheep, desired species are early-seral species like white pine and western larch because they tend to be more disturbance resistant than other mid- and late-seral species, and as a result, are more fire resilient. In order to ensure the long-term success of the plantations, activity fuels generated by the harvest would be treated in order to prepare the site for the planting activity.

Burning following Regeneration Harvest – This would consist of broadcast burning, underburning, jackpot burning, or mechanical or hand piling followed by pile burning. This treatment uses the silvicultural treatment of regeneration harvest to restore early-seral, fire-resilient species to the site. The vertical fuel profile is primarily removed with the harvest. Surface fuels are treated as described below to reduce the horizontal fuel profile to acceptable limits. Post-harvest fuels in regeneration units are expected to be 50 – 80 tons per acre. Prior to burning, some slashing of residual non-merchantable component may occur to ensure a more continuous fuel bed. The burning and/or mechanical treatments would reduce fuel loading to approximately 7 – 33 tons per acre, depending on the coarse woody debris guidelines for the site. Wetter sites would have retention on the upper end of the spectrum, while drier sites would retain less fuel. Activity slash would be retained on the site over the winter before slash treatment occurs as required to mitigate soil resource concerns. Some mortality in leave trees is expected, especially if they are less fire-resilient species. This mortality is acceptable for snag recruitment. Hand surface fuel reduction would be done at the base of some leave trees to protect them better from potential high fire intensity during burning operations.

Units with moderate slopes of less than 35% would likely be machine piled to reduce fuels and achieve adequate site preparation. Units with steeper slopes would be broadcast or underburned to achieve objectives. Units with a mix of slopes may have a mix of piling and burning in order to maximize the effective burn window and ensure units are treated and reforested in a timely manner. Prescribed fire burning windows are unpredictable, and smoke emission concerns can further limit that window. This mix of treatment methods for post-regeneration harvest fuel provides managers with alternatives to accommodate burn windows and achieve objectives.

B. Alternative Descriptions

1. Alternative 1 – No Action

The "no action" alternative means the proposed action would not take place. Although this alternative provides a baseline for comparing the environmental consequences of the other alternatives to the existing condition (36 CFR 1502.14), it is potentially an appropriate management option that could be selected by the Responsible Official. Selection of the "no action" alternative would mean that the following trends would likely continue:

- Soil stability and erosion risks would remain the same since no vegetation removal, prescribed burning, or road decommissioning would occur.
- Recovery of soil productivity in areas currently detrimentally disturbed would occur over time, but recovery would be slow over several decades.
- Watershed benefits from the decommissioning, storage, and road crossing/drainage improvements proposed in the action alternatives would not be attained.
- Unless affected by large-scale wildfire, current trends would continue for sediment and water yield.
- The progression of forest succession would improve habitat for most wildlife and plant species. Older habitats favored by these species could see localized declines, due to insect-caused mortality and/or possible intense wildfires. However, the trend overall would be one of increasing habitat suitability.
- Tree species composition (mostly grand fir and Douglas-fir) would remain susceptible to insects and disease. The percentage of more resilient species (white pine and other seral tree species) would continue to be low or absent across the landscape.
- Opportunities for all recreation activities would remain unchanged.
- Travel management in the analysis area would remain the same, and the minimum road system identified in the Barnyard South Sheep Travel Analysis would not be implemented.

Table 2.1 – Summary of Proposed Activities by Alternative

	Alt 1	Alt 2	Alt 3	Alt 4
WATERSHED IMPROVEMENTS				
System Road Decommissioning (mi)	0	44.6	44.6	44.6
Non-System Road Decommissioning (mi)	0	31.0	31.0	31.0
System Road Storage (mi)	0	28.4	28.4	28.4
Non-System Road Storage (mi)	0	20.6	20.6	20.6
Stream Crossing Improvements?	No	Yes	Yes	Yes
TRANSPORTATION SYSTEM				
Road Reconstruction (mi)	0	30.1	19.3	28.8
Temporary road Construction (mi)	0	7.8	0	6.5
VEGETATIVE TREATMENTS				
Regeneration Harvest (ac)	0	860	430	560
Commercial Thinning (ac)	0	730	480	730

2. Alternative 2 – Proposed Action (Preferred Alternative)

This alternative responds fully to the project's purpose and need for action and would treat a total of 1,590 acres. The project would be implemented in 2016 (refer to the maps at the end of this chapter).

Watershed Improvements[2]

Decommission 44.6 miles of system roads and 31.0 miles[3] of non-system roads.

Place into storage 28.4 miles of system roads and 20.6 miles[4] of non-system roads.

Improve numerous stream crossings by replacing or adding culverts (refer to Appendix B).

Timber Harvest

Regeneration harvest 28 units, totaling approximately 860 acres. **Note:** Regional approval was obtained to exceed the 40-acre opening limitation.

Commercial thin 6 units, totaling approximately 730 acres.

- Construct 7.8 miles of temporary roads, to be decommissioned after use.
- Reconstruct 21.0 miles of system roads and 9.1 miles[5] of non-system roads.

Table 2.2 – Treatment Unit Summary[6]

Unit	Acres	Treatment	Method	Unit	Acres	Treatment	Method
1	29	CT	T/S	19	10	CC w/Reserves	S
2	5	CC w/Reserves	S	20	8	CC w/Reserves	S
3	17	CC w/Reserves	S	22	7	ST w/Reserves	S
4	26	CT	S	23	9	CC w/Reserves	T/S
5	18	Shelterwood	S	24	5	CC w/Reserves	T
6	11	CT	T/S	25	6	ST w/Reserves	T/S
7	93	CC w/Reserves	S	26	18	ST w/Reserves	T/S
8	4	CC w/Reserves	S	27	35	ST w/Reserves	T/S
9	35	CC w/Reserves	T/S	28	51	ST w/Reserves	T/S
10	30	CC w/Reserves	S	29	100	ST w/Reserves	T/S
11	419	CT	T/S	30	10	CC w/Reserves	S
12	9	CC w/Reserves	S	31	15	ST w/Reserves	S
13	67	CC w/Reserves	T/S	32	23	CC w/Reserves	T/S
14	53	CC w/Reserves	T/S	33	60	CC w/Reserves	T/S
15	215	CT	T/S	34	60	ST w/Reserves	T/S
16	56	CC w/Reserves	T/S	35	44	Shelterwood	T/S
17	27	CT	S				
18	22	CC w/Reserves	T/S				

CT=Commercial Thin; CC=Clearcut; ST=Seedtree; T=Tractor Skidding; and S=Skyline Yarding

[2] For all action alternatives, any spur roads accessed by the proposed roads to be treated would be similarly treated.
[3] There may be additional non-system roads discovered during implementation that are eligible to be decommissioned. Such opportunities would be viewed as potentially changed circumstances and analyzed under direction of Forest Service Handbook 1909.15 Section 18.1.
[4] For all action alternatives, these roads would be added to the transportation system and placed into storage.
[5] For all action alternatives, these roads would be added to the transportation system and placed into storage after use.
[6] The size of treatment units represent gross acreage and may be reduced or adjusted during field layout, with the implementation of design measures and feasible unit boundaries.

3. Alternative 3 – Existing Roads

While meeting the project's purpose and need for action, this alternative responds to the public comment asking us to develop an alternative that uses the existing road system. It would treat a total of 910 acres and would be implemented in 2016 (refer to the maps at the end of this chapter).

Watershed Improvements

Decommission 44.6 miles of system roads and 31.0 miles of non-system roads.

Place into storage 28.4 miles of system roads and 20.6 miles of non-system roads.

Improve numerous stream crossings by replacing or adding culverts.

Timber Harvest

Regeneration harvest 22 units, totaling approximately 430 acres.

Commercial thin 4 units, totaling approximately 480 acres.

- Reconstruct 14.9 miles of system roads and 4.4 miles of non-system roads.

Table 2.3 – Treatment Unit Summary

Unit	Acres	Treatment	Method	Unit	Acres	Treatment	Method
1	13	CT	S	20	8	CC w/Reserves	S
5	18	Shelterwood	S	22	7	ST w/Reserves	S
6	7	CT	S	24	5	CC w/Reserves	T
9	35	CC w/Reserves	T/S	25	2	ST w/Reserves	T
10	15	CC w/Reserves	S	26	16	ST w/Reserves	T
11	249	CT	T/S	27	3	ST w/Reserves	T
12	9	CC w/Reserves	S	28	38	ST w/Reserves	T
13	35	CC w/Reserves	T/S	29	80	ST w/Reserves	T/S
14	44	CC w/Reserves	T	31	7	ST w/Reserves	S
15	215	CT	T/S	32	20	CC w/Reserves	T/S
16	48	CC w/Reserves	T/S	33	17	CC w/Reserves	T/S
18	8	CC w/Reserves	T				
19	10	CC w/Reserves	S				

4. Alternative 4 – Openings ≤ 40 Acres

While meeting the project's purpose and need for action, this alternative responds to the requirement to develop an alternative that keeps openings to 40 acres or less. It would treat a total of 1,290 acres and would be implemented in 2016 (refer to the maps at the end of this chapter).

Watershed Improvements

Decommission 44.6 miles of system roads and 31.0 miles of non-system roads.

Place into storage 28.4 miles of system roads and 20.6 miles of non-system roads.

Improve numerous stream crossings by replacing or adding culverts.

Timber Harvest

Regeneration harvest 27 units, totaling approximately 560 acres.

Commercial thin 6 units, totaling approximately 730 acres.

- Construct 6.5 miles of temporary roads, to be decommissioned after use.
- Reconstruct 20.0 miles of system roads and 8.8 miles of non-system roads.

Table 2.4 – Treatment Unit Summary

Unit	Acres	Treatment	Method	Unit	Acres	Treatment	Method
1	29	CT	T/S	19	10	CC w/Reserves	S
2	5	CC w/Reserves	S	20	8	CC w/Reserves	S
3	17	CC w/Reserves	S	22	7	ST w/Reserves	S
4	26	CT	S	23	9	CC w/Reserves	T/S
5	18	Shelterwood	S	24	5	CC w/Reserves	T
6	11	CT	T/S	25	6	ST w/Reserves	T/S
7	34	CC w/Reserves	S	26	17	ST w/Reserves	T/S
8	4	CC w/Reserves	S	27	34	ST w/Reserves	T/S
9	35	CC w/Reserves	T/S	28	27	ST w/Reserves	T/S
10	16	CC w/Reserves	S	29	23	ST w/Reserves	T/S
11	419	CT	T/S	30	10	CC w/Reserves	S
13	38	CC w/Reserves	T/S	31	15	ST w/Reserves	S
14	25	CC w/Reserves	T	32	23	CC w/Reserves	T/S
15	215	CT	T/S	33	33	CC w/Reserves	T
16	40	CC w/Reserves	T/S	34	38	ST w/Reserves	T/S
17	27	CT	S	35	38	Shelterwood	T/S
18	22	CC w/Reserves	T/S				

C. Mitigation or Design Measures Common to all Action Alternatives

Mitigation measures are designed to eliminate or reduce to acceptable levels the effects of proposed activities, and design measures are aimed at avoiding specific resource issues. A majority of these are in addition to Forest Plan standards (i.e. INFISH) and best management practices (BMP) from the Idaho Forest Practices Act. Both measures are listed below, and the effectiveness of each measure is also included, where applicable.

Measures Addressing Watershed and Soils Issues

1. Avoid direct ignition of fuels within RHCAs and/or clumps of live trees. Where low-intensity fire is allowed to back into the edges of some of these areas, the result should be no more than 10% tree mortality. In areas requiring more distributed live-canopy retention and individual leave-trees, the objective would be for a majority (>50%) of the leave trees to survive the prescribed burn.

Low-intensity prescribed fire and underburning has resulted in incidental mortality of leave-trees in RHCAs, yet mortality is minimal and often limited to edges or isolated trees. Unit boundary placement, slash treatment and/or fire prescriptions are among the practices used to avoid or minimize tree mortality.

2. Leave a 50 ft. slope distance (or ½ the height of a site potential tree, whichever is greatest) no-harvest, no-ignition INFISH buffer from perimeter of areas that contain unstable soils.

- Unstable and landslide-prone areas in treatment units have been field-checked and units with potentially unstable areas according to stability assessments are displayed in the soils report. **Units 1-7, 10, 13, 14, 19, 20, 23, 34 and 35** have the highest percentages of unit area with potentially unstable slopes. Site-specific delineation of unstable areas would occur during project layout.

Retention of root strength is important for reduction of landslide hazard (McClelland et al. 1997). Forest soil scientists have observed that adjusting canopy retention based on landscape features has been effective in maintaining slope stability. Avoidance of wet and unstable soils provides effective soil and water protection.

3. Restrict activities when soils are wet to prevent resource damage (indicators include excessive rutting, oil displacement, and erosion).

BMP implementation and effectiveness rates on similar landforms have been found adequate to prevent sediment delivery to streams. On the Forest, BMPs applied to prevent sediment delivery from roads used and maintained for timber harvest activities have high implementation and effectiveness rates, averaging 99% and 98% respectively, from 1990-2009 (USDA 1990-2009).

4. Temporary roads would be located on upper hillslope or ridgetop positions and would not cross highly sensitive or unstable areas such as perennial or intermittent streams, wetlands, areas with wet or poorly-drained soils or unstable steep concavities and dissections that accumulate water to minimize the potential for surface erosion, road failures and sediment delivery. Exceptions are listed below for specific temporary roads that cross sensitive areas:

- Increased drainage frequency (80 to 545 feet) and slash filter windrow placement below the road prism would be required on specific temporary roads identified in Appendix C of the Watershed Report.
- Under Alternative 2, temporary roads 33.5 and the segment of temporary road 29.1 from milepost 0.65 to milepost 0.93 (end of road) would be constructed, used, and decommissioned

during one summer/fall season to minimize erosion and the potential for stream sediment delivery.

- Under Alternative 2, temporary road 29.1 from milepost 0.00 to 0.65 would be retained for site preparation activities (expected to occur within 5 years following construction) before being decommissioned. This temporary road would be specifically located and designed by a FS Engineer to alleviate soil and water resource concerns during the extended time period. The road would be closed to public motorized-use and open for administrative use only.
- Under Alternatives 2 and 4, temporary road 11.4 would be constructed, used, and decommissioned during one summer/fall season to minimize erosion and the potential for stream sediment delivery.

5. To restore slope hydrology and soil productivity, all temporary roads would be scarified and recontoured (decommissioned) following use (within 3 years after construction, with exceptions listed in Design Measure #4). Excavated skid trails would also be scarified and recontoured. Reshape cut/fill slopes to natural contours. Apply seed and available slash to the recontoured surfaces (slash is considered available where the equipment is able to reach it from the working area where the decommissioning is occurring).

Decompaction has been shown to decrease bulk density by 30-60% in comparison to compacted areas (Rone 2011). Road decommissioning monitoring on the Forest across a wide range of sites has documented an increase in vegetative cover from 18% the year after decommissioning to 64% at 10 years after decommissioning (USDA 2009). Monitoring has shown decommissioning and storage treatments to be effective at reducing surface erosion, mass failure risk and soil bulk density while increasing water infiltration rates, vegetative ground cover and soil organic matter (Foltz 2007, Lloyd et al. 2013, USDA 1999-2009).

6. During road decommissioning or long-term storage activities, measures are to be taken to prevent sediment from entering streams during project activities and in the long-term, such as: (a) placing removable sediment traps below work areas to trap fines; (b) when working instream, removing all fill around pipes prior to bypass and pipe removal (where this is not possible, use non-eroding diversion); (c) revegetating scarified and disturbed soils with grasses (weed free) for short-term erosion protection and with shrubs and trees for long-term soil stability; (d) mulching with native materials, where available, or using weed-free straw to ensure coverage of exposed soils; (e) dissipating energy in the newly constructed stream channels using log or rock weirs; and (f) armoring channel banks and dissipating energy with large rock whenever possible.

Monitoring has shown decommissioning and storage treatments to be effective at reducing surface erosion and mass failure risk while increasing water infiltration rates and vegetative ground cover (Foltz 2007, Lloyd et al. 2013, USDA 1999-2009).

7. Proposed culvert replacements would be sized to meet or exceed natural bankfull channel width and designed to pass a 100 year flow event. Crossing replacements would follow natural stream grade to accommodate sediment, debris and water transport. BMPs and mitigation measures similar to those listed above for road decommissioning and storage activities would be employed to minimize sediment inputs to streams.

8. Areas with very thin, rocky or droughty soils where soil productivity and reforestation potential is low would be avoided or would receive heavy live-tree retention to assure soil and site protection and regeneration success. These areas may include rock outcrops, areas of bare surface soil lacking vegetation, litter and organic surface horizons, and soils with abundant rock fragments in the surface soil horizons. During field surveys, these sensitive areas were noted in **Units 8, 9, 18, 20, 29 and 33**.

Adjusting tree-retention on sensitive soil areas and sites with potential regeneration limitations during project layout and implementation has been a routine and effective practice to protect soil and site productivity.

9. Locate and design skid trails, landings and yarding corridors to minimize the area of detrimental soil effects. Space tractor skid trails no less than 80 feet apart (edge to edge), except where converging on landings. This does not preclude the use of feller bunchers. Excavations would be minimized as much as possible.

10. Restrict equipment used for post-harvest excavator piling to existing trails and/or previously impacted areas. When machine piling, existing duff/litter would be retained (as much as possible) and not included in the activity slash piling. Slash would be allowed to overwinter prior to burning.

11. On dry sites, retain an average of 7 to 15 tons/acre of coarse woody debris (greater than 3 inches in diameter) following completion of activities. On moist sites, retain an average of 17 to 33 tons/acre.

Effectiveness is moderate to high based on past monitoring and research (Froehlich and McNabb 1983; Graham et al. 1994; Graham et al. 1999; Korb 2004; Neary et al. 2008; Curran et al. 2005). BMPs applied on the Clearwater NF have consistently exceeded 97% implementation and effectiveness (Clearwater NF 1994, 1997-2009) for soil protection practices.

12. Scarify non-excavated skid trails and landings that are compacted or entrenched 3 inches or more. Scarify to a depth of 6 to 14 inches, and seed disturbed areas having bare soil. No decompaction work should be done during wet weather or when the ground is frozen or otherwise unsuitable for effective decompaction.

Decompaction has been shown to decrease bulk density by 30-60% in comparison to compacted areas (Rone 2011). Vegetative cover increases from from 18% the year after decompaction during road decommissioning to 64% at 10 years after decommissioning (USDA 2009).

13. Paying attention to **(Alt. 2: Units 1, 4, 6, 7, 11, 18, 22, 33; Alt. 3: Units 1, 6, 11, 22; Alt. 4: 1, 4, 6, 7, 11, 14, 18, 22, 33),** a logging system layout design would be developed to reuse as many of the existing skid trails and landings as possible to limit the amount of new detrimental disturbance.

New soil disturbance can be minimized by using existing skid trails and/or by designating the locations of new skid trails (Froehlich and McNabb 1983). Logging systems developed with limits on the potential area affected have been successful in reducing soil compaction by harvest activities (Adams and Froehlich 1981). Soil improvement through decompaction and decommissioning activities can only moderately offset soil compaction and displacement but these actions initiate recovery on areas otherwise left in an unproductive condition.

14. For **Unit 15**, limit acreage of new disturbance (skid trails/landings) to (Alt. 2: 16.8 acres; Alt. 3: 17.2 acres; Alt. 4: 16.8 acres) to be within 15% Standard (Adams and Froehlich 1981). To assure that this unit remains at or below 15% DSD following project implementation, where possible, locate main skid trails only on existing disturbed areas with few one pass trails occurring on undisturbed ground or use a cut-to-length forwarder system.

Machine trails can accomplish harvest and site preparation and remain within the 15% standard (Archer 2008), but if uncontrolled, can lead to extensive trails and detrimental soil disturbance. Sale administration and equipment operator skills are necessary for success. Re-use of trails and subsequent decompaction minimizes impacts. Logging systems developed with limits on the potential area affected have been successful in reducing soil compaction by harvest activities (Adams and Froehlich 1981).

Measures Addressing Other Resource Issues

15. For the purpose of maintaining snag habitat, timber harvest prescriptions would follow Regional guidance (Bollenbacher et al. 2009, pgs 18-20) on project level snag/live tree retention estimates in early seral and mid-seral conditions. The larger legacy/relic tree species (ponderosa pine, western larch, Douglas-fir) would be selected for retention. In regeneration harvest units, snags/live trees would be retained in ¼ to 3 acre groups, with preference to snags or damaged trees that are greater than 15 inches in diameter, greater than 20 feet tall, and with broken tops. Leave clumps of snags mixed with green trees, or lone snags that have little potential to cause safety issues during timber felling. The retention of snags would be avoided near log landings and firelines and within 100 feet below and 200 feet above a road opened to any motorized vehicle.

Effectiveness is expected to be high, if tree marking guides are properly implemented.

16. If activities impact previously unknown sensitive plant occurrences, the Botanist will be notified, who will direct appropriate measures depending upon the ecology of the plant species involved and the nature of the activity.

Effectiveness is expected to be high, based on past experience with the implementation of other projects, in which new sensitive plant occurrences were brought to the attention of the Forest Botanist and appropriate measures were applied to protect the plants.

17. For the purpose of meeting the recommended Visual Quality Objectives (VQOs) for OHV trail systems and the Camp 60 Trailhead, a Landscape Architect would assist in the final layout and design of the proposed timber harvest units. The following design measures that may be implemented would include:

- Retaining vertical structure within the regeneration harvest units, edge treatments that emulate natural openings, and keeping trees within a 50-100 foot buffer to screen timber harvest activity from public recreating on popular trails in the area.
- Leaving trees (live and dead) that provide vertical structure within the regeneration harvest units to emulate the same structure that would remain after a natural mixed severity wildfire. These leave areas would range from ¼ to 3 acres in size and may include leave areas adjacent to unit boundaries.
- Shaping and feathering unit boundaries visible in the foreground to reduce any hard edges that appear as a man-made features on the landscape.

A Scenic Resource Report was completed for this project and is located in the project file. The report stated: "All alternatives in this project will meet the current Clearwater National Forest Land Management Plan Visual Quality Objectives of maximum modification. There are no sensitive viewsheds in the Barnyard South Sheep project area currently identified in the Forest Plan. The trail system within the project area was not present when the Forest Plan was signed in 1987."

18. If additional heritage resources are found during implementation of the project, project activities are to cease. The Forest Archaeologist will then be notified, and an assessment will be made regarding the effect of continued activities on the newly identified heritage resource.

19. Any goshawk nests found before and during implementation would be protected with a 40-acre no-activity buffer, and a 420-acre Post Fledging Area would be seasonally restricted from 4/15 to 8/15.

20. If being utilized for either haul/removal of material or crossed for transport of logs, trail templates will be returned to their original size and condition that existed prior to commencement of management activities.

21. Any trail infrastructure, features, etc. (i.e., bridges, puncheon, waterbars, trail tread armoring, geo-block/bull rock, culverts, signs, etc.) that are removed or damaged due to management activities, will be restored to its previous condition upon completion of management activity.

22. Timber and recreation personnel would coordinate the timing of vegetation management to minimize trail closures and impacts to users, as follows:

a. Lodge Creek Loop Trail 606 and/or Tumble Creek Trail 608 (around T39N, R7E, Sections 5 and 32) are both located in the vicinity of Regeneration Harvest **Units 25, 26, 27, 28 and 33**, with the units running adjacent to or through these trails. Both of these trails are part of the Sheep Mountain Trail system, and to minimize impacts to the public, attempts would be made (allowing for public safety during timber haul) to keep at least one trail open to allow for continued availability of loop riding opportunities.
b. Lodge Creek Loop Trail 606 (around T38N, R7E, Sections 6 and 7) is located in the vicinity of **Units 34 and 35**. To maintain public OHV trail access between the Clarke Mountain and Sheep Mountain OHV trail systems, logging activity would not be permitted Friday – Sunday and trail access would be open and available to the public.
c. **Units 14, 15, 16 and 18** are located within Deadhorse Loop Trail 610 (T39N, R7E, Section 7) which provides ATV access to the northern portion of the Sheep Mountain Trail system. While these units are being harvested, to minimize impacts to the public, NFS Road 683 would be made available to the public to ensure access to the northern portion of Trail 610 and the northern portion of the Sheep Mountain Trail system.
d. In the northern portion of the project area **Units 10, 11, 12 and 13** are adjacent to NFS Road 246 and bisect NFS Road 5323, both of which are designated portions of the Sheep Mountain Trail system. To minimize impacts to the public, attempts would be made (allowing for public safety during timber haul) to keep at least one road open to allow for continued availability of loop riding opportunities. .
e. **Unit 9** (T40N, R7E, Section 32) in the northern portion of the project area bisects Swanson Saddle Trail 614 and is also located within portions of Deadhorse Loop Trail 610 and Sheep Mountain Loop Trail 615. To provide public access in the northern portion of the Sheep Mountain Trail system, these trails would be open and available to the public on Friday – Sunday, between May – Oct.
f. No snow plowing would be allowed after December 15th on NFS Road 246, which is a popular groomed snowmobile route accessing the project area.

23. Remove all mud, soil, and plant parts from off road equipment before moving into the project area to limit the spread of noxious weeds. Conduct cleaning off National Forest lands.

24. Rock to be used for surfacing should be pre-treated in the fall or spring (prior to haul) to minimize the transport of noxious weed seeds.

25. If noxious weeds are found on the haul routes for this project, spraying of these weeds would occur along the road prisms two times, once before hauling and once after hauling is completed. Although the intent is to spray pre- and post-hauling, there may be some exceptions to this due to timing of logging and appropriate season of application. Spraying typically occurs during the spring or fall usually between June and early July, or during September. Treatment of invasive plants would be consistent with the strategy outlined in the North Fork Noxious Weed Treatment Environmental Assessment (2005).

26. In all units, to reduce ground disturbance, no ground-based skidding would be allowed on slopes over 35%, unless mitigating measures, such as operating on adequate compacted snow or only over short distances, are approved by the Timber Sale Administrator or Contracting Officer Representative. Mechanical falling and cut-to-length systems would be allowed on slopes exceeding 35% as approved to minimize soil disturbance.

D. Monitoring

The following monitoring activities would continue or be initiated with the Barnyard South Sheep project:

1. The Timber Sale Administrator or Contracting Officer Representative will make periodic checks on the progress of the sale to ensure contractual compliance.
2. INFISH compliance monitoring will be conducted annually by the Forest Fisheries Biologist in conjunction with BMP audits with the Forest Hydrologist. The monitoring is done on a sample of the recently completed activities each year, noted in the Monitoring Plan and reported in the annual Clearwater National Forest Monitoring and Evaluation Report available on the Forest web site http://www.fs.usda.gov/main/nezperceclearwater/home.
3. Soils monitoring will occur across the Forest to assess: (a) the accuracy of disturbance estimates; (b) if project design measures, such as live-tree retention, were effective; and (c) if units meet Regional soil quality standards. Sampling will cover all combinations of treatment and yarding methods, including units from this project. Results will be reported in the annual Clearwater National Forest Monitoring and Evaluation Report.

4. Herbicide effectiveness monitoring would occur following chemical application, within the season of treatment, to determine the success of treatments.

IV. Alternative Considered but Eliminated from Detailed Study

Alternative 5 – Watershed Restoration Only

1. Watershed Improvements

- Decommission 44.6 miles of system roads and 31.0 miles of non-system roads
- Place into storage 28.4 miles of system roads and 20.6 miles of non-system roads
- Improve numerous stream crossings by replacing or adding culverts.

This alternative would not fully meet the purpose and need, and it has been the policy on this Forest to look at restoration from ridgetop to ridgetop, using a holistic approach to ecosystem management. Thus, this alternative has been dropped from further consideration for the following reasons:

- Vegetative health and aquatic health are intricately linked on this landscape. Alternative 5 would only consider the aquatic needs and not address the vegetative need to improve species diversity and balance vegetative successional stages across the landscape.
- A majority of the Barnyard South Sheep area is allocated to Management Area E1, with the goal of a sustained production of wood products. Current watershed conditions do not preclude these types of actions.

V. Comparison of Alternatives

A. Comparisons of the Alternatives to the Purpose and Need

1. Restore white pine and larch to improve stand vigor and species diversity across the landscape.

Alternative 1 (no action) would not implement any timber harvest. Composition of white pine and larch would remain at 0%, and other seral species (lodgepole pine and ponderosa pine) would remain at 5%, dominated by dense stands of western redcedar, grand fir and Douglas-fir, with the latter two displaying poor health and low growth vigor.

Alternative 2 would best meet this purpose by: (a) regenerating 860 acres, followed by the planting of western white pine, larch, and other seral tree species; and (b) commercial thinning 730 acres to reallocate growing space in favor of healthy seral tree species. Timber harvest would cause a 5% decrease in the grand fir/Douglas-fir cover types, and the subsequent planting of seral species would cause a 5% increase in the western white pine cover type.

Alternative 3 would least meet this purpose, compared to Alternatives 2 and 4, by: (a) regenerating 430 acres, followed by the planting of western white pine, larch, and other seral species; and (b) commercial thinning 480 acres to reallocate growing space in favor of healthy seral tree species. Timber harvest would cause a 3% decrease in the grand fir/Douglas-fir cover types, and the subsequent planting of seral species would cause a 3% increase in the western white pine cover type.

Alternative 4 would meet this purpose by: (a) regenerating 560 acres, followed by the planting of western white pine, larch, and other seral tree species; and (b) commercial thinning 730 acres to reallocate growing space in favor of healthy seral tree species. Timber harvest would cause a 3% decrease in the grand fir/Douglas-fir cover types, and the subsequent planting of seral species would cause a 4% increase in the western white pine cover type.

2. Improve water quality conditions (i.e. reducing stream sediment) and soil productivity.

Alternative 1 (no action) would not implement any watershed improvement activities aimed at reducing sediment, and recovery of soil productivity in areas currently detrimentally disturbed would occur over time (i.e. several decades).

Alternatives 2, 3 and 4 would each improve watershed conditions by decommissioning 75.6 miles of problem roads and placing 49.0 miles of roads into a self-maintaining condition. The decommissioning of these roads, plus existing skid trails and landings, associated with the timber harvest would have positive effects on soils by initiating recovery of soil productivity functions.

3. Manage the landscape to provide for goods and services.

Alternative 1 (no action) does not provide any timber products or revenues to local economy. There would be no change in fish habitat or the availability of public recreational opportunities.

Alternative 2 would harvest an estimated 16.4 MMBF of timber products, valued at $1,601,223. Fish habitat would be protected with the implementation of INFISH buffers and in some cases improved following the decommissioning of problem roads and the replacement of undersized culverts. The effects on recreational opportunities would be mitigated.

Alternative 3 would harvest an estimated 9.9 MMBF of timber products, valued at $982,046. Fish habitat would be protected with the implementation of INFISH buffers and in some cases improved following the decommissioning of problem roads and the replacement of undersized culverts. The effects on recreational opportunities would be mitigated.

Alternative 4 would harvest an estimated 12.4 MMBF of timber products, valued at $1,060,073. Fish habitat would be protected with the implementation of INFISH buffers and in some cases improved following the decommissioning of problem roads and the replacement of undersized culverts. The effects on recreational opportunities would be mitigated.

B. Comparisons of Alternatives by Issues

The following table provides a comparison of the alternatives in relation to the issues described earlier in this chapter:

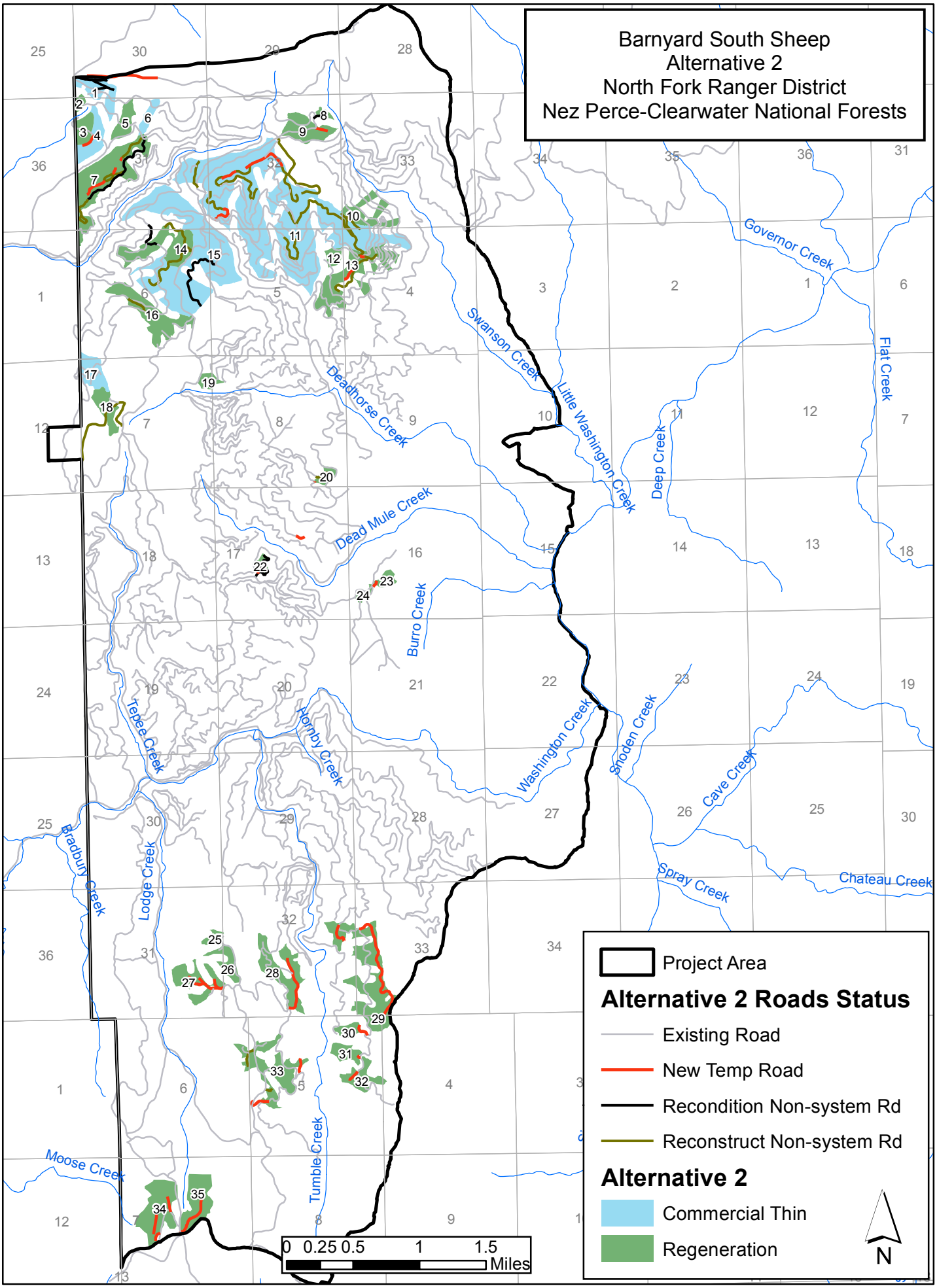
Table 2.5 - Comparison of Alternatives by Issues

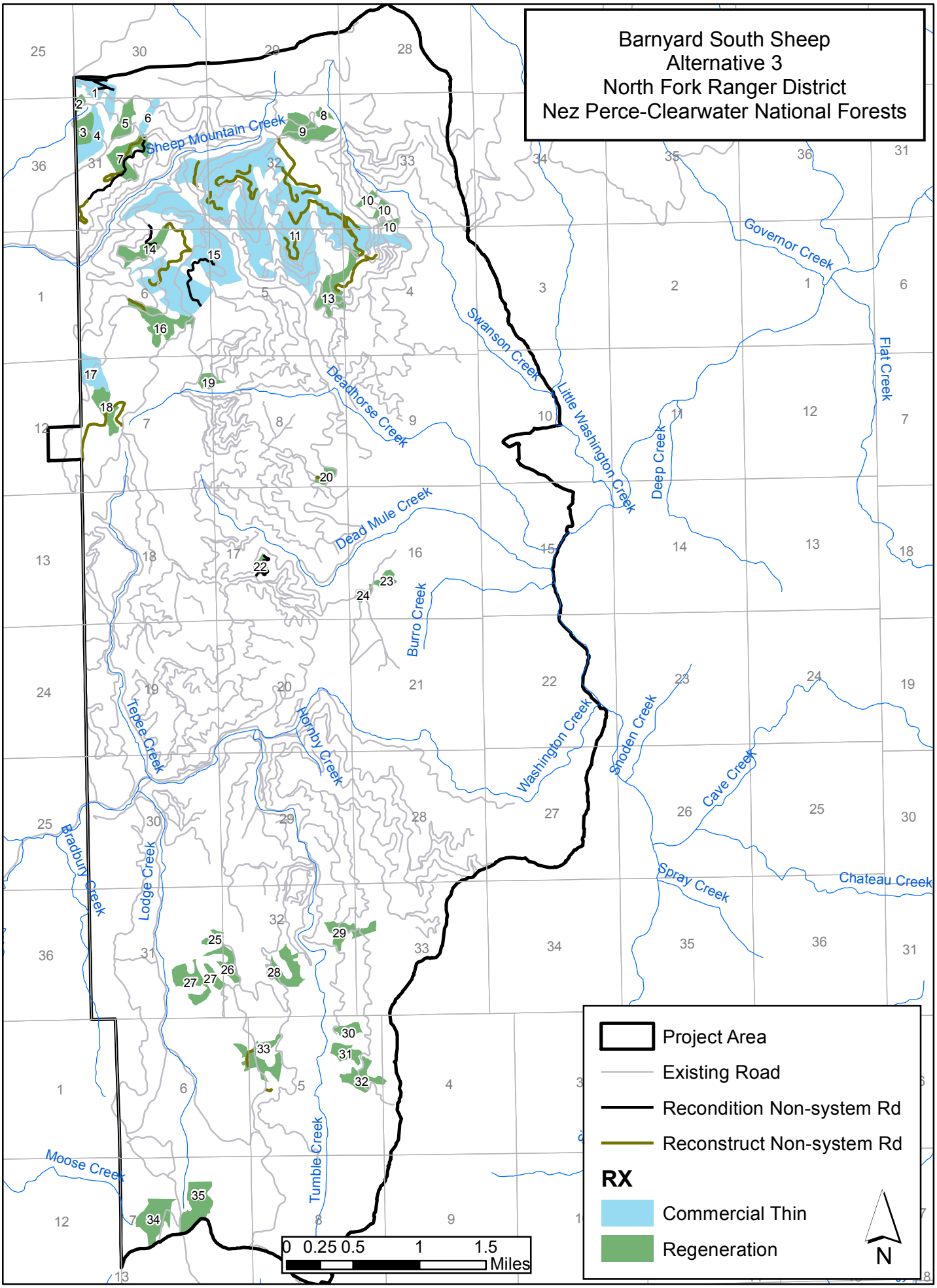
Resource Issue	Comparison Summary of Effects
Access Management – The effects of proposed watershed improvements on recreation opportunities and the area's transportation system.	
Alt 1 – No Action	There are no road activities proposed that would result in changes to the area's recreation opportunities or transportation system.
Alt 2	75.6 miles of road decommissioning 49.0 miles of roads placed into intermittent storage 30.1 miles of road reconstruction 29.6 miles of road reconditioning (maintenance) In summary, this alternative would have a high impact on OHV recreation, non-motorized recreation, firewood gathering, and hunting (short-term). This alternative would implement the minimum road system as recommended by the project Travel Analysis.
Alt 3	75.6 miles of road decommissioning 49.0 miles of roads placed into intermittent storage 19.3 miles of road reconstruction 29.6 miles of road reconditioning (maintenance) In summary, this alternative would have a low impact on all recreation activities, and would implement the minimum road system as recommended by the project Travel Analysis.
Alt 4	75.6 miles of road decommissioning 49.0 miles of roads placed into intermittent storage 28.8 miles of road reconstruction 29.6 miles of road reconditioning (maintenance) In summary, this alternative would have a moderate impact on OHV recreation, non-motorized recreation, firewood gathering, and hunting (short-term). It would implement the minimum road system as recommended by the project Travel Analysis.
Economic Feasibility – Provide for a cost efficient timber sale and funding to complete non-timber sale activities.	
Alt 1 – No Action	Not applicable.
Alt 2	Appraised Value = $758,946. This represents a **positive** sale offering that could fund a portion of the proposed non-timber sale activities.
Alt 3	Appraised Value = $502,123. This represents a **positive** sale offering that could fund a portion of the proposed non-timber sale activities.
Alt 4	Appraised Value = $459,643. This represents a **positive** sale offering that could fund a portion of the proposed non-timber sale activities.

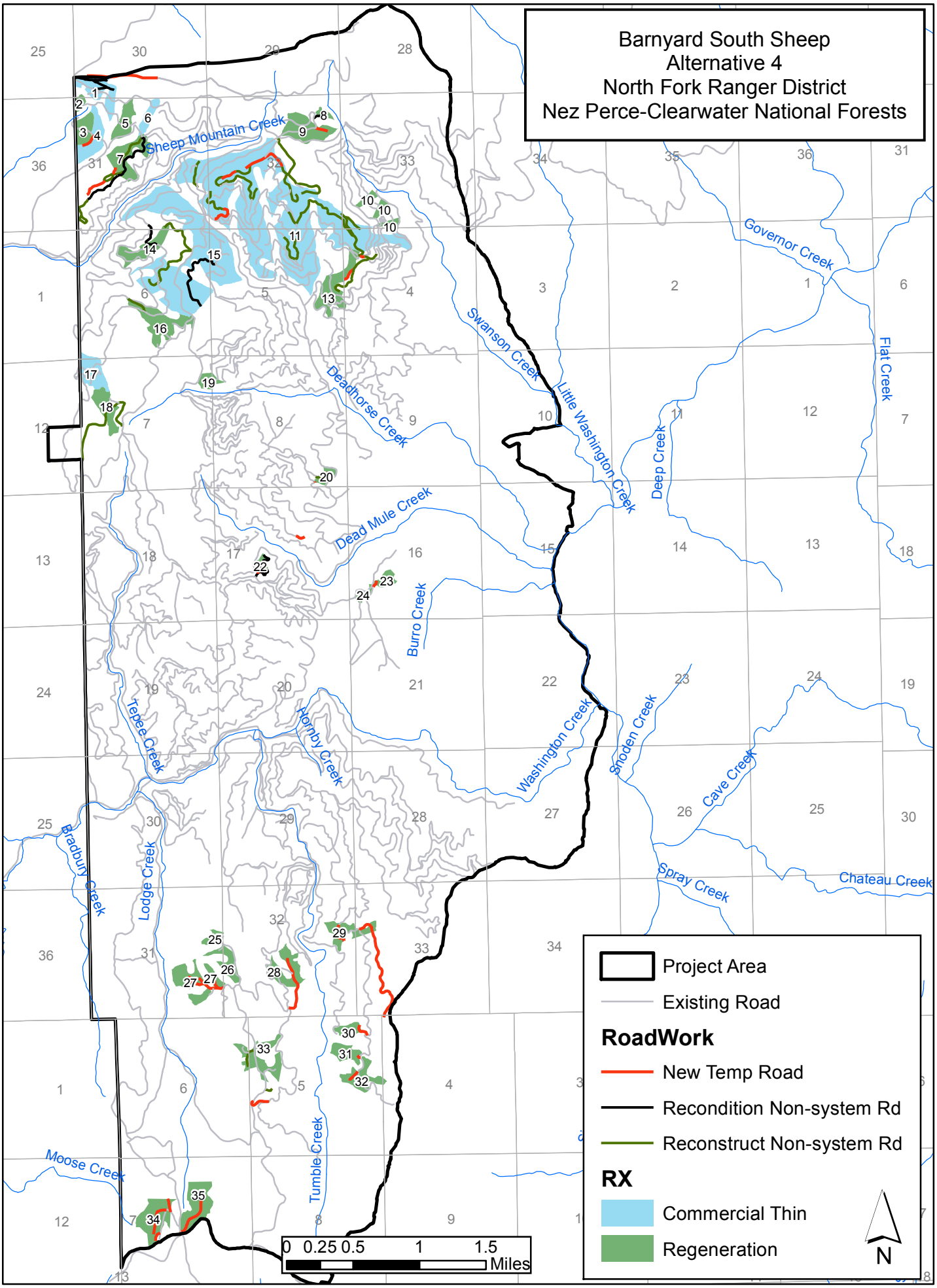
Resource Issue	Comparison Summary of Effects
MIS and TES Species of Wildlife – Certain species of wildlife could be affected by proposed management activities.	
Alt 1 – No Action	This alternative would have no direct or indirect effects on MIS or TES wildlife species, because none of the proposed treatments would be conducted. Two Elk Analysis Units would remain below the Forest Plan standard of 25%.
Alts 2, 3 and 4	The following is a brief summary of effects by species or species group: **Elk/Moose** – There would be little difference between the action alternatives at the project scale, with each alternative trending towards a better balance in cover and forage. The Forest Plan standard for elk habitat effectiveness would be met with each alternative. **Northern Goshawk –** There would be no meaningful reduction in foraging success or PFA for the hypothetical home range, resulting in little effect on goshawk abundance or persistence. **Pileated Woodpecker –** The net effect of each action alternative would be a possible reduction in foraging success in one or a few territories, but there should be no direct effect on individual pileated woodpeckers and little to no effect on woodpecker abundance or persistence. **Pine Marten -** Given the thousands of acres of modeled habitat within and outside the project area, the proposed activities would have no effect on marten survival within the project area. **Gray Wolf** – All habitat in the project area would remain suitable for wolves, and their prey species (deer, elk and moose) should benefit from the shift to more early seral habitat. **Canada Lynx** – Given the lack of sufficient habitats anywhere in the vicinity of the project area, only a dispersing lynx would likely be in the vicinity. Disturbing a dispersing lynx would have little or no effect on their survival and would not jeopardize their existence on the Forest. **Fisher** – Each action alternative would cause a slight reduction in fisher habitat, making it less desirable. However, no effects on fisher survival or reproduction would be anticipated, because adults and advanced juvenile fishers could easily avoid direct injury. **Flammulated Owl** – Since modeled habitat for this species is relatively rare, it is likely that the consequence of the regeneration harvest proposed under each alternative would be the lack of preferred habitat to attract or retain owls (if currently present) for the foreseeable future. On a Forest scale, the effects would be unmeasurable. **Fringed/Long-eared/Long-legged Myotis Bats** – Possible impacts would occur outside of modeled habitat and may impact individual bats. However, available roosting habitats would be protected, and nocturnal foraging along streams would remain unaffected, leaving the amount of modeled habitat unchanged. **Wolverine** – Since denning habitat is non-existent, any wolverine use would be transient. Therefore, any disturbance by proposed activities would not affect their survival or reproduction. **Neotropical and other Migratory Birds** – Timber harvest would reduce core habitat for species that exclusively use densely forested areas, which may reduce nesting habitat. Although each alternative would reduce forest canopies and add some degree of fragmentation and edge habitats, those species that prefer open canopies and early-seral habitat would benefit.

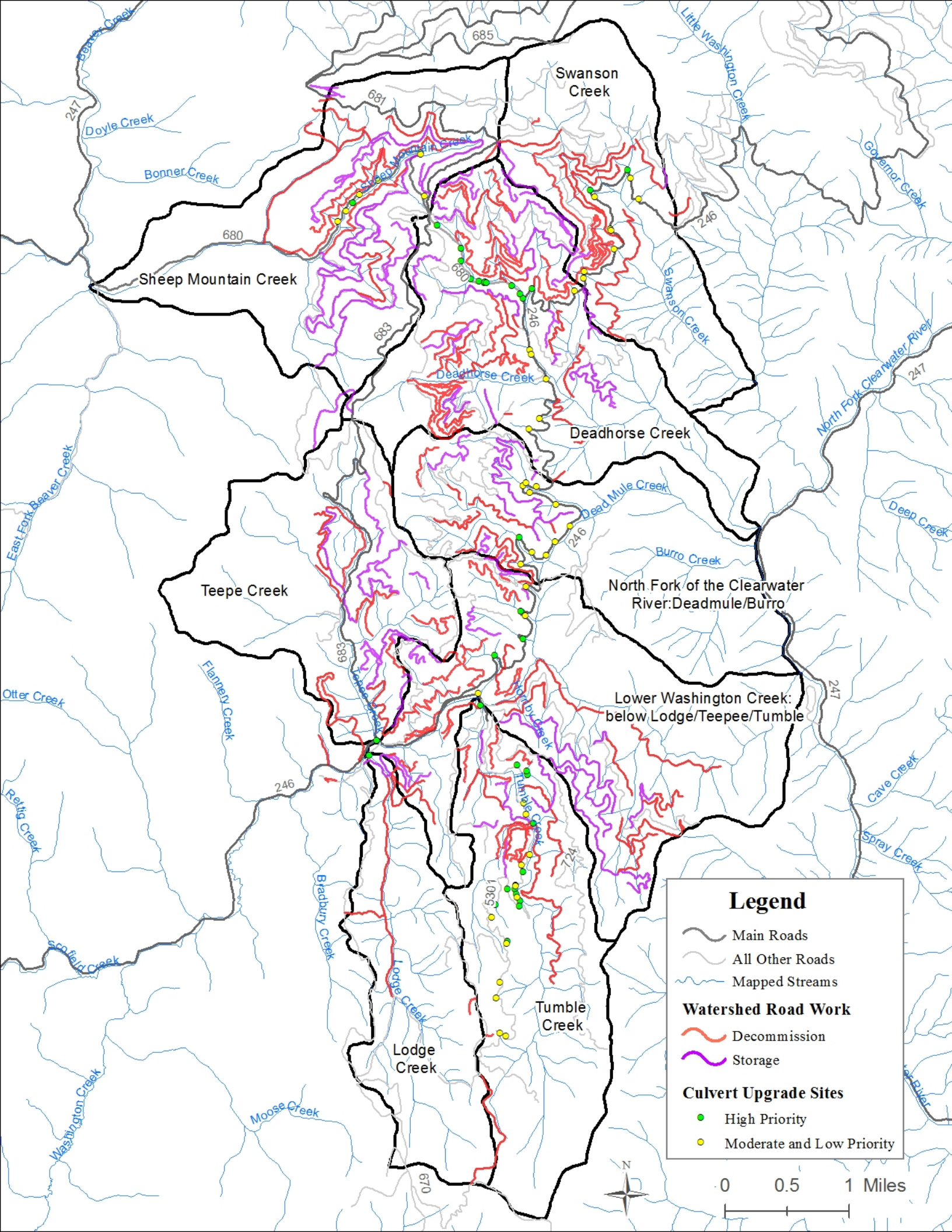
Resource Issue	Comparison Summary of Effects
MIS, Sensitive, and Threatened Species of Fish – Certain species of fish could be affected by proposed management activities.	
Alt 1 – No Action	This alternative would have no direct or indirect effects on fish or other aquatic species, because none of the proposed treatments would be conducted.
Alts 2, 3 and 4	The effects of each alternative would be limited to possible temporary and site-specific impacts related to road decommissioning, storage, reconstruction, culvert replacement, and hauling, which may injure or kill a small number of individuals or affect the habitat of these species. In regard to westslope cutthroat trout, redband trout, and western pearlshell mussel, each of these alternatives would impact individuals or habitat, but would not likely cause a trend toward federal listing or reduce viability for the population or species. In regard to bull trout, the same proposed activities of each alternative are not likely to adversely affect individuals or habitat.
Sensitive Plants – Plants that may occur within the analysis area could be affected by proposed management activities.	
Alt 1 – No Action	There would be "no impact" to sensitive plants in the area.
Alts 2, 3 and 4	For most species, the effects of these alternatives would be about the same, with Alternative 2 proposing more activities that transform habitat. For all sensitive plant species considered in detail, the effects of each alternative "may impact individuals or habitat but not likely cause a trend towards federal listing or reduce viability for the population or species." A "beneficial impact" is possible for evergreen kittentail and Idaho barren strawberry.
Soil Stability and Erosion Hazards – Removal of vegetation and/or ground disturbance associated with timber harvest, road construction, or prescribed fire can increase erosion on certain landtypes.	
Alt 1 – No Action	There are no activities proposed affecting soil stability and erosion hazards.
Alts 2, 3 and 4	High landslide and stability hazards are present on 42 treatment acres in Alt. 2; on 15 treatment acres in Alt. 3; and on 20 treatment acres in Alt. 4. To mitigate this, unstable and landslide-prone areas would be further delineated in the field during unit layout using site-specific stability indicators (see mitigation/design measure #2) and would receive a no-harvest, no-ignition buffer.
Soil Productivity – The ash-derived soils, common in much of the project area, are highly susceptible to compaction, displacement and loss of site productivity.	
Alt 1 – No Action	No activities are proposed.
Alts 2, 3 and 4	Depending on the specific alternative, 5 to 10 harvest units would require implementation of unit-specific design measures in order to meet Regional soil standards (refer to design measures #13 and #14).

Resource Issue	Comparison Summary of Effects
Water Quality and Quantity – Forest management activities alter watershed conditions which may affect water quality and quantity/yield.	
Alt 1 – No Action	Existing condition: Road densities in the eleven affected drainages range from 4.1 mi/mi^2 to 10.5 mi/mi^2 ECAs in three affected subwatersheds range from 2.1% to 17.6% (<25% is the research recognized level of ECA) There would be no change in sediment yield from its current status.
Alt 2	Road densities would range from 2.9 mi/mi^2 to 7.9 mi/mi^2 ECAs would range from 3.5% to 18.3%, which is below the recognized level of 25% There would be no measureable increase in sediment delivery to streams with the implementation of watershed and soils design measures.
Alt 3	Road densities would range from 2.9 mi/mi^2 to 7.9 mi/mi^2 ECAs would range from 2.8% to 17.9%, which is below the recognized level of 25% There would be no measureable increase in sediment delivery to streams with the implementation of watershed and soils design measures.
Alt 4	Road densities would range from 2.9 mi/mi2 to 7.9 mi/mi2 ECAs would range from 3.2% to 18.1%, which is below the recognized level of 25% There would be no measureable increase in sediment delivery to streams with the implementation of watershed and soils design measures.


Barnyard South Sheep
Alternative 2
North Fork Ranger District
Nez Perce-Clearwater National Forests
Project Area
Alternative 2 Roads Status
Existing Road
New Temp Road
Recondition Non-system Rd
Reconstruct Non-system Rd
Alternative 2
Commercial Thin
Regeneration
N
0 0.25 0.5 1 1.5
Miles
Governor Creek
Flat Creek
Swanson Creek
Little Washington Creek
Deadhorse Creek
Deep Creek
Dead Mule Creek
Burro Creek
Washington Creek
Snoden Creek
Cave Creek
Spray Creek
Chateau Creek
Tepee Creek
Romby Creek
Bradbury Creek
Lodge Creek
Tumble Creek
Moose Creek


Barnyard South Sheep
Alternative 3
North Fork Ranger District
Nez Perce-Clearwater National Forests
Sheep Mountain Creek
Governor Creek
Swanson Creek
Little Washington Creek
Flat Creek
Deadhorse Creek
Deep Creek
Dead Mule Creek
Burro Creek
Washington Creek
Snoden Creek
Cave Creek
Tepee Creek
Romby Creek
Bradbury Creek
Lodge Creek
Spray Creek
Chateau Creek
Moose Creek
Tumble Creek
Project Area
Existing Road
Recondition Non-system Rd
Reconstruct Non-system Rd
RX
Commercial Thin
Regeneration
0 0.25 0.5 1 1.5
Miles
N


Barnyard South Sheep
Alternative 4
North Fork Ranger District
Nez Perce-Clearwater National Forests
Sheep Mountain Creek
Governor Creek
Swanson Creek
Little Washington Creek
Flat Creek
Deadhorse Creek
Deep Creek
Dead Mule Creek
Burro Creek
Tepee Creek
Romby Creek
Washington Creek
Snoden Creek
Cave Creek
Bradbury Creek
Lodge Creek
Spray Creek
Chateau Creek
Tumble Creek
Moose Creek
Project Area
Existing Road
RoadWork
New Temp Road
Recondition Non-system Rd
Reconstruct Non-system Rd
RX
Commercial Thin
Regeneration
0 0.25 0.5 1 1.5
Miles
N


Swanson Creek
Sheep Mountain Creek
Deadhorse Creek
Teepe Creek
North Fork of the Clearwater River:Deadmule/Burro
Lower Washington Creek: below Lodge/Teepee/Tumble
Tumble Creek
Lodge Creek
Doyle Creek
Bonner Creek
Little Washington Creek
Governor Creek
Swanson Creek
North Fork Clearwater River
Deep Creek
East Fork Beaver Creek
Dead Mule Creek
Burro Creek
Flannery Creek
Otter Creek
Cave Creek
Spray Creek
Retig Creek
Bradbury Creek
Scofield Creek
Washington Creek
Moose Creek
685
681
680
683
246
247
724
530
670
Legend
Main Roads
All Other Roads
Mapped Streams
Watershed Road Work
Decommission
Storage
Culvert Upgrade Sites
High Priority
Moderate and Low Priority
N
0
0.5
1 Miles

CHAPTER 3
AFFECTED ENVIRONMENT

This chapter describes the baseline (existing) conditions against which environmental effects can be evaluated with the implementation of any of the action alternatives. Most of the environmental descriptions in this chapter reference specialist reports and technical data contained in the project file.

I. Soils (Ref: Barnyard South Sheep Soils Report)

Soils across the project area vary by slope, aspect, parent material, texture, depth, vegetative cover, and microclimate. Soils are generally deep (45 to +60 inches) with volcanic ash cap or mixed-ash topsoil overlying coarser sandy or gravelly loam subsoil. These soils have overall high productivity, no major regeneration limitations and are well-drained. Subsoils in the project area are primarily derived from Idaho Batholith granite. Across the project area, about 60% of the granite parent material is considered grussic and more sensitive to disturbance, while about 40% of the granite parent material is considered non-grussic, less-sensitive to disturbance and more productive.

Areas of thin, coarser textured and rockier soils with minimal volcanic ash influence are present in the project area. These soils are less productive and have a relatively low water-holding capacity. They are often found on warmer and more exposed southerly aspect slopes, thus these sites can be droughty and present regeneration problems. Thin and rocky soils in the project area are often associated with a higher watershed sensitivity to vegetation removal. These areas have a higher potential for increased peak flows in streams, due to changes in snow interception, distribution and melt processes and decreased evapotranspiration in the years immediately following harvest. Poorly drained soils with higher subsurface clay content and perched water tables are found in valley bottoms and depositional areas. Grussic granitic soils present in the project area are sensitive to disturbance, highly erodible and difficult to revegetate due to low fertility and low water-holding capacity. Retention of the ash cap and ash-influenced topsoil is critical to maintain productivity and erosion protection on these areas (Wilson et al. 1983).

Volcanic ash deposited by wind after eruptions in the Cascade Range has greatly influenced the local landscape and soils. The most influential eruption was that of Mt. Mazama (~6,700 years ago) located in southwestern Oregon at Crater Lake. Soils weathered and developed from volcanic ash are fundamental to the overall high productivity of the project area due to very high infiltration rates and water-holding capacities compared to the coarser-grained soils weathered from bedrock parent materials.

A. Landtype Associations

Ecological land units used to describe and evaluate the project are the larger landscape-scale landtype associations (LTAs) and smaller-scale landtypes (Wilson et al. 1983). Landtype associations and landtypes are mainly defined and delineated by similarities in soils, landforms, geologic parent materials and plant associations. These factors affect biotic distributions, hydrologic function, soil erosion and productivity, natural disturbance regimes and other ecological processes. The major landtype association landforms in the project area are low-relief rolling hills (50%) and breaklands (25%). The distribution of LTAs in the project area is displayed in Table 3.1 and Figure 3.1.

Table 3.1 – LTA Composition for the Barnyard South Sheep Analysis Area.

LTA	LTA Description	LTA Groups	% of Project Area
81A	Granitic, Low-relief, Rolling Hills, Non-umbric	Low-relief Rolling Hills	50%
81B	Granitic, Low-relief, Rolling Hills, Umbric		
21A	South-facing, Thin Soil, Highly Weathered, Granitic Breaklands	Breaklands	25%
21B	South-facing, Deep Soil, Highly Weathered, Granitic Breaklands		
21C	North-facing, Granitic, Breaklands		
61	Highly Weathered, Granitic, Colluvial Midslopes	Colluvial Midslopes	14%
71B	Highly Weathered, Granitic, Frost-churned Ridges, Lodgepole Pine-Dry	Frost-churned Ridges	9%
71C	Highly Weathered, Granitic, Frost-churned Ridges, Subalpine Fir-Moist/Wet		
10A	Low Elevation (<4500') Stream Bottoms & Meadows	Stream Bottoms	2%
10B	High Elevation (>4500') Stream Bottoms and Meadows		
90	Mass Wasted Areas	Mass Wasted	0.3%

Low relief rolling hills are gently rolling uplands areas with slopes ranging from 10-30%. This LTA group occupies 50% of the project area and dominates the project area. Topography is generally are flat to rolling. Soils are a result of deep chemical weathering. Because of the deep soils and gentle topography, these contain some of the most productive sites on the Forest. Soils in this LTA can also have water restricting clay layers (fragipans) or umbric surface layers that support very moist habitat types. Landtype erosion hazards are generally low to moderate except in areas with grussic granitic subsoils that have high to very high subsurface and parent material erosion potential.

Breaklands occupy 25% of the project area and generally located on the east portion of the project area. They generally have slopes over 60% and exceed 120% in some areas. First and second order streams are high energy and channels are sensitive to debris jams. Bedrock substrate is common. Soil stability and mass wasting concerns are typically high in breakland areas, due to steep slopes, subsurface water concentrations, and complex, dissected topography. High and very high parent material and subsurface erosion hazards exist on this landtype in areas with grussic granitic soils.

Colluvial midslopes are transitional landforms with slopes ranging from 30 to 60%. This is a major LTA group occupying 14% of the project area. This group generally occurs adjacent to the low-relief rolling hill LTA group. Ridges generally are convex and the sideslopes are straight, but concave areas that accumulate surface and subsurface water can be common. Soil creep, surface erosion, and mass wasting events are the dominant erosional processes. Project area landtype erosion hazards are generally low to moderate except in areas with grussic granitic subsoils that have high to very high subsurface and parent material erosion potential.

Frost-churned ridges occur in upper hillsope positions at high elevations but below zones of past glaciation. Slopes are generally less than 50% in the project area with some steeper inclusions. Landtype erosion hazards are generally low to moderate, yet high mass wasting potential exists in isolated areas with steeper concave slopes and subsurface water concentrations. High surface erosion potential is present on the south-aspect steeper slopes of near Sheep Mountain in the north portion of the project area.

Streambottoms are predominantly alluvial, and consist of floodplains, old stream terraces, meadows and frost pockets. These are meandering, low gradient streams that are moderately to very sensitive to changes in flow and sediment regime. Many of these areas have saturated soils and wetland vegetation. Although mass wasting and surface erosion hazard ratings are generally low, there is a risk of sedimentation from roads in close proximity to streams due to high and very high parent material erosion hazards.

Mass wasted areas occupy 0.3% of the project area. These areas have already experienced mass wasting events (e.g. landslides, debris torrents/avalanches, rotational slumps). Some of these have arrived at their final, stable angle of repose, but other areas retain a high potential for further movement. The areas have a combination of wet areas and dry scarp slopes.

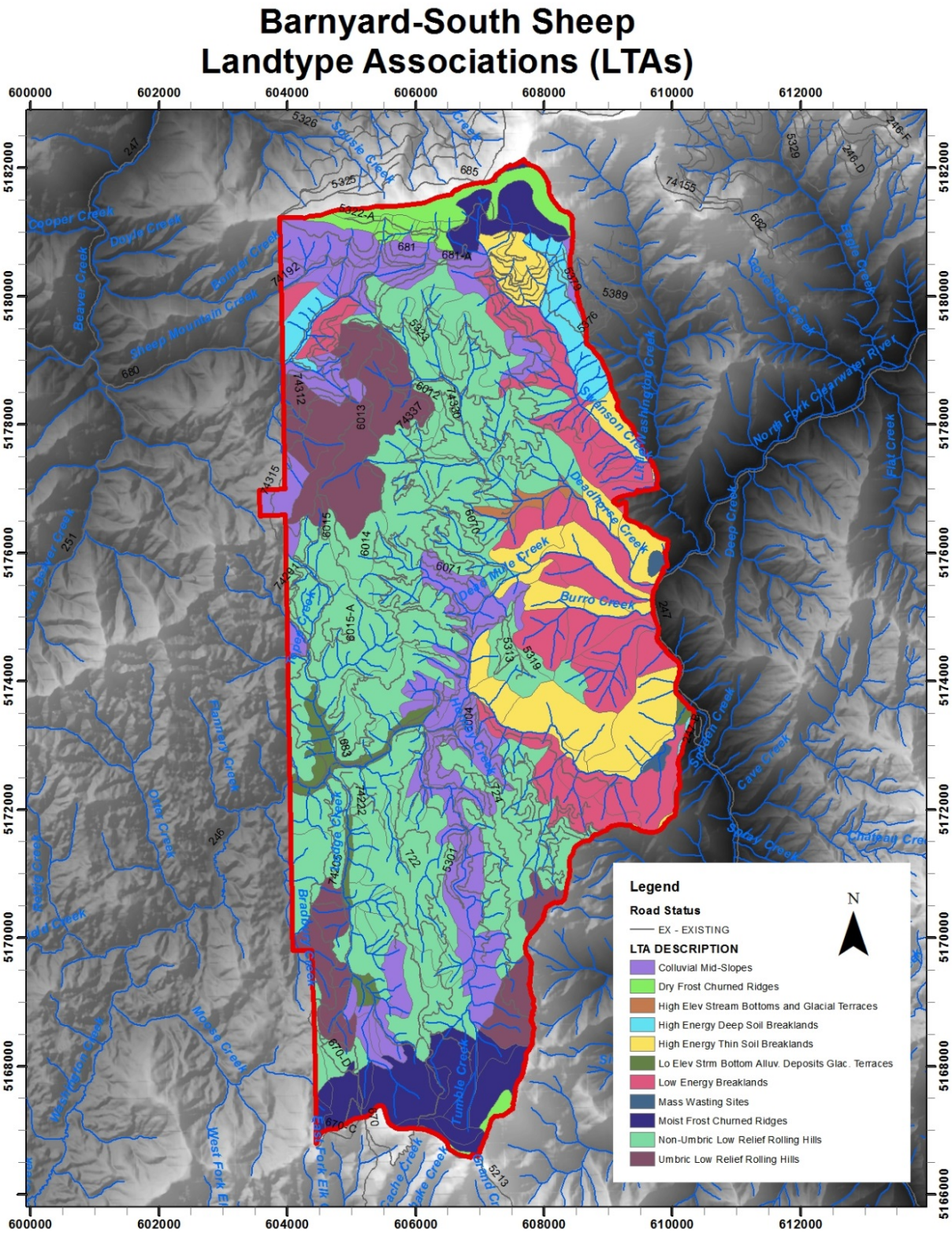


Figure 3.1 - Project Area Landtype Associations

B. Soil Stability and Erosion Hazards

Table 3.2 displays the potential for mass wasting, debris avalanches, surface erosion, subsurface erosion, parent material erosion, and sediment delivery efficiency within the project area. Landtype erosional characteristics are based on the Land System Inventory for the Clearwater National Forest (Wilson et al 1983).

Table 3.2 – LTA Group Erosion Hazards in the Barnyard South Sheep project area.

LTA Group (% of area)	LTA	Area (acres)	Mass Wasting Potential	Debris Avalanche Potential	Surface Erosion Potential	Subsurface Erosion Potential	Parent Material Erosion Potential
Low-relief, Rolling Hills (50%)	81A	7102	L,M	L,M	L	H,L	VH,H
	81B	1630	M	L	L	H,L	VH,H
Breaklands (25%)	21A	1653	M,H	H,M	M,H,L	M,H	L,VH,M
	21B	409	H,VH	H,M	L	H,M	VH,M
	21C	2257	H,M	M,L,H	L,H,M	M,H	M,VH
Colluvial Midslopes (14%)	61	2498	M,L	L,M	L, M	L,H,M	VH,M,H
Frost-churned Ridges (9%)	71B	436	L,H	L	H,L	L	L
	71C	1162	L,H	L	L	L	L
Stream Bottoms (2%)	10A	298	L	L	L	L	L
	10B	88	L	L	L	L	L
Mass wasted (0.3%)	90	44	VH	M	L	M	L

During storm and flood events in the 1995-1996 period, over 860 landslides occurred across the Clearwater National Forest, with high frequency in the vicinity of the project area. Four landslides originating at roads and two with natural origins were documented in the project area. The road – related slides occurred in Sheep Mountain and Tumble Creek watersheds and the natural slides occurred on the breaklands in Burro and Washington Creek watersheds. More recent slides originating at Road 246 in the upper Swanson Creek watershed have occurred, with one in the early 2000s and one in 2011.

A survey was conducted to review these landslides and five factors were identified to assess the inherent risk of landslides on the Clearwater National Forest (McClelland et al. 1997). The analysis

was based upon an inventory of landslides that occurred on the Forest during storm events in the fall of 1995 and the winter/spring period of 1996. The five factors commonly used to assess landslide hazard and slope stability on the Forest are slope angle, geologic parent material, landform, aspect and elevation (Megahan et. al., 1977).

Geology, slope angle, and landform are considered to be the most important factors, since elevation and aspect generally impact climatic conditions (whether the precipitation occurred as rain or snow) and the storm direction.

The geologic parent material of the Barnyard South-Sheep project area is comprised of a mixture of Idaho Batholith granitic rocks (80%), undifferentiated parent material (17%), and minor components of alluvial sediments (2%), and glacial tills (1%) (Wilson et al 1983). The undifferentiated materials have varying composition with granitic components the most common. Isolated areas of Border Zone metamorphic rocks and Belt series rocks are present in areas mapped as undifferentiated. The soil stability and landslide hazards associated with Granitic and Belt Series are moderate, alluvial sediments are low and Border Zone metamorphic rocks are high. Border Zone metamorphic rocks were observed in the Swanson, Deadhorse and Sheep Mountain Creek watersheds where landslides have been documented.

Slope angles in the project area range from <2% to >120%. Slope angle is closely associated with landform, since certain landforms typically have steeper slopes than others. Low-relief, rolling hills are relatively stable with slopes ranging from 10-30%. Colluvial midslope landforms, which generally have slopes ranging from 30-60%, have overall moderate stability hazards, but do contain high hazard areas on steeper slopes, concave areas, southerly aspects, thin soils, and unstable parent materials. Breaklands and mass wasted slopes are the most unstable landforms in the project area. Slopes in breakland areas are generally greater than 60% and exceed 120% in some areas.

Aspects vary widely across the project area. South, southwest, west and southeast aspects have high landslide hazard ratings, based on previous landslide occurrence on the forest. North, northeast, northwest, and east aspects have low landlside hazard ratings due to the lower frequency of slides observed on these aspects.

Elevations within the project area range from 2080 at the mouth of Deadhorse Creek to 5800 near both Elk Mountain and Sheep Mountain. This range overlaps the zone where the majority of landslides occurred during the 1995-1996 storm events.

Past management activities have influenced the existing soil stability and erosion potential in the project area, with roads having the greatest impacts. Harvest operations and motorized recreation are other activities that have increased soil erosion and instability. Natural erosion and mass wasting events (i.e. landslides, debris flows) have occurred and will continue to occur in the project area. These events, often associated with fire disturbance and intense weather events, have shaped the project area landscape.

C. Soil Productivity

Soil productivity is defined as the inherent capacity of the soil resource, including the physical, chemical, and biological components, to support resource management objectives. It includes the growth of specific plants, plant communities, or a sequence of plant communities (USDA 2014).

Past management activities have impacted the existing productivity of the soils in the project area. Decreased productivity in the project area is mostly the result of soil compaction, displacement and

erosion on roads and skid trails. Down coarse woody material (CWD) is generally low and below recommended amounts in areas with previous activities due to past timber and slash removal.

1. Compaction, Displacement and Productivity

Soil compaction can result from the use of mechanized equipment during harvest practices. This often leads to a decrease in total porosity and increased soil strength and volumetric water content, which can result in increased water runoff and soil erosion, less rooting volume, and poor aeration (Curran et al. 2005; Page-Dumroese et al. 2006a, Greacen et al. 1980). The effects of compaction on soil properties can lead to decreased plant growth and soil productivity (Powers 1990, Froehlich et al. 1985).

Researchers have also found the detrimental effects of compaction on productivity to be variable in duration and extent, dependent on soil texture and other site specific factors affecting air and water balance in the soil (Curran et al. 2005; Powers et al. 2004; Page-Dumroese et al. 2006b; Froehlich et al. 1985; Fleming et al. 2006). Surface layers to a depth of several centimeters generally recover to undisturbed bulk densities faster than the subsurface layers, but the effects of compaction can last for decades (Froehlich et al. 1985). Recovery after soil compaction can occur from a variety of physical and biological processes. Physical recovery processes include freeze-thaw and wetting-drying cycles which are very site-specific. Biological recovery of soils affected by compaction is dependent on the activity of roots and soil organisms. Soil decompaction would enhance the decomposition activity of soil microorganisms by improving water and gas infiltration and exchange.

Surface soil loss through displacement and mixing with less productive substrata decreases soil productivity. This occurs during temporary road construction, excavation of skid trails and landings, and displacement of soils during ground based harvest. The loss of the Mazama ash cap layer, which exists over much of the Barnyard South Sheep project area, would reduce the water-holding capacity and increase the overall soil bulk density. These effects would decrease available soil moisture and tree root penetration. Since volcanic ash is not replaced, the effects of erosional losses of the ash cap would be long-term.

2. Organic Matter and Productivity

Soil organic matter is fundamentally important to sustaining soil productivity (Powers *et al.* 2005; Powers 2002) but can be influenced by fire, silviculture activities, and decomposition and accumulation rates. Forest soil organic matter influences many critical ecosystem processes, including water-holding capacity and the formation of soil structure. Soil structure influences soil gas exchange, water infiltration rates and water-holding capacity. Soil organic matter is the primary location for nutrient cycling and humus formation by microorganisms, which enhances soil cation exchange capacity and overall fertility. Soil organic matter is most concentrated in the surface soil horizons. Surface soil displacement (e.g. excavations, ground-based machinery disturbance, log-skidding) and erosion can result in a loss of soil organic matter.

Soil organic matter depends on inputs of biomass (e.g. vegetative litter, fine and coarse woody debris) to build and maintain the surface soil horizons, support soil biota, enhance moisture-holding capacity, and prevent surface erosion. Woody debris in the form of slash also provides a practical and effective mitigation for reducing harvest impacts on soil physical function and processes.

The retention of CWD is essential to maintaining soil organic matter, soil productivity and sustainable forest ecosystems (Graham et al. 1994). Regional guidance on retention of CWD recommends following guidelines such as those contained in Graham et al. (1994). Graham recommended CWD

amounts of 7–15 tons/acre for drier habitat types (e.g. Douglas-fir, ponderosa pine) and 17–33 tons/acre for moister habitat types (e.g. western redcedar). Retaining these amounts of down CWD and providing for future recruitment through the natural addition of snags and standing trees should provide sufficient nutrients and organic material for long–term soil productivity (100-300 years).

II. Watershed (Ref: Barnyard South Sheep Watershed Report)

A. Watershed Characteristics

Elevations within the project area climb from about 2,100 feet at the mouth of Deadhorse Creek on the North Fork Clearwater River to 5,800 feet at Elk Mountain above Tumble and Lodge creeks. Average precipitation ranges from 44 inches along the lower portions of the face drainages to the North Fork (e.g. Deadmule/Burro) to over 60 inches near upper Tumble and Lodge creeks, with over half of annual precipitation received as snow November thru March (PRISM). Geology is composed primarily of granitic rock associated with the Idaho Batholith. Much of the area is overlaid by Mount Mazama volcanic ash up to 20 inches or more in thickness. The landforms in the Barnyard South Sheep project area are mostly low relief hills, followed by colluvial midslopes, and areas of breaklands along most of the lower portions of the face drainages to the North Fork.

In the project area drainages, headwater tributaries are mostly high gradient A and B channel types with lower portions of mainstem alluvial channels, such as Lodge, Tumble, and Washington creeks characterized by less confined, cobble and gravel B and C channel types. No stream gages exist in the project area, but extrapolations have been made from the USGS gage on the North Fork Clearwater River near Canyon Ranger Station, ID. The streams in the basin have a spring snowmelt hydrograph, with high flows in May and June and low flows during the late summer and early fall. Occasionally there are large flows from rain on snow events. Streamflow models for project area drainages reveal that a total of about 5% of the mean annual flow at the North Fork USGS site is produced here, with Washington Creek at the mouth accounting for well over half of this (USGS 2014).

B. Activities and Existing Indicators

The Barnyard South Sheep project area covers lands that are managed solely by the Forest Service; however, large portions of the cumulative effects analysis watersheds of Washington Creek and Beaver Creek are owned and managed for private and state forest industry purposes (71% and 83% non-Forest Service ownership, respectively). Overall the project drainages have had a high level of management activity. Trails and roads were built in the area, with timber harvest activities dating back to 1935 (USDA 1999). Recreational trail use is popular in the area with 56 miles of managed trails, and dispersed campsites occur across the landscape.

Timber harvest has been a major activity in the cumulative effects analysis area since the early 1900s. Over this time period, large fire events affecting project drainages have occurred in 1919 and 1957 but since then most fires have been suppressed. Prior to the fire suppression era, wildfire was the dominant disturbance process (USDA 1999). A large road network is present and most of the main tributaries have roads along the valley bottom streams. Six landslides related to roads and two natural landslides have occurred in the project area, as a result of the historic 1995/96 flood events (USDA 1999). Table 3.3 displays the watershed existing condition information in relation to past harvest, fire and roads.

Table 3.3 – Existing condition information for Barnyard South Sheep Watersheds.

Drainage	Watershed Acres (% Forest Service, FS, land indicated)	Percent of Forest Service Land with Past Harvest (since 1956)	Percent of Forest Service Land with Large Fire Occurrence (since 1914)	Road Miles (% Forest Service, FS, managed indicated)	Road density* (mi/mi^2)	ECA*[a] (% in 2016)
Washington Creek HUC 6 – 170603070801	30,143 (29% FS)	14%	9%	273 (42% FS)	5.8	15.6
Tepee Creek	2,111 (59% FS)	44%	—	30 (62% FS)	9.2	—
Lodge Creek	1,555 (100% FS)	35%	90%	10 (100% FS)	4.3	—
Tumble Creek	2,309 (100% FS)	42%	11%	24 (100% FS)	6.7	—
Lower Washington Creek: below Lodge/Tepee/Tumble	3,110 (100% FS)	48%	14%	37 (100% FS)	7.7	—
Little Washington Creek-North Fork Clearwater River HUC 6 – 170603070802	19,843 (100% FS)	25%	77%	126 (100% FS)	4.1	2.1
North Fork of the Clearwater River: Deadmule/Burro creeks	2,237 (100% FS)	29%	54%	17 (100% FS)	4.8	—
Deadhorse Creek	2,648 (100% FS)	61%	27%	43 (100% FS)	10.5	—
Swanson Creek	1,923 (100% FS)	47%	27%	21 (100% FS)	7.2	—
Beaver Creek HUC 6 – 170603080401	39,800 (17% FS)	11%	2%	392 (26% FS)	6.3	17.6
Sheep Mountain Creek	2,602 (62% FS)	42%	1%	42 (78% FS)	10.2	—

* ECA and road density calculations include privately owned land portions of the watershed.
[a]The ECA assessment is typically applied at the larger watershed scale (HUC 6, between 10 to 40 thousand acres).

General Watershed Condition (Roads): There are about 226 miles of roads in the project area drainages, which are part of the larger road system mileages reported for the larger Washington Creek,

Little Washington Creek-North Fork Clearwater River, and Beaver Creek HUC 6 watersheds. For all drainages, total road densities (roads open and closed to motorized traffic) range from 4.3 mi/mi^2 to 10.5 mi/mi^2 and are greater than 3.0 mi/mi^2 density indicator which is considered "Low" or poor watershed condition (NMFS 1998).

Water Quantity: Past harvest and existing roads result in existing ECAs of 15.6% in the Washington Creek, 2.1% Little Washington Creek-North Fork Clearwater River and 17.6% in the Beaver Creek HUC 6 watersheds. These ECAs in the analysis area indicate overall moderate habitat conditions (15-20% ECA) in the Washington and Beaver Creek HUC 6s, and good habitat conditions (<15% ECA) in the Little Washington Creek-North Fork Clearwater River HUC 6 (NMFS 1998). All cumulative effects analysis watersheds are under the 25-30% threshold generally recognized as the point where water yield is increased beyond acceptable limits (Gerhardt 2000). Hydrologic recovery from earlier timber harvest has occurred, and only those acres logged less than 23 years ago are part of the reported ECA (Ager and Clifton 2005).

It is important to note that almost 100% of the ECA values for both the Washington and Beaver Creek watersheds are due to activities on private and state managed lands. It is also important to note that about 20% of the ECA values for both the Washington and Beaver Creek watersheds and 90% of the Little Washington Creek-North Fork Clearwater River watershed ECA value are due to road areas. This may be a conservative overestimate of the effects, because roads that are not open to motorized traffic and are growing over with vegetation are not likely to have the same runoff response as traveled roads. However, where data is available for Forest Service managed roads, less than 6-25% of the mileages reported for all HUC6 watersheds are shown to be closed to motorized traffic, which equates to less than half of one percent ECA for these watersheds.

A search of water rights was made within the project analysis area and identified one domestic water right on an unnamed tributary to the North Fork Clearwater River associated with the Washington Creek campground (USFS owned). The Barnyard South Sheep proposed action Alternatives would not alter any existing claim for this water right nor decrease the available water relative to this claim.

C. Existing Stream Conditions

A review of analysis area stream conditions is summarized within the North Fork Big Game Habitat Restoration on a Watershed Scale (BHROWS, USDA 1999), and important highlights are included here along with recent monitoring data where available. Since the BHROWS was released, no major activities have occurred on Forest Service managed lands that would have markedly changed stream conditions except for 2 landslides that occurred in (2000s) off of the 246 Road in the Swanson Creek drainage. Overall, stream conditions range from high integrity within the headwaters of Lodge and Tumble creeks and the steep breaklands along lower Washington Creek, to moderate in the Deadmule/Burro, Deadhorse and Swanson creek drainages, and low in the Tepee and Sheep Mountain creek drainages. Data collected from the 1990s to 2013 indicate that response reaches of project area streams exceed Forest Plan standards for cobble embeddedness. Stream adjacent roads, historic jammer roads and related failures are likely the largest non-natural contributor of fine sediment, while the granitic geology found within the analysis area is naturally highly erosive. Because project area streams do not meet Forest Plan standards for sediment, the Barnyard South Sheep project has been designed to produce no measureable increase in sediment production in the analysis area watersheds.

Roads have increased erosional processes within portions of the analysis area and have also increased the risk of landslides, as evidenced by the majority of recently observed landslides being due to roads. In 1998 a watershed improvement project was implemented by the Forest Service in the Tepee and

lower Washington creek drainages to decommission almost 10 miles of unneeded roads, place a little over 1 mile of infrequently accessed roads into long-term storage and convert about 1 mile of road to trail. Road densities within these drainages still remain very high (9.2 and 7.7 mi/mi^2, respectively). 2013 monitoring data in the Tepee, Tumble, Deadhorse and Sheep Mountain creek response reaches show slight increases in cobble embeddedness from the 1997 survey data (Fisheries Project File). Similarly, cross sections monitored in 2013 along lower Tepee and Tumble creeks show and increase in fines and a slight tendency towards sediment deposition in comparison to 1997 data (Hydrology Project File). Confounding factors may include a beneficial increase in downed large woody debris, as observed in Tumble Creek, which also tends to increase sediment deposition. Additionally, beaver presence in the project area, such as along Tumble Creek, function as temporary sediment traps and locally alter the water table.

III. Fisheries (Ref: Barnyard South Sheep Fisheries Report)

A. Management Indicator Species (MIS)

Management Indicator Species (MIS) were identified in the Forest Plan to allow assessment of the effects of planned management activities on viable populations of fish and wildlife, including those that are socially or economically important, via habitat monitoring. Some of the MIS have specific habitat requirements that allow MIS monitoring to represent impacts on some non-MIS species with similar habitat requirements.

Table 3.4 displays the MIS evaluated. Information on those aquatic MIS species likely to occur in the project area is presented in individual detail, following the table.

Table 3.4 – MIS, ESA-listed, and Sensitive Species Considered

Species	Special Status*	Considered in this Analysis	Rationale
Westslope cutthroat trout *Oncorhynchus clarki lewisi*	MIS, S	Yes	Native to most of the North Fork RD, and ubiquitous in the project area and most other portions of the North Fork Clearwater River (NFCR) subbasins in Idaho (CBS 1998, 1998a, and 1999; IWW 1998).
Yellowstone cutthroat trout *(Oncorhynchus clarki bouvieri)*	S	No	Native to and present in Idaho, but not native to the NFCR subbasins (Behnke 1992).
Snake River steelhead trout *Oncorhynchus mykiss gairdneri*	MIS, T	No	Native to the project area and formerly present on much of the North Fork RD in the NFCR drainage, but blocked by Dworshak Dam for 40+ years (70 FR 52630).
Redband trout *Oncorhynchus mykiss gairdneri*	S	Yes	On the North Fork RD, present as landlocked populations of steelhead above Dworshak Dam. Potentially introgressed in the project area from historic stocking (May et al. 2012).
Rainbow trout *Oncorhynchus mykiss*	MIS	No	Potentially present as introduced coastal or introduced/native interior redband forms or hybrids in project area (see redband discussion, above).

Species	Special Status*	Considered in this Analysis	Rationale
Snake River spring/summer chinook salmon *Oncorhynchus tshawytcha*	MIS, S	No	Native to the project area and formerly present on much of the North Fork RD in the NFCR drainage, but blocked by Dworshak Dam for 40+ years (70 FR 52630).
Snake River fall chinook salmon *Oncorhynchus tshawytcha*	T	No	Possibly native to and present on portions of the North Fork RD in the NFCR drainage, but blocked by Dworshak Dam for 40+ years7 (70 FR 52630).
Kokanee salmon *Oncorhynchus nerka*	MIS	No	MIS for mainstem of NFCR, and likely annually present in lower Washington Creek (Kenney, personal observation).
Bull trout *Salvelinus confluentus*	MIS, T	Yes	Native to much of the NFCR drainage North Fork RD, but known to be currently present in the project area only in the mainstem NFCR (Hanson et al. 2014).
Brook trout *Salvelinus fontinalis*	MIS	No	Present in some Washington Creek streams (CBS 1998a). MIS for Palouse, but not North Fork RD.
Pacific lamprey *Lampetra tridentata*	S	No	Possibly native to and present on portions of the North Fork RD in the NF Clearwater R drainage, but blocked by Dworshak Dam for 40+ years (70 FR 52630) .
Western pearlshell mussel *Margatifera falcate*	S	Yes	No populations known in the project area or project subwatersheds, but occurs in portions of the NFCR mainstem and Kelly Creek (Kenney personal observations).

*MIS = Management Indicator Species; S = R1 Sensitive Species; T = ESA "Threatened" species

Westslope cutthroat trout (WCT): This species is native to Snake River tributaries in Idaho from the Salmon River downstream (although likely excluding the Palouse River) and Upper Columbia River tributaries (Behnke 1992) and are often the most abundant (or only) native salmonid inhabitants of the low-order streams in these drainages. The species naturally coexists with anadromous or formerly-anadromous redband rainbow trout (see below) in many Idaho streams with varying degrees of hybridization (Weigel et al. 2003).

Forest-sponsored sampling at 64 sites in the project area (CBS 1998, 1998a, and 1999; IWW 1998) recorded WCT as the most abundant and wide-spread native fish species. Cutthroat trout were present at all but one of the 12 sample sites in which any fish were observed in streams outside the Washington Creek subwatershed, and in 15 of the 17 sites in the Washington Creek subwatershed with any native salmonids. Tumble Creek, Swanson Creek, Dead Mule Creek, and Burro Creek are substantial streams which appear not to support fish for most of their lengths because of vertical or velocity barriers a short distance upstream from their mouths. The Idaho Department of Environmental Quality (IDEQ) also sampled four sites for fish in the project area (two on Tumble, one on Washington, and one on Tepee), but did not detect WCT at any of these sites.

Cutthroat trout require cold water and relatively low levels of fine sediment to breed and survive (McIntyre and Rieman 1995), so the presence of individuals of the species, especially juveniles, indicates relatively high water quality. Cutthroat trout populations are sometimes extirpated or reduced in low order streams by non-native brook trout (Peterson et al. 2004), and such population

effects are most prevalent when accompanied by water quality or stream channel degradation (McIntyre and Rieman 1995). In the project area, brook trout were the only salmonid observed in 10 streams in the Washington Creek subwatershed, and likely completely displaced or greatly outnumber WCT in these streams.

WCT were sympatric with redband rainbow trout at four of the lower Washington Creek sites and the site on lower Little Washington Creek. Inland cutthroat trout populations are also often extirpated or reduced through hybridization with non-native rainbow trout, but WCT in the NFCR drainage have coexisted with redband rainbow trout for millennia, thus behavioral or physiological barriers have apparently developed to keep hybridization to a minimum (Behnke 1992).

The Forests conducted follow-up surveys in 2013 of CNF-contracted fish and stream habitat surveys (one site each on Tumble, Sheep Mountain, and Deadhorse creeks) and found WCT to be the only salmonid present in Sheep Mountain and Deadhorse Creeks, while at the Tumble Creek site, one WCT was present along with several brook trout.

Redband (rainbow) trout: This is a subspecies of rainbow trout found in interior regions of the Pacific Northwest and California. Rainbow trout are officially recognized as *Oncorhynchus mykiss*, a species that exists in different forms along the Pacific Rim from southern California up to Alaska and across the Bering Strait in northeast Russia (Behnke 1992). The most widespread form is the coastal rainbow trout, *O.m. mykiss* (first described in Russia), was historically found in the United States in waterbodies relatively close to the ocean, while the redband rainbow trout, *O. m. gairdneri*, was found further inland. Anadromous rainbow trout are called steelhead, and across the range of the species are typically of the coastal subspecies; in the Columbia River system, however, the rough dividing line between the coastal and redband subspecies is the Cascade Mountains (Behnke 1992) and so both steelhead and resident rainbow trout in Snake River tributaries were originally of the redband subspecies.

The visible differences between rainbow and redband trout are relatively subtle, however, and there is no physiological barrier to crossbreeding, so artificial propagation of rainbow trout created a number of hybridized strains which were introduced to the wild without consideration of the native subspecies of the locality. For example, redband trout are the native subspecies of rainbow trout in Idaho, but many of the hatchery strains introduced to Snake River tributaries were entirely or largely of coastal rainbow origin (Weigel et al. 2003). Survival of hatchery rainbow trout in the wild is often low, but it is often high enough that hatchery trout interbreed with stream-origin trout to produce fish that are coastal/redband hybrids. Coastal rainbow trout genes can persist in apparently wild rainbow trout populations (and in rainbow/cutthroat hybrid swarms) even after stocking has ceased and stream-origin hybrid fish can migrate to non-stocked streams, so all but the most remote redband trout populations in Idaho now have some level of coastal rainbow trout introgression.

On the CNF, non-native rainbow trout were stocked into the NFCR and tributaries and in Dworshak Reservoir for decades (Idaho Department of Fish and Game (IDFG) website stocking database, Weigel et al. 2003). More recent policy by IDFG has been to avoid stocking the North Fork drainage or to stock only sterile triploids; the most recent non-sterile rainbow trout stocking recorded in the North Fork subbasins was 1981 for the mainstem North Fork, 1969 for Orogrande Creek (upstream of the mouth of Washington Creek), and 1999 for Dworshak Reservoir (IDFG website stocking database).

Given their relative inaccessibility and small size, it seems likely that none of the Beaver or Little Washington Creek subwatershed project streams have been directly stocked with non-native rainbow trout. Weigel et al. (2003) found no hybridization of WCT with rainbow trout genes at their sample site on Little Washington Creek (just outside the project area). The presence of non-native brook trout

in the Washington Creek drainage (both in the project area and upstream) and the relatively good road access to the upper and middle subwatershed for many decades suggests that at least a few stockings of hatchery rainbow trout were performed here.

Whatever their full genetic history, any redband trout in the project area are likely primarily of an original anadromous stock which has been blocked from completing its normal life cycle since the construction of Dworshak Dam in the early 1970's. The CNF commissioned fish and fish habitat surveys in the project drainages in the late 1990's found redband trout in the Washington Creek, mostly in sympatry with WCT. Redband trout were also present in the lower reaches of Little Washington and Deadmule creeks. The IDEQ did not find redband trout at any of its four sites in the project area.

Redband trout have similar habitat requirements to WCT and, despite their apparent absence or paucity in the smaller or steeper streams in the project vicinity, are quite capable of expanding into headwater streams in areas where WCT or brook trout are not present. It seems likely that the incomplete stream-order division of habitat present between redband and WCT in the North Fork Clearwater drainage is a genetically-based behavioral mechanism that allows maintenance of reproductive isolation between the two species (Behnke 1992). The former anadromous tendency of redband trout in the North Fork drainage would also tend to select for faster growth rates of steelhead parr compared to WCT juveniles, which would have been congruent with selection of warmer and more-downstream habitat by the young steelhead.

B. Threatened, Endangered, Proposed, and Candidate Species

Section 7 of the Endangered Species Act (ESA) of 1973, as amended, requires federal agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of threatened, endangered, or proposed species, or cause the destruction or adverse modification of their critical habitats. In addition, the USFS has established direction in Forest Service Manual (FSM) 2670 to guide habitat management for threatened, endangered, proposed, and sensitive species. This analysis and the Biological Assessment were prepared in accordance with legal requirements set forth under section 7 of the ESA and follows standards established in FSM direction (2672.42) and the Code of Federal Regulations (50 CFR 402).

The USFWS apparently no longer posts ESA species list for specific counties in Idaho. When seeking a species list, the public is currently directed to employ the "planning tool" IPaC (http://ecos.fws.gov/ipac/). When accessed on April 21, 2014, IPaC yielded the correct result that bull trout should be considered as potentially affected by the proposed project. No evidence exists that any listed, proposed, or candidate aquatic species administered by the USFWS may occur in the project area (See Table 3.4).

There do not appear to be any records of bull trout occurring within the project area, excluding the NFCR, which is migratory habitat for several bull trout populations. Within the larger area of the three project subwatersheds (Washington, Little Washington, and Beaver Creek, and again excluding the mainstem North Fork), extensive snorkeling surveys were conducted by CNF contractors in the 1990s, but only a single bull trout was detected; a 90-mm juvenile at the uppermost site on Beaver Creek. Other sampling efforts in these three subwatersheds includes Moffitt and Bjornn (1984) who conducted snorkel transects at two sites on Beaver Creek in 1983, detecting two bull trout at one site and one at the other. Idaho Department of Fish and Game (IDFG) followed up with snorkel surveys at these same sites each year from 1994-1998, detecting one bull trout at one site in 1998 (Cochnauer et al. 2001, 2003). In conjunction with a bull trout radiotelemetry study, IDFG snorkeled a total of 11

transects in Beaver Creek from 2002 through 2005 and detected a total of two bull trout (Hanson et al. 2014). In addition to the above efforts, the IDEQ electrofished at 17 sites in the three project subwatersheds from 1997 through 2010, but recorded sampling no bull trout. Kenney (1994) documented electrofishing at 10 sites on Potlatch Corporation land within the Washington Creek subwatershed in 1989, which also detected no bull trout.

In the radiotelemetry study mentioned above, IDFG radio-tracked several hundred adult bull trout in Dworshak Reservoir and its tributaries. IDFG determined that, between 2000 and 2005, seven radio-tagged bull trout entered the Beaver Creek drainage and five entered the "Schofield Creek HUC 5" and "presumably spawned" (or it at least survived the spawning period), because they were detected entering these areas and migrating passed a fixed radio antenna in or just upstream of Dworshak Reservoir. Scofield Creek is a tributary of Washington Creek, but the boundaries of this IDFG "HUC 5" include about 15 miles of the mainstem North Fork Clearwater and several other face drainages in addition to the Washington Creek subwatershed. The figures in Hanson et al. (2014) which depict individual radio-tag detections in the mainstem of Beaver Creek do not show any in the Washington Creek drainage. Thus, it appears that there is no evidence than any Scofield HUC 5 bull trout entered or spawned in the Washington Creek drainage (or the project area).

The bull trout draft recovery plan (USFWS 2002) discusses sampling efforts and professional judgments of knowledgable biologists regarding presence and distribution of bull trout in streams and drainages in the North Fork Clearwater subbasins, but does not document the species' presence in the project area. Neither the Washington Creek watershed nor the Beaver Creek watershed was considered by the USFWS (2002) as supporting a local population of bull trout, although the latter was identified as an area that had some potential to support a reproducing population. The watershed was actually identified as a "second priority" potential population because "although still important to recovery…they currently have degraded habitat or threats present such that support of bull trout may not be currently possible."

In summary, while occasional bull trout have been recorded from portions of the Beaver Creek drainage, no record of individuals of this species exist for the project area, except for the mainstem of the NFCR. The mainstem of the North Fork and the lower reaches of Washington Creek (and possibly Little Washington Creek), along with mainstem of many or all of substantial streams in the North Fork River drainage may harbor adult and advanced juvenile fluvial (i.e., large-river dwelling) bull trout year-around and are known to serve as migratory corridors for adult and advanced juvenile fluvial and adfluvial (lake-dwelling) bull trout during the spring and fall. In addition, some subadult fluvial and adfluvial bull trout (typically 175-300 mm in length) are known to "wander" into habitat which may not be suitable for spawning or early rearing (as opposed to migration to or from spawning and/or early rearing habitat) and may exist for short or long periods in streams reaches that otherwise would be unoccupied or used only as a migratory corridor (Personal communication, Bruce Rieman, Fisheries Research Biologist, RMRS).

C. Sensitive Species

The USFS established direction in FSM 2670 to guide habitat management for proposed, endangered, threatened, and sensitive species. For sensitive species, a biological evaluation (BE) is prepared in accordance with FSM 2672.42 and the Code of Federal Regulations (50 CFR 402). The BE meets the objectives set forth in FSM 2672.41, which include: Ensure that Forest Service actions do not contribute to loss of viability of any native or desired non-native plant or animal species; ensure that activities do not cause the status of any species to move toward federal listing; and incorporate

concerns for sensitive species throughout the planning process, reducing negative impacts to species and enhancing opportunities for mitigation.

To accomplish these objectives, the BE reviews the proposed action and any alternatives in sufficient detail to determine the level of effect that would occur to each species evaluated. The BE considers the best available scientific literature, a thorough analysis of the potential effects of the project, and the professional judgment of the biologists who completed the evaluation. This document incorporates the effects on terrestrial sensitive species), per direction pertaining to streamlining (USDA FS 1995). The streamlined process for doing biological evaluations for sensitive species focuses on two areas: (1) incorporating the Effects on Sensitive Species into the NEPA Document; and (2) summarizing the Conclusions of Effects of the Biological Evaluations for Sensitive Species. The analysis area for sensitive species is the entire Barnyard South Sheep project area because the direct and indirect effects of the project would occur in this area.

Western pearlshell mussel: The western pearlshell is present in many western states and is relatively common in the Pacific Northwest, including in Idaho (Nedeau et al. 2009). It requires fish hosts to complete its lifecycles and brook trout have been documented as hosts (Nedeau et al. 2009). This species is a sedentary filter feeder and so is vulnerable to changes in streambed habitat, especially high levels of fine sediment accumulation (Jepsen et al. undated). The Forest has not been surveyed in the NFCR drainage for this species, and no individuals have been documented to occur in the project area or subwatersheds. However, populations have been observed in the mainstem of the North Fork and in Kelly Creek.

IV. Wildlife (Ref: Barnyard South Sheep Wildlife Report)

The 1982 planning rule, which implements the National Forest Management Act (NFMA), requires the Forest Service to manage fish and wildlife habitat "to maintain viable populations of existing native and desired non-native vertebrate species in the planning area" (36 CFR 219.19). Management indicator species (MIS) are designated as surrogates for other species with similar life histories or habitat requirements in order to assess the effects of management activities. The Forest Plan identifies 10 potential wildlife MIS.

Other species considered in this section include federally listed threatened or endangered species, Northern Region sensitive species, and Neotropical and other migratory birds identified as high priority in the Idaho Bird Conservation plan (Idaho partners in Flight, 2000).

A. MIS and TES Wildlife Species

For most species, suitable habitats were described qualitatively based on reconnaissance of the analysis area and current literature. Suitable habitat for each MIS was described based on Forest Plan direction, the conditions of existing vegetation, and other relevant habitat attributes. Security and habitat effectiveness for elk, and suitable habitats for moose and belted kingfisher were qualitatively described based on reconnaissance of the analysis area. Quantification of suitable habitats was based on the USDA Forest Service Northern Region wildlife habitat relationship models (Samson 2006a, Samson 2006b). These habitat models were run using the Forest's GIS databases.

Species specific surveys were conducted for goshawks in the project area in July of 2013. A systematic random sampling scheme was used and broadcast call technique used during nesting and post fledging time frame. Random start points were generated in all potential vegetation treatment units, however, some units were later dropped. In addition to surveying for goshawks, field crews

captured site habitat data and looked for pileated woodpecker activity as well as big game sign. Incidental wildlife observations were also captured.

The following table lists all MIS and TES species of wildlife applicable to the Clearwater National Forest and their occurrence within the Barnyard South Sheep analysis area:

Table 3.5 – Status, Occurrence, and Habitat of MIS/TES Wildlife Species

Species	Status	Considered in detail?	Rationale
Belted Kingfisher	MIS	No	Although suitable habitats may occur, none would be affected by proposed timber harvest and associated road activities. Minor impacts may occur during road decommissioning, but would not jeopardize kingfishers in the project area or on the Forest.
Elk	MIS	Yes	May occur in suitable habitats.
Northern Goshawk	MIS	Yes	May occur in suitable habitats..
Pileated Woodpecker	MIS	Yes	May occur in suitable habitats.
Pine Marten	MIS	Yes	May occur in suitable habitats.
Moose	MIS	Yes	May occur in suitable habitats.
Bald Eagle	MIS/Sensitive	No	No preferred habitats in project area, no documented sightings and, no known or suspected nest sites. Some chance for foraging in North Fork of the Clearwater River (touches the project area on the east boundry), but because no harvest would occur in RHCAs, species would not be affected.
Gray Wolf	MIS/Sensitive	Yes	May occur in suitable habitats.
Grizzly Bear	MIS/Threatened	No	Not on the current Nez Perce-Clearwater Forests list from the USFWS. Not expected to occur in the western portion of the North Fork RD.
Canada Lynx	Threatened	Yes	Secondary occupied habitat present in project area, and there have been recent unverified sightings on District.
American Peregrine Falcon	Sensitive	No	Not known to occur on CNF (USFS 2011). Little to no suitable nesting habitat exists in the project area.
Bighorn Sheep	Sensitive	No	Not known to occur on CNF (USFS 2011).
Black-backed woodpecker	Sensitive	No	Only 23.6 acres of modeled habitat, none of which would be affected by proposed activities.
Black Swift	Sensitive	No	Not known to occur on CNF (USFS 2011). No habitat likely present in project area.
Coeur d'Alene Salamander	Sensitive	No	Although suitable habitats may occur, none would be affected by proposed activities, due to the implementation of INFISH riparian buffers.
Common Loon	Sensitive	No	Not known to occur on CNF (USFS 2011). No habitat likely present in project area.
Fisher	Sensitive	Yes	May occur in suitable habitats.
Flammulated Owl	Sensitive	Yes	May occur in suitable habitats, but amount is likely overestimated.
Fringed Myotis Bat	Sensitive	Yes	May occur in suitable habitats
Harlequin Duck	Sensitive	No	Harlequin nesting habitat is made up of second to fifth order stream with a 1%-7% gradient, which is

Species	Status	Considered in detail?	Rationale
			not present in the project area or general area.
Long-eared Myotis	Sensitive	Yes	May occur in suitable habitats.
Long-legged Myotis	Sensitive	Yes	May occur in suitable habitats.
Mountain Quail	Sensitive	No	Not known to occur on CNF (USFS 2011). No habitat likely present in project area.
Pygmy Nuthatch	Sensitive	No	Modeled habitat (1,372 acres) in the project area is likely overestimated, and the project would only treat between 0 and 7 acres.
Ringneck Snake	Sensitive	No	Modeled habitat (566 acres) in the project area is likely overestimated, and the project would only treat between 0 and 7 acres.
Townsend's Big Eared Bat	Sensitive	No	No preferred habitat in the project area.
Western (Boreal) Toad	Sensitive	No	Although suitable habitats may occur, none would be affected by proposed activities, due to the implementation of INFISH riparian buffers. The effects on individual toads in upland habitats outside of INFISH buffers would be indiscernible.
White-headed Woodpecker	Sensitive	No	Not known to occur on CNF (USFS 2011). No habitat likely present in project area.
Wolverine	Proposed ESA	Yes	May occur in suitable habitats.
Yellow-billed Cuckoo	Candidate ESA	No	Not known to occur on CNF (USFS 2011). No habitat likely present in project area.

Those species considered in detail are briefly discussed below. (Refer to the *Barnyard South Sheep Wildlife Specialist Report* in the project file for a complete analysis of all species, including those species not considered in detail.)

1. Elk and Moose

Elk habitat consists of open grasslands, brush fields, riparian areas, and dense forests. Areas of preferred use are typically associated with benches or small flats in proximity to water, forage and cover. Within the analysis area, cover is abundant, with many dense, widely distributed, mid- and late-seral stands. Foraging habitat is available in relatively low proportion in meadows and other natural openings, as well as in 1990's timber harvest units. Habitat effectiveness is compromised because of the high road density. Elk typically move to lower elevation winter ranges.

Exact population size is unknown, but elk are occasionally observed. Habitat use appears moderate to high in the Washington and Beaver Creek watersheds. The project area is in the east portion of IDFG Unit 10A, in the Dworshak Zone, where cow elk are at the upper end of the objective and bull numbers are below objective (IDFG 2014). The primary factors effecting elk in this zone is predation.

Moose habitat consists of a mosaic of second-growth forests, openings, lakes, and wetlands. Within the analysis area, some patches of moderate quality habitat are found along drainages and meadows. Habitat effectiveness is compromised because of the high road density. Exact population size is unknown, but moose are expected to be present because of the presence of suitable habitats.

2. Northern Goshawk

Goshawks use a variety of forest types, structures, and successional stages, and have been primarily associated with late-successional habitat. Goshawks nest in mature timber stands with high canopy cover and open understory. The post-fledging area (PFA) is more structurally diverse, providing security from predators and high prey density. Foraging areas are diverse forested and open habitats. Within the analysis area, mature/over-mature forest habitats are limited because of large-scale wildfires early in the 20th century and timber harvest in the late 20th century. Many forested areas are second growth and only just beginning to develop trees of sufficient size to provide suitable nesting habitat. Younger stands are often too dense for goshawks to fly. Exact population size is unknown, but is expected to be low to moderate, because many of the stands that make up the modeled habitat have only recently begun to display attributes of suitable nesting habitats. These habitats are limited in the project area. Goshawks were located within the project area during the 2013 field season, but no nest sites were identified.

3. Pileated Woodpecker

Pileated woodpeckers are often associated with late successional forests, but they also use young and fragmented forests with abundant remnant old structure (Bull and Jackson 1995). Pileated woodpeckers require large snags, down logs, and dense canopy for nesting. The woodpecker inhabits second growth of sufficient size and maturity and forages in some mid-seral habitat. Within the project area, mature/over-mature forest habitats are limited because of large-scale wildfires early in the 20th century and timber harvest in the late 20th century. Many forested areas are second growth and only just beginning to develop trees of sufficient size to provide suitable snags and down logs for nesting and foraging. Exact population size is unknown, but is expected to be moderate, because some of the stands that make up the modeled habitat have only recently begun to display attributes of suitable pileated woodpecker habitats. In 2013, pileated activity (foraging or nesting) was observed at 46 of 152 sites visited.

4. Pine Marten

Pine martens are members of the weasel family and closely related to fishers. They prefer dense mid- and late seral mixed and coniferous forests (>4,000’ elevation), which usually include abundant fallen logs, stumps, and shrubs. Within the project area, mature/over-mature forest habitats are limited because of large-scale wildfires early in the 20th century and timber harvest in the late 20th century. Many forested areas are second growth and only just beginning to develop trees of sufficient size to provide suitable habitat. Exact population size is unknown, and no signs of marten were observed in the summer/fall of 2013. However, recent IDFG surveys document presence in and near project area.

5. Gray Wolf

Wolves use a variety of habitats and are known to occur in the analysis area. Gray wolves occupy diverse habitats, from open meadows to heavily forested stands. Wolves occupy broad territories and travel extensively in search of prey, generally medium to large ungulates, especially elk in Idaho. They are adaptable to human and land management activity in general, but sensitive to disturbance at denning and rendezvous sites. Although there are no known denning or rendezvous sites in or near the project area, suitable habitats are present and widespread. One wolf was observed by the District Wildlife Biologist while conducting field work for this project in the summer of 2013.

The gray wolf has a global rank of *apparently secure* and an Idaho State ranking of *imperiled* (IDFG 2005). Wolves were reintroduced into north central Idaho beginning in 1995. Since then wolf populations have multiplied dramatically throughout the state. In May of 2011, they were removed from the list of threatened species in Idaho.

6. Canada Lynx

Canada lynx live in coniferous forests with cold, snowy winters and prey base of snowshoe hares. In the western United States, lynx are associated with relatively high-elevation moist conifer forest, primarily lodgepole pine, subalpine fir, and Engelmann spruce, although Douglas-fir and cedar-hemlock habitat types may be used in north and north central Idaho (Ruediger et al. 2000). A substantial amount of habitat considered secondary occupied (USFS 2007) by Canada lynx exists on the North Fork Ranger District, but none of this habitat was designated as critical (36 FR 8616).

The Clearwater National Forest has delineated lynx analysis units (LAUs) for analysis purposes, and the Barnyard South Sheep area is not in any LAU. The Idaho Animal Conservation Database (ACD, IDFG 2013) lists two occurrence records for Canada lynx within 25 miles of the project area, with one as recent as 2005.

7. Fisher

Fishers prefer mature to old growth coniferous forests containing a diversity of habitat types and successional stages. Fishers are closely associated with forested riparian areas, which are used extensively for foraging, resting, and travel corridors. The analysis area contains 15,689 acres of modeled fisher habitat with a high probability of use. There have been a number of documented sightings or detections of fishers in the vicinity of the project area. Quite a few fishers have been caught by trappers within a 25 mile radius of the project area (Albrecht 2012, IDFG 2014), and the Barnyard South Sheep project area is thought to be the heart of core fisher habitat in north Idaho (Olsen 2014).

8. Flammulated Owl

Flammulated owls are one of the smallest forest dwelling owls and range from British Columbia to Central America (Powers 1996). They are Neotropical migrants that move north to breed and winter further south. These owls are cavity nesters and almost exclusively insectivores (Hayward and Verner, 1994). This owl is considered a sensitive species by the Region 1 of the Forest service.

Nesting flammulated owls select for predominately older ponderosa or Douglas-fir forest that has moderate canopy cover and relatively open understory (Reynolds and Linkhart, 1992). Flammulated owls prefer abundant forest edges or ecotones with adjacent grass/forb communities for foraging. Flammulated owls are unable to excavate nest cavities and instead occupy old woodpecker cavities excavated by pileated woodpeckers or northern flickers. Flammulated owls have been documented nesting in live trees, dead trees and snags (Powers 1996).

The analysis area contains 513 acres of modeled suitable nesting habitat. This habitat is likely over stated due to the elimination of historic fire regimes in the project area. The removal of frequent low intensity fire that ponderosa pine evolved with has many of the stands in the project area ingrown with grand fir and other shade tolerant species. There are no recent site-specific surveys for flammulated owls on the North Fork Ranger District, but they have been observed at relatively low-elevation sites in north central Idaho, typically within ponderosa pine stands.

9. Fringed, Long-eared, and Long-legged Myotis Bats

Habitat for each of these bats occurs in the project area, with all three species known to be multiple habitat bats in regard to roosts, hibernacula and foraging habitats. They utilize caves, mines, buildings, cliff faces, bridges, exfoliating tree bark, snags, and crevices in rocks as roost and hibernacula sites. Large trees with protective bark and large snags provide the primary roosting habitat in the project area.

The fringed myotis inhabits a variety of habitats, including sagebrush steppe, grassland, and montane forests, primarily at middle elevations of 3,900 to 7,050 feet (Weller 2005). It is often found in dry habitats where open areas are interspersed with mature forests, creating complex mosaics with ample edges and abundant snags (Keinath et al. 2004). There are 936 acres of suitable habitat for fringed myotis. The reduction in the amount of large diameter trees and snags in previously harvested areas and the transition of older forests dominated by large shade-intolerant tree species toward a dense structure of smaller diameter, shade-tolerant tree species, primarily due to fire exclusion (Wisdom et al. 2000) has subsequently reduced bat roosting habitats. The change in species composition resulting from fire exclusion has slowly replaced such species as ponderosa pine, white pine and western larch, with stands trending toward smaller and younger size and age classes that are more susceptible to insects and disease before reaching maturity. These conditions have limited suitable habitat for fringed myotis in the project area.

The long-eared myotis often occurs in rocky areas in an extensive variety of habitats. Individuals typically roost under bark, in tree cavities, in crevices in cliffs, or in abandoned buildings (Romin & Bosworth 2010). The species has been found roosting in the snags and stumps of Douglas-fir, western hemlock, western red cedar, building, and under bridges (Bogan et al 2005b).

The long-legged myotis generally occurs in forested montane regions. Habitat is often relatively continuous tracts of late-successional forest. They forage throughout most of the night in and above the forest canopy (Bogan et al 2005a). In managed forests, the long-legged myotis avoided harvest units, unless large snags and old trees were left in relatively high densities, such as in shelter woods and aggregate retention patches (Taylor 1999). These bats have been found in north central Idaho using managed forests with trees that range from 5 to 15 inches in diameter.

The present population status of fringed myotis is unknown. The Western Bat Working Group concluded that it may be uncommon or rare through most of its western range. It was one of the least common detected species during surveys in northern Idaho (Romin and Bosworth 2010). Long-eared and long-legged myotis were captured in 2004-2005 to east of the project area in the Elk River area (Baker and Lacki 2006). They were the 1st and 3rd most abundant bats captured (251 and 124 respectively). Although none of the three bats have been observed in the project area, all have been observed on the North Fork District and are thought to occur within the project area.

10. Wolverine

Within the western states, wolverines occur principally in remote, high-elevation mountain basins and cirques, particularly during the breeding season (Rowland et al. 2003). Wolverines are opportunistic scavengers, and ungulate carrion is considered an important food source. Productivity of habitats and related ungulate carrion availability are important aspects of wolverine habitat management.

In Idaho, wolverines inhabit montane, mature forests associated with subalpine rock/scree habitats in areas of low human occurrence (Copeland and Hudak 1995), and the subalpine rock/scree habitats are used for foraging and for natal denning. Snow that persists until May 15th is important for denning

habitat (Copeland et. al. 2010). The most recent peer review wolverine model (Inman et. al. 2013) showed a limited amount of primary habitat in the project area (1,367 acres or 7.8% of the project area).

B. Neotropical and Other Migratory Birds

There are approximately 243 bird species breeding in Idaho, and about 119 of those species are neotropical migrants (Idaho Partners in Flight 2000). The causes of western U.S. neotropical migrant declines are not clear. The Breeding Bird Survey data indicated western neotropical migrants, as a group, were not declining, but there was evidence of widespread declines in 19 songbird species, most of which are predominately restricted to native grassland and shrub steppe habitats. Results of other studies indicate that western populations seemed to lack the same indicators of overall trend declines that were obvious in eastern populations. Except for the western grasslands and shrub steppe species, the relative magnitude of neotropical migrant bird population problems for forest-dwelling species when compared to declines in eastern birds is relatively minor.

Forest landbirds include all the avian species, sometimes collectively termed 'neotropical migratory birds' and 'resident songbirds.' This group of birds is not treated separately by species, because they are an extremely diverse group of species, with widely disparate habitat requirements.

The project area provides potential breeding and foraging habitat for neotropical migratory birds. Species identified as high priority in 'The Idaho Bird Conservation Plan' (Idaho Partners in Flight 2000). Those birds that are known or suspected to occur in the project area, are listed in the following table:

Table 3.6 – High priority Bird Species thought to occur in the analysis area.*

Habitat Type	Species
Cedar and Hemlock Forests	Vaux's swift
High-elevation Mixed Conifer	Olive-sided flycatcher and Hammond's flycatcher
Low-elevation Mixed Conifer	Sharp-shinned hawk, northern goshawk, black-backed woodpecker, brown creeper, varied thrush, Townsend's warbler, and western tanager
Ponderosa Pine	Flammulated owl
Non-Riverine Wetlands (Marshes, Lakes, Ponds)	Cinnamon teal, redhead, sandhill crane, killdeer, and American avocet
Riparian	Rufous hummingbird, willow flycatcher, black-billed magpie, American dipper, yellow warbler, and MacGillivray's warbler

* All data and habitat type descriptors come from Idaho Partners in Flight (2000).

No monitoring of neotropical migrant species numbers or diversity has been conducted within the project area, so local population trends are unknown.

V. Vegetation (Ref: Barnyard South Sheep Vegetation Report)

Ecological processes, historic land use patterns, the introduction of white pine blister rust, native insects and pathogens, and recent timber and vegetation management activities has shaped current ecosystem health and resilience in the Barnyard South Sheep area. Ecosystem health and resilience are best measured by measuring attributes of ecosystems, which, for this project, include forest cover types, age class distribution, and landscape pattern.

A. Data Collection Methods

Intensive stand exams were completed by a contractor and inspected by Forest Service personnel for much of the project area. Stand exams were performed according to National Common Stand Exam (CSE) protocol.

Forest cover types were analyzed using Clearwater National Forest GIS data. Major Species Code was used to determine the forest cover type. Historic distribution of cover types was Haig and others' (1941) distribution of "Mature stands of [the western white pine] region as a whole". Since Haig and others classifiy maturity as "140-200" years old, these numbers were assumed to be indicative of historic (ie. pre-European settlement) conditions.

To analyze age classes across the Barnyard South Sheep project area, each Landtype Association (LTA) Group was analyzed separately. First, LTA groups present within the watershed were identified. Then stands were assigned to an LTA, based upon which LTA the centroid of the stand was in. Analysis was then performed by using the basal area weighted age (BAGE) field in the Clearwater National Forest GIS database to determine the age of the stand, then tabulating acreage for each age class.

Forest GIS data was used to analyze landscape pattern. The Successional Stage field was used, which has four defined classes. When each successional stage was selected, the results were aggregated by successional stage; then boundaries between adjacent stands were dissolved to determine patch size.

For stand density statistics, Nez Perce-Clearwater GIS data was used to identify stands having medium basal area or higher. Medium basal area is classified as 100-199 ft^2/ac and basal area was used because this is how density is classified in this dataset for stands with a basal area weighted diameter of 5" or greater. Field visits were used to identify additional stands needing density control. Moderate density was used as the qualifier (rather than high or very high density) because much of the vegetation data in the database has not been updated since the late 1990s, so it is expected that as trees have grown, many of the stands that were categorized as having medium stocking 15 years ago now would be classified as having high or very high stocking.

B. Forest Cover Types

Currently the project area is dominated by the western redcedar (*Thuja plicata*), grand fir (*Abies grandis*), and Douglas-fir (*Pseudotsuga menziesii*) cover types, but many of these areas would have historically been dominated by the western white pine type. The percentages of current forest cover types in the Barnyard South Sheep project area are displayed in Table 3.7. Historic data displayed in the table is for the area that Haig and others (1941) classified as "the western white pine region" which primarily encompassed north central Idaho and was the area in which western white pine was "the principal forest cover".

Table 3.7 – Comparison of Historic and Current Forest Cover Types

Cover Type	Historic[1] Distribution	Current Distribution Project Area[2]
Western white pine	45%	0%[2]
Western larch	8%	0%[2]
Douglas-fir	12%	22%
Grand fir	14%	24%
Western hemlock	3%	0%
Western redcedar	4%	25%
Engelmann spruce	4%	2%
Lodgepole pine	1%	2%
Ponderosa pine	9%	3%[2]

Historically, western white pine (*Pinus monticola*) was the most important forest cover type in North Idaho, occupying the region's cooler moister sites in elevations between 2,000 ft and 5,500 ft. (Haig, 1932). Because of the shade intolerance of western white pine, successful fire suppression efforts of the 1900s discouraged the continued reproduction of white pine, as did the introduction of white pine blister rust. Due to the lack of stand replacing disturbances and lack of naturally occurring blister rust resistant seed sources on the landscape, western white pine is being supplanted by more shade tolerant, more disease susceptible species, including grand fir and Douglas-fir (Fins, et al 2001). Site specific observations in the project area verify these general observations made by Fins and others. In the stands proposed for vegetation management, the most abundant species are shade tolerant species, rather than long-lived early seral species such as western white pine, ponderosa pine (*Pinus ponderosa*), or western larch (*Larix occidentalis*).

Previous harvest activities within the project area set the stage for forest cover types to depart from historical species distributions. Neuenschwander and others (1999) give an excellent history on the decline of white pine and the synergism between previous harvest and blister rust that caused the forest to be altered so radically:

> *By the late 1950's, Inland Northwest National Forests accelerated timber harvests to meet timber demand resulting from the post-World War II housing boom. At the same time, despite Ribes control efforts, blister rust mortality accelerated in mature white pine. By the 1960's it became obvious that the war against Ribes was lost. In 1968 the Forest Service officially abandoned both its Ribes control efforts and its antibiotic treatments of white pine. The 1968 Forest Service policy discontinued planting of non-blister rust resistant white pine, emphasized regeneration and thinning of species mixes that did not include white pine, and focused major commercial timber harvests on white pine groves threatened by blister rust. Commercial harvests after 1968 were clearcuts planted with Douglas-fir. Most of the remainder were partial harvests that removed white pine and left other trees in the forests. Not only were dead and dying white pine harvested,*

[1] Haig et al, 1941. Haig has records of mature stands for the "white pine region" in which this project area is located.
[2] Clearwater National Forest GIS data. It may be observed that the totals in this column do not equal 100%. About 13% of the Barnyard South Sheep project area is classified with a null value in the MSC field, so information is not available for these stands. About 5% of the project area is classified as species other than those listed in the table. The remaining amount that is missing is due to rounding errors.

but entire populations of white pine were removed- effectively also removing any blister rust-resistant genes that might have remained. From the 1960's through the mid-1970's the areas formerly holding the best mature white pine groves were being converted to other trees- predominantly Douglas-fir, grand fir, and hemlock.

The Barnyard South Sheep project area would not have been exempt from this, and it is highly likely that the area was affected as described in Neuenschwander and others'(1999) history.

About 5,829 acres of the Barnyard South Sheep project area have been regeneration harvested since 1956, with much of this harvest very likely focused on removing western white pine. Areas that were regenerated up until the 1980s would likely not have been replanted to white pine; these areas would probably have been planted to Douglas-fir (Neuenschwander et al, 1999) or left to regenerate naturally. In areas where western white pine salvage occurred as a partial harvest, canopy openings would have been small enough that growing conditions would be more favorable for more shade tolerant species. Likewise in these areas, since the goal was to remove white pine before it was killed by blister rust, there would have been no seed source retained to allow white pine to regenerate naturally. Thus, due to past harvest removing seed sources, creating conditions unfavorable for white pine, and focusing on planting species other than white pine, the forest cover types in this area show their current departure from historic conditions.

The shift in forest cover types from historic conditions has contributed to a change in insect and disease activities. Because Douglas-fir and grand fir are both highly susceptible to root disease (Lockman, 2009) and they dominate much of the project area (46% combined), root disease is a common problem in the project area. *Armillaria ostoyae* was identified within the project area and *Fomes annosus* and *Phellinus sulphurascens* are suspected. Root disease can cause mortality as well as increase susceptibility of trees to bark beetle- caused mortality. According to Hagle (2009), "root diseases exceed all other forest insects and diseases in annual volume losses in forests of Northern Idaho and western Montana." It is of particular interest here because the lands within the project area are comprised primarily (77%) of Management Area (MA) E1 ground, which is to be managed to "provide optimum, sustained production of wood products" (USDA Forest Service, 1987).

Aerial Detection Survey (ADS) data from 2013 indicates that Douglas-fir beetle (*Dendroctonus pseudotsugae*), fir engraver (*Scolytus ventralis*), and mountain pine beetle (*Dendroctonus ponderosae*) are causing damage within the project area. Current insect activity noted in walk-thru examinations within the project area includes Douglas-fir beetle, mountain pine beetle, and fir engraver beetle. Though damage from other insects was not specifically observed, it can be assumed that other forest insects indigenous to the Inland Northwest occur at endemic levels within the project area.

C. Age Class Distribution

Age classes are displayed by LTA group for the Upper Palouse watershed. LTA groups are meant to be used as a tool to understand ecological processes at the landscape scale (Cleland et al, 1997) and comparing current age class distribution to historic distribution can give a picture of whether current ecological processes are functioning as they did historically. The following LTA groups, listed from least prevalent to most prevalent within the project area, are those that comprise the majority of the Barnyard South Sheep project area[3].

[3] Other LTA groups are present, but comprise 2% or less of the analysis area: Mass Wasting Sites, High Elevation Stream Bottoms and Glacial Terraces, Low Elevation Stream Bottom Alluvial Deposits and Glacial Terraces, High Energy Deep Soil Breaklands, and Dry Frost Churned Ridges.

Moist Frost Churned Ridges: About 1,165 acres within the Barnyard South Sheep project area are located within this LTA group. Lethal fires would have occurred every 150-200 years within this LTA, which would have created 500-1,000 acre even-aged patches (Mital 2010). Since little more than 1,000 acres occurs within this LTA and patch sizes were historically up to 1,000 acres, historically, the whole LTA within the project area could have been one age class. Thus, analysis of this LTA alone should not form a basis for treatment; it is merely depicted as part of the puzzle of age classes within the Barnyard South Sheep project area.

Table 3.8 – Moist Frost Churned Ridges age class distribution.

Age Class	Historic Age Class Distribution	Current Age Class Distribution	Current Acreage in Age Class
0-40 yrs	20-50%	8%	89
40-60 yrs	5-15%	5%	54
60-100 yrs	10-20%	32%	376
100-150 yrs	20-30%	26%	304
150+ yrs	10-30%	30%	351

Umbric Low Relief Rolling Hills: About 1,631 acres within the Barnyard South Sheep project area are located within this LTA group. Lethal fires would have occurred about every 300 years within this LTA, which would have created ¼ -1,000+ acre even-aged patches (Mital 2010).

Table 3.9 – Umbric Low Relief Rolling Hills age class distribution.

Age Class	Historic Age Class Distribution	Current Age Class Distribution	Current Acreage in Age Class
0-40 yrs	30-50%	35%	561
40-60 yrs	5-15%	12%	197
60-100 yrs	10-20%	14%	220
100-150 yrs	20-35%	32%	518
150+ yrs	20-40%	6%	100

High Energy Thin Soil Breaklands: About 1,668 acres within the Barnyard South Sheep project area are located within this LTA group. Mixed lethal/non-lethal fires would have occurred every 26-50 years within this LTA, which would have created smaller than 100 acre patchy mosaics (Mital 2010).

Table 3.10 – High Energy Thin Soil Breaklands age class distribution.

Age Class	Historic Age Class Distribution	Current Age Class Distribution	Current Acreage in Age Class
0-40 yrs	15-30%	13%	207
40-60 yrs	5-15%	5%	83
60-100 yrs	15-25%	45%	738
100-150 yrs	25-35%	38%	618
150+ yrs	15-30%	0%	0

Low Energy Breaklands: About 2,417 acres within the Barnyard South Sheep project area are located within this LTA group. Lethal fires would have occurred every 76-150+ years within this LTA, which would have created 200-500 acre uniform patches (Mital 2010).

Table 3.11 – Low Energy Breaklands age class distribution.

Age Class	Historic Age Class Distribution	Current Age Class Distribution	Current Acreage in Age Class
0-40 yrs	20-40%	8%	186
40-60 yrs	5-15%	7%	175
60-100 yrs	15-30%	50%	1,215
100-150 yrs	15-25%	28%	688
150+ yrs	5-30%	6%	153

Colluvial Midslopes: About 2,489 acres within the Barnyard South Sheep project area are located within this LTA group. Lethal fires would have occurred every 76-150+ years within this LTA, creating patches that were a 200+ acre variable mosaic (Mital 2010).

Table 3.12 – Colluvial Midslopes age class distribution.

Age Class	Historic Age Class Distribution	Current Age Class Distribution	Current Acreage in Age Class
0-40 yrs	30-55%	29%	745
40-60 yrs	10-20%	34%	870
60-100 yrs	10-20%	18%	468
100-150 yrs	15-25%	13%	322
150+ yrs	10-30%	5%	138

Non-Umbric Low Relief Rolling Hills: The Non-Umbric Low Relief Rolling Hills LTA encompasses 7,077 acres within the Barnyard South Sheep project area. Lethal fires would have historically occurred every 150-300 years within this LTA, creating ¼-1,000+ acre patches (Mital, 2010).

Table 3.13 – Non-Umbric Low Relief Rolling Hills Age Class Distribution.

Age Class	Historic Age Class Distribution	Current Age Class Distribution	Current Acreage in Age Class
0-40 yrs	25-45%	38%	2,695
40-60 yrs	5-15%	19%	1,373
60-100 yrs	10-20%	16%	1,169
100-150 yrs	20-35%	18%	1,296
150+ yrs	20-40%	9%	651

Based upon the picture of age classes within the various LTAs, age class distribution appears to be within or near historic ranges within the project area, but amounts within the 150 year old plus age class tend to be underrepresented. This is likely caused in part by the fire history of the project area. About 3,000 acres on the east side of the project area was burned in the great fires of 1919. The south end of the project area was burned by wildfires in 1914 and 1959, for a total of about 30% of the project area being burned by wildfires since 1919.

D. Landscape Patterns

Turner and others (2001) say that "the size, shape, and spatial relationships of patches on the landscape influence the structure and function of ecosystems." Attempting to emulate historic disturbance patterns is "likely to minimize adverse impacts on complex ecological processes that knit together the forest landscape" (North and Keeton 2008). Landtype associations reflect "biotic distributions, hydrologic function, natural disturbance regimes, and general land use" (Cleland et al 1997), so landscape pattern should be consistent with or approach historic LTA values.

The following LTA groups that represent the majority of the land in the project area, in order of increasing prevalence in the project area:

- The moist frost churned ridges LTA historically had a primary fire regime of lethal fires occurring every 150-200 years, which created even aged patches ranging in size from 500-1,000 acres (Mital, 2010).
- The umbric low relief rolling hills LTA historically had a wide range of even aged patch sizes-from ¼ acre to patches exceeding 1,000 acres, which were caused by lethal fires occurring every 300+ years (Mital, 2010).
- Within the high energy thin soil breaklands, mixed lethal and non-lethal fires historically occurred every 26-50 years, creating a patchy mosaic, with patch sizes less than 100 acres (Mital 2010).
- Lethal fires historically occurred at an interval of 76-150+ years in the low energy breaklands, creating uniform 200-500 acre patches (Mital 2010).

- Within the colluvial midslope LTA, the primary fire regime contributing to disturbance would be lethal fire occurring every 76- 150+ years and would result in a patch with a variable mosaic pattern that would be 200+ acres in size (Mital 2010).
- The non-umbric low relief rolling hills LTA historically had a primary fire regime of lethal fire occurring every 150-300 years, with patch sizes ranging from ¼ acre to patches exceeding 1,000 acres (Mital 2010).

Within the project area, patch sizes range widely as shown in the following table. Desired patch sizes were developed by an interdisciplinary team and vary by LTA. These desired conditions were intended to be consistent with or approach historic values for each LTA. Among the LTAs found in this project area, desired conditions are for patches to range between 50 and 1,000 acres (USDA Forest Service, 2009).

Table 3.14 – Existing patch sizes and ranges.

Successional Stage	Existing Patches in Desired Range	Existing Size Range in Acres
Early Seral	5	0-361
Mid Seral/ Young	17	2-1,957
Mid Seral/Mature	10	4-1,237
Late Seral/ Old Forest	4	4-140
Total for All Stages	**36**	

E. Sensitive Plant Species (Ref: Botany Specialist Report)

The Barnyard South Sheep area is botanically significant as part of the overall North Fork Clearwater basin, which is noted for coastal disjunct vegetation and a wide assemblage of rare plant species. Overall the project area is dominated by moist, mixed conifer forests with potential vegetation being mostly of various western red cedar habitats. The upper elevations grade into the Grand Fir Mosaic forest communities, which are mesic, highly productive mixed conifer forests characterized by open alder glades.

Potentially suitable habitat occurs for 22 sensitive plant species in the project area, although, only 7 of them would be affected by proposed activities. Given the extensive area of suitable habitat for some species of concern, it is anticipated that undocumented populations occur. Some plant communities in the watershed have been altered through time, by timber harvest, fire exclusion and several other factors that have contributed to the present condition. These past management activities have had variable effects on rare plant species and their habitats, ranging from enhancement to reduction.

1. Threatened Species

Current direction from the U.S. Fish and Wildlife service indicates federally listed plant species do not occur in Clearwater County, thus projects in the county do not need to address any of these species. Local knowledge of the project area supports this finding as there is no habitat for any of the listed species in the project area. For these reasons, none of the Threatened species typically addressed on Forest projects are treated further in this analysis.

2. Sensitive Species

Three sensitive plant species have documented occurrences in the project area, while habitat for 19 others is also present. Nine of these have occurrences within four miles of the project boundary. Discussions of each species' habitat and potential occurrence follow in Table 3.15, which summarizes

species occurrence and potential habitat on Forest Service ground in the project area. The seven species that may be affected by proposed project activities are highlighted in the table and described further in the narratives. Sensitive species not included in the table are not suspected to occur in the project area, nor is suitable habitat present based upon existing information or habitat modeling. A complete list of the sensitive plant species for the Nez Perce - Clearwater National Forest can be found in the determinations section.

Table 3.15 – Potential Sensitive Plants within the Project Area

Common and Latin Name	Presence	Habitat/Community Type	Potential Habitat (acres)
Maidenhair spleenwort *Asplenium trichomanes*	Potential	Moist, rocky, cliff crevices, and talus slopes, associated with coastal disjuncts locally.	1,356
Deerfern *Blechnum spicant*	Potential	Mid-elevations of shaded, mature cedar and western hemlock, often riparian.	13,856
Crenulate moonwort *Botrychium crenulatum*	Potential	Shaded moist sites under various conifers, usually western red cedar; also meadows.	662
Lance-leaf moonwort *Botrychium lanceolatum* var. *lanceolatum*	Potential	Shaded moist sites under various conifers; dry to moist meadows.	662
Linear-leaf moonworts *Botrychium lineare*	Potential	Shaded moist sites under various conifers; dry to moist meadows.	662
Mingan moonwort *Botrychium minganense*	Potential	Shaded moist sites under various conifers, usually western red cedar; also meadows.	662
Mountain moonwort *Botrychium montanum*	Potential	Shaded moist sites under various conifers, usually western red cedar.	662
Northern moonwort *Botrychium pinnatum*	Potential	Shaded moist sites under various conifers; dry to moist meadows.	662
Least moonwort *Botrychium simplex*	Potential	Forest openings, dry to moist meadows.	662
Green bug-on-a-stick *Buxbaumia viridis*	Potential	Moist grand fir or cedar forests on large decayed logs and ash soils.	14,577
Constance's bittercress *Cardamine constancei*	Yes	Breaklands and stream terraces, in maritime environments of low-elevation river canyons; coastal disjunct communities.	1,356
Clustered lady's-slipper *Cypripedium fasciculatum*	Yes	Partial shade of warm and moist cedar, grand fir or Douglas fir.	6,878
Light moss *Hookeria lucens*	Potential	Wet sites in humid coniferous forest, occasionally submerged and generally close to water courses.	3,650
Chickweed monkeyflower *Mimulus alsinoides*	Potential	Shady moist places, especially moss mats on cliffs in low, maritime forests.	344
Spacious monkeyflower *Mimulus ampliatus*	Potential	Seeps, springs and seasonally wet ground in grasslands and dry forest openings.	344
Sweet coltsfoot *Petasites frigidus* var. *palmatus*	Potential	Meadows, swamps, riparian areas and moist woods, mesic cedar, with coastal disjuncts.	17
Licorice fern *Polypodium glycyrrhiza*	Potential	Low elevations, moss-covered substrates in maritime habitats.	1,356
Naked rhizomnium *Rhizomnium nudum*	Potential	Moist substrates at low to moderate elevation in cool to warm mesic forests. Often riparian.	14,577
Evergreen kittentail *Synthyris platycarpa*	Yes	Openings, partial shade under grand fir mosaic habitats.	2,356
Sierra wood-fern *Thelyptris nevadensis*	Potential	Seepy ground and stream sides in cooler, moist, maritime forests.	3,650

Common and Latin Name	Presence	Habitat/Community Type	Potential Habitat (acres)
Short style toefieldia *Triantha occidentalis* ssp. *brevistyla*	Potential	Wet meadows, streambanks and peatlands.	17
Idaho barren strawberry *Waldsteinia idahoensis*	Potential	Edge habitats and open forests of grand fir, subalpine fir, and western red cedar.	10,287

Deerfern (*Blechnum spicant*): Deerfern is a coastal disjunct species of maritime climates in northern Idaho. It is generally found in mid-elevation, moist, mineral rich soils of shaded western red cedar and western hemlock habitats. The species occurs rarely in wet areas of other series (Blake and Ebrahimi 1992). It has a strong affinity for draws and riparian areas where it prefers the slope above and adjacent to the wettest plant communities. It rarely forms a part of these wet communities, but is associated with the slightly drier maidenhair fern and wild ginger. Deerfern occurs at only a few locations on the Clearwater National Forest; however suitable habitat for this species occurs in cool, moist to wet western red cedar forests throughout the project area. It may also occur in the riparian areas of moister grand fir forest habitats. In the project area, these forests occur on 13,856 acres. The nearest documented occurrences are approximately four air miles away.

Green-bug-on-a-stick (*Buxbaumia viridis*): This moss is found across the Pacific Northwest and Northern Rockies, but is considered relatively rare to uncommon across its range. In north central Idaho it is found at widely scattered locations on moist sites under mid-to-late seral conifer forests. Substrate availability and distribution and shade (humidity levels) are important habitat elements (Laaka 1992). Occurrences are predominately under a closed canopy on large logs in advanced stages of decay. Relatively moist forest habitats occur in most of the project area and cover approximately 14,577 acres. Though it may occur in microsites of suitable conditions anywhere in the moist forest, the large majority of desirable habitat would be along forested riparian areas and in mesic old growth or late successional forest that provide the necessary logs. This species is often overlooked due to its small size and inconspicuous nature, but with an abundance of suitable habitat, occurrences are expected.

Clustered lady's-slipper (*Cypripedium fasciculatum*): This orchid is widespread, but sparse in the western United States where it grows in a variety of forest habitat types. In north central Idaho, most occurrences are in warm, moist sites in mid-to-late seral conifer communities of a western red cedar habitat type, but a significant number of populations are in Douglas-fir and grand fir habitats. No unique habitat parameter is known that allows biologists to predict future occurrences with more than a very general specificity (Greenlee 1997).

Due to the wide ecological amplitude virtually the entire project area, save the non-forest habitats and poorly represented higher elevation habitats could be considered suitable for this species. However, the species does not grow in areas that have undergone even aged management. The presently suitable fir and cedar forests habitats in the project area cover approximately 6,878 acres. The apparent abundance of habitat does not translate into species abundance however. Limitations in the species biology and ecology result in this orchid being very rare throughout its range; however occurrences exist in the North Fork Clearwater basin, including one population within the project area.

Light Moss (*Hookeria lucens*): In North America, light moss ranges from southeastern Alaska to California, predominantly near the coast (Schofield 1992), with disjunct populations in north Idaho. In the Clearwater Basin it is known from Lolo Creek, Clear Creek, the Lochsa River and four locations in the North Fork. Habitat is moist or wet shaded areas, on a variety of substrates (Welch 1962),

predominantly in humid coniferous forest, occasionally submerged in pools in depressions or along water courses (Schofield 1992). It has not been found in the project area, but its occurrence in the coastal disjunct communities is a good possibility with occurrences only a little over a mile away. Suitable riparian areas in moist cedar forests cover approximately 3,650 acres on Forest Service ground in the project area.

Naked rhizomnium (*Rhizomnium nudum*): In North America this moss is found in the Pacific Northwest and is considered rare in the Columbia River basin. General habitat can be described as cool and oceanic (Koponen 1973). It grows in boreal and temperate forest on soil, humus, or rotten logs, often along streams or in damp depressions, and occasionally among boulders or talus at cliff bases, within conifer forest, from near sea level to subalpine zones (Christy and Wagner 1996, Gray 1999). Most inland populations are riparian, but it occasionally is found on moist slopes well above the streams usually in western red cedar forests. It has not been found in the project area; however suitable habitat occurs in lower elevations of moist forest types and riparian areas. These areas comprise 14,577 acres in the project area.

Evergreen kittentail (*Synthyris platycarpa*): This plant has a very narrow range, being endemic to north-central Idaho, where it occurs mostly in moist grand fir forests, but may also occur in cooler western red cedar habitats. The range of evergreen kittentails is strongly associated with the occurrence of the grand fir mosaic, which is a zone of mid-elevation forest of mainly grand fir, interspersed with alder and braken fern glades. It is considered an indicator of this ecosystem (Crawford 1980). Occupied sites may be both mature closed-canopy forest and forest openings, such as alder or fern glades, harvest units, and roadsides (Lichthardt 1999). Modeling efforts of the project area indicated 2,356 acres of potentially suitable habitat for this species in the project area, where occurrences are known from the extreme north portion.

Idaho barren strawberry (*Waldsteinia idahoensis*): This species in endemic to north central Idaho where it can be locally common in the Elk City/Red River and the Powell vicinity of the Nez Perce – Clearwater National Forests. Other areas of occurrence are widespread and few and support small populations. Idaho barren strawberry has wide ecological amplitude (Crawford, 1980) and is found predominately in moist grand fir and cool and moist western red cedar at mid-elevations (3,500-5,500 feet). Cool, moist micro sites within these general habitats are most favorable for its development (Crawford 1980). *Waldsteinia* is tolerant of shade, but responds favorably to increased light (Crawford 1980) and is also able to colonize disturbed soils (Lichthardt 1999) being frequently found at dispersed sites and along road ways. It can be found growing in stands with open canopies, and transition zones between riparian meadows and conifer forests. *Waldsteinia* is not known to occur in the project area; however, suitable habitat occurs on 10,287 acres and populations are known less than two air miles of the boundary.

VI. Recreation (Ref: Barnyard South Sheep Recreation Report)

A. Introduction

The Barnyard South Sheep project area, located on the western edge of the North Fork Ranger District, receives moderately high recreation use and pressure. This is due to a number of factors including relatively easy access with both paved and well-maintained native surface roads; the relative proximity of National Forest System (NFS) Lands, especially in comparison to the remainder of the North Fork

Ranger District; numerous dispersed camping opportunities in the area; and access to hundreds of miles of road and trail systems on both NFS lands and adjacent lands under other land management (mainly Potlatch Corporation).

Most visitors gain access to the project area via U.S. Highway 12, and then head north/north-east on either State Highway 11(out of Greer, ID) or the Grangemont Road out of Orofino, ID. Grangemont Road then meets Highway 11 at Hollywood Junction, with the highway then continuing North to its termination at Headquarters. From Headquarters, there are two main access points for visitors to reach the project area:

- Paved National Forest System (NFS) Road 247 heads north out of Headquarters towards Beaver Creek Divide. Approximately 10 miles north/north-east, at the junction with NFS Road 680, visitors would access the project area by heading east towards Sheep Mountain Saddle.
- Native surface NFS Road 246 heads east out of Headquarters. Users reach the Forest boundary approximately 10 miles later just prior to arriving at the Camp 60 area.

Historic access into the North Fork Ranger District, including the project area, began with primitive trails, following main rivers and ridges, many of which were initially in place by the late 1920s. The primary mode of travel on the trail system was with riding and pack stock. The trail system was constructed primarily for administrative access although some recreation use of trails during the early years probably took place. With the advent of aerial detection for fires, the expansion of the road system, and the use of smokejumpers for fire suppression, the need for trails for administrative access was all but eliminated by the 1940s.

As the post-war housing boom began in the 1950s and 1960s, demand for timber became a priority in the North Fork drainage. To accommodate timber harvest, roads were needed for log hauling and equipment access. Access to the Sheep Mountain Creek portion of the Beaver Creek drainage; and the Lodge, Tepee, and Tumble creeks portions of the Washington Creek drainage began in the late 1950s, branching off roads built by Potlatch Forest Industries to access their lands (BHROWS, pg. 50).

Once a network of roads became available, and personal vehicle use coupled with leisure time was more prevalent, trails became a more important component of the North Fork landscape. As mentioned previously, a base trail system was available for use back in the 1930s. However, with the increase in popularity of small motorized vehicles – ATV's, motorcycles, etc., the public requested new routes for access into the forest. A big step towards developing this access was the Sheep Mountain Trail system, which was cleared for approval in May 2007. Utilizing a network of existing, low-volume roads and connecting those with newly developed trails, the system totals approximately 56 miles of riding opportunities.

Recreation use occurs throughout the year; however, summertime receives significant use, especially around holiday weekends. During these weekends, virtually all available camp spots are occupied, traffic along existing roads is busy and trails are at their most heavily used.

B. Off-Highway Vehicle (OHV) Recreation

As mentioned above, the project area includes trails associated with the Sheep Mountain OHV Trail system. In fact, the vast majority of the trail system is located within the Barnyard South Sheep project area, with the only portion outside of the project the extreme northern section. With this trail system in place, OHV recreation is extremely popular throughout the project area.

Table 3.16 – Sheep Mountain Trail System

Trail Name	Number	Length – miles
Lodge Creek Loop	606	12.1
Tumble Creek	607	2.1
Bradbury Spur	609	0.4
Deadhorse Loop	610	23.2
Tepee Creek	611	1.7
Tepee Creek Spur	612	0.2
Dead horse Spur	613	0.7
Swanson Saddle	614	1.9
Sheep Mountain	615	13.5
Total		**55.8**

In addition to the extensive trail system, there is a well-developed road system available, providing the opportunity for lengthy excursions. Well-traveled roads in the project area include:

1. Swanson Saddle, NFS Road 681
2. Sheep Mountain Saddle, NFS Road 680
3. Schofield-Sourdough, NFS Road 246
4. Tepee Creek, NFS Road 683

There are approximately 156 miles of National Forest System (NFS) Roads within the project area, with an additional 107 miles of non-system roads (mapped and non-mapped). The two watersheds in the project area – Washington Creek and Beaver Creek – are the most densely roaded watersheds on the North Fork Ranger District, with 6.83 and 6.78 road mi/square mi respectively.

C. Camping

There are several locations available for dispersed camping within the project area. Most weekends throughout the summer will find the majority of campsites occupied, particularly on holiday weekends.

Dispersed campsites within the project area are not identified with posts, numbers or any other type of signage. Visitors are drawn to these dispersed sites from evidence of prior use –"hardened" locations that due to use, are generally devoid of vegetation. Sites are located throughout the project area on major National Forest System (NFS) Roads including, but not limited to the 246, 680, 681, and 683. A small number of the dispersed sites in the project area are located in close proximity (within ¼ mile) of vault toilets that are serviced periodically in the summer season. However, many other dispersed sites in the project area have no developed amenities (such as a toilet, picnic table, etc). Visitors are expected to use 'Leave-No-Trace' practices when using all dispersed sites. Recreationists occupying the dispersed campsites are generally engaged in either off-highway vehicle (OHV) recreation or hunting during the fall season and a mix of activities during the summer, including berry picking, hiking and OHV use.

D. Non-Motorized Recreation

Non-motorized recreation (hiking, bicycling and horse riding) is relatively rare in the project area. This is due in large part to the fact that there are no non-motorized specific trails in the project area, plus a large portion of the trail miles are either double-track trails more suitable to OHV's or trails on existing road templates.

E. Winter Recreation

Both motorized and non-motorized winter recreation opportunities are available in the project area; however, the predominant winter use is motorized snowmobile activity. Groomed snowmobile routes are available throughout the project area and include NFS Roads 246, 680, and 683.

F. Other recreation

Firewood gathering and berry picking: Opportunities such as firewood gathering and berry picking are both a part of the recreation experience in the Barnyard South Sheep project area, providing cultural and practical benefits for area residents. Firewood is an important heat source for residents of the surrounding communities, and berry picking along National Forest System Roads gives area recreationists access to the local huckleberry crop. Each of these activities has been occurring in the area for generations and is engaged in to strengthen family ties, and provide food and fuel for local residents.

Hunting: During the fall, hunting is a very popular activity within the Barnyard South Sheep project area. Species hunted in this area include elk, deer, bear, cougar, turkey and wolf.

VII. Transportation (Ref: Barnyard South Sheep Transportation Report)

A. Existing Condition

The Barnyard South Sheep analysis area is located within Clearwater County on the Nez Perce-Clearwater National Forest on the North Fork Ranger District. The analysis area is accessed from State Highway 11 at Headquarters, ID and can be accessed via National Forest Road (NFSR) 246 from the Southwest and NFSR 680, off of (NFSR) 247, from the Northwest.

There are 156 miles of FS System Roads and 52 miles of Non-System that have been mapped and approximately 55 miles of unmapped non-system roads within the project area. The area has a well-developed transportation system that has been primarily managed for timber production with road development beginning in the 1950's.

Overall the area is a popular recreation destination for OHV/motorcycle riding as the area provides many OHV riding opportunities. Other recreational activities include hunting, camping, and hiking.

B. Function Class and Service Life

All Forest Service system roads are identified by their Function Class and corresponding Maintenance Levels. The three types of function class are; Arterial, Collector, and Local. An Arterial road is a high use road that serves as a major route to other roads. There are no arterial roads with in the project area. A Collector road is a major road that accesses Local roads. Collector roads have adequate road geometry to accommodate large and varying traffic volumes. They typically have aggregate surfacing and have higher design speeds. Collector roads consist of 15% or 23.0 miles of system roads within

the analysis area. Local roads are typically single lane, native surfaced roads with turnouts. They have tighter road alignments and typically have seasonal restrictions. Local roads consist of 85% of the system roads or 133 miles within the analysis area.

The Service Life of a route pertains to the duration the route is planned to be used. A route with a long term service life is designated for long term use. Likewise a route designated for intermittent service life may be used only as the road is needed and may be closed or stored in the meantime.

C. Maintenance Level

Maintenance levels describe the level of maintenance and road standard that is applied to each individual road. The maintenance levels vary from level 5, which is a high standard two lane road, to a level 1, which is a road in storage not open to vehicle traffic. There are no level 5 or 4 roads in the project area. There are approximately 23 miles of maintenance level three roads, making up 15% of the system roads in the project area. The remaining 85% are maintenance level 1 and 2, totaling 133 miles. A detailed table of all roads within the analysis area, with length, function class and maintenance level can be found in the appendix of the Barnyard South Sheep Travel Analysis.

D. Access Management

The Forest Service manages vehicle access on roads and trails to protect soil and water resources, provide wildlife security, reduce road maintenance, and to avoid conflict with other users. About 58% or 91 miles of the roads in the project area have some type of yearlong restriction to motor vehicles. A yearlong restriction can be for all motor vehicles or just a certain type, such as full size vehicles. Roads with this type of restriction are South Washington Road 726 (Open to vehicles less than 50 inches) and Elk Mountain Road 670D, which is restricted to vehicle use yearlong.

About 19% or 29 miles of the roads have some type of seasonal restriction. Cedar Break Road 6013 has a restriction to full size vehicles except from 10/1 – 6/15. This is an example of a restriction in place to minimize damage caused by vehicle use in wet conditions.

About 23% or 36 miles of the roads do not have any vehicle restrictions. An example of this would be the Scofield-Sourdough Road 246 which is a collector road. This road and others without access restrictions are the primary routes within the project area. Many of these routes go through Forest Service and private land.

There is a Forest Supervisor's order prohibiting use of any motor vehicle on other than designated routes. There are some exemptions to this restriction, such as travel to dispersed sites and use of over snow vehicles. All of the current designated routes on the North Fork Ranger District are listed in the Clearwater National Forest Motor Vehicle Use Map (10/28/2013). This map identifies all road, trails and areas designated for motor vehicle use under CFR 212.51.

VIII. Economics (Ref: Barnyard South Sheep Socio Economic Report)

Clearwater County has approximately 9,000 people living within its boundaries. Most of the population (approximately 94%) is Caucasian and the median income is $39,800 (http://quickfacts.census.gov/qfd/states/16/16035.html). Latah and Nez Perce counties are within the commuting area of the planning area. The area has a long history of logging as this area was previously managed by Weyerhaeuser (later Potlatch Forest Industries). There was a major logging railroad system (with numerous side tracks) that went from Elk River through Potlatch and onward to points in the state of Washington.

The Interior Columbia River Basin Ecosystem Management Project released a report that examines the economic and social conditions of 543 communities in the Upper Columbia River Basin (USDA Forest Service, 1998). The analysis looked at geographic isolation, community specialization in different industries, and association with Forest Service and Bureau of Land Management administered lands.

The study concluded that isolated towns such as Elk River, Orofino, Bovill, Pierce and Weippe are different from non-isolated towns in that a higher percent of the population may be more specialized in agriculture, wood products, mining, or Federal Government, and have a high percent of Forest Service or Bureau of Land Management lands within a 20-mile radius. Pierce is the community closest to the Barnyard South Sheep project and is considered an isolated timber dependent community with employment specialization in agriculture (USDA Forest Service, 1998).

Timber dependent communities have been defined as those in which primary forest products manufacturing facilities provide ten percent or more of the total employment in the community. The scientific assessment for the Columbia River Basin project concluded that 64 isolated communities in the Columbia River basin are timber specialized. Elk River, Orofino, Pierce, Weippe, and Lewiston are considered timber specialized communities (USDA Forest Service, 1998).

Timber sales and related activities such as fuel treatment projects may have an effect on local communities, primarily through their potential impact on rural employment. Timber sales and stewardship contracts directly influence the wood products industry, local governments (Secure Rural Schools and Community Self-Determination Act), and recreation (Road and Trail Fund). Many other economic sectors may be indirectly influenced as they engage in business transactions with these directly impacted industries.

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CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

This chapter describes the effects of each alternative, based on the issues identified in Chapter 2, and is the scientific and analytic basis for the comparison of the alternatives described in Chapter 2. The resource components are discussed in the same order as in the previous chapter. Each discussion centers on impacts (effects) that are direct, indirect, or cumulative. These can be either beneficial or adverse and are defined as follows:

Direct impacts are caused by the action and occur at the same time and place [40 CFR 1508.8(a)].

Indirect impacts are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable [40 CFR 1508.8(b)].

Cumulative impacts are those that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions [40 CFR 1508.7]. A cumulative effects analysis was completed for each resource component using the following steps: (1) establish the geographic boundary for the analysis; (2) establish the time frame for the analysis; and (3) identify past, present, and reasonably foreseeable future actions. (Refer to Appendix A for a list of past, present, and foreseeable future actions.)

I. Soils (Ref: Barnyard South Sheep Soils Report)

This section addresses the direct, indirect, and cumulative effects of the project on the soil resource. The effects are derived by predicting the likely effects of the treatment activities considering all management requirements, mitigation measures and monitoring requirements.

A. Methodology

The soils analysis used GIS-generated queries, maps, reports, aerial photos, and field monitoring and review to analyze the effects of the proposed activities on the soil resource. All of the proposed activity areas with known previous harvest activity were visited and evaluated for soil disturbance in 2012 and 2013 using the Forest Soil Disturbance Monitoring Protocol (FSDMP) (Page-Dumrose et al., 2009).

The FSDMP consists of sampling along random azimuths at fixed point-spacing. At each sampling point, visual measurements were made that documented factors related to soil disturbance including forest floor condition, soil compaction, displacement, rutting, platy structure and burn intensity. Disturbance class and the presence of detrimental soil disturbance (DSD) were determined at each point, and the percent DSD of each treatment unit was calculated. The FSDMP monitoring protocol is further described in the appendix to the soils report.

A soil stability and erosion hazard assessment used landtype characteristics (Wilson et al. 1983), five primary landslide factors (slope angle, geologic parent material, landform, aspect and elevation) (McClellan et. al 1997; Megahan et al. 1978), and field reviews to determine erosion risks. Areas of unstable and sensitive soils have been identified to inform treatment prescriptions, harvest/burning plans and road construction.

Additional soil and site characteristics were also obtained from activity areas, such as duff/litter depth, texture, rock content, root distribution, coarse woody debris and vegetation composition. Landtype associations (LTAs) were used to describe terrestrial characteristics and disturbance processes for the project area.

Data Assumptions and Limitations: Field soil survey methodology based on visual observations can produce variable results among observers, and the confidence of results is dependent on the number of observations made in an area (Page-Dumroese *et al.* 2006a). The existing and estimated values for detrimental soil disturbance (DSD) are not absolute and best used to describe the existing soil condition. The percent additional DSD expected from a given activity is an estimate since DSD is a combination of such factors as existing groundcover, soil texture, timing of operations, equipment and burning methods used, skill of the equipment operator and fire personnel, the amount of wood or fuels targeted for removal, and sale administration. The DSD estimates of proposed activities used in this project are mostly based on local monitoring and research results (Archer 2008, Reeves et al. 2011). The DSD estimates of proposed activities also assume that Best Management Practices (BMPs) will be implemented and that soil recovery occurs over time.

Scientific Uncertainty and Controversy: Site and soil productivity relies on complex chemical, physical, and climatic factors that interact within a biological framework. For any given site and soil, a change in a key soil variable (i.e. bulk density, soil loss, nutrient availability, etc.) can lead to changes in potential soil productivity. Defining the threshold at which productivity is detrimentally disturbed has been controversial. Powers (1990) notes the rationale for the 15% limit of change in soil bulk density was largely based on the collective judgment of soil researchers, academics, and field practitioners, and the accepted inability to detect changes in productivity less than 15% using current monitoring methods. Powers cites that the soil quality guidelines are set to detect a decline in potential productivity of at least 15%. This does not mean that the Forest Service tolerates productivity declines up to 15%, but that it recognizes problems with detection limits.

Currently soil quality standards are being studied by a cooperative research project called the North American Long-Term Soil Productivity Study (LTSP). The 5-year results were recently published (Page-Dumroese *et al.* 2006b; Flemming *et al*. 2006; Sanchez *et al*. 2006). The LTSP study is ongoing and provides the best available science to resource professionals. In a ten-year study, there was no observed reduction in tree growth as a result of compaction or organic matter removal in plots with soils generally similar to those found in the Barnyard South Sheep project area (silt loam) (Powers *et al.*, 2005). The authors highlight that these results are relatively short-term with many site- and soil-specific factors involved. Future results from this long-term study should be beneficial and informative to assessing harvest practices on soil productivity.

Additional controversy surrounds the use of the term ‘irreversible’ in NFMA. NFMA has guidelines that “insure that timber will be harvested from NFS lands only where soil, slope, or other watershed conditions will not be irreversibly damaged.” The detrimental soil disturbance (DSD) described in this analysis does not necessarily result in irreversible damage. DSD is reversible if elements that support productivity processes (i.e. organic matter, moisture, top soil, and soil biota) are in place and time is allowed for recovery. Irreversible damage to soils in the Barnyard South Sheep project area could result from the loss of the volcanic ash cap through erosion or removal by excavation for temporary roads and/or skid trails. Decommissioning of temporary roads and skid trails (mitigation/design Measure 15), which includes recontouring and recovery of excavated and displaced ash cap topsoil, is expected to initiate recovery of soil productivity functions over time.

1. Activities Analyzed

Though considered, the following three activities, not analyzed in detail, are limited to areas with existing soil disturbance. These activities would not increase detrimental soil disturbance (DSD) or the risk of mass failure and erosion on the productive land base.

- **Road Reconditioning and Reconstruction:** Road reconditioning activities would occur with all action alternatives and would include activities such as grading, culvert cleaning and brushing. Reconstruction would occur in all action alternatives (Alt. 2: 30.1 mi.; Alt. 3: 19.3 mi.; Alt. 4: 28.8 mi.). Reconstruction would include more intensive clearing and grading than reconditioning and could include gravel placement and culvert replacements. All of these activities would be limited to currently disturbed road prisms and would not contribute additional DSD.
- **Road Decommissioning and Storage:** Approximately 75.6 miles of road would be decommissioned and 49.0 miles would be placed in storage in all action alternatives. All of these activities would be limited to currently disturbed road prisms and would not contribute additional DSD. Decommissioned road areas are considered returned to the productive land base through removal from the transportation system. Road decommissioning would directly improve soil conditions on existing road-affected areas by decompacting soils and adding coarse woody material and other organic matter to the existing road surface. Soil structure, water infiltration, aeration, root penetrability, and soil biological activity improvements are observed with road decommissioning techniques used on the Nez Perce - Clearwater National Forests (Lloyd et al., 2013). Monitoring has shown decommissioning and storage treatments to be effective at reducing surface erosion and mass failure risk and increasing vegetative ground cover (Foltz 2007, Lloyd et al. 2013, USDA 1999-2012).
- **Soil Restoration:** Improvement of soil productivity would occur in regeneration units on areas affected by management activities. Reducing compaction and rutting on skid trails and landings, increasing infiltration, and adding woody debris or organic matter would be the primary techniques to improve soil quality and function. Equipment would be used to decompact soils, recontour excavated skid trails and landings, and add organic material as cover for stabilization and support for revegetation. These soil improvement activities would only moderately offset soil compaction and displacement, but would improve infiltration and revegetation and decrease soil recovery time.

The following three activities, analyzed in detail, can contribute to DSD, cause erosion, increase mass wasting and landslide risks, and can affect soil productivity.

- **Regeneration Harvest and Commercial Thinning:** Alternative 2 proposes 840 acres of regeneration harvest within 27 units and 745 acres of commercial thinning in 7 units. Alternative 3 proposes 410 acres of regeneration harvest in 21 units and 500 acres of commercial thinning in 5 units. Alternative 4 proposes 540 acres of regeneration harvest 26 units and 745 acres of commercial thinning in 7 units. Silvicultural treatments in regeneration units include clearcut with reserves, seed-tree, and shelterwood methods. Commercial thinning would removing approximately 50 percent of the canopy and basal area in each unit. Both skyline yarding and ground-based skidding systems would be used to remove trees. Activity-generated slash piled along roadsides and in landings would be disposed of through biomass utilization, chipping or burning. Slash within the units would be left in place or treated using prescribed burning or machine piling and burning. Activity generated slash would be machine piled and burned on slopes less than 35% to increase survival of leave-trees. On steeper ground, broadcast and jackpot burning would be used for fuels reduction and site preparation.

- **Temporary Road Construction:** Alternative 2 includes 7.8 miles of temporary road construction and alternative 4 includes 6.5 miles. Temporary roads are considered 100% DSD with reduced soil productivity until vegetation, organic matter, and hydrologic function is restored. The greatest disturbance associated with temporary road construction is the displacement or mixing of the Mazama ash cap soil during road excavation. Temporary roads will be constructed, used, and decommissioned in a one to three year time period. Decommissioning would consist of decompacting, recontouring and revegetating the road prism. Slash, stumps or other woody debris would be placed on the recontoured corridor. Decommissioning following use will promote restoration of soil structure, water infiltration, aeration, root penetrability, and soil biological activity, as observed with road decommissioning techniques used on the Nez Perce-Clearwater National Forest. These techniques will support recovery of productivity on soils disturbed by temporary roads.

B. Effects on Soil Stability and Erosion Hazards

1. Direct and Indirect Effects

Direct and indirect effects on the soils resource are assessed within each individual activity area, defined by individual harvest and fuels treatment unit boundaries and associated skid trails, landings and temporary roads.

Alternative 1 (No Action): This alternative would maintain the existing soil productivity and stability risks. In the absence of catastrophic fires, these recovery trends would occur at varying rates and extents across the project area. Soil stability and erosion risks would remain the same since no vegetation removal, prescribed burning, temporary road construction or decommissioning would occur.

Alternatives 2, 3 and 4: Soil stability and erosion hazards were identified in activity areas and new road locations using GIS data such as slope, aspect, parent material, landtype, stability/erosion hazard ratings, and field verification. Overall, soil stability and erosion hazards are low to moderate for the project activity areas for all action alternatives, but high hazard areas exist.

The results of the landslide/stability hazard assessment based on the five primary landslide factors (slope angle, geologic parent material, landform, aspect and elevation) are displayed by alternative in Table 4.1. Based on this assessment, areas within treatment units have a mostly moderate stability hazard rating. Alternative 2 has approximately 42 acres with high landslide and soil stability hazards exist in 8 units. Alternative 3 includes 15 high hazard acres in 5 units, and alternative 4 contains 20 acres in 8 units.

Table 4.1 – Units with high landslide and stability hazards

Unit	Alternative 2			Alternative 3			Alternative 4		
	High Hazard Acres	Total Unit Acres	High Hazard (% of Unit)	High Hazard Acres	Total Unit Acres	High Hazard (% of Unit)	High Hazard Acres	Total Unit Acres	High Hazard (% of Unit)
1	---	---	---	5	13	38	---	---	---
2	0.2	5	4	---	---	---	0.2	5	4
3	3.0	17	20	---	---	---	3.3	17	20
4	2.5	26	10	---	---	---	2.5	26	10
5	2.9	18	16	2.9	18	16	2.9	18	16
6	2.0	11	17	1.0	7	14	2.0	11	17

Unit	Alternative 2			Alternative 3			Alternative 4		
	High Hazard Acres	Total Unit Acres	High Hazard (% of Unit)	High Hazard Acres	Total Unit Acres	High Hazard (% of Unit)	High Hazard Acres	Total Unit Acres	High Hazard (% of Unit)
7	22.0	93	24	---	---	---	4.8	34	14
13	7.3	67	11	4.3	35	13	2.2	38	6
14	2.1	3	4	2.1	44	5	1.9	25	8
Totals	42.0	240		15.3	117		20.0	174	

Landtype erosion hazards were used to evaluate erosion characteristics in the activity areas and road locations, and to identify high hazard areas requiring specific mitigation and design features to minimize erosion risk.

Surface erosion and debris avalanche potential is predominately low for all activity areas in all action alternatives, with a few exceptions where moderate hazards exist.

High subsurface erosion and high to very high parent material erosion landtype hazards are common in many activity areas due to highly erodible grussic grantic parent materials that dominate the subsoils across the project area. The main activity concern in areas of elevated risk for subsurface and parent material erosion are deep excavations into the subsurface soils, such as those that could occur with temporary roads and associated landings. Most proposed temporary roads are either located in low-relief ridgetop areas requiring minimal excavations or on existing excavated templates that would not require extensive new excavations into the subsoil. New temporary road construction in units 11, 13, 27, 29, 32, and 33 would have particular emphasis placed on minimizing excavation depth in these areas with high to very high subsurface and parent material erosion hazards.

To reduce the potential for erosion in all activity areas, all temporary roads and excavated skid trails would be constructed with BMPs and design measures to minimize erosion. After use, these areas would be decompacted and recontoured to recover excavated topsoil, large woody material would be placed on the surface and seeding and planting would occur to support soil recovery and stability.

Isolated areas of higher surface erosion potential exist where the ash layer has been displaced or lost and the surface soil is more heavily influenced by the grussic granitic parent material. This occurs most often on steep, southerly aspect slopes and is often associated with exposed or shallow bedrock. Field observations documented several areas within units 8, 9, 18, 20, 29, and 33 where the ash cap soil is absent, very shallow or mixed with rock and subsurface soil. These sensitive soils are more susceptible to disturbance impacts and erosion and could present regeneration challenges. Highly sensitive areas with very thin and rocky soils would be avoided (see design measure #8) or would have increased tree retention to protect the site and support soil stability, productivity and regeneration.

Mass wasting potential according to landtype hazard ratings is generally low to moderate for most activity areas and road locations in the actions alternatives, but high and very high mass wasting potential areas are present. Units 7, 10, 13 and 15 include areas with high mass wasting potential according to landtype mapping. Field visits identified unstable areas in these units. Unstable areas would be further delineated during layout (see design measure #2) and would receive no-harvest and no-ignition INFISH buffers and new roads would be located outside of these unstable areas.

For new temporary roads, appropriate mitigation measures and BMPs would be implemented to prevent potentially adverse impacts from surface erosion and mass failures (see design measure #4). Proposed road locations have been reviewed, refined and appropriate mitigation/design measures developed. Roads would not cross highly sensitive and unstable areas such as streams, wetlands, areas with wet or poorly-drained soils or unstable steep concavities and dissections that accumulate water. Road designs would include properly spaced and located drainage crossings to minimize risks to soil and slope stability in unstable areas. Site-specific stability would be further assessed during layout to determine the most stable road locations and specific design measures.

2. Cumulative Effects

Geographic Boundary: Cumulative effects on soil stability and landslide hazard are assessed within and immediately adjacent to treatment unit boundaries and proposed road locations

Time Frame: Mass soil movement (i.e. landslides) and surface erosion can result in impaired soil productivity and chronic instability. Recovery of basic soil productivity functions and stability on affected areas can require several decades or more. After tree harvest and/or prescribed burning on unstable landslide-prone areas, increased stability and landslide risks are considered to extend at least 20 years after the action.

Past, Present, and Foreseeable Future Actions: All past activities have been assessed as part of the existing condition and there are no present or future foreseeable activities planned in the immediate treatment boundaries that would contribute to cumulative effects on soil stability.

Alternative 1 (No Action): There are no cumulative effects related to the No Action alternative since cumulative effects can only arise from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions. There are no actions associated with this alternative. Estimating the likelihood, timing and/or extent of a wildfire event that could contribute to slope instability would be difficult at best and is therefore not included in this determination.

Alternatives 2, 3 and 4: There would be no direct effects to erosion or landslide hazard risk and indirect effects are expected to be minimal due to design features and BMP implementation. With no direct and only minimal indirect effects, there would be no cumulative effects on the erosion and landslide hazard risk.

Conclusion: There is a low risk for increased landslide hazards from any of the action alternatives. Although each action alternative has treatment units and road locations proposed in areas with unstable soils, site-specific mitigation/design measures, such as implementing no-harvest, no-ignition buffers and locating final road locations outside of highly unstable areas, would minimize or remove the risk of surface erosion and mass movement(i.e. landslides). Other areas having moderate stability hazards would employ increased tree retention to minimize the risk. The proposed temporary road construction (Alts. 2 and 4) would have design measures to minimize instabilty and erosion concerns.

C. Effects on Soil Productivity

Compaction, displacement, rutting, severe burning, surface erosion, loss of surface organic matter, and soil mass movements can all reduce site productivity. For the purpose of the project, proposed harvest units, temporary roads, and prescribed burn units are all considered Activity Areas.

Assumptions

Much research has been conducted on the extent of ground disturbance from harvest activities. Disturbance has been shown to range from 4 to over 40 percent, depending on equipment used, method and season of operation, and silvicultural prescription (Clayton 1987, Clayton 1990, McNeel et al.

1992, Tepp 2002). Megahan (in USEPA 1980) documented the highest amount of disturbance came from tractor yarding, with lesser amounts from skyline and aerial methods. For estimating the potential amount of increased detrimental disturbance created by proposed activities, the following assumptions were made for ground based skidding, skyline yarding, temporary road construction and fuels treatments.

- Detrimental soil impacts from proposed ground based skidding are estimated at 8 to 12% (average 10%) of an activity area based on use of designated skid trails (Archer 2008, Reeves 2011). Disturbance is generally limited to main skid trails and landings. Soil disturbance can be minimized by using existing skid trails and/or by designating the locations of new skid trails (Froehlich and McNabb 1983, Korb 2004).
- Estimated detrimental soil impacts from proposed skyline yarding are 4% of an activity area and disturbance is mostly concentrated at landings (Archer 2008, Reeves 2011).
- Temporary road construction is estimated to impact an area with an average 25 feet width, about 3 acres per mile of road. This is based on the assumption of a running road surface 12-15 feet wide and an additional area 3-6 feet in width cleared of vegetation on each side of the road where the soil would likely be displaced and the organic litter layer disturbed and/or removed. Temporary roads located on existing road prisms are not considered an increase in detrimental soil disturbance.
- Activity generated slash would be machine-piled and burned on slopes less than 35% where needed to increase survival of leave-trees. Machinery would utilize existing trails for piling operations. On steeper ground, broadcast and jackpot burning would be used for fuels reduction and site preparation. Treatment of slash and site preparation is already incorporated in the disturbance estimates discussed above. Pile and burning slash on existing skid trails would overlap detrimental disturbance on already disturbed areas and minimize new soil impacts (Korb 2004).

Based on the above DSD assumptions, the proposed activities in Alternative 2 could cause soil disturbance on approximately 116 acres, 64 acres for Alternative 3, or 98 acres for Alternative 4, with the estimated increase of DSD in the activity areas ranging from 3.6 to 13.4% (see project file). The estimated DSD increases include skid trails, landings, and temporary roads that would be decommissioned and rehabilitated after project activities, initiating recovery of soil productivity functions on these areas. The highest percent increase in soil disturbance occurs in units with proposed ground-based yarding methods and units that require temporary road construction. Some of these units have existing roads, skid trails and landings that could be reused, thus minimizing the amount of new DSD.

Implementation of project design measures and BMPs would minimize new DSD from proposed harvest and post-harvest slash treatment activities. The decommissioning of skid trails, landings, and temporary roads after use would further improve soil condition. Decommissioning activities include decompaction, recontouring, adding coarse wood and organic matter, and seeding/planting. These activities are expected to improve water infiltration, reduce the potential for weed invasion, minimize erosion and stabilize slopes, and improves tree growth and vegetation establishment.

Down coarse woody material (CWD) is generally low and below standards in most proposed units with previous activities due to excessive slash removal through burning and whole-tree yarding. Down coarse woody debris is adequate in many units without previous harvest or in areas of blowdown. Forest floor organic material in the form of litter and duff is considered adequate in most activity areas and averages about an inch in depth on drier sites with thicker litter and duff layers on the more moist

sites. Some areas with little to no duff or litter cover exist. Field observations documented frequent areas of thin litter/duff layers (<.75 inches) in Units 9, 13, 15, 20, 29, and 33, and other areas of bare soil with missing forest floor were noted in many activity areas. Areas of thin or absent duff are most common in large openings with sparse vegetation, on hot and dry southerly aspects and areas with very thin, rocky soils. Some of these impacted areas are related to past-management, but some areas naturally have thinner litter and duff layers.

For regeneration units, 14–28 standing trees per acre would be retained as individuals or in groups. Commercial thin units are expected to retain at least 50% of the current canopy cover, which would support organic material (e.g. coarse wood and litter) recruitment and maintain soil stability and productivity. In addition, 7–33 tons/acre (depending on habitat type and aspect) of down woody material would be left in the interior of each unit (see design measure #11). Slash-and-burn units are expected to retain at least 90% of the current canopy cover, which would support organic material (e.g. coarse wood and litter) recruitment and maintain soil stability and productivity. By adhering to these design elements, the action alternatives would meet Region 1 Soil Quality Standards, CWD requirements, plus maintain soil organic matter and surface cover.

Fire can remove organic matter from the soil or change the soil physical, chemical and biological soil properties, depending on the severity of burn, temperatures, and burn depth. High-severity fires with high soil temperatures can remove substantial amounts of surface organic matter, alter biological, chemical and physical properties, and create water repellent soils that may result in soil erosion through mass wasting, sheet, rill and gully erosion. Low-severity burns with a light burn depth have a low potential to negatively affect soils. The prescribed fire proposed to treat activity-generated fuels i.e. pile, broadcast, jackpot burning) is expected to emulate an overall low-severity, low-intensity fire with minimal detrimental impacts to soils. Most of the burned area would retain adequate ground cover, roots mats, live grasses, shrubs, trees, and woody debris. These retained elements would provide nutrient replenishment and soil stability to support beneficial physical, biological, and chemical soil processes fundamental to soil productivity (Neary et al. 2008). Small and isolated areas of high severity burn with detrimental soil impacts are expected where fuels are plied and burned. These impacts are incorporated into the DSD estimates. Unstable and sensitive soils would be avoided during burning activities (design measures #1 and #2).

1. Direct, Indirect, and Cumulative Effects

Geographic Boundary: Direct, indirect and cumulative effects on the soils resource are assessed within each individual activity area, defined by individual harvest and fuels treatment unit boundaries and associated skid trails, landings and temporary roads. Productivity effects are spatially static and productivity in one location does not influence productivity in another location, thus it is appropriate to spatially limit the geographic boundary to the activity area (USDA 2011).

Time Frame: Impaired productivity due to management actions can take several decades to recover, depending on soil texture, depth of compaction and extent of displacement, erosion or loss of organic material (Powers et al. 2005; Froehlich et al. 1983). Impacts from tree harvest and/or prescribed burning are considered to extend at least 20 years after the action. This analysis considers impacts from the 1960s to present, as well as 20–50 years into the future.

Past Actions: Since the 1950s, approximately 8800 acres (50%) of the project area has been timber harvested with up to about 1,113 acres of previous harvest within the proposed treatment units. Most harvest activities occurred in the 1960s and 1970s and about 70 percent of the past harvests were regeneration harvests. The most common detrimental impacts from past harvests observed in the proposed units are soil compaction, displacement, and severely burned areas at landings.

In the 1950s, 1960s and 1970s, tractor logging, dozer piling and mechanical site preparation frequently resulted in extensive compaction, rutting and areas of scraped or displaced topsoil and organic matter. Ground-based logging occurred on slopes exceeding 35% and dense networks of excavated roads and skid trails were commonly constructed. Forest practices have changed over the last few decades. Project design measures, BMPs, and Forest Plan guidelines have been developed in order to reduce the extent of DSD and maintain soil productivity and stability. Common practices now include minimized road systems, riparian buffers, designated skid trails, retention of woody material, operating under dry conditions, planting trees and seeding, and limiting ground-based skidding activities to slopes less than 35%. Fuel treatment techniques have changed from dozer piling to excavator piling along designated trails, so that less soil displacement occurs while the woody material is moved, reducing the detrimental effects to soil.

Fire: Since the 1950s, one 1,600 acre wildfire is documented in the project area and located mostly in Lodge Creek watershed and most small fires have been suppressed. Impacts to soils from fire suppression activities and a man-caused wildfire were observed in unit 33 during soil surveys. Larger stand-replacing fires occurred in the project area in in the 1914, 1919 and 1945.

Roads: Approximately 165 miles of system roads and over 100 miles of nonsystem roads roads exist in the project area, which has directly disturbed and impaired productivity on about 1325 acres or 7.5 percent of the project area. Non-system roads and associated DSD from compaction, displacement and erosion exist in several units. Although system roads are excluded in the DSD determination and whether projects meet Forest Plan and Regional soils standards, these roads do result in long-term to permanent impairment of soil productivity and are a part of the existing soil condition. Road impacts include topsoil and subsoil displacement, mixing and erosion. Road-related landslides have occurred in the project area, resulting in downslope soil disturbance. Since the1990s, 9.6 miles of roads have been decommissioned. The project proposes to decommission 75.6 miles of roads. Decommissioning would not result in new DSD, and would have positive effects on soils by initiating recovery of soil productivity functions.

Recreation: Impacts to soils from recreation include enlargement of dispersed camping sites, and development of user-created routes. Dispersed camping is generally located on already disturbed sites along system roads. No dispersed campsites or user-created routes were observed in the proposed units. Effects from recreation activities are primarily associated with full-size vehicles and OHVs using system or non-system roads and trails during wet conditions, creating wheel ruts that concentrate water flow and increase erosion and failure potential.

Ongoing and Foreseeable Future Actions: Within the proposed activity areas (harvest and burn units), ongoing and foreseeable actions consist of road and trail maintenance, closure of user-created routes, noxious weed treatments, and fire suppression. Road and trail maintenance would occur on existing system routes and would likely decrease surface and mass erosion risks on roads due to improved and maintained drainage. Motorized recreation and dispersed-camping activities may increase in the future, but increased DSD is not expected since effects on soils should be limited to designated existing routes and existing dispersed-camping areas due to restrictions on off-route travel. Noxious weed treatments would provide a benefit to soil productivity and stability by promoting native vegetation. Fire suppression activities could DSD, but the occurrence, extent, or intensity of suppression efforts cannot be estimated or predicted.

Alternative 1 - No Action: This alternative would not increase existing detrimental soil disturbance or existing soil productivity. Recovery of soil productivity in areas currently detrimentally disturbed would occur over time, but recovery would be slow over several decades. Large woody debris from dead trees would fall on the ground and contribute to soil organic matter, water-holding capacity and

soil stability. Processes such as freeze-thaw, animal burrowing and root growth would slowly loosen compacted soils over time. In the absence of catastrophic fires, these recovery trends would occur at varying rates and extents across the project area.

There are no cumulative effects related to the No Action alternative since cumulative effects can only arise from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions.

Alternatives 2, 3 and 4: In the following table, the cumulative effects of past and proposed activities in the action alternatives were determined by adding the estimated new detrimental soil disturbance (DSD) from the proposed project activities (increases ranges from 3.6% to 13.4%) to the existing DSD (ranging from 0% to 10.6%). Potential cumulative DSD within the treatment units is estimated to be between 4% and 15.3% prior to implementation of project design measures.

Table 4.2 – Existing and Post-activity Detrimental Soil Disturbance (DSD)

Existing and Post-activity Detrimental Soil Disturbance (DSD)								
Alternative 2			Alternative 3			Alternative 4		
Unit	Existing DSD (%)	Cumulative Post-activity DSD (%)	Unit	Existing DSD (%)	Cumulative Post-activity DSD (%)	Unit	Existing DSD (%)	Cumulative Post-activity DSD (%)
1	10.0	14.6	**1**	10.0	14.0	**1**	10.0	14.6
2	10.0	13.9	**5**	10.0	13.9	**2**	10.0	13.9
3	10.0	13.6	**6**	10.0	14.0	**3**	10.0	13.6
4	10.0	14.1	**9**	0.0	6.9	**4**	10.0	14.1
5	10.0	13.9	**10**	3.0	7.0	**5**	10.0	13.9
6	10.0	14.0	**11**	7.7	14.6	**6**	10.0	14.0
7	10.3	14.6	**12**	5.9	10.6	**7**	10.6	14.7
8	0.0	4.0	**13**	6.6	12.1	**8**	0.0	4.0
9	0.0	7.7	**14**	6.6	11.3	**9**	0.0	7.7
10	3.0	7.0	**15**	7.0	<15*	**10**	3.0	7.0
11	8.1	14.8	**16**	3.2	10.1	**11**	8.1	14.8
12	5.9	10.9	**18**	2.5	12.5	**13**	8.3	13.6
13	8.3	13.2	**19**	3.1	7.2	**14**	9.1	14.3
14	6.6	11.2	**20**	0.0	4.0	**15**	7.0	<15*
15	7.0	<15*	**22**	10.0	14.1	**16**	3.2	13.9
16	3.2	12.0	**24**	0.0	10.3	**17**	7.7	13.9
17	7.7	13.9	**25**	2.3	9.3	**18**	6.5	14.0
18	6.5	14.0	**26**	0.0	10.0	**19**	3.1	7.2
19	3.1	7.2	**27**	1.0	11.0	**20**	0.0	6.0
20	0.0	6.0	**28**	0.0	9.8	**22**	10.0	14.1
22	10.0	14.1	**29**	1.4	9.0	**23**	0.0	6.4

Existing and Post-activity Detrimental Soil Disturbance (DSD)								
Alternative 2			Alternative 3			Alternative 4		
Unit	Existing DSD (%)	Cumulative Post-activity DSD (%)	Unit	Existing DSD (%)	Cumulative Post-activity DSD (%)	Unit	Existing DSD (%)	Cumulative Post-activity DSD (%)
23	0.0	6.4	**31**	0.0	4.0	**24**	0.0	10.3
24	0.0	10.3	**32**	0.0	7.6	**25**	2.3	9.7
25	2.3	9.7	**33**	0.0	8.2	**26**	0.0	10.8
26	0.0	10.5				**27**	1.0	10.6
27	1.0	10.7				**28**	0.0	7.6
28	0.0	8.7				**29**	1.4	9.7
29	1.4	12.6				**30**	0.0	7.3
30	0.0	7.3				**31**	0.0	4.7
31	0.0	4.7				**32**	0.0	8.2
32	0.0	8.2				**33**	1.0	14.4
33	2.7	14.7				**34**	0.0	9.6
34	0.0	8.0				**35**	0	9.4
35	0	8.6						
* Cumulative DSD % incorporates special design measures to remain <15% DSD following project activities. Potential cumulative DSD for this unit without incorporating special design measures is 15.3% for Alterantives 2 and 4 and 15.2% for Alternative 3.								

Depending on the specific alternative, 5 to 10 harvest units would require implementation of unit-specific design measures in order to meet Regional soil standards. These measures would limit the amount of increased DSD from project activities and reduce the amount of existing detrimental disturbance by decommissioning and rehabilitating existing skid trails and landings. The project would meet the Regional soil standards by limiting the extent of detrimental disturbance to <15% following project implementation.

Table 4.3 – Unit-specific design measures to meet Regional soil standards

Design Category	Design Measures	Alternative 2 (unit #s)	Alternative 3 (unit #s)	Alternative 4 (unit #s)
Reuse	Units expected to be close to the 15% DSD standard without reuse design[a] measures	1, 4, 6, 7, 11, 18, 22, 33	1, 6, 11, 22	1, 4, 6, 7, 11, 14, 18, 22, 33
Special	Units expected to exceed the 15% standard without special design measures and limits on new disturbance[b]	15	15	15
[a]Estimated to be from 14.0% to 14.8% DSD based on standard new DSD estimates without reuse design measures [b]Estimated to be from 15.2 to15.3% DSD based on standard new DSD estimates without special design measures				

Reuse Design Category: Methods include: (1) using as many of the existing skid trails and landings as possible to limit the amount of new detrimental disturbance; (2) decommissioning all skid trails and landings after use; and (3) keeping equipment used for machine piling or mastication of activity slash on designated skid trails, or require rehabilitation of any detrimental disturbance created by off-trail activity (see design measure #13).

Special Design Category: Special attention is required for these units to remain below 15% DSD following project implementation (see design measure #14). Methods to meet this requirement include: (1) locating main skid trails on existing disturbed areas with minimal, one-pass trails occurring on undisturbed ground; (2) using cut-to-length forwarder systems; (3) keeping equipment used for machine piling or mastication of activity slash on designated skid trails; and (4) designing logging system layout to limit the amount of new detrimental disturbance (i.e. portions of the unit would be dropped if the layout plan cannot reach the entire unit while staying under the 15% standard).

The standard estimates of new DSD from project activities used for this project are based on designation of skid trails but do not incorporate reuse of existing disturbed skid trails, landings and roads in a unit. Since existing skid trails and nonsystem roads were identified and are present to varying extent in most units, opportunities for reuse of existing disturbed areas are present which would decrease the amount of new DSD from proposed harvest and temporary road activities. New soil disturbance can be minimized by using existing skid trails and/or by designating the locations of new skid trails (Adams and Froehlich and 1981, Froehlich and McNabb 1983), and this project is designed to capitalize on reuse opportunites followed by decommissioning and rehabilitation of disturbed areas to promote soil recovery.

Restoration of existing disturbed skid trails and non-system roads through decommissioning would directly improve soil conditions, processes and functions in the units by decompacting soils and adding CWD and other organic matter to the existing skid trail or road surface. Skid trail and road decommissioning following harvest would utilize methods similar to the Forest's road decommissioning methods utilized for over 15 years. Soil structure, water infiltration, aeration, root penetrability, and soil biological activity improvements are observed with road decommissioning techniques used on the Forest. A local soil study on the Forest (Lloyd et al. 2013) observed improved infiltration rates and soil bulk densities on decommissioned roads recover to values similar to never-roaded areas at 1, 5, and 10 years following decommissioning. In this same study and timeframe, soil organic matter, total carbon and nitrogen pools and processes increased to levels similar to never-roaded surfaces. Skid trail and road decommissioning following reuse would also improve slope stability and decrease long-term erosion.

Previous harvest in the project area occurred primarily with ground-based equipment in from the 50s and through the 90s. Assuming soils in these previously harvested areas were subject to some degree of compaction, displacement and extensive vegetation removal, the generally low existing DSD existing across activity areas indicates that recovery processes have occurred over the past 20-60 yrs in the project area. The active soil restoration on existing disturbed areas proposed for the project is expected to accelerate soil recovery and improve soil properties (e.g. bulk density, infiltration rates, soil organic matter, carbon, nitrogen) and provide support for continued long-term recovery of soil functions and productivity.

Irreversible and Irretrievable Commitment of Resources: Complete loss of the volcanic ash cap through erosion (i.e. surface and mass erosion, including landslides) or removal (i.e. excavations for roads, skid trails, landings) is considered irretrievable and irreversible. Some minor soil recovery could still occur in remaining subsurface soils, yet the exceptionally high porosity and water- holding properties of the Mazama ash cap would be lost and productivity would be impaired.

All other project activities include BMPs, design features or rehabilitative measures to avoid irreversible and irretrievable commitment of resources on the productive land base. Decommissioning of temporary roads and skid trails, which includes recontouring and recovery of excavated ash cap topsoil, is expected to initiate recovery of soil productivity functions over time, which could be as long as 40-60 years. Additional mitigation measures such as keeping disturbance to less than 15% areal extent, re-use of existing skid trails in units, decompaction of skid trails and landings, and retention of woody debris are intended to avoid loss of the ash cap soil.

D. Regulatory Framework

Federal law directs land management to avoid permanent impairment of the productivity of the land and to maintain or improve soil quality, and state laws have similar goals. Soil quality is the capacity of a specific kind of soil to function, within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation and ecosystem health. Soil productivity is the inherent capacity of the soil resource to support appropriate site-specific biological resource management objectives, which includes the growth of specified plants, plant communities, or a sequence of plant communities to support multiple land uses. Soil function includes soil biology, soil hydrology, nutrient cycling, carbon storage, soil stability and support and filtering and buffering.

The Barnyard South Sheep project was designed to meet Forest Plan direction and the standards set forth in the following federal and State laws and regulations.

Forest Service Manual (FSM) 2500 Watershed and Air Management Manual: Region 1 has one FSM supplement related to soil management applicable to this project--The Region 1 Soil Quality Standards, FSM Soil Supplement 2500-99-1. Except for this regional supplement, national FSM direction applies.

Region 1 FSM Soil Supplement 2500-99-1: updates and clarifies the previous soil quality supplement (FSH 2509.18-94-1, Chapter 2) based on recent research and collective experience. The analysis standards address basic elements for the soil resource: (1) soil productivity (including soil loss, porosity; and organic matter), and (2) soil hydrologic function. These Regional Soil Quality Standards require that detrimental management impacts to the soil resource are less than 15 percent of an activity area and that retention of coarse woody material is appropriate for the habitat type. Detrimental impacts include compaction, rutting, displacement, severely burned soil, surface erosion and soil mass movement In areas where more than 15% detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration should not exceed the conditions prior to the planned activity and should move toward a net improvement in soil quality.

Region 1 Forest Service Handbook (FSH) 2509.22: This handbook provides direction in Region 1 for the implementation of Watershed Conservation Practices or Best Management Practices (BMPs). Implementation of BMPs would minimize effects of management activities on soil and water resources and protect water-related beneficial uses. Best Management Practices are designed to achieve compliance with the Clean Water Act (Sections 208 and 319 Non-point Source Pollution) and State of Idaho Water Quality Standards.

National Forest Management Act (NFMA) of 1976: This Act recognizes the “fundamental need to protect and where appropriate, improve the quality of soil, water, and air resources.” NFMA directs management of soil and land productivity to avoid “substantial and permanent impairment of the productivity of the land …. And … to maintain or improve soil quality”, and to “insure that timber will be harvested from National Forest System lands only where…. soil, slope, or other watershed conditions will not be irreversibly damaged”.

Idaho Forest Practices Act (1974) and Idaho Forestry Best Management Practices (BMPs): The Forest Practices Act was passed by the 1974 Idaho Legislature to assure the continuous growing and harvesting of forest trees and to maintain forest soil, air, water, vegetation, wildlife, and aquatic habitat. This act regulates forest practices on all land ownership in Idaho. Forest Practices on National Forest lands must adhere to the rules pertaining to water quality (IDAPA 20.02.01). Idaho Forestry BMPs are included in the Idaho Forest Practices Act. Idaho Forestry BMPs are measures determined to be the most effective and practical means of preventing or reducing pollution inputs from forest practices (timber harvesting, forest road construction and maintenance, forest tree residual stocking and reforestation, use of chemicals, and the management of slash and the use of prescribed fire) in order to achieve water quality goals.

E. Forest Plan Consistency

The Clearwater Forest Plan standards related to soils listed on page II-33 of the Plan would also be met as explained in Table 4.4. Best Management Practices and project design measures used to meet Forest Plan standards would fulfill the objectives related to soils in the project management areas.

Table 4.4 – Forest Plan Compliance

Standard Summary	Compliance Achieved By
Manage activities on lands with ash caps such that bulk densities on at least 85 percent of the area remain at or below 0.9 gram/cubic centimeters.	Project design and mitigation measures to minimize soil erosion, compaction and displacement. Treatment units were evaluated for disturbance (including compaction) using regional standards and the Forest Soil Disturbance Monitoring Protocol. Soil improvement activities would occur on areas with prior impacts to achieve a net improvement in soil productivity.
Design resource management activities to maintain soil productivity and minimize erosion.	Design and mitigation measures to maintain or improve soil productivity and stability were developed and applied throughout this project and are described in the analysis.
Minimum coordinating requirements on land types with high or very high mass stability or parent material erosion hazard ratings are: •The field verification of the mapped unit and predicted hazard rating. •Review road locations using a team consisting of a engineering geologist, hydrologist, soil scientist, and a silviculturist. Assess concerns and possible mitigation measures to determine if a geotechnical investigation is needed •After the "P" line has been located, stake mitigating road designs, using the original ID team members and road designer.	Units with high and very high mass wasting hazards were identified and visited in the field to assess stability. Temporary road locations were reviewed, and design measures for road construction developed.
Review silvicultural prescriptions and unit locations on landtype 50 (old slump) to determine whether vegetation removal may contribute to slope instability.	Landtype 50 occurs in the project area but no activities are proposed on or near this landtype. Other unstable areas were identified in the analysis. Unit boundaries and road locations have been adjusted to avoid unstable areas. Further identification and delineation of unstable areas would occur during layout, with design measures recommended to maintain stability.

II. Watershed (Ref: Barnyard South Sheep Watershed Report)

The purpose of proposed watershed improvements is to improve water quality conditions (i.e. reducing stream sediment) to initiate recovery of watershed function. The Teepe Creek, Lodge Creek, Tumble Creek, Lower Washington Creek, Deadmule/Burro Creeks, Deadhorse Creek, Swanson Creek, and Sheep Mountain Creek drainages are used for direct and indirect effects analysis, which is the lowest level at which effects would be seen. The Washington Creek, Little Washington Creek-North Fork Clearwater River, and Beaver Creek subwatersheds (HUC 6s) are used for the cumulative effects analysis.

A. Methodology

Data sources include the Nez Perce-Clearwater National Forest GIS Database, the Clearwater National Forest Land System Inventory (USDA 1983), the North Fork Big Game Habitat Restoration on a Watershed Scale, BHROWS (USDA 1999), StreamStats (USGS 2014), Idaho DEQ water quality reports (IDEQ 2002-2013), Forest BMP implementation and effectiveness data (USDA 1990-2009), and recent stream surveys. Project specific watershed condition field reviews were conducted by the former hydrologist in 2012 and 2013. Field crews gathered data during this timeframe on project streams including Teepee, Tumble, Deadhorse, and Sheep Mountain creeks. During 2012 and 2013, the project soil scientist identified unmapped, perennial and intermittent streams and seeps within and adjacent to proposed harvest units. Focused culvert and road inventories were completed in 2014 in the project area. Historic files of past projects, surveys and activities in the project area were also referenced and used to estimate effects.

These data were used to generate reports and analyses, including the water yield and sediment models, which were then used to compare the predicted effects of the action Alternatives on the related indicators. Models are widely accepted as reasonable interpretation and prediction tools in the dynamic forest environments and are well-suited for comparison of alternatives and project design. However, models simplify very complex physical systems and are used only as a tool in the interpretation of how real systems may respond. Model results are generated for trend and magnitude comparisons and should not be considered absolute values. Throughout the analyses, results were used in project design and mitigation development to minimize impacts on watershed resources.

General Watershed Condition: Roads influence both water quantity and quality. Roads concentrate surface water and can be a source of sediment entering streams (Elliott 2013, USDA 2000, Trombulak et al. 2000); however, roads have unequal effects depending on a variety of factors. Roads that have grown in and have some level of natural recovery but are mapped may be represented as equal to open roads, when in fact partially recovered roads may have reduced impacts. Roads with higher slope positions, on ridgetops, or away from streams are likely to have a much lesser impact on water quality than roads in valley bottoms, along streams and riparian areas, and roads that have stream crossings.

Existing and proposed watershed road densities (mi/mi^2) are presented for the project alternatives, but are not direct measures of watershed condition. Road density calculations (mi/mi^2) are used to index the level of disturbance in a watershed, and may indicate possible sources of chronic sediment input.

The Matrix of Pathways and Indicators of Watershed Condition (NMFS 1998) suggests watershed condition categories based on road densities. A watershed with a total road density of less than 1.0 (mi/mi^2) is considered in “High” or good condition; road density greater than 3.0 (mi/mi^2) is considered “Low” or poor condition; and road density between 1.0 and 3.0 (mi/mi^2) is considered “Moderate” or fair condition. Road density is calculated for all mapped roads, whether they are open to motorized travel or not.

Water Quantity: Compaction and disturbance of the ground surface or removal of vegetation can alter water yield. At the larger watershed scale (HUC 6 as defined by the NRCS), the indicator used to assess potential effects on water quantity or yield is the Equivalent Clearcut Area (ECA) method, which was originally developed for use in Northern Idaho (USDA 1974). Existing roads are considered as permanent openings when estimating ECA. The ECA analysis includes harvest, wildfire, and roads in the project area. An extensive analysis of past and planned harvest on non-Forest lands was conducted to account for effects of private activities and is included in these calculations (Fisheries Project File). The ECA analysis used treatment and recovery coefficients from Ager and Clifton (2005) to determine the current and proposed ECA conditions.

The Matrix of Pathways and Indicators of Watershed Condition (NMFS 1998) categorizes an ECA of less than 15% as good habitat condition for Chinook, Steelhead and Bull Trout and an ECA of 15-20% as an indicator of moderate habitat condition. This matrix also indicates that low habitat conditions occur in watersheds with an ECA greater than 20-30%. A measure of 25-30% ECA is generally recognized as the point where water yield could be increased beyond acceptable limits (Gerhardt 2000), but research results are highly variable (Grant et al. 2008).

The ECA assessment is not typically applied at the scale of the smaller drainages within the project area. In order to assess whether increases in peak stream flow could be detected at this scale, the percent of smaller drainage areas proposed for harvest is presented by alternative. A recent compilation of water yield research indicates that in the transient snow zone (i.e. most similar climatic setting as the Barnyard South Sheep project area), changes in peak flows may be detectable/ increase by more than 10% when harvest exceeds 20% of the basin area (Grant et al. 2008, p. 35).

Water Quality: The WEPP:Road model is used to estimate erosion and sediment delivery to streams (tons/year), from proposed temporary roads (Eliot et al. 1999). The Disturbed WEPP model is used to estimate erosion and sediment delivery to streams (tons/year), from proposed vegetation treatments (Eliot et al. 2000). These WEPP models include user inputs for climate, topography, road design, road surface condition, soil type, ground cover, and buffer characteristics to predict erosion and potential transport of sediment through the adjacent buffer (Hydrology Project File). WEPP predictions represent annual averages of sediment delivery produced by events based on the selected climate and road conditions. In any given year, erosion values will vary because of site specific conditions and precipitation.

Road decommissioning and storage would produce sediment, but past monitoring of obliteration shows only minor amounts of short-term sediment delivered to headwater streams at crossing removal locations, mostly in the form of suspended sediment, as indicated by increases in turbidity (Foltz et al. 2008).

1. Direct and Indirect Effects

Alternative 1 (No Action): Under this alternative, no proposed management actions would occur. Actions occurring on private lands would continue. Because no vegetation removal or ground disturbing activities would occur, there are no direct effects from this alternative. Indirectly, road density and road related erosion would remain unchanged. Benefits from the decommissioning, storage, and road crossing/drainage improvements proposed in the action Alternatives would not be attained. Additional road improvements could be made in the future, but would likely be in response to failure or maintenance needs. Openings from past timber harvest activities would continue to regrow, which would result in incremental decreases from current ECA values. Unless affected by large-scale wildfire, the sediment and water yield trends would continue as described.

Action Alternatives 2, 3, and 4: Table 4.5 lists the activities included in the Barnyard South Sheep action Alternatives.

Water Temperature

The Barnyard South Sheep project is not expected to increase stream water temperature due to implementation of no-harvest INFISH buffers and is not further analyzed. Streams are expected to maintain recovery trends as riparian areas continue to undergo vegetative recovery.

Floodplains and Wetlands

No activities, other than road work, are proposed in floodplains or wetlands. INFISH buffers would be implemented along streams and seeps/springs in the harvest units and road maintenance and construction BMPs would be applied to road work. The protection of health, safety, and welfare, the prevention of loss of property values, and the maintenance of natural systems would be retained under each of these alternatives.

Table 4.5 – Proposed activities in the Barnyard South Sheep project area drainages by action alternative[1].

Drainage		Alternative	Regeneration Harvest (acres)	Commercial Thin Harvest (acres)	Temporary Roads (mi)	Road Decom (mi)	Road Storage (mi, % non-system indicated)	Road Reconditioning and Reconstruction (mi)
Washington Creek	Teepe Creek	2	—	—	—	6.7	5.9 (52%)	<0.1
		3						
		4						
	Lodge Creek	2	124	—	1.2	3.3	0.5 (0%)	0.8
		3	20		—			0.4
		4	109		1.2			0.8
	Tumble Creek	2	247	—	2.4	8.3	2.3 (31%)	10.8
		3	161		—			10.6
		4	120		1.5			10.8
	Lower Washington Creek: below Lodge/Teepee/Tumble	2	1	—	—	14.6	9.8 (30%)	4.4
		3	—					
		4						
Little Washington Creek-North Fork Clearwater River	North Fork of the Clearwater River: Deadmule/Burro creeks	2	21	—	0.1	4.1	4.2 (29%)	3.8
		3	12		—			
		4	21		0.1			
	Deadhorse Creek	2	68	413	1.2	17.3	11.3 (61%)	13.1
		3	42	288	—			10.9
		4	56	413	1.2			13.1
	Swanson Creek	2	99	26	0.2	10.5	1.5 (80%)	1.9
		3	74	20	—			0.8
		4	57	26	0.2			1.8
Beaver Creek	Sheep Mountain Creek	2	204	288	1.9	9.5	12.5 (30%)	19.6
		3	92	190	—			13.3
		4	102	288	1.8			19.0

[1] Activity acres and road mileages do not include totals for small drainage areas not analyzed in detail, (e.g. East Fork Beaver Creek), and thus will not total to values reported for the project as a whole.

General Watershed Condition (Road Density)

Summary: *For all action Alternatives, road densities would decrease in all drainages at both the HUC 6 and smaller project drainage levels. All watersheds would remain in the "Low" (poor) condition using the road density indicator (NOAA 1998); however, road density metrics would be reduced by 20% or more in all the smaller analysis drainages with many localized benefits anticipated from the proposed road decommissioning.*

Road densities as a result of proposed permanent road decommissioning are presented for the Barnyard South Sheep project drainages in Table 4.6. For all action Alternatives, road densities would decrease by 20% or more in all the smaller project analysis drainages with the greatest change in the Swanson Creek drainage (7.2 to 3.7 mi/mi^2, less 10.5 miles), but the most miles proposed for decommissioning occur in the Deadhorse Creek drainage (10.5 to 6.3 mi/mi^2, less 17.3 miles). Temporary roads are not included in this road density assessment since they will have short-term effects, will be fully obliterated after use and are not considered permanent additions to the Forest road system.

All watersheds would remain in the "Low" (poor) condition using the road density indicator (NOAA 1998); however, many localized benefits are anticipated from the proposed road decommissioning.

Table 4.6 – Existing and proposed road densities for the Barnyard South Sheep Project.

Drainage	Existing Road Density (mi/mi^2)	Proposed Road Density (mi/mi^2)		
	ALT 1	ALT 2	ALT 3	ALT 4
Washington Creek HUC 6 – 170603070801	5.8	5.1		
Teepe Creek	9.2	7.1		
Lodge Creek	4.3	2.9		
Tumble Creek	6.7	4.4		
Lower Washington Creek: below Lodge/Teepee/Tumble	7.7	4.7		
Little Washington Creek-North Fork Clearwater River HUC 6 – 170603070802	4.1	3.1		
North Fork of the Clearwater River: Deadmule/Burro creeks	4.8	3.6		
Deadhorse Creek	10.5	6.3		
Swanson Creek	7.2	3.7		
Beaver Creek HUC 6 – 170603080401	6.3	6.1		
Sheep Mountain Creek	10.2	7.9		

Water Quantity (Water Yield)

Summary: *The effects of Alternatives 2, 3, and 4 on water yield would vary, as indicated by ECAs and the percentage of smaller drainage areas proposed for harvest. Increases in ECAs are the greatest under Alternative 2, followed by Alternatives 4 and 3, based mainly on the differing amounts of harvest acreages proposed within the smaller project drainages. Post-project ECAs for the larger watersheds will remain in their existing ranges of ECAs associated with overall moderate watershed conditions in the Washington and Beaver Creek HUC 6s (15-20% ECA) and high or good watershed conditions in the Little Washington Creek-North Fork Clearwater River HUC 6 (0-15% ECA). The slight increases in ECA as a result of the project Alternatives are expected to be within acceptable limits and not result in adverse effects on stream channels (Gerhardt 2000). At the smaller drainage basin scale, the potential risk for peak flow increases remains low.*

The effects of vegetative manipulation on water yield are complex, highly variable, and dependent on many independent factors such as elevation, climate, aspect, and especially precipitation. Removal of vegetation has the potential to increase stream flow in the short term (0–10 years) due to changes in evaporation, precipitation, wind patterns, and soil infiltration and percolation (Haupt 1979; Fowler et al. 1987 and Dunne and Leopold 1978, cited in Grant et al. 2008).

At the larger watershed scale, water yield is assessed for the Barnyard South Sheep project using the ECA metric which accounts for past harvest and existing roads on all ownerships, plus proposed Forest Service regeneration harvest, temporary road construction and road decommissioning (Table 4.7). The analysis takes a simple snapshot in time, with the assumption that all project activities would be implemented in 1 year. In reality, project activities would likely occur in phases which would moderate changes in ECA values. No Federal or State of Idaho standards govern changes in water yield. The ECA indicator serves only as a red flag that suggests a potential for decreased stability due to sustained increased energy in the stream channel.

The estimated percent increase in ECA from the Barnyard South Sheep project activities ranges from less than 2% to less than 1%, depending on watershed and alternative. When these increases are added to the existing ECAs, they produce estimates of watershed condition with respect to water yields after the project is implemented. These ECA estimates range from 18.3% to 3.5% for Alternative 2, 18.1% to 3.2% for Alternative 4, and from 17.9% to 2.8% for Alternative 3 (listed in decreasing order of change). A lower ECA indicates a higher (better) watershed condition (NFMS 1998).

Under all action Alternatives, the larger watersheds will remain in their existing ranges of ECAs associated with overall moderate watershed conditions in the Washington and Beaver Creek HUC 6s (15-20% ECA) and high or good watershed conditions in the Little Washington Creek-North Fork Clearwater River HUC 6 (0-15% ECA). As mentioned previously, the anticipated phased implementation of the project would likely buffer changes in ECA values. Even when conservatively assuming the changes occur at one time, ECAs would remain below research recognized levels of concern in the HUC 6 watersheds for all proposed alternatives (i.e. remain well below 25%, Gerhardt 2000).

Table 4.7 – Estimated % increase in ECA for modeled year 2016.

Subwatershed (HUC 6)	Existing ECA	Proposed ECA (Existing plus Project)		
	ALT 1	ALT 2	ALT 3	ALT 4
Washington Creek	15.6%	16.5%	16.0%	16.1%
Little Washington Creek-North Fork Clearwater River	2.1%	3.5%	2.8%	3.2%
Beaver Creek	17.6%	18.3%	17.9%	18.1%

Much research has been conducted on harvest activities and the potential for increased peak flows and water yield. Typically increases in peak flows are more likely to be observed in smaller low order watersheds and dampened out in larger streams. King (1989) found in the Horse Creek watersheds of central Idaho, statistically significant increases in maximum instantaneous streamflow in first and second order streams where 25-36% of the vegetation had been removed. At the outlet of the third order stream, these increases did not occur. A recent compilation of multiple water yield research efforts by Grant et al. (2008) supports the likelihood of potential peak flow effects diminishing as basin size increases, but also reveals site-specific variation among results as multiple studies found no detectable changes in peak flows ranging from 25-100% vegetation removal of drainage areas in the transient snow zone (i.e. most similar climatic setting as the Barnyard South Sheep project area).

To assess for potential peak flow concerns in the smaller drainages of the Barnyard South Sheep project, the percent of areas proposed for harvest were evaluated (Table 4.8). Percent of drainage areas proposed for harvest range from 1% to 13% for Alternative 2, 1% to 10% for Alternative 4, and from 1% to 7% for Alternative 3 (listed in decreasing order of change). A conservative basin area value of 20% or greater harvested would exceed the mean response line for potential detectable changes in peak flows (i.e. greater than 10% increase) within the transient snow zone (Grant et al. 2008). For all project drainages under the action Alternatives, no drainage would exceed this value. Thus detectable peak flow increases under the Barnyard South Sheep would not be expected under any of the action Alternatives.

Table 4.8 – Estimated % area harvested from project activities for modeled year 2016*.

Subwatershed (HUC 6)	Drainage	ALT 2	ALT 3	ALT 4
Washington Creek	Teepe Creek	—	—	—
	Lodge Creek	7%	1%	6%
	Tumble Creek	10%	6%	5%
	Lower Washington Creek: below Lodge/Teepee/Tumble	—	—	—

Subwatershed (HUC 6)	Drainage	ALT 2	ALT 3	ALT 4
Little Washington Creek	North Fork of the Clearwater River: Deadmule/Burro creeks	1%	—	1%
	Deadhorse Creek	10%	7%	10%
	Swanson Creek	5%	4%	3%
Beaver Creek	Sheep Mountain Creek	13%	7%	9%

*Note percent harvest areas were developed by tallying unit areas using a 90% coefficient for regeneration harvest units with reserves and a 50% coefficient for commercial thin units.

Water Quality (Sediment Yield from Temporary Road Construction and Vegetation Treatments)

Summary: *Alternatives 2 and 4 are the only action Alternatives evaluated with the WEPP:Road model, because no temporary road construction is proposed under Alternative 3. Modeled annual road erosion rates for Alternative 2 were higher than for Alternative 4 mainly due to the difference in proposed temporary road miles. The WEPP:Road model predicted the total amount of sediment to leave buffers and enter streams was 4.1 and 3.3 tons/year for alternatives 2 and 4 with the majority of this sediment produced in the Sheep Mountain Creek drainage (1.9 and 1.5 tons, respectively).*

Vegetation treatments for all action Alternatives were evaluated with the Disturbed WEPP model. Modeled annual erosion rates above natural are the greatest under Alternative 2, followed by Alternatives 4 and 3, based mainly on the differing amounts of harvest acreages proposed within the smaller project drainages. The Disturbed WEPP model predicted the total amount of sediment to leave buffers and enter streams was 15.7, 7.5 and 4.3 tons/year for alternatives 2, 4 and 3 with the majority of this sediment produced in the Sheep Mountain and Tumble creek drainages. This should be viewed as a worst-case scenario, because on average the units with erosion modeled to exceed natural background have a 60% chance of not delivering sediment through the buffer within the first year of disturbance.

When combined, all WEPP modeled estimates range from less than 1% to 22% of total annual natural sediment production values for the project area drainages (USDA 1999). Forest Plan allowances for natural sediment production exceedance in these drainages ranges from 110% to 150% over natural. Additionally, the implementation of design and mitigation measures is expected to result in no measureable increase in sediment delivery to streams for any of the action Alternatives (see Design Features and Mitigation Measures).

The WEPP:Road model (Elliot et. al. 1999) predicted annual surface erosion on the area disturbed by temporary roads, with limited sediment delivery through stream buffers primarily to Sheep Mountain Creek, followed by Tumble, then Deadhorse, and Lodge creeks (Table 4.9). The higher rates of erosion and sediment delivery are largely a reflection of steeper slopes and higher precipitation found in these areas, which also lends to greater stream transport capacity. Temporary road construction would be accomplished as part of the timber sale contract and these roads are expected to be in use for up to three seasons.

Surface erosion from roads is generally highest immediately following construction and tends to decrease over time (Megahan and King 2004, Elliot 2013). Temporary roads in this project are expected to generate the most erosion in the first precipitation events following construction with less erosion occurring over time. It is expected that once decommissioned some surface erosion would occur immediately following ground-disturbing activities but erosion would decrease with time as

vegetation reestablishes (less than 5 years). Forest monitoring has observed the trend for decreased erosion on decommissioned roads over time as vegetation reestablishes (USDA 1999-2009).

Temporary road locations are essentially in the same location for both Alternatives but are either absent or shorter under Alternative 4, which accounts for the lower sediment model values in comparison to Alternative 2 (see Table 4.9). The proposed temporary roads are generally on upper hillslope and ridgetop positions and well-buffered from streams. The specific locations of temporary roads would be approved by contract administrators and Forest specialists as needed and BMPs would be applied to minimize adverse impacts to soils and prevent sediment delivery to streams. Full-obliteration of temporary roads after use would initiate restoration of hydrologic function and productivity on the road location.

Table 4.9 – WEPP:Road sediment modeling estimates for temporary roads.

Drainage	UNIT	Total Average Annual Upland Erosion (Tons) - ALT2	Total Average Annual Upland Erosion (Tons) - ALT4	Total Average Annual Sediment Leaving Buffer (tons) - ALT 2	Total Average Annual Sediment Leaving Buffer (tons) - ALT 4
Lodge	25	0.1	0.1	0.0	0.0
Lodge	26	0.1	0.1	0.0	0.0
Lodge	27	2.1	2.1	0.2	0.2
Lodge	33	0.6	0.6	0.1	0.1
Lodge	34	0.4	0.4	0.0	0.0
Lodge	35	0.6	0.6	0.0	0.0
Tumble	28	1.2	1.1	0.2	0.2
Tumble	29	3.6	1.0	0.5	0.2
Tumble	30	0.3	0.3	0.1	0.1
Tumble	31	0.0	0.0	0.0	0.0
Tumble	32	0.6	0.6	0.0	0.0
Tumble	33	1.5	1.2	0.1	0.0
Deadmule/Burro	22	0.1	0.1	0.1	0.1
Deadmule/Burro	23	0.1	0.1	0.1	0.1
Deadhorse	11	3.0	3.0	0.6	0.6
Deadhorse	13	0.1	0.1	0.0	0.0
Deadhorse	15	0.6	0.6	0.1	0.1
Deadhorse	20	0.1	0.1	0.0	0.0
Swanson	11	0.0	0.0	0.0	0.0
Swanson	13	0.4	0.4	0.1	0.1
Swanson	9	0.7	0.7	0.0	0.0
Sheep Mountain	1	0.7	0.7	0.5	0.5
Sheep Mountain	11	0.6	0.6	0.5	0.5
Sheep Mountain	14	0.4	0.4	0.1	0.1
Sheep Mountain	16	1.2	1.2	0.1	0.1
Sheep Mountain	17	0.4	0.4	0.1	0.1
Sheep Mountain	18	0.7	0.7	0.0	0.0
Sheep Mountain	4	0.2	0.2	0.1	0.1
Sheep Mountain	7	0.7	0.4	0.4	0.1
TOTALS		**21.3**	**17.9**	**4.1**	**3.3**

As described earlier, the WEPP:Road modeled sediment yield estimates are not considered absolutes and are used here to assess the potential for erosion and sediment delivery from roads and to compare alternatives. For both Alternatives, the modeled estimates range from about 3% of total annual natural sediment production values for Sheep Mountain and Tumble creeks to less than 1% for all other project analysis drainages (USDA 1999). Past BMP monitoring has shown that BMPs to prevent sediment delivery from roads constructed or used for timber harvest activities have high implementation and effectiveness rates, averaging 99% from 1990-2009 (USDA 1990-2009). Based on these data, no measureable increase in sediment delivery to streams from proposed permanent or temporary roads is expected for either action Alternative 2 or 4.

Regeneration and commercial thinning harvest is proposed for all action alternatives. Silvicultural treatments include clearcut with reserves, seed-tree, and shelterwood methods. Commercial thinning would remove approximately 50 percent of the canopy and basal area in each unit. Both skyline yarding and ground-based skidding systems would be used to remove trees. Activity-generated slash piled along roadsides and in landings would be disposed of through biomass utilization, chipping or burning. Slash within the units would be left in place or treated using prescribed burning. Activity generated slash would be machine piled and burned on slopes less than 35% to increase survival of leave-trees. On steeper ground, broadcast and jackpot burning would be used for fuels reduction and site preparation. About 90 percent of the tree canopy would be removed within the harvest units, affecting water yield. Areas of unstable soils would have increased tree retention and would have less impact on water yield (see Soils report/INFISH criteria).

The Disturbed WEPP model (Elliot et. al. 2000) predicted annual surface erosion within vegetation treatment units with limited sediment delivery through stream buffers primarily to Sheep Mountain Creek, followed by Tumble, then Lodge, Swanson, and Deadhorse creeks (Table 4.10). These values should be viewed as worst-case scenarios, because on average the units with erosion modeled to exceed natural background have a 60% chance of not delivering sediment through the buffer within the first year of disturbance.

Table 4.10 – Disturbed WEPP sediment modeling estimates for vegetation treaments.

Subwatershed (HUC 6)	Drainage	Total Average Annual Sediment Leaving Buffer, Above Natural (tons) - ALT 2	Total Average Annual Sediment Leaving Buffer, Above Natural (tons) - ALT 3	Total Average Annual Sediment Leaving Buffer, Above Natural (tons) - ALT 4
Washington Creek	Teepe Creek	—	—	—
	Lodge Creek	3.2	0.3	2.5
	Tumble Creek	4.7	3.3	1.8
	Lower Washington Creek: below Lodge/Teepee/Tumble	—	—	—

Subwatershed (HUC 6)	Drainage	Total Average Annual Sediment Leaving Buffer, Above Natural (tons) - ALT 2	Total Average Annual Sediment Leaving Buffer, Above Natural (tons) - ALT 3	Total Average Annual Sediment Leaving Buffer, Above Natural (tons) - ALT 4
Little Washington Creek	North Fork of the Clearwater River: Deadmule/Burro creeks	0.1	0.1	0.1
	Deadhorse Creek	0.4	0.2	0.4
	Swanson Creek	0.7	0.4	0.2
Beaver Creek	Sheep Mountain Creek	6.6	—	2.5

Again, the Disturbed WEPP modeled sediment yield estimates are not considered absolutes and are used here to assess the potential for erosion and sediment delivery from vegetation treatment activities and to compare alternatives. Under Alternative 2, the Disturbed WEPP modeled estimates range from less than 1% of total annual natural sediment production values for Swanson Creek to 6% in Lodge Creek, 8% in Sheep Mountain Creek and 19% in Tumble Creek. Values appear relatively higher in Tumble Creek due to the lower natural annual sediment production value of 10 tons/square mile/year as compared to 16 tons/square mile/year in the Sheep Mountain Creek drainage. Forest Plan allowances for natural sediment production exceedance in these drainages ranges from 110% to 150% over natural.

Implementation of project design features and adherence to BMPs would reduce the potential for erosion and prevent channelized flow from originating in the vegetation treatment units. As ground cover reestablishes in disturbed areas (0 to 3 years), hillslope erosion potential in these areas would also diminish. In areas where erosion does occur, topography, retained woody material, and vegetated buffers would capture and store eroded material before reaching stream channels. Vegetated buffer strips located between ground-disturbing activities and streams have been shown to be highly effective at preventing sediment delivery to streams in numerous locations and under varying conditions (Belt et al. 1992, Elliott 2013, Litschert and MacDonald in 2009, Megahan and King 2004). Since 1994, BMPs used on the Forest have averaged 99% implementation and effectiveness rates for preventing sediment delivery to streams through soil and stream protection measures and the proper design, location and maintenance of skid trails, yarding corridors and landings, as well as the proper timing of prescribed burning (USDA 1990-2009). Based on these data and in light of WEPP modeling, no measureable increase in sediment delivery to streams from proposed timber harvest, site preparation or fuels treatments is expected for any of the action Alternatives.

Road Maintenance, Reconditioning, and Reconstruction:

Summary: *For Alternatives 2, 3, and 4, proposed road maintenance, reconditioning, and reconstruction; culvert replacements; and road decommissioning and storage activities are similar, thus the effects to water resources are anticipated to be similar. Minor short-duration sediment*

increases may be observed during the road-related activities described here, but these activities would provide a net benefit to water quality and flow by improving existing road drainage and restoring hydrologic function through road decommissioning or storage activities.

Road maintenance activities could occur under the action and no action Alternatives. In the action Alternatives, road reconditioning activities would occur and would include activities such as grading, culvert cleaning and brushing. Reconstruction of existing roads may include activities such as clearing vegetation, blading to reestablish drainage, adding gravel, and culvert replacements. These activities would improve road surface drainage and are expected to decrease the potential for sediment delivery from roads. Ditch maintenance would be designed to minimize soil and vegetation disturbance by only removing vegetation or debris where it is impeding water flow. For example, gravel placement and drainage improvements on Roads 5301(stream adjacent) and 724 (multiple stream crossings) in the Tumble Creek drainage would minimize erosion from the existing condition. Although the road maintenance, reconditioning, and reconstruction activities are designed to reduce sediment input over the long-term, there is the potential for a minor increase in sediment production in the short term particularly during reconstruction activities, such as with culvert replacements (one year, see *Culvert Replacements*).

All roads used for harvest activities and haul would be maintained to minimize erosion and provide proper drainage through surface blading, installation of drainage dips, and ditch and culvert maintenance. Haul on roads would not occur during wet conditions to prevent rutting and concentrated water flow on roads. This would minimize erosion from the road surface and the risk of sediment delivery to streams. At the end of the operating season, surface grading and maintenance of existing drainage structures on roads would occur to control erosion during the precipitation and runoff seasons. Additional temporary waterbars or drainage dips may be needed to effectively control erosion during the non-use season. These requirements are included in road maintenance contract provisions and BMPs applied on this project and are expected to minimize road erosion and prevent sediment delivery to streams. On the Forest, BMPS applied to prevent sediment delivery from roads used and maintained for timber harvest activities have high implementation and effectiveness rates, averaging 99% and 98% respectively, from 1990-2009 (USDA 1990-2009).

Culvert Replacements:

Summary: *Culvert replacements are expected to produce minor and short-term increases in sediment and turbidity at and immediately downstream from construction activities. Sediment increases could be measureable in the short-term (12-24 hours) immediately after and immediately downstream from the crossing replacement (100-300 feet), but effects would be localized and minor compared to the potential sediment inputs that could result from crossing failure. Overall net beneficial effects to streams and sediment conditions would occur with crossing replacement activities, and no measureable increase in sediment is expected.*

Culvert replacement needs have been identified on Roads 246, 5301, 5323, 670, 680, 722 and 724 (Refer to Appendix B).

Monitoring has shown that peak sediment input occurs immediately upon allowing water to flow through a newly adjusted channel, followed by a decrease in sediment transport and turbidity within several hours and with increasing distance downstream, typically within 300 feet (Connor 2014, Foltz et al. 2013). BMPs and mitigation measures that would minimize sediment inputs to streams during crossing removal and installation would be implemented. Additional minor short-term sediment input is expected to occur over a short time frame (1-5 days per site) as the channel makes minor adjustments. Overall the impacts downstream are expected to be short-term and recover to pre-project

conditions by the next summer due to mitigation measures that minimize sediment increases and the flushing action of the higher stream flows from runoff events.

Road Decommissioning and Storage:

Summary: *Road decommissioning and storage activities may produce short-term (0 to 3 years) and localized sediment increases, but these activities would produce both immediate and long-term beneficial effects through reductions in sediment sources, reduced culvert and fill failure risk and restored hillslope water flow processes. Design features, mitigation measures and BMPs would be applied decommissioning and storage activities to minimize sediment delivery to stream channels, and no measureable increase in sediment is expected from these activities.*

Roads proposed for storage and decommissioning are equal under all action Alternatives. The greatest water quality benefits of decommissioning are typically realized along segments of roads considered streamside and roads with stream crossings, as these segments would directly influence water resources. Many of the roads proposed for decommissioning would meet these criteria (Refer to *Appendix D of the Watershed Report).* Indirect benefits of decommissioning all roads would be expected over time as hillslope hydrology and vegetation are reestablished. Monitoring has shown decommissioning and storage treatments to be effective at reducing surface erosion and mass failure risk while increasing water infiltration rates and vegetative ground cover (Foltz 2007, Lloyd et al. 2013, USDA 1999-2009).

Road decommissioning and storage activities would disturb soil on the modified road prisms. Some of this soil would then have the potential to be transmitted downhill until stabilized by vegetation growth. Growth of vegetation on road prisms would be strongly enhanced by BMPs such as soil decompaction, live transplants, duff placement, woody debris application and seeding. Most of the soil disturbed by the proposed activities would be hundreds of feet or more from stream channels. Vegetation, downed woody material, duff, or topographical features would intercept and stabilize any immobilized soil before reaching a stream.

Compared to upland decommissioning and storage activities, soil disturbed at stream or seep crossings or in riparian areas would have a greater potential to enter stream channels during project implementation and before treated channels and slopes stabilize (1-2 years). Culvert removal and stream channel reconstruction are expected to produce potentially measureable short-duration (<12 hour) increases in stream sediment and turbidity levels immediately downstream (100-300 feet), similar to the effects previously describe for *Culvert Replacements*. Long-term benefits in sediment reductions would result from these minor, short-duration disturbances.

2. Cumulative Effects

Geographic Boundary: The Washington Creek, Little Washington Creek-North Fork Clearwater River, and Beaver Creek subwatersheds (HUC 6s) are used for the cumulative effects analysis. The extent of cumulative watershed effects is dependent on the scale of the watershed. The magnitude of changes in water and sediment yield is inversely proportional to stream order so detectable changes would not be expected beyond these scales due to the dilution of effects.

Time Frame: The temporal scope for effects is from implementation (estimated 2016), to 2040. The beginning of scope is based on when timber harvest and road and trail construction activities in the watershed first began. The scope continues to year 2040, which is approximately 24 years after project implementation, the estimated amount of time required for ECA levels from this project to be no longer perceptible. An average of 10 years after timber and shrub removal is the time believed for slopes to stabilize and when planted trees begin to be effective in providing shade to streams and

increased root strength in landslide prone terrain. Area of soils disturbance resulting from road decommissioning and storage are expected to be stabilized and revegetated within three to five years.

Past, Present, and Foreseeable Future Actions: Past activities dating to the early 1900s with varying influences on present watershed condition include fire, and timber harvest with associated road construction (refer to *Existing Stream Conditions*). Timber harvest and road construction have had the most widespread management-related impacts. Timber sales conducted between the early 1950s and late 1990s involved many miles of new road construction, little to no tree retention in regeneration harvest areas, and high severity broadcast burning of slash. These activities increased sediment delivery; reduced stream shade and tree recruitment to streams; and altered water yields. For the most part, adverse watershed effects from historical harvest activities have diminished with natural recovery (e.g. tree growth) in previously disturbed riparian areas; however, management controls on private lands are less restrictive than on Forest Service lands and many roads remain on the landscape. Given the presence of mixed land ownership and current land uses within the cumulative effects analysis area, the feasibility of relocating main system roads outside of riparian areas or decommissioning large portions of the road network is low. Since the 1990s, the Forest Service has decommissioned a little more than 6 miles of system roads and 3 miles of non-system roads; stored a little over 1 mile of system road; and converted 1 mile of system road to trail in the Teepee and lower Washington Creek drainages. Current effects of past activities indicate that management-related water yields are below thresholds of concern for all drainages affected by this project; however, sediment levels continue to exceed Forest Plan standards.

Present activities include recreation, road maintenance and noxious weed control. Overall, recreation is not creating large-scale watershed impacts and an active program is in place to maintain the existing trail system and to decommission undesignated routes. Road maintenance has minor short-term effects and long term benefits, because road maintenance routes runoff off of roads and away from water resources. Noxious weed control occurs primarily along roadsides and has a low probability of affecting water quality with the implementation of BMPs that prevent introduction of chemicals into waterways.

In addition to the continuation of present activities, future activities considered in the analysis area include precommercial thinning and harvest on private lands. Precommercial thinning is currently being explored on Forest Service lands on the North Zone (Palouse and North Fork Ranger Districts). Precommercial thinning would not result in ground disturbance, has little to no effect on erosion, and would have minimal effect, if any, on water yields. Harvest of state of Idaho lands and on private lands are part of the assumptions of the ECA analysis and are expected to increase ECA in the Washington and Beaver Creek watersheds (refer to *Cumulative Effects* discussion for Alternatives 2, 3, and 4) and could increase soil erosion. Private harvest activities would follow water and soil quality protection practices regulated through the Idaho Forest Practices Act.

Alternative 1: This alternative would create no direct or indirect effects; therefore, no cumulative effects to water yield or sediment yield would occur under this alternative. The lack of road decommissioning and storage would slow localized areas of watershed recovery.

Actions occurring on private lands would continue and are expected to increase ECAs in the Washington and Beaver Creek watersheds, as discussed below:

Action Alternatives: When all past, present and proposed project activities are considered together, it is expected that there would be no significant, adverse cumulative watershed effects.

General Watershed Condition (Road Density)

For all action Alternatives, total road density would decrease in both the Washington Creek, Little Washington Creek-North Fork Clearwater River, and Beaver Creek watersheds as a result of road decommissioning. All watersheds would remain in the "Low" (poor) condition using the road density indicator (NOAA 1998). These effects would be relatively minor at the cumulative effects scale for the Washington Creek and Beaver Creek watersheds as decommissioning activities are planned for only a portion of these watersheds; however, improvements may be more noticeable for the Little Washington Creek-North Fork Clearwater River watershed. Road decommissioning actions are considered to be important for watershed health.

Water Quantity (Water Yield)

All action Alternatives are modeled to have slight increases in water yield, as modeled by ECA, but would remain within the existing ranges of ECAs associated with overall moderate watershed conditions in the Washington and Beaver Creek HUC 6s (15-20% ECA) and high or good watershed conditions in the Little Washington Creek-North Fork Clearwater River HUC 6 (0-15% ECA) thru 2026. As a result of harvest on private lands, ECA values are expected to increase slightly by 2026 within the Washington and Beaver creek even without implementation of the Barnyard South Sheep project.

Table 4.11 – Estimated Equivalent Clearcut Areas (ECA) for all project alternatives for modeled years 2016 and 2026 (6th field HUCs).

Subwatershed	ALT 1		ALT 2		ALT 3		ALT 4	
	2016	2026	2016	2026	2016	2026	2016	2026
Washington Creek	15.6%	16.6%	16.5%	17.0%	16.0%	16.6%	16.1%	16.6%
Little Washington Creek-North Fork Clearwater River	2.1%	1.9%	3.5%	2.1%	2.8%	1.9%	3.2%	2.0%
Beaver Creek	17.6%	19.2%	18.3%	19.4%	17.9%	19.3%	18.1%	19.3%

All modeled changes are well below thresholds where detrimental effects may be observed (25-30% ECA). No effects related to water yield would be notable beyond the cumulative effects analysis area. As such, no adverse cumulative watershed effects due to changes in water yield are expected.

Water Quality (Sediment Yield)

The indicator used for sediment yield is sediment delivered to streams. For all action Alternatives, modeled estimates indicate a very low potential for measurable sediment delivery to streams from temporary roads and vegetation treatment activities. Proposed harvest, site preparation, and fuels treatment activities under all Action alternatives are expected to produce similar non-measurable direct and indirect sedimentation effects, consistent with the conclusions from the WEPP modeling, literature, field observations and monitoring results used in this analysis. The implementation of BMPs

and design criteria would minimize soil disturbance, exposure and erosion in the treatment units and decrease erosion and the potential for sediment delivery from road and watershed improvement activities.

The implementation of INFISH buffers will not increase water temperature, change woody debris recruitment, pool frequency or width to depth ratios, thus INFISH objectives will be met.

Based on the implementation of project design measures and adherence to Idaho Best Management Practices, the Barnyard South Sheep project would produce no measurable increase in any pollutants and therefore would have no impacts to the beneficial uses for the main North Fork Clearwater River.

Irreversible and Irretrievable Commitment of Resources: There are no effects to watershed resources from this project that are considered to be irreversible or irretrievable.

B. Compliance with Regulatory Laws and Forest Plan

Executive Orders 11988 and 11990 regarding Floodplain and Wetland Management

EO 11988 directs the Forest to "*restore and preserve the natural and beneficial values served by floodplains*". The Project will not modify or occupy floodplains to an extent greater than already exists. As such, there will be no adverse impacts to floodplains; thereby complying with EO 11988.

EO 11990 directs the Forest to "*minimize the destruction, loss or degradation of wetlands*". The Project does not propose to modify or destroy wetlands. As such, the Project will not adversely affect wetlands; thereby complying with EO 11990.

Clean Water Act, Safe Drinking Water Act, and Idaho State Water Quality Laws

The proposed project is also consistent with all applicable State and Federal water quality laws because project Design Criteria and Mitigation Measures have been included to protect water resources.

Idaho State Water Quality Standards designate beneficial uses in Washington and Beaver creeks for cold water biota, salmonid spawning, and secondary contact recreation. All other streams in the analysis area fall under 'Nondesignated Surface Water', where standards for cold water aquatic life and secondary contact recreation apply (IDAPA 58.01.02; sec.101). The associated water quality criteria that may be affected by this project include water temperature and turbidity. This project would not have a significant effect on stream temperatures or turbidity levels.

Multiple-Use, Sustained Yield Act

The proposed project is consistent with the intent of the Multiple-Use Sustained-Yield Act of 1960, which states that management of the National Forests must provide "sustained yields in perpetuity without impairment of the productivity of the land", because watershed functions are not expected to be impaired.

National Forest Management Act

The proposed project is consistent with the intent of the NFMA because project activities will not irreversibly damage water resources and project Design Criteria, Mitigation Measures, and BMPs have been included to protect water resources.

Clearwater National Forest Plan

Forest Plan standards for water (pages II-27-29) apply to this project and would be met as displayed in the following table:

Table 4.12 – Compliance with Clearwater National Forest Plan Water Standards

Standard Number	Subject Summary	Compliance Achieved By
8a.	Secure favorable condition of flow by maintaining the integrity and equilibrium of all stream systems.	No adverse increase in peak flow or sediment increases expected, so channel processes would not be altered.
8b.	Manage water quality and stream conditions to assure management activities do not cause permanent or long-term damage to beneficial uses.	No adverse increase in peak flow or sediment increases expected, so channel processes would not be altered. Temperature would not increase due to INFISH buffers. Beneficial uses would be maintained.
8c.	Apply BMPs to project activities to ensure water quality standards are met or exceeded.	BMPs would be implemented.
8d.	Manage all waters under a basic standard.	Project managed and designed for appropriate standard.
8e.	In addition to standard d., manage all watershed systems considered important for the fishery resource based on 1) No effect, 2) High Fishable, 3) Moderate Fishable, 4) Low Fishable, and 5) Minimum Viable.	
8g	Design, schedule and implement management activities that would: (1) maintain water quality and stream conditions that are not likely to cause sustained damage to the biological potential of the fish habitat; (2) not reduce fish habitat productivity in the short-term below the assigned standard; (3) maintain water quality in a condition that is not likely to inhibit recovery of the fish habitat; and (4) require a watershed cumulative effects analysis	Project design measures, BMPs, and watershed improvement projects would maintain or improve water quality, channel conditions, and fish habitat. A cumulative watershed effects analysis was completed for this project.
8k.	Conduct nonpoint source activities in accordance with applicable BMPs as referenced in *Idaho Water Quality Standards and Wastewater Treatment Requirements* and *Soil and Water Conservation Handbook.*	BMPs would be implemented.

Project activities were designed to produce no measureable increase in stream sediment to protect water quality and comply with the Lawsuit Settlement Agreement for causing no measurable increase in sediment.

III. Fisheries (Ref: Barnyard South Sheep Fisheries Report)

A. Management Indicator, Sensitive and Threatened Species

1. Direct and Indirect Effects

Alternative 1: This alternative would have no direct or indirect effects on MIS, sensitive or threatened fish species, because none of the proposed treatments would be conducted. Road decommissioning and storage, which have the potential to improve watershed conditions, would not be funded by or performed as a part of the proposed timber harvest, although it would not be precluded from future implementation.

Alternatives 2, 3 and 4: As displayed in Table 4.13, each of these alternatives would impact individuals or habitat for westslope cutthroat trout, redband trout, and western pearlshell mussel, but

would not likely cause a trend toward federal listing or reduce viability for the population or species. Also, the effects of each of these alternatives would not likely adversely affect bull trout. The effects of each alternative would be limited to possible temporary and site-specific impacts related to road decommissioning, storage, reconstruction, culvert replacement, and hauling. These activities may injure or kill a small number of individuals of these species (excluding bull trout), but there should be no long-term effect at the population scale. The road-related activities may similarly affect habitat at the site-specific and temporary scales, but in aggregate and in the long term should improve watershed conditions and therefore species habitat. There should be no direct and little to no indirect effects to species habitat from vegetation manipulation, chiefly because of the use of INFISH riparian buffers.

Table 4.13 – Threatened, Endangered, and Sensitive Species Summary of Conclusion of Effects

LATIN NAME	Common Name	Cat.	ALT 1	ALT 2	ALT 3	ALT 4
Oncorhynchus clarki lewisi	Westslope cutthroat trout	**S**	NI	MIIH	MIIH	MIIH
Oncorhynchus clarki bouvieri	Yellowstone cutthroat trout	**S**	NI	NI	NI	NI
Oncorhynchus mykiss gairdneri	Snake River steelhead trout	**T**	NE	NE	NE	NE
Oncorhynchus mykiss	Redband trout	**S**	NI	MIIH	MIIH	MIIH
Oncorhynchus tshawytcha	Snake River spring/ summer chinook salmon	**S**	NI	NI	NI	NI
Oncorhynchus tshawytcha	Snake River fall chinook salmon	**T**	NE	NE	NE	NE
Salvelinus confluentus	Bull trout	**T**	NE	NLAA	NLAA	NLAA
Lampetra tridentata	Pacific lamprey	**S**	NI	NI	NI	NI
Margatifera falcate	Western pearlshell mussel	**S**	NI	MIIH	MIIH	MIIH

Federally listed Threatened (T) Species Determination: NE = No Effect; NLAA = Not likely to adversely affect.
Sensitive (S) Species Determination: NI = No Impact; MIIH = May impact individuals or habitat but not likely to cause trend toward federal listing or reduce viability for the population or species.

2. Cumulative Effects

Geographic Boundary: The area for assessing cumulative effects is the Washington Creek subwatershed, the project portion of the Beaver Creek subwatershed, the Sheep Mountain Creek drainage down to its confluence with Beaver Creek, and the approximate 7,000 acres of the Little Washington Creek subwatershed. The total cumulative effects area is about 40,000 acres, of which approximately 44% is NFS land, with the majority of the rest owned by the Potlatch Corporation, and a small percentage owned by the State of Idaho and managed by the Idaho Department of Lands. This is the area in which past, present, and foreseeable future activities could measurably affect the hydrology, aquatic habitat, and biota of the combined subwatersheds.

Time frame: The duration of cumulative effects would be about 3 years for direct effects, while long-term beneficial effects should last indefinitely unless the project area is subject to future (and currently unplanned) road construction, reconstruction, or a similar large-scale soil disturbing event. Beyond the period of implementation, about an additional two years would be required for vegetation to sufficiently establish and minimize surface erosion from soil disturbed by the timber harvest, road construction, culvert replacement, and decommissioning and storage activities.

Past, Present, and Foreseeable Future Actions: The past, present, and reasonable foreseeable activities in an analysis area and adjacent non-federal lands are listed in Appendix A. The following narratives briefly describe those activities that have affected aquatic species and their habitat:

- Livestock grazing, which began at the time of European settlement, was concentrated in meadows and riparian areas that reduced the quality of these habitats for fish and wildlife. Although there are no FS grazing allotments, there is likely some cattle grazing on Potlatch land in the upper Washington Creek drainage.
- Placer mining was common in most to the North Fork Clearwater River basin in the late 19th and early 20th century, and there was probably some in the cumulative effects area. There does not appear to be much gold in the streams of the cumulative effects area, and no placer mining is known to currently occur.
- Most (~70%) of the timberlands in the cumulative effects area escaped the effects of the wildfires of the early 20th Century, but the effects of white pine blister rust and fire suppression left most of the area in an early-seral stage and shifted from a white pine dominated forest to one dominated by Douglas-fir and grand fir. Timber harvest on National Forest lands within the project area started in the 1950s, primarily as white pine selection and clearcuts, and continued at a relatively rapid pace through the 1960s. Timber harvest declined substantially in the 1980s through the present. On the private and state lands in the upper Washington Creek drainage, timber harvest has continued at a rapid pace as stands mature to commercial size, and so nearly all of the mature and old growth stands in the cumulative effects area are on National Forest lands. Road density (primarily for access to timber stands) in the cumulative effects area subwatersheds is very high at between 4 to 6 mi/mi^2. The harvest of private and state timber stands will likely continue to occur on a rotation of about 60 years.
- Recreational use occurs throughout the summer months, starting around Memorial Day at lower elevation as snow melts off access roads, continuing through the fall hunting seasons. A number of dispersed campsites are located along the road system. The road system is used by full-size vehicles and OHVs. Along with the developed Camp 60 trailhead area, several system OHV routes exist and OHV use is increasing. Roads are also open to snowmobile use in the winter, which can cause disturbance and/or displacement of wildlife species. Similar or slightly increased motorized and non-motorized winter use is anticipated in the future.
- The Idaho Department of Fish & Game has no public records of fish stocking within the cumulative effects area, although some (of mostly rainbow trout) occurred in the North Fork Clearwater River up until the 1980s. There was likely unrecorded stocking of rainbow and perhaps cutthroat trout in the cumulative effects area in the mid-20th century, and the ubiquity of brook trout in the upper Washington Creek subwatershed makes it very likely that this species was directly introduced to the drainage.

Alternative 1: There would be no cumulative effects on MIS, sensitive, or threatened species, because this alternative proposes no activities that could be added to ongoing and foreseeable actions. Local or regional populations or stream habitats would not be affected.

Alternatives 2, 3 and 4: With regard to westslope cutthroat trout, redband trout, and western pearlshell mussel, past road construction and maintenance, timber harvest, fuels treatments, motorized recreation, livestock grazing, and other human activities, especially within stream channels and in riparian areas have reduced the quality of habitat for these species and other aquatic organisms. As for the proposed project, little to no detectable turbidity should occur in fish-bearing streams in the short or long-term, because any turbidity reaching the North Fork Clearwater River or Beaver Creek below

the project boundary would be diluted to a level that would not affect aquatic organisms. Similarly, project-caused fine sediment transmission to fish-bearing streams would be minimal and undetectable in all time scales. As a result, these species and other aquatic organisms in fish-bearing streams downstream of the project area should not be substantially affected by the proposed activities. Potential sedimentation effects of the project would be immeasurable beyond the confluence of Washington, Little Washington, Deadhorse, Dead Mule, and Burro creeks with the North Fork Clearwater River and Sheep Mountain Creek with Beaver Creek, due to the minor amounts of sediment potentially produced from activities and the dissipation of sediments in the higher flows of the North Fork Clearwater River and Beaver Creek.

Maintenance of existing roads in the watershed is a current and ongoing activity that has the potential to deliver minor amounts of sediment to streams. These activities would utilize best management practices to minimize the potential for sediment delivery to streams. Ongoing and future use of existing roads and unauthorized motorized recreation would likely continue to degrade suitable habitats to some extent, and a large majority of the watershed is well-roaded or otherwise accessible to off-road vehicles. Road access closures, decommissioning, and storage may reduce the effects of roads on stream and riparian habitats. Ongoing and future road management activities (including those associated with the proposed project) would continue this trend, leading to long-term improvement in the quality of habitats. Also, riparian buffers and Idaho Forest Practice Act standards (for private and state land activities) would be implemented for all ongoing and future projects, preventing or greatly minimizing degradation of habitat.

With regard to bull trout, critical habitat has been designated in the North Fork Clearwater River and Beaver Creek, both of which are located tangent to the cumulative effects area. Although individual bull trout could enter the project area and the effects on water quality could be transmitted to aforementioned critical habitat, possible effects to bull trout would be similar or likely less to those discussed for the other species. As such, no cumulative effects to bull trout or its habitat are anticipated with any of the action alternatives.

B. Compliance with Regulatory Laws and Forest Plan

Endangered Species Act: Section 7 of the Act, as amended, requires federal agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of threatened, endangered, or proposed species, or cause the destruction or adverse modification of their critical habitats. In addition, the USFS has established direction in Forest Service Manual (FSM) 2670 to guide habitat management for threatened, endangered, proposed, and sensitive species. This analysis and a Biological Assessment were prepared in accordance with legal requirements set forth under section 7 of the ESA and follows standards established in FSM direction (2672.42) and the Code of Federal Regulations (50 CFR 402).

Clearwater National Forest Plan: Forest Plan standards for water (pages II-27-29) also apply to fisheries and would be met as displayed in Table 4.12 of the *Watershed* section.

IV. Wildlife (Ref: Barnyard South Sheep Wildlife Report)

This section discusses the effects of management activities on the habitat of wildlife species listed in Chapter 3. The issue indicator for all species is the acres of habitat affected.

A. MIS and TES Wildlife Species

Suitable habitats for each wildlife species were described based on Forest Plan direction, the conditions of existing vegetation, and other relevant habitat attributes. Specific habitat models are described further in this section, where applicable.

1. Elk and Moose

Methodology: The amount and condition of winter habitat (i.e. winter range) on the North Fork District is considered to be more limiting to the elk population than summer range (CNF 1999), and the Forest Plan mandates the use of the Elk Habitat Effectiveness (EHE) model (Leege 1984 and updated in Servheen et al. 1997) in assessing baseline conditions for summer/fall elk habitat and the likely effects of proposed management actions. The model uses road density, proportions of cover and forage habitat, and proportion of "security" habitat within the analysis area to numerically assess habitat quality, with a maximum score of 100 (often not achieved even in pristine, unroaded habitat).

The project area contains all or portions of three Elk Analysis Units (EAUs); Washington, Sourdough-Deadhorse, and Deadhorse-Washington (see Table 4.14). Additionally the project area contains 3,481 acres of winter range, which for the purpose of this analysis was treated like a separate EAU.

a. Direct and Indirect Effects

Although there are important differences between the habitat preferences and life history characteristics for moose and elk, the direct and indirect effects on each species would essentially be the same as those described below for elk.

Table 4.14 – Elk Habitat Effectiveness (EHE) Metrics by Alternative

Washington EAU				
Metric	**Alt. 1**	**Alt. 2**	**Alt. 3**	**Alt. 4**
% Cover/Forage	91/9	84/16	88/12	87/13
Standard Road Density (mi/mi^2)	2.8	1.5	1.5	1.5
% Security Small/Large[1]	0/0	0/0	0/0	0/0
EHE %	32	45	45	45
Sourdough-Deadhorse EAU				
Metric	**Alt. 1**	**Alt. 2**	**Alt. 3**	**Alt. 4**
% Cover/Forage	84/16	76/24	80/20	79/21
Standard Road Density (mi/mi^2)	4.2	2.5	2.5	2.5
% Security Small/Large	0/0	0/0	0/0	0/0
EHE %	22	37	37	36

[1] The proportion of the total EAU area composed of small (<250 acre) and large (>250 acre) security patches.

Deadhorse-Washington EAU				
Metric	**Alt. 1**	**Alt. 2**	**Alt. 3**	**Alt. 4**
% Cover/Forage	90/10	89/11	89/11	89/11
Standard Road Density (mi/mi^2)	4.0	3.0	3.0	3.0
% Security Small/Large	0/0	0/0	0/0	0/0
EHE %	22	30	30	30
Winter Range				
Metric	**Alt. 1**	**Alt. 2**	**Alt. 3**	**Alt. 4**
% Cover/Forage	94/6	94/6	94/6	94/6
Standard Road Density (mi/mi^2)	0.9	0.5	0.5	0.5
% Security Small/Large	0/20	0/20	0/20	0/20
EHE %	58	72	72	65

Alternative 1: Since this alternative would implement no treatments, elk summer habitat effectiveness and security would remain unchanged in the short term. Habitats would continue to be altered by natural events such as succession and potential wildfire. Indirect effects on elk would primarily include a decrease in the amount of early succession stage vegetation (forage habitat) for about 30 years, as old regeneration harvest units grow from early- to mid-successional stage.

In the long term, as a result of fire suppression, forest succession would likely continue. Open patch sizes would continue to decrease as trees grow and mature in old openings, and conifers would potentially encroach within riparian meadows. If wildfires were to occur in the area, forage areas could be replenished, but existing cover would decrease. As bug kill and root rot continue, areas that currently provide thermal cover would become too open to serve that function, and the dead fall of trees may become too deep for elk to move through in certain areas.

Another conceivable indirect effect of “no action” would the lack of complete physical closure of roads that would be decommissioned or stored under the action alternatives. Any current or future unauthorized motorized use of some of the closed roads, reducing elk security, would likely continue. This might be the biggest impact from Alternative 1.

Alternatives 2, 3 and 4: For the purpose of this analysis canopy cover greater than 40% was classified as being “cover” and canopy cover less than 40% (grass and shrub cover types) were classified as “forage”. The regeneration harvest proposed under each action alternative would reduce existing cover, while causing a like increase in forage. The eventual growth of shrubs and young trees in the treated areas would replace the lost cover in about 20 years. Proposed commercial thinning would reduce some cover, and there would be a slight increase in grasses, shrubs, and forbs within the treated areas. However, sufficient cover would remain after the thinning, and unlike the regeneration harvest, the acreage thinned under the action alternatives was not converted to “forage” in the EHE modeling.

Roads affect elk in that individual animals can be displaced from preferred habitat because of increased disturbance and because the animals are more vulnerable to human-caused mortality (Servheen et al. 1997). Because the amount and type of human use of roads as well as simple density is thought to be important in assessing effects on elk populations, the concept of road density is modified for use in the Elk Habitat Effectiveness model (Leege 1984 and updated in Servheen et al. 1997) by the type of road, amount of motorized use, and timber stand screening ability (i.e., cover vs. forage) to develop a “standard” road density (Servheen et al. 1997) for analysis areas.

All the action alternatives would decommission 44.6 miles of system roads and 31.0 miles of non-system roads. Additionally, 28.4 miles of system roads and 20.6 miles of non-systems roads would be placed into storage. These reductions in road density have the largest impacts on the Elk Habitat Effectiveness calculations for the action alternatives.

In regards to elk security, access management and effective road closures can reduce the levels of human activity in elk habitat, thereby reducing the level of some human-induced disturbances (Servheen et al. 1997). The EHE model designates summer security habitat as those areas occurring more than ½ mile from roads on which motorized use occurs (Servheen et al. 1997). Based on these buffers, the three EAU's contain no small or large of elk security habitat. This is true regardless of the alternative. The portion of winter range within the project area does contain 693 acres of "elk security" but also remains unchanged between the no action and action alternatives.

In summary, the proposed activities under either action alternative should have small but positive long term effects for elk within the project area. Short term, some elk may be displaced from parts of the project area during implementation. However, given the size of the project area and the fact that various parts of the project would be implemented over time, elk should have adequate habitat in the project area and vicinity of the project area to avoid disturbance. Based on the extent of harvest and thinning treatments, there would be little difference between the action alternatives at the project scale, with each alternative trending towards a better balance in cover and forage. Proposed watershed improvement activities would increase the effectiveness of elk habitat by changing standard road densities. Modeled security habitat would not change under any of the alternatives. Because of the relatively small differences among the alternatives, future changes in elk population within the project area would likely be driven primarily by hunting regulations and enforcement, off-site winter forage and cover conditions, and predator abundance.

b. Cumulative Effects

Geographic Boundary: The area for assessing cumulative effects for elk and moose is the combined area of the three EAUs and the portion of winter range contained within the project area, which is the area potentially affected by the proposed activities.

Time frame: The period for this analysis is 20 years, which is the amount of time required for regenerated stands to develop hiding cover.

Past, Present, and Foreseeable Future Actions: The past, present, and reasonable foreseeable activities in an analysis area and surrounding non-federal lands are listed in Appendix A. Past and present timber harvest, primarily on private and State land, has increased the availability of early seral habitats in analysis area, which has provided foraging opportunities. Road construction increased open road density and caused the loss of security areas, increasing vulnerability to hunting and decreasing habitat effectiveness. More recently, roads have been closed, stored, or decommissioned, causing a trend toward increased security, decreased vulnerability, and increased security. The proposed project and probable harvest on private timber ground is the only foreseeable activity in the project area that would affect these species.

The project area is located in the western edge of Game Management Unit (GMU) 10A of the Dworshak Zone. The elk population in this GMU is below objectives for bulls, but cow numbers are currently at the upper end of the population objective (IDFG 2014). The new IDFG Elk Plan (2014) list vulnerability due to high road density as being a population level issue, particularly for bulls. Unit 10A contains a large amount of Potlatch Corp. timber ground (in excess of 1/3 of the GMU) which limit opportunities to reduce road density zone wide.

No population data for moose have been collected on a regular basis in the region. Some populations appear to be increasing and seem to respond favorably to extensive habitat alteration by silvicultural practices. However, other populations may be displaced or eliminated because they cannot adapt to habitat changes, particularly where yew thickets are eliminated through logging and where increased road densities make moose more vulnerable to harvest (Toweill 2008).

Alternative 1: There would be no cumulative effects on elk, because this alternative proposes no activities that could be added to present or foreseeable actions. Current population trends would not be affected.

Action Alternatives: Either of these action alternatives would provide some additional forage while reducing cover as a consequence of the proposed treatments. These two effects would balance each other to some extent but would likely be beneficial in the three EAUs, because cover is abundant while forage habitat is somewhat limited. The opposite would continue to be true on the private lands to the west of the project area. The action alternatives would also contribute to the ongoing trend of reduced motorized access, which would increase security, decrease vulnerability, and increase habitat effectiveness.

Forest Plan and Regulatory Consistency: The Forest Plan standard for elk habitat effectiveness (managing for a minimum of 25%) would be met by each of the action alternatives. The same is true for Alternative 1, even though two of the EAUs display habitat effectiveness values below 25%. This is due to the 25% standard applying to management areas, which in this case is being met within management Area E1. There are no standards that apply directly to moose.

2. Northern Goshawk

Methodology: The first analysis uses a Forest nesting habitat model that uses stand age of ≥130 years as a surrogate for the presence of the large-diameter trees and snags necessary for nesting success. A Forest foraging habitat model uses crown closure of ≥40% in all stands as a surrogate for suitability, while the PFA habitat model assesses stands with relatively large tree diameter and moderate to high canopy closure as suitable. In this analysis, existing habitat areas and changes associated with action alternatives are quantified and displayed in the following table:

Table 4.15 – Habitat Availability and Short-term Changes for Northern Goshawk

	Habitat Available on the Clearwater National Forest (acres)	Habitat in the Analysis Area (acres)	Habitat in the Treatment Units (acres)	Change in Habitat Availability in the Analysis Area (percent)	Change in Habitat Availability on the Clearwater NF (percent)
Existing Condition & Alt 1	Nesting: 31,801 Foraging: 575,596	Nesting: 2,571 Foraging: 5,850	Nesting: 0 Foraging: 0	Nesting: 0 Foraging: 0	Nesting: 0 Foraging: 0
Alt 2			Nesting: 0 Foraging: 459	Nesting: 0 Foraging: -7.8	Nesting: 0 Foraging: -0.08
Alt 3			Nesting: 0 Foraging: 195	Nesting: -0 Foraging: -3.3	Nesting: 0 Foraging: -0.03
Alt 4			Nesting: 0 Foraging: 268	Nesting: 0 Foraging: -4.6	Nesting: 0 Foraging: -0.05

The second analysis focuses on the potential number of goshawk territories in the project area. Assessment areas of 5,000 acres at a minimum (USDA 1990) and 5,400 acres not including nest areas, post fledging area (PFA), and natural or created openings are recommended for evaluation of potential goshawk suitability (Reynolds et. al. 1992).

Given these recommendations, there should be at least one home range within the FS managed ground[2] of the project area. Management recommendations for the home range include approximately three suitable nest areas and three replacement areas (each 40 acres) and a mosaic of vegetation structural stages in approximately 420-acre PFAs. In the case of Barnyard South Sheep, the hypothetical home range would each support at least a total of 7 full 40-acre nesting areas surrounded by 420-acre PFAs with 6 out 7 of these containing at least 60% mid and late seral habitat (one of the PFAs contains 59% due to being 3 acres short). The following table displays the effects of the alternatives on the seven PFAs:

Table 4.16 – Goshawk Recommended Condition and Predicted Conditions by Alternative

Habitat	**Existing (Alt. 1)**			**% Change by Action Alternatives[3]**		
PFA	Nesting[4]	Foraging	Total	Nesting	Foraging	Total
1	184	68	249	0	0	0
2	135	207	342	0	0	0
3	148	137	285	0	0	0
4	269	72	342	0	0	0
5	199	98	296	0	0	0
6	166	88	254	0	-1.1	-0.4
7	149	123	272	0	-11.4	-5.1

a. Direct and Indirect Effects

Alternative 1: This alternative would have little to no direct effects on the northern goshawk. No treatment would cause goshawk habitats to be altered by natural events such as succession, insect and disease, and potential wildfire.

In general, nesting habitat would increase and foraging habitat would decrease as forest succession continues to fill in understories and increase stand canopy closure. In predominantly grand fir and Douglas-fir stands, additional trees would die as a result of root rot, and dead trees would eventually fall to the ground. This process would create openings and gaps that could be utilized as foraging habitat by goshawks.

Fuel build-up resulting from fire suppression activities would continue, thereby increasing the likelihood of a stand-replacing fire. Stand-replacing fires could potentially reduce nesting habitat across the project area, and depending on size and severity, could even create the various elements of goshawk habitat.

[2] For the purposes of this analysis only the FS portion of the project area were used, given the high probability of future logging on the private timber ground.
[3] Largest impact is from regeneration harvest. Commercial thinning is not considered, because it does not eliminate foraging habitat.
[4] Stand exam data obtained post-analysis showed 247 acres no longer classified as nesting habitat, which is not reflected in this table. None of the acreage that dropped out is proposed for treatment.

All of the PFAs described in Table 4.16 would remain intact. Alternative 1 would cause little change in northern goshawk use and occupation of the habitats managed by the Forest Service, nor would this alternative affect the availability of northern goshawk habitats at the Forest level.

Alternatives 2, 3 and 4: Timber harvest has been shown to reduce or eliminate goshawk nesting, PFA, or foraging habitat, depending on the extent of the harvest (Bull et al. 2007). Since no timber harvest would occur in old growth or mature forests, there would be no measurable effect on modeled nesting habitat with either action alternative. That leaves only the foraging habitat with the potential to be affected by the regeneration harvest proposed under each alternative. As displayed in Table 4.15, Alternatives 2, 3, and 4 would affect foraging habitat up to 7.8%, 3.3%, and 4.6%, respectively).

Construction of temporary roads associated with each alternative would affect up to eight acres of habitat on cleared road prisms. This effect would be halved in the long-term, as the decommissioned temporary roads revegetate. Changes to access management and changes in existing road configurations under all action alternatives would have little effect on the northern goshawk, because few or no substantial trees would be removed under these activities.

Blending the two analysis methods (i.e. the results displayed in Tables 4.15 and 4.16), the reduction in foraging habitat and modeled PFAs would be relatively contained and would not affect most areas of the theoretical home range. As such, there should not be a biologically meaningful reduction in foraging success or PFA for the hypothetical home range within the analysis area, and the proposed actions of each alternative should have little effect on goshawk abundance or persistence. This would be due to late seral (i.e. nesting) habitat not being affected, and mid-seral (i.e. foraging) habitat remaining abundant outside of the harvest units.

b. Cumulative Effects

Geographic Boundary: The area for assessing cumulative effects on goshawks are OGAUs 310 and 314, which total 24,559 acres. This area was selected because the project area lies entirely within these two OGAUs, and because the goshawk was selected in the Forest Plan as an old-growth MIS. Any effects would be diluted at a larger scale.

Time frame: The time frame is approximately four decades. This is about the period necessary for a regeneration-harvested unit to regrow conifers to the smallest size class that would qualify as goshawk foraging habitat under the Forest GIS model.

Past, Present, and Foreseeable Future Actions: The past, present, and reasonable foreseeable activities in an analysis area and adjacent non-federal lands are listed in Appendix A. Past timber harvest slightly decreased the availability of mature and old growth forest habitat that provide the highest quality foraging and nesting sites for this species. Most of this harvest has occurred on state and private lands, located west of the analysis area. Because of continued timber harvest by private landowners and the State of Idaho, it can be assumed that little nesting habitat for goshawk will persist or develop in the long-term. As a consequence, the long-term viability of northern goshawk is likely dependent upon National Forest lands.

All Alternatives: Those activities that have the potential to reduce northern goshawk habitat are regeneration harvest. Since there are no such foreseeable activities planned on the Forest Service managed lands within the cumulative effects area, there would be no cumulative effects to goshawk habitat. Only the direct and indirect effects, already described, would occur.

Because the geographic boundary consists entirely of National Forest lands, the long-term viability of northern goshawk in this area is dependent upon Forest Service management, of which no ongoing or

reasonably foreseeable projects are planned. The two OGAUs making up this area include many stands which will progress in seral succession over the four- decade time frame. These areas of recruitment would increase the potential suitable forage and nesting habitat for the species (likely many times that affected by the proposed project) and the number of home ranges.
It is expected that no measurable effects to goshawk populations at the Forest or regional scale, or alteration of current population trends would occur with any of the alternatives.

Forest Plan and Regulatory Consistency: None of the standards or guidelines of the Clearwater Forest Plan specifically address northern goshawk or goshawk habitat beyond the species' designation as a Management Indicator and as a relevant species for the guidelines for old growth retention in Appendix H of the Forest Plan (CNF, 1987). Since the affected OGAUs currently meet Forest Plan standards for old-growth habitat and the proposed actions of this project would not affect such habitat, including step-down (CNF, 2006), this habitat would remain available to support the local and regional populations of northern goshawk under all alternatives.

3. Pileated Woodpecker

Methodology: The analysis of effects on pileated woodpeckers is based on habitat associations and direction in USDA (1990) and Samson (2006a) and other scientific literature (primarily Bull and Jackson 1995). A Clearwater N.F. GIS-based habitat suitability model consistent with USDA (1990) and Samson (2006a) was used to identify potential suitable habitat, as shown in Table 4.17. The Clearwater N.F. nesting habitat model uses stand age of ≥130 years as a surrogate for the presence of the large-diameter trees and snags necessary for nesting success. The foraging habitat model uses stand succession of mid-seral or older as a surrogate for suitability.

Table 4.17 – Habitat Availability and Short-term Changes for Pileated Woodpecker

	Habitat Available on the Clearwater National Forest (acres)	Habitat in the Analysis Area (acres)	Habitat in the Treatment Units (acres)	Change in Habitat Availability in the Analysis Area (percent)	Change in Habitat Availability on the Clearwater NF (percent)
Existing Condition & Alt 1	Nesting: 268,718 Foraging: 338,680	Nesting: 2,571 Foraging: 6,894	Nesting: 0 Foraging: 0	Nesting: 0 Foraging: 0	Nesting: 0 Foraging: 0
Alt 2			Nesting: 0 Foraging: 729	Nesting: 0 Foraging: -10.6	Nesting: 0 Foraging: -0.22
Alt 3			Nesting: 0 Foraging: 355	Nesting: -0 Foraging: -5.1	Nesting: 0 Foraging: -0.11
Alt 4			Nesting: 0 Foraging: 462	Nesting: 0 Foraging: -6.7	Nesting: 0 Foraging: -0.14

The second analysis methodology for determining potential effects on pileated woodpeckers involved mapping old growth and mature forest stands (i.e. suitable nesting habitat) in the wildlife analysis area and delineating hypothetical 1,000-acre home ranges based on the distribution of suitable nesting stands/groups of stands. For analysis purposes a total of six home ranges were delineated (refer to Figure 6 in Appendix A of the *Wildlife Specialist Report*). The habitat contained within each home range is summarized in the following table:

Table 4.18 – Pileated Woodpecker Habitat[5] by Hypothetical Home Range.

Alternative	Home Range A		**Total**	Home Range B		**Total**
	Nesting	Foraging		Nesting	Foraging	
1 (existing)	185	597	782	316	338	654
2	185	597	782	316	317	633
3	185	597	782	316	317	633
4	185	597	782	316	317	633
Alternative	Home Range C		**Total**	Home Range D		**Total**
	Nesting	Foraging		Nesting	Foraging	
1 (existing)	219	321	540	367	492	859
2	219	314	533	367	480	847
3	219	314	533	367	489	856
4	219	314	533	367	480	847
Alternative	Home Range E		**Total**	Home Range F		**Total**
	Nesting	Foraging		Nesting	Foraging	
1 (existing)	288	459	747	318	285	603
2	288	459	747	318	263	581
3	288	459	747	318	266	584
4	288	459	747	318	269	587

a. Direct and Indirect Effects

Alternative 1: This alternative would have little to no direct effects on pileated woodpeckers. No treatment would cause pileated woodpecker habitats to be altered by natural events such as succession, insect and disease, and potential wildfire. All of the home ranges described in table 4.18 would be sufficient to support a pair of pileated woodpeckers. Alternative 1 would cause little change in pileated woodpecker use and occupation of the habitats managed by the Forest Service, nor would this alternative affect the availability of pileated woodpecker habitats at the Forest level.

Alternatives 2, 3 and 4: Timber harvest has been shown to potentially reduce reproductive success of pileated woodpeckers (Bull et al. 2007), depending on the extent of the harvest. As displayed in Table 4.16, Alternatives 2, 3 and 4 would affect foraging habitat up to 10.6%, 5.1%, and 6.7%, respectively. Similarly, their effects on foraging habitat within the six home ranges described in Table 4.18 would still provide sufficient habitat to support a pair of pileated woodpeckers.

Construction of temporary roads associated with Alternatives 2 and 4 would affect up to eight acres of habitat on cleared road prisms. This effect would be halved in the long-term, as the decommissioned temporary roads revegetate. Changes to access management and changes in existing road configurations under all action alternatives would have little effect on pileated woodpeckers because few or no substantial trees would be removed under these activities.

For the project area as a whole, including the hypothetical home ranges, the net effect of each of the action alternatives on pileated woodpecker habitat would be minor. Nesting habitat, which is relatively abundant, would remain undisturbed, and foraging habitat, which is even more prevalent, would have up to 729 acres (or 10.6% of total) treated. As such, there may be a biologically meaningful reduction in foraging success in one or a few territories within the analysis area, but the proposed actions should have no direct effect on individual pileated woodpeckers and little to no effect on woodpecker

[5] Stand exam data obtained post-analysis showed 247 acres no longer classified as nesting habitat, which is not reflected in this table. None of the acreage that dropped out is proposed for treatment.

abundance or persistence, because late seral (i.e. nesting) habitat would not be affected and mid-seral (i.e. foraging) habitat would continue to remain abundant outside of the harvest units.

b. Cumulative Effects

Geographic Boundary: The area for assessing cumulative effects on pileated woodpeckers are OGAUs 310 and 314, which total 24,559 acres. This area was selected because the project area lies entirely within these two OGAUs, and because this woodpecker was selected in the Forest Plan as an old-growth MIS. Any effects would be diluted at a larger scale.

Time frame: The time frame is approximately four decades. This is about the period necessary for a regeneration-harvested unit to regrow conifers to the smallest size class that would qualify as pileated woodpecker foraging habitat under the Forest GIS model.

Past, Present, and Foreseeable Future Actions: The past, present, and reasonable foreseeable activities in an analysis area and adjacent non-federal lands are listed in Appendix A. Past timber harvest slightly decreased the availability of mature and old growth forest habitat that provide the highest quality foraging and nesting sites for this species. Most of this harvest has occurred on state and private lands, located west of the analysis area. Because of continued timber harvest by private landowners and the State of Idaho, it can be assumed that little nesting habitat for pileated woodpecker will persist or develop in the long-term. As a consequence, the long-term viability of pileated woodpecker is likely dependent upon National Forest lands.

All Alternatives: Those activities that have the potential to reduce pileated woodpecker habitat are timber harvest and fuels treatments. Since there are no such foreseeable activities planned on the Forest Service managed lands within the cumulative effects area, there would be no cumulative effects to pileated woodpecker habitat. Only the direct and indirect effects, already described, would occur.

Because the geographic boundary consists entirely of National Forest lands, the long-term viability of pileated woodpecker in this area is dependent upon Forest Service management, of which no ongoing or reasonably foreseeable projects are planned. The two OGAUs making up this area include many stands which will progress in seral succession over the four- decade time frame. These areas of recruitment would increase the potential suitable forage and nesting habitat for the species (likely many times that affected by the proposed project) and the number of home ranges. It is expected that no measurable effects to pileated woodpecker populations at the Forest or regional scale, or alteration of current population trends would occur with any of the alternatives.

Forest Plan and Regulatory Consistency: None of the standards or guidelines of the Clearwater Forest Plan specifically address pileated woodpecker or woodpecker habitat beyond the species' designation as a Management Indicator and as a relevant species for the guidelines for old growth retention in Appendix H of the Forest Plan (CNF, 1987). Since the affected OGAUs currently meet Forest Plan standards for old-growth habitat and the proposed actions of this project would not affect such habitat, including step-down (CNF, 2006), this habitat would remain available to support the local and regional populations of pileated woodpecker under all alternatives.

4. Pine Marten

Methodology: The Clearwater N.F. marten habitat model credits all mid- and late-seral stands with at least a portion of the stands ≥4,000 feet in elevation, with a live tree stem density of ≥40 per acre as suitable. As a result, modeled habitat in the analysis area is relatively common, with more than 26% of the project area being modeled marten habitat, as displayed in the following table:

Table 4.19 – Habitat Availability and Short-term Changes for Pine Marten

	Habitat Available on the Clearwater National Forest (acres)	Habitat in the Analysis Area (acres)	Habitat in the Treatment Units (acres)	Change in Habitat Availability in the Analysis Area (percent)	Change in Habitat Availability on the Clearwater NF (percent)
Existing Condition & Alt 1	903,146	4,609	0	0	0
Alt 2			710	-15.4	-0.08
Alt 3			343	-7.4	-0.04
Alt 4			451	-9.8	-0.05

a. Direct and Indirect Effects

Alternative 1: Under this alternative, there would be no direct or indirect effects on pine martens because no treatments would be conducted. Marten habitats would continue to be altered by natural events such as succession, insect and disease, and potential wildfire.

As succession and fire suppression continue in the project area, mosaic patterns currently on the landscape would decline; openings would fill in and canopies would close further. With increasing amounts of root rots, dead trees would fall to the ground increasing structural diversity at the ground level which in turn would create suitable niches and habitats for marten prey. The increase in down and standing fuels would slightly increase the likelihood of a stand-replacing fire, which could result in the loss of mature and old growth stands that provide potential resting, denning, and foraging habitat for marten.

Alternatives 2, 3 and 4: As shown in Table 4.19, up to 15.4% of modeled marten habitat would be affected under the action alternatives, with Alternative 2 affecting the most. Regeneration harvest, the primary treatment, would reduce the quantity of denning and foraging habitats in the long-term (20-30 years), with the reduction of live trees, snags, down logs, and other components of structural diversity.

Powell et al. (2003) cited three studies which found a fairly consistent upper limit (25-30% of a marten's home range) to the amount of openings in the forest, including clear-cutting and natural openings, tolerated by martens. Based on the Forest's stand database, the project area would have 7.2% in a sapling or smaller size class before project implementation. After project implementation there would 33.4%, 14.4% and 20.9% in sapling or smaller, respectively, for Alternatives 2, 3, and 4.

Changes in access management would likely have the largest potential (beneficial) effect on marten habitats. The combination of road decommissioning, storage, and access changes to roads which are common to all action alternatives, would generally reduce road density increase security areas, and increase habitat effectiveness.

Given that there are large, contiguous swaths of modeled marten habitat in the northern and southern parts of the project area, the action alternatives should not affect the ability of marten to occupy the analysis area. There are also thousands of acres of modeled habitat available directly north, south, and east of the project area. Thus, it is reasonable to assume that the proposed activities would have no effect on the survival of any martens that might use the project area.

b. Cumulative Effects

Geographic Boundary: The area for assessing cumulative effects on pine marten are OGAUs 310 and 314, which total 24,559 acres. Any effects would be diluted at a larger scale. Although the pine marten was chosen as an indicator of old growth viability, modeled pine marten habitat includes some mid-seral stands. Because of this, less than a third of the cumulative effects area that is over 4,000 feet elevation qualifies as suitable habitat for the species.

Time frame: The time frame is approximately four decades. This is about the period necessary for a regeneration-harvested unit to regrow conifers to the smallest size class that would qualify as marten habitat under the Forest GIS model.

Past, Present, and Foreseeable Future Actions: The past, present, and reasonable foreseeable activities in an analysis area and adjacent non-federal lands are listed in Appendix A. Past timber harvest decreased the availability of mature and old growth forest habitat that provide the highest quality foraging and denning sites for this species. Most of this harvest has occurred on state and private lands, located west of the analysis area. Because of continued timber harvest by private landowners and the State of Idaho, it can be assumed that in these areas little foraging and denning sites for this species will persist or develop in the long-term. As a consequence, the long-term viability of pine marten is likely dependent upon National Forest lands.

All Alternatives: Those activities that have the potential to reduce pine marten habitat are timber harvest and fuels treatments. Since there are no such foreseeable activities planned on the Forest Service managed lands within the cumulative effects area, there would be no cumulative effects to pine marten habitat. Only the direct and indirect effects, already described, would occur.

Because the geographic boundary consists entirely of National Forest lands, the long-term viability of marten in this area is dependent upon Forest Service management. The two OGAUs making up this area include many stands that will progress in seral succession over the four-decade time frame. These areas of recruitment would increase the potential suitable forage and denning habitat for the species (likely many times that affected by the proposal) and the number of home ranges.

Forest Plan and Regulatory Consistency: None of the standards or guidelines of the Clearwater Forest Plan specifically address pine marten or marten habitat beyond the species' designation as a Management Indicator and as a relevant species for the guidelines for old growth retention in Appendix H of the Forest Plan (CNF, 1987). Since the affected OGAUs currently meet Forest Plan standards for old-growth habitat and the proposed actions of this project would not affect such habitat, including step-down (CNF, 2006), this habitat would remain available to support the local and regional populations of pine marten under all alternatives.

5. Gray Wolf

a. Direct and Indirect Effects

Alternative 1: This alternative would have no direct or indirect effects on on the gray wolf because no activities would be conducted. Although long-term wolf habitat would continue to be altered by natural events such as succession, insects/disease and potential wildfire, wolves have evolved to exist in a variety of habitats. Lethal management by state and Federal wildlife agencies would continue.

Action Alternatives: The temporary increase of human activity in the project area could increase the possibility of human-wolf interactions and influence how wolves use the project area, as well as their prey species. However, there would generally be little risk of direct or indirect effects to individual wolves from either of the action alternatives because of their high mobility and large territories.

All wolf habitat in the project area would remain suitable for wolves and their prey species, such as deer, elk and moose should benefit from the shift to more early seral habitat in the project area. Although some disruption in behavior may occur with the action alternatives, the reduction in road densities, common to the action alternatives, would slightly reduce the extent of human activities in the long term. The effects on prey species should be neutral to beneficial.

b. Cumulative Effects

Geographic Boundary: The cumulative effects area for the wolf is the project area because any incremental effects associated with the action alternatives would not be detectable at a scale larger than this.

Time frame: The period for this analysis is 20 years, which is about the time it takes for new plantations to restore big game hiding cover in the harvested areas.

Past, Present, and Foreseeable Future Actions: The past, present, and reasonable foreseeable activities in an analysis area and adjacent non-federal lands are listed in Appendix A. Activities considered were those that would affect the wolves prey base or security from human disturbance. Stand replacing effects that would affect elk forage or hiding cover, such as regeneration harvest, were also considered. Other than continued timber harvest on private lands, there are no other present or foreseeable future actions projects within the cumulative effects area.

All Alternatives: The most important cumulative effect to gray wolves in Idaho is mortalities from shooting, trapping, and vehicle strikes. This probability increases with increased road access. Human access, available cover, and public attitudes largely determine mortality risk to wolves. In addition, the project area and surrounding landscape receive heavy hunting pressure for deer, elk, and moose, which not only affects the wolf prey base, but increases the number of wolf-human interactions. These impacts are expected to be lessened with the action alternatives as existing road densities would decrease, thus improving security and decreasing human interactions and disturbance.

Fragmentation of habitat due to timber harvest has not reduced wolf habitat considerably, but has impacted habitat for preferred prey species through the loss of cover and reduced quality of security areas. Short term primary prey such as elk are likely to be displaced, which might affect wolf use within the project area. However, the potential for cumulative effects associated with management activities is considered very low.

Forest Plan and Regulatory Consistency: No specific Forest Plan standards apply to the gray wolf. Although wolves have been observed in the vicinity, none of the alternatives are expected to measurably affect populations of the gray wolf. It is concluded that Alternative 1 would have “no impact” on gray wolf, while the action alternatives “May impact individuals or habitat but not likely to cause a trend toward federal listing or reduce viability for the population or species” within the planning area or range wide.

6. Canada Lynx

The lynx habitat model for the Nez Perce/Clearwater National Forests credits as foraging habitat all mid- and late-seral stands with at least a portion of the stand between 4,000 and 7,000 feet above sea level and uses the potential vegetation type data layer to delineate lynx habitat. There are no Lynx Analysis Units (LAU's) in the project area. There are LAU's across the North Fork of the Clearwater River; one slightly less than 5 miles north of the project area, and one a little less than 9 miles south of the project area. It is questionable if habitat outside of LAU's provides any benefit to lynx, since it consists of small fragmented patches and is too sparse to put in a LAU. The Clearwater National Forest is classified as secondary habitat and contains no critical habitat.

a. Direct and Indirect Effects

Alternative 1: This alternative would have no direct or indirect effects on Canada lynx because no treatments would be conducted.

Alternatives 2, 3 and 4: Individual lynx may be disturbed by project activities. However, this disturbance is not expected to measurably affect their survival or reproduction. Individuals would move away from areas of active treatment and would not be injured or killed.

The project area does contain 2,420 acres of modeled habitat. Up to 300 acres of this habitat would be treated depending on the alternative. Only the regeneration and commercial thinning harvest treatments are expected to substantially change habitat conditions for lynx. Alternative 2 would treat the most lynx habitat, in which 81 acres would receive regeneration cuts and 219 acres would receive commercial thinning.

Regeneration harvest treatments would reduce the quantity of lynx foraging habitats in the short term (~15-30 years), because this amount of time necessary for new conifers or brush to grow above the average snow depth and provide food and cover for snowshoe hares (Ruediger et al. 2000). Conversely, regeneration harvest can improve lynx foraging habitat in the long-term, because the resulting early-seral vegetation would benefit snowshoe hares in most circumstances. Regeneration harvest (or subsequent fuel treatment) would eliminate denning habitat in the long-term, because it would typically remove existing large woody debris and would reduce most of its recruitment and other components of structural diversity for many decades.

Similar to regeneration harvest, commercial thinning could reduce lynx foraging habitat over the short term and improve it over the long term, or such treatments may have little short or long-term effects if site characteristics are not substantially modified (Ruediger et al. 2000). Effects on denning habitat would be variable, depending on site-specific effects to large woody debris and its recruitment. Fuels treatment in the harvest units may also reduce the understory structural components, particularly down logs and snags that could be consumed by prescribed fire. However,fuels treatment could also enhance or accelerate regeneration of conifers and shrubs.

Given the lack of sufficient habitats anywhere in the vicinity of the project area, only a dispersing lynx would likely be in the vicinity. Disturbing a dispersing lynx would have little or no effect on their survival and would not jeopardize their existence on the Forest. Changes to access management and road configurations would also have little effect on lynx, because few or no substantial trees would be removed in these activities.

b. Cumulative Effects

Geographic Boundary: The cumulative effects area for lynx is the Washington Creek and a portions of Beaver Creek and Little Washington-North Fork Clearwater subwatersheds.

Time frame: The period for this analysis includes the short-term (15 years), during which the direct and indirect effects of the project would occur, and the long-term (20-40 years), which is about the time it takes for sapling and pole stands to occupy the former treatment areas to create suitable wintering habitat for snowshoe hares.

Past, Present, and Foreseeable Future Actions: The past, present, and reasonable foreseeable activities in an analysis area and adjacent non-federal lands are listed in Appendix A.

All Alternatives: There and no foreseeable future actions on Forest Service managed lands. However, within the Washington and Beaver Creek subwatersheds, Potlatch corporation and Idaho Department of Lands own extensive areas. If timber harvest continues in these areas at the same rate as over the last decade, there would be a continued increase of early successional habitats and the decline of mature habitats. It would be anticipates that a lynx moving through these subwatersheds would face disturbance even if this project were not implemented.

A majority (89%) of the project area consists of stands having canopy cover of 40% or more, which should facilitate a disturbed lynx moving around project activities while avoiding openings. Given the large size of the area and the staggered implementation of project activities, it is anticipated that project activities or those conducted on private lands would not eliminate the ability of lynx to move through the area.

Forest Plan and Regulatory Consistency: No specific Forest Plan standards apply to the lynx. Considering the widespread availability of suitable habitats across the Forest and region, no measurable effects to lynx populations are anticipated. It is determined that the Barnyard South Sheep project, if implemented, would not likely adversely affect Canada lynx or its habitat.

7. Fisher

Methodology: Modeled fisher habitat is a relative use probability layer based on Olsen (2013). Sauder (2014) found fisher selected home ranges in landscapes that had greater than 50% mature forest and less than 5% open areas and were in complex arrangements. Additionally, he found that these features typically were not found on ground managed primarily for timber production, like what has occurred and continues to occur in the Barnyard South Sheep area. Modeled habitat is displayed in the following table:

Table 4.20 – Winter Habitat Availability and Short-term Changes for Fisher

	Habitat Available on the Clearwater National Forest (acres)	Habitat in the Analysis Area (acres)	Habitat in the Treatment Units (acres)	Change in Habitat Availability in the Analysis Area (percent)	Change in Habitat Availability on the Clearwater NF (percent)
Existing Condition & Alt 1	1,127,021	15,689	0	0	0
Alt 2			750	-4.8	-0.07
Alt 3			372	-2.4	-0.03
Alt 4			470	-3.0	-0.04

a. Direct and Indirect Effects

Alternative 1: This alternative would cause no direct effects to fisher habitat, which would continue to be altered by natural events such as succession and insects/disease. Snag and large down wood habitat elements would remain available as trees die (and fall) from natural causes. The current root rot and other tree diseases would continue to provide ample downed wood. A pulse of large logs on the ground due to fire or insect epidemics could provide denning structures and cover for fisher and several prey species, but these areas are likely to be avoided until the living canopy cover again exceeds 40 percent.

A wildfire and/or increased insect and disease activity would leave greater numbers of snags and large down wood than exist now, but would also reduce canopy cover, which would provide unsuitable conditions for fisher. Ongoing fire suppression may be beneficial for this species, because it can help maintain mature and older habitats on the landscape longer.

Alternatives 2, 3 and 4: As shown in Table 4.20, between 2.4 and 4.8 percent of modeled fisher habitat would be affected by the timber harvest proposed under each alternative. Regeneration harvest would reduce the quantity of denning and foraging habitats in the long-term (20-30 years), with the reduction of live trees, snags, down logs, and other components of structural diversity. Commercial thinning would temporary reduce the understory structural components, particularly snags and down logs that could cause a short term reduction of prey species and consequently the quality of fisher habitat. In the long term, commercial thinning would provide higher quality habitat by allowing the remaining trees to increase in size.

Changes in access management would have the largest effect on available fisher habitats. The combination of road decommissioning, road storage, and access changes to roads, which are common to all action alternatives, would generally decrease open road density, slightly increase security areas, and increase habitat effectiveness.

In summary, all action alternatives would cause a slight reduction in fisher habitat, making it less desirable, in the north and south portions of the project area, where most harvest units are clumped. However, the center of the project area would remain relatively unchanged, plus, no old growth or stepdown habitat (preferred denning habitats) would be touched. Those individual fishers disturbed or displaced by timber harvest would have ample habitat available outside the harvest units and project area to avoid project activities. Within the project area, no effects on fisher survival or reproduction would be anticipated, because adults and advanced juvenile fishers could easily avoid direct injury.

b. Cumulative Effects

Geographic Boundary: The area for assessing cumulative effects on fishers is the Barnyard South Sheep analysis area, since the direct and indirect effects of the project would occur in this area.

Time frame: The period for this analysis includes the short-term (five to seven years), during which the direct and indirect effects of the project would occur, and the long-term (up to 150 years), the amount of time required for stands to develop into an old growth condition, which provides primary habitat components for fishers.

Past, Present, and Foreseeable Future Actions: The past, present, and reasonable foreseeable activities in an analysis area and adjacent non-federal lands are listed in Appendix A. Past vegetation management activities (on both NFS and State/private land) and trapping contributed to the current fisher population status in the analysis area. In particular, timber harvest decreased the availability of mature and old growth forest habitats that provide the highest quality habitats for this species. Some of

the past regeneration harvest directly reduced the amount of old growth forest habitat, while other regeneration harvest in mature and old growth forest habitat reduced the availability of stands that could develop into old growth habitat in a relatively short period of time. Past commercial thinning may also have reduced the availability of suitable habitats, although some of these areas may have developed characteristics of fisher habitats in the time since treatment.

All Alternatives: Those activities that have the potential to reduce fisher habitat are primarily timber harvest. Since there are no such foreseeable activities planned on the Forest Service managed lands, the only possible cumulative effects would result from planned harvest on the private lands to the west of the project area. Given the extensive amount of fisher habitat in the project area and the activities proposed, less than 5% of the modeled habitat would be affected, plus, suitable denning and foraging habitats would be retained in untreated old growth and mature forest stands. Road construction, especially on the private lands, has fragmented and degraded riparian areas that provide important travel corridors for fisher. The watershed improvements proposed under this project would lessen that effect, and aid in decreasing fisher vulnerability. Some mortality to individual fishers may continue as a result of trapping. However, fishers cannot be legally targeted in Idaho, so the magnitude of this impact should be small to nonexistent.

In summary, no measurable effects to fisher populations at the local or regional scale, or alteration of current population trend, are expected from the cumulative effects of any of the alternatives, based on the availability of unaffected suitable habitats across the Forest and Region.

Forest Plan and Regulatory Consistency: No specific Forest Plan standards, guidelines, or other regulations apply to the fisher. Since there is an abundant amount of modeled habitat in the project area, it is not expected that any of the action alternatives would further reduce fisher habitat or the probability of its use. Also, recent science (Samson 2006b) showed that habitat on the Clearwater National Forest is more than sufficient to contribute to a viable population of fisher at a regional scale. Thus, it is concluded that Alternative 1 would have “no impact” on fisher, while the action alternatives “May impact individuals or habitat, but will not likely result in a trend toward federal listing or reduced viability for the populations or species” within the planning area or range wide.

8. Flammulated Owl

As shown in Table 4.21, modeled flammulated owl habitat in the project area is relatively rare, making up only 3% of the habitat available on the Forest.

Table 4.21 – Winter Habitat Availability and Short-term Changes for Flammulated Owl

	Habitat Available on the Clearwater National Forest (acres)	Habitat in the Analysis Area (acres)	Habitat in the Treatment Units (acres)	Change in Habitat Availability in the Analysis Area (percent)	Change in Habitat Availability on the Clearwater NF (percent)
Existing Condition & Alt 1	15,900	513	0	0	0
Alt 2			88	-17.2	<0.01
Alt 3			67	-13.1	<0.01
Alt 4			35	-6.8	<0.01

a. Direct and Indirect Effects

Alternative 1: This alternative would cause no direct effects to flammulated owl habitat, which would continue to be altered by natural events such as forest succession, insects and disease, and potential wildfire. Substantial wildfire or insect and disease activity could potentially allow development of mature ponderosa pine stands (preferred owl habitat) in the few favorable sites in the project area, but could also reduce canopy cover that may create unsuitable conditions in the limited amount of existing habitat.

Action Alternatives: As displayed in Table 4.21, proposed regeneration harvest would affect up to 17.2 % of the modeled habitat within the project area. No habitat would be affected by proposed commercial thinning. On a Forest scale, the effects of the action alternatives on flammulated owl would be unmeasurable. Since there is a very limited amount of modeled habitat in the project area, a likely consequence of the regeneration harvest proposed under each action alternative would be not enough preferred habitat to attract or retain owls (if currently present) for the foreseeable future.

Changes to access management and road configurations under each action alternatives should have little to no effect on flammulated owls. Although some of the modeled habitat for this species would be in proximity to roads proposed for decommissioning or storage, little or no vegetation outside of the road prisms should be disturbed by the proposed actions.

b. Cumulative Effects

Geographic Boundary: The area for assessing cumulative effects on flammulated owls is the Barnyard South Sheep analysis area, since the direct and indirect effects of the project would occur in this area.

Time frame: The period for this analysis includes the short-term (five to seven years), during which the direct and indirect effects of the project would occur, and the long-term (up to 100 years), the amount of time required for ponderosa pine stands to develop into the size class needed by flammulated owls.

Past, Present, and Foreseeable Future Actions: The past, present, and reasonable foreseeable activities in an analysis area and adjacent non-federal lands are listed in Appendix A. Past fire suppression and timber harvest has decreased the availability of mature forest that provided the highest quality habitats for this species. This may have promoted a shift away from open, mature ponderosa pine and Douglas-fir stands (where they occurred) towards the denser, mixed species stands currently found in the analysis area. This change may explain why preferred flammulated owl habitat is rare within the project area and probably non-existent on the adjacent private lands.

All Alternatives: Those activities that have the potential to reduce flammulated owl habitat are timber harvest, primarily regeneration harvest. Since there are no such foreseeable activities planned on the project area, there would be no cumulative effects to flammulated owl habitat. Only the direct and indirect effects, already described, would occur. It is expected that no measurable effects to flammulated owl populations at the Forest or regional scale, or alteration of current population trends would occur with any of the alternatives. This is based on the minor amount of modeled habitat within the project area and the widespread availability of suitable habitats across the Forest and region.

Forest Plan and Regulatory Consistency: No specific Forest Plan standards, guidelines, or other regulations apply to the flammulated owl. Since there is a small amount of modeled habitat in the project area, all of the action alternatives would further reduce habitat and reduce the probability of use by the flammulated owl. However, recent science (Samson 2006b) showed that habitat on the

Clearwater National Forest is more than sufficient to contribute to a viable population of flammulated owl at a regional scale. It is concluded that Alternative 1 would have "no impact" on flammulated owl, while the action alternatives "May impact individuals or habitat, but will not likely result in a trend toward federal listing or reduced viability for the populations or species" within the planning area or range wide.

9. Fringed, Long-eared, and Long-legged Myotis Bats

Methodology: The Forest model for fringed myotis estimates about 936 acres of suitable habitat in the project area. No models exist for the long-eared and long-legged myotis. However, both of these species are likely to be impacted similarly as fringed myotis, because they are selecting for similar features, such as exfoliating bark on older trees, hollow trees, and snags.

a. Direct and Indirect Effects

Alternative 1: This alternative would have no direct or short-term indirect effects on the three bat species, because no treatments would be conducted. In the long-term, bat habitat would continue to be altered by natural events such as succession and insects/disease. Substantial wildfire or insect/disease activity would leave greater numbers of snags and large down wood than exist now, but would also reduce canopy cover, especially in grand fir dominated areas. These more open areas would provide less suitable conditions for bat roosting, but potentially better conditions for bat foraging. Ongoing fire suppression may be beneficial for these species, because it can help maintain mature and older habitats on the landscape longer. However, fire suppression reduces the mosaic vegetative pattern created by wildfires with which this species has evolved.

Alternatives 2, 3 and 4: The Forest GIS model for fringed myotis estimates about 936 acres of suitable habitat within the project area, but none of it is proposed for treatment under any of the action alternatives. Timber harvest and prescribed burning may reduce down woody debris and eliminate some snags and directly injure individuals outside of modeled habitat. However, adult and advanced juvenile bats would likely avoid injury, and prescribed burning would create other snags and future woody debris, having a beneficial impact on bat roosting.

Mature and old growth forest habitats that represent the best available roosting habitats for all three bat species would be protected under all alternatives, and nocturnal foraging along streams by each bat species would remain unaffected with the implementation of INFISH riparian buffers. Changes to access management and road configurations would also have little effect on each species. Therefore, on a project and Forest-wide scale, the amount of available habitat should remain unchanged.

b. Cumulative Effects

Geographic Boundary: The cumulative effects area for these myotis species is the project area. Any incremental effects associated with either action alternative would not be detectable beyond this area.

Time frame: The period for this analysis includes the short-term (five to seven years), during which the direct and indirect effects of the project would occur, and the long-term (up to 150 years), the amount of time required for stands to develop into an old growth condition, which provides the best available roosting habitats for all three bat species.

Past, Present, and Foreseeable Future Actions: The past, present, and reasonable foreseeable activities in an analysis area and adjacent non-federal lands are listed in Appendix A. Past timber harvest may have decreased the availability of mature forest that provided the highest quality habitat

for these species in the project area. Fire suppression, in concert with timber harvest, may have promoted a shift away from mature ponderosa pine and Douglas-fir stands towards the denser, mixed species stands found in the analysis area today. This change would have reduced the amount of suitable roosting habitats.

Alternative 1: This alternative would have no cumulative effects on the three bat species, because there would be no direct or indirect effects. Current population trends would not be affected.

Action Alternatives: When added to foreseeable timber harvest on private lands, the action alternatives would not treat any of the modeled fringed myotis habitat, but may contribute to the loss of a small amount of non-modeled suitable habitat for all three species of bat. However, no measurable effects to fringed, long-legged, and long-eared myotis populations at the local or regional scale, or alteration of current population trends, are expected from the cumulative effects of any of the alternatives, based on the limited extent of suitable habitats and the low potential for these species to be present in the treatment units.

Forest Plan and Regulatory Consistency: No specific Forest Plan standards apply to the fringed, long-eared, and long-legged myotis bats. Based on the effects analysis, it is concluded that Alternative 1 would have "no impact", and the action alternatives "may impact individuals or habitat but not likely to cause a trend towards federal listing or reduce viability for the population or species" of each bat.

10. Wolverine

Inman (2103) modeled wolverine habitat as primary, maternal, female dispersal, and male dispersal. The project area has 1,367 acres of modeled primary habitat, but contains no maternal habitat.

a. Direct and Indirect Effects

Alternative 1: This alternative would have no direct or indirect effects on wolverine because no treatments would be conducted.

Action Alternatives: The action alternatives would affect up to 82 acres of primary habitat. This modification of habitat type would not affect the ability of wolverine to occupy the analysis area now or in the future, because the early succession habitat that would be created by regeneration harvest is suitable for foraging, while denning (maternal) habitat is non-existent, meaning any wolverine use within the project area would almost certainly be transient.

Individual transient wolverines may be disturbed by project activities under all the action alternatives. This disturbance is not expected to affect their survival or reproduction, because denning habitat is non-existent and adults and advanced juvenile wolverines could easily avoid direct injury.

Proposed road decommissioning, storage, and access changes would benefit wolverine survival and persistence in the long term by decreasing open road density, increasing security areas, and increasing habitat effectiveness although only slightly. Considering all of the above, the project would not affect the availability of wolverine habitat at the Forest or regional levels.

b. Cumulative Effects

Geographic Boundary: The cumulative effects area for wolverine is the Washington Creek and a portions of Beaver Creek and Little Washington-North Fork Clearwater subwatersheds. Also, much of the area is of a lower elevation than typically used by wolverines.

Time frame: The time frame is approximately four decades. This is when middle-aged conifer stands would reach maturity and be capable of providing large, down wood as potential denning sites, although there is currently no modeled maternal habitat within the area.

Past, Present, and Foreseeable Future Actions: The past, present, and reasonable foreseeable activities in an analysis area and adjacent non-federal lands are listed in Appendix A. Within the geographic boundary, there is no other present or foreseeable action on National Forest lands that would affect wolverine habitat. On the private lands within the Washington and Beaver Creek subwatersheds, it is anticipated that Potlatch Corporation and the Idaho Department of Lands will continue to harvest timber at the same rate for the next decade.

All Alternatives: The potential for disturbance is similar to the direct effects mentioned above. What differs is that even under Alternative 1 (no action) a transient wolverine could still be disturbed or displaced by foreseeable timber harvest on private land. No measurable effects to wolverine populations at the Forest or regional scale, or alteration of current population trend, are expected from the cumulative effects of any of the alternatives and none would cause jeopardy to existence of wolverine on the forest. There are no other past, present, or foreseeable future actions within the cumulative effects area that could affect wolverine.

Forest Plan and Regulatory Consistency: No specific Forest Plan standards apply to the wolverine. Based on the effects analysis, it is concluded that Alternative 1 would have "no impact", and the action alternatives "may impact individuals or habitat but not likely to cause a trend towards federal listing or reduce viability for the population or species" of wolverine.

B. Neotropical and Other Migratory Birds

1. Direct and Indirect Effects

Alternative 1: This alternative would have no direct or indirect effects on forested habitat used by Neotropical and other migrants. Fire exclusion and fuel accumulation would continue and the risk of a large-scale wildfire may increase, potentially reducing or even eliminating habitat for some migratory birds and increasing habitat for others.

Alternatives 2, 3 and 4: Regeneration harvest associated with Alternatives 2 and 4 would reduce core habitat (used for nesting) for species that exclusively use densely forested areas, whereas Alternative 3 would slightly reduce core habitat. Over time, a potential increase in predation and nest parasitism could occur as a result of openings in the overstory canopy created by commercial thinning. However, those species that prefer a more open canopy and early-seral habitat conditions would benefit. Riparian areas and those species associated with these habitats should be minimally impacted by the action alternatives because of INFISH riparian buffers.

The construction of temporary roads for harvest (Alts. 2 & 4) would temporarily eliminate available nesting and foraging habitat. However, these roads would be decommissioned and would revegetate over time. Changes to access management and road configurations (all action alternatives) would have little effect on migratory birds, because there would be little to no effect on tree quantity or diversity. Also, high-speed vehicle traffic, potentially causing direct injury or mortality, would be eliminated or continue to be hindered by gates and/or vegetation.

2. Cumulative Effects

Geographic Boundary: The area for assessing cumulative effects on Neotropical and other migrants is the Barnyard South Sheep analysis area, since the direct and indirect effects of the project would occur in this area.

Time frame: The time frame is approximately four decades. This is about the minimum period necessary for a regenerated stands to regrow conifers suitable for nesting.

Past, Present, and Foreseeable Future Actions: The past, present, and reasonable foreseeable activities in an analysis area and adjacent non-federal lands are listed in Appendix A. Ongoing and future timber harvest with its fragmentation effects, primarily on the private lands, would continue to change the habitat for some Neotropical migrant birds. Some habitats would be lost as a result of timber harvest for species using denser forested canopies. Continued fire suppression would allow succession to continue and increase the amount of mature timber in the area. However, continued fire suppression would also increase the fuel build-up in the area, thereby increasing the eventual likelihood of a large-scale wildfire, which could result in a loss of the habitat for many Neotropical migrant birds.

Alternative 1: This alternative would have no cumulative effects on forested habitat used by Neotropical and other migrants, because no treatments would be conducted.

Action Alternatives: The proposed focus on restoring seral species (white pine, ponderosa pine, and larch) components and increasing the development of large overstory trees would benefit most Neotropical migrants. Managing riparian areas (i.e. INFISH buffers) separately from upland habitat would benefit species dependent on interior habitat with dense forest canopies. Maintenance of a variety of snags in various states of decay and sizes would also help maintain existing populations of Neotropical migrants.

The actions taken on the Clearwater National Forest in the recent past and those proposed are consistent with maintaining habitat for viable populations of these species at all scales. Based on the above information, Neotropical bird habitat would be maintained and even improved for many species. Therefore, local populations within the planning area and across the Forest would be maintained.

Forest Plan and Regulatory Consistency: There are no Forest Plan standards, guidelines, or other regulations specifically addressing Neotropical and other migratory birds. However, all of the alternatives would be consistent with Forest Plan and Regional direction covering snags and old growth forests, which provide needed habitat for Neotropical and other migratory birds.

V. Vegetation (Ref: Barnyard South Sheep Vegetation Report)

The purpose of the proposed vegetative treatments is to restore white pine and larch to improve stand vigor and species diversity across the landscape to create stand conditions that are resilient and allow for rapid recovery after disturbances. The effects of all alternatives being considered are discussed below, including their effects on sensitive plants.

A. Forest Cover Types

Analysis of effects to forest cover types was performed by comparing current conditions, proposed changes, and historic conditions.

1. Direct and Indirect Effects

Alternative 1: This alternative would cause the occurrence of early seral species such as western larch and western white pine to continue to decline. Since no disturbance is planned, western larch would not be expected to regenerate naturally, because western larch is dependent upon having mineral soil or a burned seedbed to reproduce successfully (Fiedler and Lloyd 1995).

Decline in western white pine has been seen previously in the Inland Northwest when the proportion of western white pine regeneration (planted and natural) in northern Idaho, eastern Washington, and western Montana decreased from 44 percent in 1941 to 5 percent in 1979 as a result of fire protection, lack of major fires, and blister rust infection (Graham 1990). Western white pine populations have declined enough that it is unlikely that this species would return to its past prevalence without intervention (Fins et al 2001). Under the no action alternative, canopy gaps of sufficient size and openness would be not expected to create conditions to allow western white pine to outcompete grand fir and other shade tolerant competitors (Jain et al 2004).

Alternative 2: With this alternative, amounts of the western white pine cover type would increase, since these species would be planted following regeneration harvest. The western larch cover type would not increase, because western larch would be planted in conjunction with western white pine and ponderosa pine, with the planting being focused on western white pine on sites where white pine is ecologically supported and focused on ponderosa pine on those sites that are too dry for western white pine. The amount of ponderosa pine would increase within the project area, but the area classified as a ponderosa pine cover type would likely not increase. This is because cover type is assessed at the stand level and concentrations of ponderosa pine would often occur at a smaller scale than the stand level. For example, in many cases within the project, dry ridges run through proposed units, and these ridges would have ponderosa pine planted on them; but since they are only small parts of the stand, the stand would not be characterized as a "ponderosa pine cover type".

Under this alternative, the best estimate assessed at the stand level is that the western white pine cover type would be expected to increase by 850 acres. These acres would not be a monoculture of western white pine, but rather mixed conifer stands with western white pine as a prominent component of the stands. Cover types would change as displayed in the following table:

Table 4.22 – Forest Cover Type Changes for Alternative 2.

Cover Type	Historic Distribution[6]	Current Project Area Distribution[7]	Project Area Distribution in Alternative 2
Western white pine	45%	0%	5%
Western larch	8%	0%	0%
Cover Type	Historic Distribution[8]	Current Project Area Distribution[9]	Project Area Distribution in Alternative 2

[6] Haig et al, 1941. Haig has records of mature stands for the "white pine region" in which this project is located.
[7] Clearwater National Forest GIS data. It may be observed that the totals in this column do not equal 100%. About 13% of the Barnyard South Sheep project area is classified with a null value in the MSC field, so information is not available for these stands. About 5% of the project area is classified as species other than those listed in the table. The remaining amount that is missing is due to rounding errors.
[8] Haig et al, 1941. Haig has records of mature stands for the "white pine region" in which this project is located.
[9] Clearwater National Forest GIS data. It may be observed that the totals in this column do not equal 100%. About 13% of the Barnyard South Sheep project area is classified with a null value in the MSC field, so information is not available for

Douglas-fir	12%	22%	20%
Grand fir	14%	24%	22%
Western hemlock	3%	0%	0%
Western redcedar	4%	25%	25%
Engelmann spruce	4%	2%	2%
Lodgepole pine	1%	2%	2%
Ponderosa pine	9%	3%	3%

Alternative 3: With this alternative, amounts of the western white pine cover type would increase, since these species would be planted following regeneration harvest. The western larch cover type would not increase, because western larch would be planted in conjunction with western white pine and ponderosa pine, with the planting being focused on western white pine on sites where white pine is ecologically supported and focused on ponderosa pine on those sites that are too dry for western white pine. The amount of ponderosa pine would increase within the project area, but the area classified as a ponderosa pine cover type would likely not increase. This would be caused because cover type is assessed at the stand level and concentrations of ponderosa pine would often occur at a smaller scale than the stand level. For example, in many cases within the project dry ridges run through proposed units, and these ridges would have ponderosa pine planted on them, but they are only small parts of the stand, so the stand would not be characterized as a "ponderosa pine cover type".

Under this alternative, the best estimate assessed at the stand level is that the western white pine cover type would be expected to increase by 410 acres. These acres would not be a monoculture of western white pine, but rather mixed conifer stands with western white pine as a prominent component of the stands. Cover types would change as displayed in the following table:

Table 4.23 – Forest Cover Type Changes for Alternative 3.

Cover Type	Historic Distribution	Current Project Area Distribution	Project Area Distribution in Alternative 3
Western white pine	45%	0%	3%
Western larch	8%	0%	0%
Douglas-fir	12%	22%	20%
Grand fir	14%	24%	23%
Western hemlock	3%	0%	0%
Western redcedar	4%	25%	25%
Engelmann spruce	4%	2%	2%
Lodgepole pine	1%	2%	2%
Ponderosa pine	9%	3%	3%

these stands. About 5% of the project area is classified as species other than those listed in the table. The remaining amount that is missing is due to rounding errors.

Alternative 4: With this alternative, amounts of the western white pine cover type would increase, since these species would be planted following regeneration harvest. The western larch cover type would not increase because western larch would be planted in conjunction with western white pine and ponderosa pine, with the planting being focused on western white pine on sites where white pine is ecologically supported and focused on ponderosa pine on those sites that are too dry for western white pine. The amount of ponderosa pine would increase within the project area, but the area classified as a ponderosa pine cover type would likely not increase. This would be caused because cover type is assessed at the stand level and concentrations of ponderosa pine would often occur at a smaller scale than the stand level. For example, in many cases within the project dry ridges run through proposed units, and these ridges would have ponderosa pine planted on them, but they are only small parts of the stand, so the stand would not be characterized as a "ponderosa pine cover type".

Under this alternative, the best estimate assessed at the stand level is that the western white pine cover type would be expected to increase by 540 acres. These acres would not be a monoculture of western white pine, but rather mixed conifer stands with western white pine as a prominent component of the stands. Cover types would change as displayed in the following table:

Table 4.24 – Forest Cover Type Changes for Alternative 4.

Cover Type	Historic Distribution	Current Project Area Distribution	Project Area Distribution in Alternative 4
Western white pine	45%	0%	4%
Western larch	8%	0%	0%
Douglas-fir	12%	22%	21%
Grand fir	14%	24%	22%
Western hemlock	3%	0%	0%
Western redcedar	4%	25%	25%
Engelmann spruce	4%	2%	2%
Lodgepole pine	1%	2%	2%
Ponderosa pine	9%	3%	3%

2. Cumulative Effects

Geographic Area: The cumulative effects analysis area is the project area. This represents an area that is large enough that conditions within this area can be compared with historic conditions.

Time Frame: Five years after project implementation. This is the time it takes for harvested units to become successfully restocked with preferred species.

Past, Present, and Foreseeable Future Actions: The past actions that have most significantly affected forest cover types in the project area are the introduction of white pine blister rust and past harvest activities, which are the basis for the existing conditions. There are no present or reasonably foreseeable future actions beyond those in the current project that would affect forest cover types. Thus, there are no cumulative effects to forest cover types.

B. Age Class Distribution

Age classes were analyzed by LTA group for the project area. LTA groups were used as a tool to understand ecological processes at the landscape scale. The comparison of current age class distribution to historic distribution can give a picture of whether current ecological processes are functioning as they did historically.

1. Direct and Indirect Effects

Moist Frost Churned Ridges

Alternative 1: Distribution of age classes would not change under this alternative. Because regeneration harvest would not occur, the early seral stage would continue to be under-represented relative to historical conditions.

Alternative 2: With this alternative, regeneration harvest would occur and this would cause the 0-40 year old age class to increase by 104 acres within this LTA in the project area. Age class distribution within the project area would shift as depicted in the following table. Alternative 2 would trend (or maintain) the landscape toward historic conditions by decreasing the amount of land within the middle age classes and increasing the 0-40 year old age class.

Table 4.25 – Moist Frost Churned Ridges age class distribution under alternative 2.

Age Class	Historic Age Class Distribution[10]	Current Age Class Distribution	Age Class Distribution if Alt 2 Selected	Current Acreage in Age Class	Acreage if Alt 2 Selected
0-40 yrs	20-50%	8%	16%	89	193
40-60 yrs	5-15%	5%	5%	54	54
60-100 yrs	10-20%	32%	24%	376	284
100-150 yrs	20-30%	26%	25%	304	297
150+ yrs	10-30%	30%	29%	351	346

Alternative 3: With this alternative, the amount of land within the 0-40 year old age class would be increased by about 83 acres. Age class distribution within the project area would shift as depicted in the following table. Alternative 3 would trend (or maintain) the landscape toward historic conditions by decreasing the amount of land within the 60-100 year old age class and increasing the 0-40 year old age class.

Table 4.26 – Moist frost churned ridges age class distribution under alternative 3.

Age Class	Historic Age Class Distribution	Current Age Class Distribution	Age Class Distribution if Alt 3 Selected	Current Acreage in Age Class	Acreage in Age Class if Alt 3 Selected
0-40 yrs	20-50%	8%	15%	89	172
40-60 yrs	5-15%	5%	5%	54	54
60-100 yrs	10-20%	32%	26%	376	305
100-150 yrs	20-30%	26%	25%	304	297
150+ yrs	10-30%	30%	29%	351	346

[10] Mital, 2010.

Alternative 4: With this alternative, the amount of land within the 0-40 year old age class would be increased by about 75 acres. Age class distribution within the project area would shift as depicted in the following table. Alternative 4 would trend (or maintain) the landscape toward historic conditions by decreasing the amount of land within the 60-100 year old age class and increasing the 0-40 year old age class.

Table 4.27 – Moist frost churned ridges age class distribution under alternative 4.

Age Class	Historic Age Class Distribution	Current Age Class Distribution	Age Class Distribution if Alt 4 Selected	Current Acreage in Age Class	Acreage in Age Class if Alt 4 Selected
0-40 yrs	20-50%	8%	14%	89	164
40-60 yrs	5-15%	5%	5%	54	54
60-100 yrs	10-20%	32%	26%	376	308
100-150 yrs	20-30%	26%	26%	304	300
150+ yrs	10-30%	30%	30%	351	348

Umbric Low Relief Rolling Hills

Alternative 1: Distribution of age classes would not change under this alternative.

Alternative 2: Under this alternative, regeneration harvest would occur and cause the 0-40 year old age class to increase by 83 acres within this LTA in the project area. Age class distribution within the project area would shift as depicted in the following table. Alternative 2 would maintain the landscape at near historic conditions.

Table 4.28 – Umbric low relief rolling hills age class distribution under alternative 2.

Age Class	Historic Age Class Distribution	Current Age Class Distribution	Age Class Distribution if Alt 2 Selected	Current Acreage in Age Class	Acreage if Alt 2 Selected
0-40 yrs	30-50%	35%	40%	561	644
40-60 yrs	5-15%	12%	11%	197	176
60-100 yrs	10-20%	14%	11%	220	183
100-150 yrs	20-35%	32%	31%	518	493
150+ yrs	10-30%	6%	6%	100	100

Alternative 3: Under this alternative, regeneration harvest would occur and cause the 0-40 year old age class to increase by 71 acres within this LTA in the project area. Age class distribution within the project area would shift as depicted in the following table. Alternative 3 would maintain the landscape at near historic conditions.

Table 4.29 – Umbric low relief rolling hills age class distribution under alternative 3.

Age Class	Historic Age Class Distribution	Current Age Class Distribution	Age Class Distribution if Alt 3 Selected	Current Acreage in Age Class	Acreage in Age Class if Alt 3 Selected
0-40 yrs	30-50%	35%	40%	561	632
40-60 yrs	5-15%	12%	12%	197	185
60-100 yrs	10-20%	14%	12%	220	186
100-150 yrs	20-35%	32%	31%	518	493
150+ yrs	10-30%	6%	6%	100	100

Alternative 4: Under this alternative, regeneration harvest would occur and cause the 0-40 year old age class to increase by 55 acres within this LTA in the project area. Age class distribution within the project area would shift as depicted in the following table. Alternative 4 would maintain the landscape at near historic conditions.

Table 4.30 – Umbric low relief rolling hills age class distribution under alternative 4.

Age Class	Historic Age Class Distribution	Current Age Class Distribution	Age Class Distribution if Alt 4 Selected	Current Acreage in Age Class	Acreage in Age Class if Alt 4 Selected
0-40 yrs	30-50%	35%	39%	561	616
40-60 yrs	5-15%	12%	11%	197	179
60-100 yrs	10-20%	14%	11%	220	183
100-150 yrs	20-35%	32%	32%	518	518
150+ yrs	10-30%	6%	6%	100	100

Low Energy Breaklands

Alternative 1: Distribution of age classes would not change under this alternative. The 0-40 year old age class would remain underrepresented; the 60-100, and 100-150 year old age classes would remain overrepresented; and the40-60 year old and 150+ year old age classes would remain within historic values.

Alternative 2: Under this alternative, regeneration harvest would occur and cause the 0-40 year old age class to increase by 53 acres within this LTA in the project area. Age class distribution within the project area would shift as depicted in the following table, with the 0-40 year old and 60-100 year old age classes trended toward historic conditions.

Table 4.31 – Low energy breaklands age class distribution under alternative 2.

Age Class	Historic Age Class Distribution	Current Age Class Distribution	Age Class Distribution if Alt 2 Selected	Current Acreage in Age Class	Acreage in Age Class if Alt 2 Selected
0-40 yrs	20-40%	8%	10%	186	239
40-60 yrs	5-15%	7%	7%	175	162
60-100 yrs	15-30%	50%	48%	1,215	1158
100-150 yrs	15-25%	28%	28%	688	688
150+ yrs	5-30%	6%	6%	153	153

Alternative 3: Under this alternative and within this LTA, no measurable change would occur in age class distribution. Distribution of age classes would not change under this alternative. The 0-40 year old age class would remain underrepresented; the 60-100, and 100-150 year old age classes would remain overrepresented; and the40-60 year old and 150+ year old age classes would remain within historic values.

Alternative 4: Under this alternative, regeneration harvest would occur and cause the 0-40 year old age class to increase by 28 acres within this LTA in the project area. Age class distribution within the project area would shift as depicted in the following table, with the 0-40 year old and 60-100 year old age classes trended toward historic conditions.

Table 4.32 – Low energy breaklands age class distribution under alternative 4.

Age Class	Historic Age Class Distribution	Current Age Class Distribution	Age Class Distribution if Alt 4 Selected	Current Acreage in Age Class	Acreage in Age Class if Alt 4 Selected
0-40 yrs	20-40%	8%	9%	186	214
40-60 yrs	5-15%	7%	7%	175	165
60-100 yrs	15-30%	50%	49%	1,215	1192
100-150 yrs	15-25%	28%	28%	688	688
150+ yrs	5-30%	6%	6%	153	153

Colluvial Midslopes

Alternative 1: Distribution of age classes would not change under this alternative. The 0-40 year old and 100-150 year old age classes would remain slightly underrepresented, the 150+ year old age class would remain underrepresented, 40-60 year old age class would remain overrepresented, and the 60-100 year old age class would remain within historic values.

Alternative 2: Under this alternative, regeneration harvest would occur and cause the 0-40 year old age class to increase by 172 acres within this LTA in the project area. Age class distribution within the project area would shift as depicted in the following table. Under this alternative, the 0-40 year old age class would be shifted to within historic values; the 40-60 year old and 150+ year old age classes would remain unchanged; the 60-100 year old age class would shift downward, but remain within historic values, and the 100-150 year old age class would shift away from historic values.

Table 4.33 – Colluvial midslopes age class distribution under alternative 2.

Age Class	Historic Age Class Distribution	Current Age Class Distribution	Age Class Distribution if Alt 2 Selected	Current Acreage in Age Class	Acreage in Age Class if Alt 2 Selected
0-40 yrs	30-55%	29%	36%	745	917
40-60 yrs	10-20%	34%	34%	870	870
60-100 yrs	10-20%	18%	13%	468	334
100-150 yrs	15-25%	13%	11%	322	284
150+ yrs	10-30%	5%	5%	138	138

Alternative 3: Under this alternative, regeneration harvest would occur and cause the 0-40 year old age class to increase by 104 acres within this LTA in the project area. Age class distribution within the project area would shift as depicted in the following table. Under this alternative, the 0-40 year old age class would be shifted to within historic values; the 40-60 year old and 150+ year old age classes would remain unchanged; the 60-100 year old age class would shift downward, but remain within historic values, and the 100-150 year old age class would shift away from historic values.

Table 4.34 – Colluvial midslopes age class distribution under alternative 3.

Age Class	Historic Age Class Distribution	Current Age Class Distribution	Age Class Distribution if Alt 3 Selected	Current Acreage in Age Class	Acreage in Age Class if Alt 3 Selected
0-40 yrs	30-55%	29%	33%	745	849
40-60 yrs	10-20%	34%	34%	870	870
60-100 yrs	10-20%	18%	15%	468	372
100-150 yrs	15-25%	13%	12%	322	314
150+ yrs	10-30%	5%	5%	138	138

Alternative 4: Under this alternative, regeneration harvest would occur and cause the 0-40 year old age class to increase by 151 acres within this LTA in the project area. Age class distribution within the project area would shift as depicted in the following table. Under this alternative, the 0-40 year old age class would be shifted to within historic values; the 40-60 year old and 150+ year old age classes would remain unchanged; the 60-100 year old age class would shift downward, but remain within historic values, and the 100-150 year old age class would shift away from historic values.

Table 4.35 – Colluvial midslopes age class distribution under alternative 4.

Age Class	Historic Age Class Distribution	Current Age Class Distribution	Age Class Distribution if Alt 4 Selected	Current Acreage in Age Class	Acreage in Age Class if Alt 4 Selected
0-40 yrs	30-55%	29%	35%	745	896
40-60 yrs	10-20%	34%	34%	870	870
60-100 yrs	10-20%	18%	14%	468	355
100-150 yrs	15-25%	13%	11%	322	284
150+ yrs	10-30%	5%	5%	138	138

Non-Umbric Low Relief Rolling Hills

Alternative 1: Under the no action alternative, age class distribution would remain unchanged in this LTA. As displayed in the proceeding table, the 40-60 year class would remain over-represented, the 0-40 age class and the 60-100 age class would remain within historic ranges, while the other age classes would remain underrepresented.

Alternative 2: Under this alternative, regeneration harvest would occur on 310 acres and cause the shifts depicted in Table 4.36. The 0-40 year old age class would increase, but within the historic range; the 40-60 year old age class would remain overrepresented; the 150+ year old age class would remain unchanged; the 60-100 year old age class would shift down, but within historic values; and the 60-100 year old age class would shift away from historic values.

Table 4.36 – Non-umbric low relief rolling hills age class distribution under alternative 2.

Age Class	Historic Age Class Distribution	Current Age Class Distribution	Age Class Distribution if Alt 2 Selected	Current Acreage in Age Class	Acreage in Age Class if Alt 2 Selected
0-40 yrs	25-45%	38%	42%	2,695	3,005
40-60 yrs	5-15%	19%	19%	1,373	1,365
60-100 yrs	10-20%	16%	14%	1,169	991
100-150 yrs	20-35%	18%	16%	1,296	1,148
150+ yrs	20-40%	9%	9%	651	651

Alternative 3: Under this alternative, regeneration harvest would occur on 186 acres and cause the shifts depicted in Table 4.37. The 0-40 year old age class would increase, but within the historic range; the 40-60 year old age class would remain overrepresented; the 150+ year old age class would remain unchanged; the 60-100 year old age class would shift down, but within historic values; and the 60-100 year old age class would shift away from historic values.

Table 4.37 – Non-umbric low relief rolling hills age class distribution under alternative 3.

Age Class	Historic Age Class Distribution	Current Age Class Distribution	Age Class Distribution if Alt 3 Selected	Current Acreage in Age Class	Acreage in Age Class if Alt 3 Selected
0-40 yrs	25-45%	38%	40%	2,695	2,881
40-60 yrs	5-15%	19%	19%	1,373	1,373
60-100 yrs	10-20%	16%	15%	1,169	1,049
100-150 yrs	20-35%	18%	17%	1,296	1,218
150+ yrs	20-40%	9%	9%	651	651

Alternative 4: Under this alternative, regeneration harvest would occur on 185 acres and cause the shifts depicted in Table 4.38. The 0-40 year old age class would increase, but within the historic range; the 40-60 year old age class would remain overrepresented; the 150+ year old age class would remain unchanged; the 60-100 year old age class would shift down, but within historic values; and the 60-100 year old age class would shift away from historic values.

Table 4.38 – Non-umbric low relief rolling hills age class distribution under alternative 4.

Age Class	Historic Age Class Distribution	Current Age Class Distribution	Age Class Distribution if Alt 4 Selected	Current Acreage in Age Class	Acreage in Age Class if Alt 4 Selected
0-40 yrs	25-45%	38%	40%	2,695	2,880
40-60 yrs	5-15%	19%	19%	1,373	1,366
60-100 yrs	10-20%	16%	15%	1,169	1,085
100-150 yrs	20-35%	18%	17%	1,296	1,198
150+ yrs	20-40%	9%	9%	651	651

2. Cumulative Effects

Geographic Area: The cumulative effects analysis area is the project area. This area represents an area that is large enough that conditions within this area could be compared with historic conditions.

Time Frame: About four decades represents the time for young forest stands created by regeneration harvests to mature into the next age class.

Past, Present, and Foreseeable Future Actions: The past actions that have most significantly affected age classes in the project area are the introduction of white pine blister rust and past harvest activities, which are the basis for the existing conditions. There are no present or reasonably foreseeable future actions beyond those in the current project or covered in the assumptions that would affect age class distribution. Thus, there are no cumulative effects beyond effects given in the direct and indirect effects section for age class distribution.

C. Landscape Patterns

The LTAs primarily represented in the Barnyard South Sheep project area have desired patch sizes that range widely. Desired conditions for the LTAs represented here generally are that patch size should range from 50-1,000 acres. Desired patch size ranges vary by LTA, but the majority of the project area would fit into this desired condition. To analyze each of these separately within the project area would be to artificially fragment the landscape because patch boundaries within the project often differ from LTA boundaries. Thus, desired patch sizes for the project are a range of patch sizes between 50-1,000 acres.

1. Direct and Indirect Effects

Alternative 1: Landscape pattern would not change if this alternative is selected. While numerous existing patches currently approach historic conditions, the landscape would remain fairly homogeneous. Mid seral/young and mid seral/mature patches would remain very large- indicating a high degree of homogeneity in these successional stages. Early seral and old forest patches would remain smaller until forest succession or disturbance events caused a shift in the successional stages on the landscape.

Alternatives 2, 3 and 4: All action alternatives would cause an increase in the number of patches within the desired size range in the early seral successional stage. Alternative 2 would cause the greatest increase; Alternative 3 would show a slight increase over existing conditions; and Alternative 4 would show no increase in total patch sizes within the desired size range. The following table reflects changes that would occur to patch sizes on the landscape under the various alternatives.

Table 4.39 – Landscape Pattern Comparison

Successional Stage	Existing Patches in Desired Range	Alternative 2 Patches in Desired Range	Alternative 3 Patches in Desired Range	Alternative 4 Patches in Desired Range
Early Seral	5	13	9	8
Mid Seral/ Young	17	16	14	14
Mid Seral/Mature	10	10	11	10
Late Seral/ Old Forest	4	4	4	4
Total for All Stages	**36**	**43**	**38**	**36**

2. Cumulative Effects

Geographic Area: The cumulative effects area is the Barnyard South Sheep analysis area, which represents the smallest continuous area containing all of the proposed vegetative treatments. While large enough to give a landscape view of changes to patch size, the area is not so large that changes become diluted.

Time Frame: About four decades represent the amount of time for a forest stand to advance from one successional stage to another, affecting overall landscape patterns.

Past, Present, and Foreseeable Actions: The past actions that have most significantly affected landscape patterns in the Barnyard South Sheep project area are past harvest activities and fire suppression efforts, which are the basis for the existing condition. There are no present or reasonably foreseeable future actions beyond those in the current project that would affect landscape pattern. Thus there are no cumulative effects for landscape pattern.

Consistency with Forest Plan: All proposed harvest would occur within the E1 management area. Lands within management area E1 are intended to provide optimum, sustained production of wood products and to produce timber in a cost effective way while providing adequate protection of soil and water quality. The standards given in the Clearwater Forest Plan for management area E1 include the following:

- Schedule timber harvest using logging and silvicultural methods appropriate for the stand and the terrain.
- Maintain stocking control commensurate with the level of management intensity.
- Identify and maintain suitable old-growth stands and replacement habitats for snag and old-growth dependent wildlife species.

Alternative 1: This alternative would not meet the goals and standards of management area E1, since treatment is necessary within the units proposed for harvest in order for timber production to be maximized.

Alternatives 2, 3 & 4: All action alternatives meet the intent and standards given in the Forest Plan for management area E1. Timber production would be optimized by harvesting using silvicultural techniques appropriate for each site. Silviculturally, Alternative 2 is preferable to Alternatives 3 and 4 in meeting the standards and goals of this management area, due to the higher amount of timber harvest proposed. Alternatives 3 and 4 omit portions of land in this management area where regeneration harvest is needed for optimization of timber production.

Old-growth, based on criteria set forth by Green and others (1992), has been analyzed within the project area and it was determined that none of the units proposed for harvest occur within designated old-growth areas, or within areas shown to be within 20 years of achieving old growth status, as directed by former Clearwater National Forest Supervisor, Thomas K. Reilly in 2006.

D. Sensitive Plant Species (Ref: Botany Specialist Report)

This section considers the disturbance due to proposed activities within suitable habitats for sensitive plants.

1. Direct and Indirect Effects

Alternative 1: Since there are no management activities proposed under this alternative, there would be no direct effects on plant species or habitats. However, changes in stand structure would be expected through time, some of which would alter habitats that are suitable for some sensitive plant species. In some cover types, forest openings may occur as seral species decline. Generally in more mixed-conifer forest types, succession would continue to progress, resulting in a decline in size and frequency of small openings and forest gaps.

In general, species requiring later seral forests would see an improvement in habitat quality, and species with poor dispersal mechanisms would have an increased opportunity for establishment. Species requiring more open conditions would decline, baring the absence of significant fire or other forest clearing event such as severe wind or disease. An increased severity of wildfire is possible in some forest types due to the increased fuel build up in areas of past fire exclusion.

Management Activities: Rare plant species can be affected by proposed management activities in a number of ways depending upon the nature and severity of the disturbance and the individual species biology and ecology. The primary management activity that may affect species or habitats of concern would be regeneration timber harvest that subject the habitat to more mechanical disturbance and alter the light, temperature and moisture regimes that determine distribution for most plants. Early seral species may do well with such changes, but later seral species would decline or be extirpated. Much of the preferred habitats utilized by later seral species are generally associated with riparian areas that are excluded from proposed units. Alternative 2 manages the largest acreage and thus impacts the highest amounts of potential habitat for the rare species analyzed. The habitats affected are reduced under Alternative 4 and further reduced under Alternative 3 that works off existing roads only.

The direct effects of new road construction would displace habitat for rare plant species. Temporary road segments were sorted by potential habitats for sensitive plant species, and it is assumed that for each mile of road constructed approximately 2.5 acres of habitat would be reduced over the short term. The impacts of the system road construction are accounted for in the same way, but this is a permanent feature on the landscape and will not be reclaimed as the temporary corridors will. The effects on rare species habitats from road construction is miniscule compared to the effects of the harvest units, but the small impacts are the most under Alternative 2 and reduced under Alternative 4. Alternative 3 utilizes existing roads only, thus there will be no effects from that alternative from road construction.

Fuels treatments following timber harvest would occur in all action alternatives and the effects of these treatments on rare species habitat will be very similar regardless of the alternative selected. Prescribed fire is generally implemented under moderated conditions that allow fuels to be treated without displacing large areas of forests. While effects to plants on the ground can be significant at implementation, the overall habitat through time generally is not substantially changed. Plants may be lost, but the habitat largely left intact. However, some localized areas may burn severely and result in significant ecological changes. Species requiring more open habitats such as grasslands or savannahs could benefit from fire that reduces conifer or brush encroachment; however, invasive weeds could increase in such areas as a response to the disturbance. As with the other alternatives, habitats for sensitive plant species will undergo a mix of beneficial to detrimental effects depending upon the severity and placement of fire and the individual species ecology.

Decommissioning and reconstruction of existing roads are viewed as maintaining current conditions from the perspective of suitable habitat for rare and sensitive plants. Generally old roads that are candidates for decommission do not provide any habitat for species of concern. Older, shaded road surfaces sometimes provide habitat for deerfern and some species of moonwort; however, such occurrences are rare for deerfern and have not been observed for moonworts on the Nez Perce – Clearwater National Forest. Where these routes cross streams or low moist areas there is a possibility for negative mechanical effects to any occurrences or suitable habitat that may be in the immediate vicinity of the road. However, such effects would be anticipated to be rare and negligible because the work would be almost entirely limited to the road crossing itself with little impact to the adjacent grounds.

Alternatives 2, 3 and 4: The effects analysis is based on evaluation of the above proposed management activities occurring in potentially suitable habitat and the potential for those activities to directly or indirectly effect plant populations or habitat characteristics. Generally, for all species the proposed actions of Alternatives 2 would affect more potentially suitable habitat than those of Alternative 4, which would affect more than Alternative 3, which only implements activities from existing roads. The difference in effects among the action alternatives is largely due to regeneration harvests, with other activities having little or no contribution to alternative differences. Effects on sensitive plant species by management activities of this project are summarized by alternative in Table 4.40. Percentages and acres are rounded to the nearest whole number and only apply to the portion of the quantified habitat on FS ground. Forest management of private grounds in the project area has been extensive and is ongoing. Given the treatments employed it is assumed that most of the sensitive plant habitat on these grounds has been reduced at least in the short term. Specific discussion of effects of vegetation management and road construction to each species follows the table.

Table 4.40 – Comparison of Potential Sensitive Plant Habitat Affected by Action Alternative (acres)

Species	Activity	Alternative 2	Alternative 3	Alternative 4
Deerfern *Blechnum spicant*	Regeneration	662	329	413
	Commercial Thin	379	271	379
	Temporary roads	14	0	11
	Total (% of habitat)	1055 (8%)	600 (4%)	803 (6%)
Green bug-on-a-stick *Buxbaumia viridis*	Regeneration	786	357	510
	Commercial Thin	664	422	664
	Temporary roads	18	0	15
	Total (% of habitat)	1468 (10%)	779 (5%)	1189 (8%)
Clustered lady's-slipper *Cypripedium fasciculatum*	Regeneration	507	235	319
	Commercial Thin	27	0	27
	Temporary roads	9	0	7
	Total (% of habitat)	543 (8%)	235 (3%)	353 (5%)
Light moss *Hookeria lucens*	Regeneration	0	0	0
	Commercial Thin	0	0	0
	Temporary roads	+	0	+
	Total (% of habitat)	+	0	+
Naked rhizomnium *Rhizomnium nudum*	Regeneration	786	357	510
	Commercial Thin	664	422	664
	Temporary roads	18	0	15
	Total (% of habitat)	1468 (10%)	779 (5%)	1189 (8%)
Evergreen kittentail *Synthyris platycarpa*	Regeneration	136	95	100
	Commercial Thin	183	145	183
	Temporary roads	3	0	2
	Total (% of habitat)	322 (14%)	240 (10%)	285 (12%)
Idaho barren strawberry *Waldsteinia idahoensis*	Regeneration	549	316	399
	Commercial Thin	379	271	379
	Temporary roads	13	0	11
	Total (% of habitat)	1041 (10%)	587 (6%)	789 (8%)

Deerfern (*Blechnum spicant*)
The proposed actions would occur on approximately eight percent of the suitable habitat for this species. However, only about five percent of the suitable habitat would be subjected to management activities (even-aged management or road construction) that likely would displace the species or alter the habitat under Alternative 2. Alternative 4 would similarly affect six percent overall and only three percent would be subjected to habitat altering management. Under Alternative 3, less potential habitat would be affected.

In western Washington, Deerfern has withstood harvest and related treatments (Blake and Ebrahimi 1992). However, disjunct and peripheral populations often behave differently from those populations found in optimum habitats. Idaho populations have been noted to occur where air temperatures are strikingly colder, the growing season shorter and snowfall more abundant and persistent (Cousens 1981). Disjunct populations are possibly more susceptible to hydrologic and solar alterations.

Observations of Deerfern in northern Idaho suggest that disturbance may benefit some populations by creating suitable habitat for spore germination. Plants in monitored plots seem to respond favorably to disturbance and are more robust, bearing more sporophylls than plants of undisturbed habitats. This may be a short-term response and the increase in sunlight may ultimately burn the plants out, since this species naturally seems to prefer shaded moist sites (Blake and Ebrahimi 1992). After several years of monitoring, plants that were most common in riparian areas and were disturbed but not burned intensely were found to increase, however plants also increased in undisturbed control plots. Sporophyll production in open disturbed sites continued to be greater (Hammett 2001).

Thinning and timber harvest activities that do not mechanically remove existing plants and leave much of the canopy intact would not harm the population. Also the majority of Deerfern populations and habitat occur in or near the riparian areas, which are protected by standard riparian buffers. It is anticipated that even aged management resulting in temperature and hydrologic changes would likely have harmful effects on plants or the continued suitability of the habitat.

Green bug-on-a-stick (*Buxbaumia viridis*)
Under Alternative 2 approximately ten percent of the suitable habitat for this species would see management activities, while even-aged management and road construction that would displace habitat would occur on approximately six percent of the suitable habitat. Under Alternative 4, approximately eight percent of potential habitat would be affected overall with about four percent being affected by even-aged management and temporary road construction. Proposed actions of Alternative 3 would affect even less habitat.

Processes, natural or man-caused, that open the overstory canopy, remove large organic debris, or disturb the soil surface could affect *Buxbaumia viridis* habitat. The species is rare due to inefficient dispersal and difficulties in establishment on limited, specialized substrates (Wiklund 2002). The occurrence of the required micro-habitats are limited to shaded moist forests, thus the moss would not cope well with significant effects to suitable habitat that would change the microclimate. Regeneration harvest would change the ecology of site to the point extirpation would be expected. While thinning would not significantly alter stand structure, down log recruitment, a necessary component of Buxbaumia habitat, would not occur or would be lessened. Moist riparian bottoms and toe-slopes have the greatest potential for maintaining large decaying logs within grand fir habitats. Buffering these draws and riparian areas would protect the moist microsites where large logs and suitable habitat are most likely to occur.

Clustered lady's slipper (*Cypripedium fasciculatum*)
The mechanical treatments of Alternative 2 would occur on approximately eight percent of the potential *Cypripedium* habitat. Management activities such as even-aged management and road construction that would displace the species and its habitat would occur on slightly less ground, but still would be approximately eight percent of the potentially suitable habitat. Under Alternative 3 and 4 these values are approximately three percent and five percent respectively.

Clustered lady's slipper is highly sensitive to ground disturbance and canopy removal. Apparent population decreases have been observed where the overstory canopy was reduced (Lake 2002). The few plants found growing in full sunlight had yellowed and deformed leaves. Disturbance to the duff layer that results in exposed soil may also be detrimental to established populations. With even-aged management practices, the mycorrhizal fungal relationships believed to be necessary for seedling germination and health would be severed. Nor would the fungus tolerate the direct sunlight that would result from such activities. The species has never been found in clearcut areas and extirpation would be the expected result of this form of management (Greenlee 1997).

Thinning would often maintain enough overstory canopy and leaves the light, heat and moisture regimes intact enough to sustain suitable habitat, however the skidding of logs and the construction of temporary roads would alter the soil surface and physically remove plants if present. Some populations persist in areas that have undergone low intensity wildfire (Hays 1995) and in areas that underwent some form of intermediate harvest that leaves the duff layer and some cover intact (Lichthardt 2003). Occurrences in areas that burn intensely and lose tree cover or burn the duff layer have been observed to be extirpated (Pipp 1999). It is possible that intermediate harvest treatments in grand fir and Douglas fir habitat types may represent a mixture of detrimental and beneficial effects; in the short term, individuals may be harmed by the timber harvest activities or canopy reduction, but in the long term populations may benefit from the reduced threat of stand replacing fire (Greenlee 1997).

Light Moss (*Hookeria lucens*)
Management activities would occur on a trace of this species' potentially suitable habitat due to temporary roads crossing riparian areas under Alternatives 2 and 4. However, because the habitat is along forested riparian areas that are protected from most management activities, there are virtually no activities that would occur in the species' habitat other than road or trail crossings.

Processes, natural or man-caused, that open the overstory canopy, remove large organic debris, disturb the soil surface or change the microclimate could affect light hookeria populations and habitat (Bohlin et al 1977). Even aged forms of timber harvest within suitable habitat likely would adversely affect light hookeria microhabitat; however the proposed thinning would not likely alter stand structure significantly and thus have little effect. Also, because this moss typically is found in or immediately adjacent wet draw or drainage bottoms, it would be protected from disturbance by standard riparian buffers.

Naked-stem Rhizomnium (*Rhizomnium nudum*)
Under Alternative 2 approximately ten percent of the suitable habitat for this species would see management activities, while even-aged management and road construction that would displace habitat would occur on approximately six percent of the suitable habitat. Under Alternative 4, approximately eight percent of potential habitat would be affected overall with about four percent being affected by even-aged management and temporary road construction. Proposed actions of Alternative 3 would affect even less habitat.

Processes, natural or man-caused, that significantly open the overstory canopy, remove large organic debris, or disturb the soil surface could adversely affect *Rhizomnium nudum* habitat. Commercial

thinning would not be expected to significantly alter stand structure to a point where there would be concern for this species' habitat, but mechanical harm could pose a threat. The majority of suitable habitat is likely limited to the immediate riparian area and would thus be protected from disturbance by standard riparian buffers. However, the species likely occurs on low, moist forested areas away from the draws as well.

Evergreen kittentail (*Synthyris platycarpa*)
Under Alternatives 2 and 3 respectively, approximately 14 percent and ten percent of suitable habitat would undergo ground disturbing activities. Under Alternative 4, approximately 12 percent would be affected. Evergreen kittentails appears to be somewhat tolerant of disturbance including timber harvest and fire (Crawford 1980). Light surface disturbance that does not greatly affect the shallow roots would have little effect and thinning that removes a portion of the canopy may improve suitable habitat for evergreen kittentail. Individual plants may be mechanically harmed or little affected depending upon the severity of implementation. The resulting open ground surfaces may provide for increased germination after the disturbing activities are completed. Thus the effects of the proposed project would likely be mixed.

Idaho barren strawberry (*Waldsteinia idahoensis*)
Approximately 10 percent of the modeled suitable habitat in the project area would be managed under Alternative 2, while six percent and eight percent would be managed under the Alternative 3 and Alternative 4 respectively. Idaho barren strawberry appears to be tolerant of disturbances. Fire used to burn slash would reduce competition and stimulates both seed and rhizome production. However, prolonged and intense heat that penetrates deeply into the soil may kill the plant (Crawford 1980). Population density of Idaho barren strawberry is greater in open stands with past harvest and in old burns as compared to a more shaded closed conifer community (Crawford 1980). It is capable of colonizing disturbed soils where competition from shrubs and larger plants may be reduced, providing a temporal window for Waldsteinia (Lichthardt 1999). Thus the effects of the proposed project would likely be mixed.

a. Effects Determinations

Determination of effects on rare plant species by management activities of this project are summarized by alternative in Table 4.41. This table includes all plant species on the Nez Perce - Clearwater National Forest TES list to allow this document to serve at the biological assessment and biological evaluation.

Table 4.41 – Summary of Effects for Threatened and Sensitive Plant Species

Plant Species	Known Occurrence	Habitat Present	Effects Determination			
			Alt 1	Alt 2	Alt 3	Alt 4
Water howellia *Howellia aquatilis*	No	No	NE	NE	NE	NE
MacFarlane's four-o'clock *Mirabilis macfarlanei*	No	No	NE	NE	NE	NE
Spalding's catchfly *Silene Spaldingii*	No	No	NE	NE	NE	NE
Maidenhair spleenwort *Asplenium trichomanes*	No	Yes	NI	NI	NI	NI
Payson's milkvetch *Astragalus paysonii*	No	No	NI	NI	NI	NI
Deerfern	No	Yes	NI	**MI**	**MI**	**MI**

Plant Species	Known Occurrence	Habitat Present	Effects Determination			
Blechnum spicant						
Crenulate moonwort *Botrychium crenulatum*	No	Yes	NI	NI	NI	NI
Lance-leaf moonwort *Botrychium lanceolatum* var. *lanceolatum*	No	Yes	NI	NI	NI	NI
Linear-leaf moonworts *Botrychium lineare*	No	Yes	NI	NI	NI	NI
Mingan moonwort *Botrychium minganense*	No	Yes	NI	NI	NI	NI
Mountain moonwort *Botrychium montanum*	No	Yes	NI	NI	NI	NI
Northern moonwort *Botrychium pinnatum*	No	Yes	NI	NI	NI	NI
Least moonwort *Botrychium simplex*	No	Yes	NI	NI	NI	NI
Leafless bug-on-a-stick *Buxbaumia aphylla*	No	No	NI	NI	NI	NI
Green bug-on-a-stick *Buxbaumia viridis*	No	Yes	NI	**MI**	**MI**	**MI**
Broadfruit mariposa *Calochortus nitidus*	No	No	NI	NI	NI	NI
Constance's bittercress *Cardamine constancei*	Yes	Yes	NI	NI	NI	NI
Buxbaum's sedge *Carex buxbaumii*	No	No	NI	NI	NI	NI
Bristle stalked sedge *Carex leptalea*	No	No	NI	NI	NI	NI
Many headed sedge *Carex sychnocephala*	No	No	NI	NI	NI	NI
Anderegg's cladonia *Cladonia andereggii*	No	No	NI	NI	NI	NI
Pacific dogwood *Cornus nuttallii*	No	No	NI	NI	NI	NI
Clustered lady's-slipper *Cypripedium fasciculatum*	Yes	Yes	NI	**MI**	**MI**	**MI**
Dasynotus *Dasynotus daubenmirei*	No	No	NI	NI	NI	NI
Idaho douglasia *Douglasia idahoensis*	No	No	NI	NI	NI	NI
Giant helleborine *Epipactis gigantea*	No	No	NI	NI	NI	NI
Puzzling halimolobos *Halimolobos perplexa* var. *perplexa*	No	No	NI	NI	NI	NI
Sticky goldenweed *Haplopappus hirtus* var. *sonchifolius*	No	No	NI	NI	NI	NI
Light moss *Hookeria lucens*	No	Yes	NI	**MI**	NI	**MI**
Salmon-flowered desert-parsley *Lomatium salmoniflorum*	No	No	NI	NI	NI	NI
Chickweed monkeyflower *Mimulus alsinoides*	No	Yes	NI	NI	NI	NI

Plant Species	Known Occurrence	Habitat Present	Effects Determination			
Spacious monkeyflower *Mimulus ampliatus*	No	Yes	NI	NI	NI	NI
Thin sepal monkeyflower *Mimulus hymenophyllus*	No	No	NI	NI	NI	NI
Gold-back fern *Pentagramma triangularis* var. *triangularis*	No	No	NI	NI	NI	NI
Sweet coltsfoot *Petasites frigidus* var. *palmatus*	No	Yes	NI	NI	NI	NI
Whitebark pine *Pinus albicaulis*	No	No	NI	NI	NI	NI
Licorice fern *Polypodium glycyrrhiza*	No	Yes	NI	NI	NI	NI
Naked rhizomnium *Rhizomnium nudum*	No	Yes	NI	**MI**	**MI**	**MI**
Mendocino sphagnum *Sphagnum mendocinum*	No	No	NI	NI	NI	NI
Evergreen kittentail *Synthyris platycarpa*	Yes	Yes	NI	**MI/BI**	**MI/BI**	**MI/BI**
Sierra wood-fern *Thelyptris nevadensis*	No	Yes	NI	NI	NI	NI
Short style toefieldia *Triantha occidentalis* ssp. *brevistyla*	No	Yes	NI	NI	NI	NI
Douglas clover *Trifolium douglasii*	No	No	NI	NI	NI	NI
Plumed clover *Trifolium plumosum* var. *amplifolium*	No	No	NI	NI	NI	NI
Idaho barren strawberry *Waldsteinia idahoensis*	No	Yes	NI	**MI/BI**	**MI/BI**	**MI/BI**

Threatened Species Determination: NE = No Effect.
Sensitive Species Determination: NI = No Impact; **BI** = Beneficial Impact; **MI** = May impact individuals or habitat but not likely to cause trend toward federal listing or reduce viability for the population or species.

2. Cumulative Effects

Discussion of cumulative effects for rare plants is addressed through the general trend of the suitable habitat required by these species as a result of past, present and future management actions. Because all potentially affected species occur predominantly in the moist western hemlock and red cedar habitats that are so dominant in the project area, the species have been grouped for this analysis. It generally is not possible to directly quantify effects of specific activities that are several years or decades old on species of concern today. The status and occurrence of rare plants was completely unknown for much of the management history of the watershed. Historically the changes in condition and abundance of specific habitats important to these species are also largely unknown. Therefore the effects of these past projects can only be qualified through general discussions. However, the results of past projects contribute to the current condition, which can be used to discuss and quantify effects of proposed activities on rare plant species.

Geographic Boundary: The area of consideration for cumulative effects includes lands within the entire project area. The rationale for this is that the effects are site specific to areas treated within the project area and will not extend beyond the boundaries, and effects from outside the defined area will likewise not affect the resource within.

Time Frame: These effects are considered only for the species potentially affected by this project from the initial habitat transformations in the early 1900s through the proposed and reasonably foreseeable future.

Past, Present, and Foreseeable Future Actions: The primary management activities that have influenced rare plant habitat in the Barnyard project area and continue to under this project include past and present timber harvest, and road construction. Timber harvest on National Forest lands within the area started in the 1950s, when 1,026 acres were harvested; 164 acres being clearcut. In the 1960s harvest increased substantially with 2,268 acres total harvest, of which 1521 acres were clearcut. In the 1970s total harvest increased slightly to 2,444 acres, but the clearcut acres declined to 461 acres. In the 1980s management substantially, involving 909 acres, with just 96 being clearcut. In the 1990s harvest continued to decline with only 59 acres clearcut out of a total of 375 acres managed. The following decade only 78 acres were treated with none being clearcut. Trends of harvest activity have significantly declined with a corresponding decline in effects to plant habitat. In addition, advancement in harvest operations and logging technology has further reduced resource impacts.

Roads built to support logging have put 165 miles of system roads, 53 miles of mapped non-system roads and 55 miles of unmapped non-system roads in the project area. Construction activity probably parallels logging activity as far as implementation. The effects of this activity are generally vegetation removal, soil compaction and some areas of stream channelization. Changes to hydrologic function and indirect effects such as human pressure on wildlife and influx of invasive species are also associated with roads. Many of these roads are no longer used and have become overgrown. Over the years, some roads have received various levels of maintenance and reconstruction. Very few if any roads have been created in recent years.

There are approximately 56 miles of trails in the project area that may receive irregular, but ongoing maintenance in the project area. The effects of trail work on sensitive species habitats are generally negative, but very small. This irregular maintenance is considered routine and ongoing, with virtually no effects to the habitat which they pass through. Weed treatments occur on approximately four acres in the project area each year. These are spot applications not expected to affect any species of concern. These activities are considered ongoing and routine with virtually no effects to the habitats of concern or rare species. Foreseeable future actions of this nature would largely occur in areas already disturbed at present or declining levels.

Alternative 1: The no action alternative would produce no additional effects on potential rare plant habitat, as compared to past activity levels. The progression of forest succession would improve habitat for most sensitive plant species. However, the decline of successional tree species due to insect-caused mortality may cause localized openings and increases in light and fuel loads, which could lead to more intense wildfires and resource damage. In such cases, older habitat favored by these species could see localized declines, but the trend overall would be one of increasing habitat suitability. Succession could also be a detriment to some species favored by lightly disturbed or transitional habitats.

Alternative 2: This alternative adds short-term disturbance to this landscape through harvest activities, and temporary road construction. These activities along with ongoing activities would result in a slight decline of potentially suitable sensitive plant habitat for some species. Long-term trends would be static to slightly downward for species favored by older, closed forest habitats. A slight downward trend in habitat quality would not lead to concerns for population viability, since these habitats are common in much of the project area. Habitat for other species favored by more open or transitional habitat would be maintained or slightly improved as a cumulative result of the proposed and ongoing actions.

Alternatives 3 and 4: The cumulative effects of Alternatives 3 and 4 would be similar, but slightly less to those of Alternative 2 due to fewer acres proposed for management and lack of road construction in the case of Alternative 3

3. Regulatory Framework

Threatened and endangered species are designated under the Endangered Species Act. It is the policy of Congress that all Federal departments shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of this purpose (ESA 1531.2b). Three plants listed as Threatened in Idaho may occur in areas managed by the Nez Perce – Clearwater National Forest and are addressed under the ESA. The Threatened plants are Macfarlane's four-o'clock (*Mirabilis macfarlanei*), water howellia (*Howellia aquatilis*), and Spalding's catchfly (*Silene spaldingii*). Current direction from the U.S. Fish and Wildlife Service directs water howellia and Spalding's catchfly need to be addressed for projects in Benewah and Latah County. An additional species listed as a Candidate for listing is whitebark pine (*Pinus albicaulis*). This species is addressed as a sensitive plant species.

Sensitive species are defined in the Forest Service Manual (FSM 2670.5) as "those plant and animal species identified by the Regional Forester for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers, density, or habitat capability that reduce a species/existing distribution." In FSM 2670.22, management direction for sensitive species is in part, to ensure that species do not become threatened or endangered, because of Forest Service actions and to maintain viable populations of all native species. The most recent update to the sensitive species list became effective in May 2011. The updated R1 sensitive plant list made no changes to the Clearwater National Forest sensitive plant list. The Forest Service must evaluate impacts to sensitive species through a biological evaluation.

This specialist report contains the necessary determinations section and discussion of effects for sensitive plant species to serve as the Biological Evaluation for rare plants as directed by the streamlined BE processes outlined in the FSM. This report also discloses and documents the effects to the threatened plant species that potentially occurs on the Clearwater National Forest, thus this report also serves as the Biological Assessment for this project.

Forest Plan Consistency: The forest plan states that no action will be taken that will jeopardize a threatened and/or endangered species. As stated under the regulatory framework, the objective for managing sensitive species is to ensure population viability throughout their range on National Forest lands and to ensure they do not become federally listed as threatened or endangered. The forest plan supports this direction but does not set specific standards and guides for sensitive plants. The alternatives are consistent with this direction to the extent that proposed management actions would not adversely affect viability of existing sensitive plant populations or habitat.

VI. Recreation (Ref: Barnyard South Sheep Recreation Report)

A. Methodology

Analysis for the recreation resource included developing an understanding of current use types and use patterns in the project area. Evidence of existing recreation use identifies that visitors are engaging in a number of different activities such as off-highway vehicle (OHV) use, camping, non-motorized recreation (hiking, biking, horse riding), winter recreation and other recreation (berry picking, hunting, firewood gathering). To address the effects of each alternative, we looked at the following issue indicators:

Off-highway vehicle (OHV) Recreation: OHV recreation continues to be a growing segment of recreation use throughout the North Fork Ranger District; particularly within the Barnyard South Sheep project area, use is moderately high both on National Forest System Trails and National Forest System Roads. To address the effects of the individual alternatives on OHV recreation, the analysis focused on the following:

- Degree of impact on trails to use due to location of vegetation management activities
- Total number of road miles decommissioned, by alternative
- Total number of road miles placed into storage, by alternative

Camping: There are a number of opportunities for dispersed camping throughout the project area. To address the effects of the individual alternatives on camping, the analysis focused on the following:

- Total number of road miles decommissioned, by alternative
- Total number of road miles placed into storage, by alternative

Non-motorized recreation: Currently, non-motorized recreation activities such as hiking, biking and horse riding are occurring on a very light basis within the project area. To address the effects of the individual alternatives on non-motorized recreation, the analysis focused on the following:

- Degree of impact on trails due to location of vegetation management activities
- Total number of road miles decommissioned, by alternative
- Total number of road miles placed into storage, by alternative

Winter recreation: Both motorized and non-motorized winter recreation is available in the project area; non-motorized recreation is not extremely popular, however, motorized activity is more popular with use occurring on a moderate basis throughout the winter months. To address the effects of the individual alternatives on winter recreation, the analysis focused on the following:

- Degree of impact on groomed snowmachine trails due to timing of vegetation management activities
- Likelihood of winter logging/haul
- Total acres of vegetation management activity, by alternative

Other recreation: There are a number of other important recreation activities that take place throughout the project area, including berry picking, firewood gathering and hunting. To address the effects of the individual alternatives on *berry picking and hunting*, analysis focused on the following:

- Total acres of vegetation management activity, by alternative
- Total number of road miles decommissioned, by alternative
- Total number of road miles placed into storage, by alternative

To address the effects of the individual alternatives on *firewood gathering*, analysis focused on the following:

- Total acres of vegetation management activity, by alternative
- Total number of road miles decommissioned, by alternative
- Total number of road miles placed into storage, by alternative

B. Direct and Indirect Effects

1. OHV Recreation

Alternative 1: The opportunities for OHV recreation would remain the same as exists currently, with OHVs restricted to existing National Forest System (NFS) roads and trails. Annual and deferred maintenance (as needed) of existing trails would continue to be completed as identified in each individual Trail Management Objective (TMO's).

Alternative 2: With the proposed level of vegetation management activity, there would be a high degree of impact to OHV Recreation within the project area. Impacts would be due to a wide variety of factors including the likelihood of:

- Trails crossing through vegetation management units would need to be closed for some degree of time
- Trails within units may be used for haul of material
- Recreationists may have difficulty accessing valued recreation destinations

Impacts would likely be felt most in the extreme northern and southern sections of the project area, and in spots that coincide with the existing OHV trail sections. For instance, impacts are likely to be felt in the Sheep Mountain Saddle/Swanson Saddle area. Reconstruction of NFS Roads 74195 and 5323, with the fact that they are part of or directly adjacent to the Sheep Mountain OHV Trail system, will directly impact the experience for OHV users. In the southern portion of the project area, reconstruction of NFS Road 5303-A and 5213 would have similar substantial impacts. Currently, these roads are not open to full-size vehicles – which would change with the proposed actions in this alternative.

It warrants notice that the trail system within the project area consists of trails that are either in coincident use with an open road, have been created on an existing road template currently closed to full-sized vehicles, or exist as a "true" trail template with specifications such as width that would only be navigable by trail vehicles. The "true" trail templates are not expected to be used for or converted to a road to facilitate management actions in this, or any alternative. However, those coincident roads/trails and those trails on an existing road template have the real potential to be used as a haul route to remove vegetation. Finally, while "true" trail templates are not expected to be used for hauling of material, it should be expected that the possibility exists for logging activity to occur adjacent to/across these trails resulting in likely closures during periods of logging activity.

Furthermore, attention would need to be placed in the development of visual screens/buffers within all units slated for logging. If visual screens and buffers are not adequate, and openings in the forest are clearly noticeable, the likelihood of additional user created routes being created increases substantially. Therefore, with the scale of harvest activity proposed in this alternative, the potential for new user created trails appearing on the landscape is relatively high.

Planned watershed improvements which would result in the decommissioning of 44.6 miles of system roads and 31.0 miles of non-system roads and storage of 28.4 miles of system roads, plus 20.6 miles of non-system roads would impact OHV recreation to a moderate degree. This is due to the fact that decommissioning would result in approximately 26% of system roads becoming unavailable to recreationists; when combined with the road mileage placed in storage, approximately 43% of system roads in the project area become unavailable for use. Decommissioning of the non-system roads, while impacting OHV recreation somewhat, is less of a concern due to the fact that many of these non-system roads are already in an overgrown state that makes current use at best, difficult or even

impossible. Therefore, while there would be impacts to OHV recreation due to the reduction in available roads, the remaining roads and trails would still allow recreationists the ability to experience a wide variety of recreation opportunities and access valued destinations.

Alternative 3: There would be far fewer impacts to OHV Recreation than those described under Alternative 2. With approximately 40% fewer acres proposed for harvest and treatment, fewer trails and existing roads would be impacted, thereby creating fewer inconveniences for users. An example of this is that this alternative does not include reconstruction of NFS 5213, thereby reducing the impacts to OHV users in this portion of the project area.

Alternative 4: This alternative would result in a moderate degree of impact with fewer impacts to users than in Alternative 2, however, a higher degree of impact than in Alternative 3. The proposed level of managed acres is approximately 20% less than that identified for Alternative 2, with the likely result being fewer inconveniences for users due to potential use of/haul across existing trails (although potentially more inconveniences than in Alternative 3).

2. Camping (Dispersed)

Alternative 1: Since existing dispersed camping opportunities would remain for the public, there would be no change in the availability of this activity.

Action Alternatives: There would be moderate impacts to dispersed camping within the project area. The biggest impact will be short-to-mid-term with the expected dust and noise due to log truck activity. Minimal impact will occur due to project road decommissioning and storage – the roads identified under these categories are very lightly used for dispersed camping activity.

3. Non-motorized Recreation (Hiking, Biking, and Horse Riding)

Alternative 1: Since existing hiking opportunities would remain for the public, there would be no change in the availability of this activity.

With biking and horse riding occurring sparingly in the Barnyard South Sheep area, there would be little to no direct or indirect effects to this activity.

Action Alternatives: With all hiking activity taking place on the motorized trails in the project area, the impact of proposed management activities would be similar to those described above under OHV Recreation. Similar effects would be experienced by bikers and horse riders.

4. Winter Recreation

Alternative 1: Opportunities for winter recreation will remain unchanged. Road access would not be altered with this alternative, thereby providing the same amount of opportunities as currently exist.

Action Alternatives: The timing of material removal along NFS Roads would determine the potential effects to winter recreation in the project area. Summer removal would not affect winter recreation at all. However, if winter haul is to occur, it would have the potential of impacting popular groomed snowmobile routes in the area. Currently, NFS Roads 680, 683, 246 and 670 are all groomed routes that receive regular use in the winter. If winter haul is to take place, there should be close coordination between recreation and timber resources to ensure that alternate routes remain available for snowmobile grooming opportunities.

5. Other Recreation (Berry Picking, Firewood Gathering, and Hunting)

Alternative 1: Due to the unchanged nature of road access with this alternative, in the short-term, opportunities for berry picking and firewood gathering would remain the same. In the long-term, there is the potential to reduce the amount of huckleberries available for users due to the likely increase in canopy cover and the resulting shading that would limit the expansion of existing berry patches. Firewood gathering would not be impacted.

In the short-term, opportunities for hunting would remain the same, since road access would not be altered, thereby providing the same degree of access that currently exists. However, in the mid-to-long-term, continued increase in canopy cover has the potential to decrease the availability of browse for big game species, which could potentially inhibit population growth of some animals that are desirable species for hunting.

Action Alternatives: Proposed timber harvest, ranging from approximately 910 to 1,585 total acres would result in both positive and negative impacts to these activities. Regarding berry picking, the proposed harvest activities have the potential to increase availability of huckleberry crops, thereby providing a huge benefit to recreationists. Berry bushes have the propensity to thrive in newly opened landscapes and would likely do so in treated units throughout the project area. As noted in the OHV section, there would be a percentage of roads either decommissioned or placed in storage, but this will not significantly hinder availability of huckleberry picking areas due to their very low current use.

Firewood gathering would be highly impacted with Alternative 2 and least impacted with Alternative 3. Up to 9% of the project area would become unavailable for personal use firewood gathering. It is important to note though, that the project implementation would consist of multiple timber sales. This would result in only a portion of the vegetation management work taking place in any one year, which would (to a degree) lessen the immediate impacts to firewood gatherers. Also, with decommissioning/storage of a small percentage of roads within the project area, there would be some loss of opportunity. However, these roads are lightly used, so impacts due to this factor would be minimal.

Each action alternative would result in a short-term impact to hunting in the project area. This would be due to the increased level of activity from timber management, including the truck activity on area roads, all of which may impact the availability of game. However in the mid-to-long-term, the proposed management activities have the potential to benefit hunting opportunities, through a potential increase in browse material, thereby potentially increasing populations of some desirable species.

Summary of Direct and Indirect Effects

Table 4.42 – Overall impact on recreation resources by Alternative[11]

Recreation resource	Alt. 1:	Alt. 2:	Alt. 3:	Alt. 4:
OHV Recreation	L	H	L	M
Camping (dispersed)	L	M	L	L
Non-motorized recreation	L	H	L	M
Winter Recreation	L	L	L	L
Other Rec. (berry picking)	L	L (+++)	L (+)	L (++)
Other Rec. (firewood)	L	H	L	M

[11] Overall impact is expressed in negative terms; however, when a "Low" level of impact is identified followed by a +, ++, or +++, this is expressing the degree of *positive* impact to this particular resource due to proposed management actions.

gathering)				
Hunting (short-term)	L	H	L	M
Hunting (long-term)	L	L (+++)	L (+)	L (++)

C. Cumulative Effects

Geographic Boundary: The boundary evaluated for cumulative effects of recreation is the Barnyard South Sheep project area.

Time Frame: The time frame for the evaluation of cumulative effects is 10 years following implementation of the project. This timeframe is used because after 10 years, the public's adjustment to access changes would be complete and closed and decommissioned roads would be adequately revegetated to provide natural closures to roads closed year long.

Past, Present and Foreseeable Actions: The Barnyard South Sheep project area has been home to a variety of management activities throughout the mid-to-late 20th Century and continuing to this day. Timber removal has been part of the landscape, with active and engaged management by the District for many years (refer to Appendix A). Roads are a significant part of the landscape in this project area, with approximately 170 miles of NFS Roads present. The extensive road system was largely developed in the 1950s/1960s, and primarily developed to facilitate management of district timber resources. Additional activities include mining, treatment of noxious weeds, and recreational trail use. Furthermore, dispersed camping, berry picking, hunting, and firewood gathering have all evolved in the area throughout time given availability and access.

All Alternatives: It is expected that each of these activities would occur into the future, with some degree of natural ebbs and flows of use depending on a variety of factors, including the availability of various resources (big game, available timber, forage, etc.).

Due to the status of recreation budgets, it is unlikely that any large scale recreational development would occur within the project area. In fact, at this time, there is nothing planned into the future. It is expected that Forest Service work in the area will only be annual and deferred maintenance of recreation sites, particularly of trails within the project area. Regardless of the alternative selected, this maintenance work would still occur.

VII. Transportation (Ref: Barnyard South Sheep Transportation Report)

This section addresses the effects of proposed watershed improvements and road activities associated with timber harvest on the area's transportation system. Issue indicators include: (1) miles of road decommissioning; (2) miles of roads placed into intermittent storage; (3) miles of road reconstruction; (4) miles of road reconditioning (maintenance); and (5) road density (mi/mi^2).

A. Direct and Indirect Effects

Alternative 1 (No Action): This alternative would take no action with regard to the National Forest transportation system within the project area, except for the maintenance of system roads that are part of the Forest road maintenance program. Due to limited funds the Forest currently is focusing road maintenance on the collector roads in the project area. These are the 246, 680, 681, and the 683 which total approximately 19.5 miles. Not all of these roads have maintenance performed yearly but it could be expected that they would receive maintenance with in a 3-year cycle. Other system roads with in the project area may receive maintenance if they are determined to be a public safety hazard or are

causing significant resource damage. However, these roads are determined on a case by case basis, and it is difficult to estimate road miles maintained for these roads. Finally, the minimum road system identified in the Barnyard South Sheep Travel Analysis would not be implemented.

All Action Alternatives: Each of these alternatives would implement the **minimum road system** as recommended by the Barnyard South Sheep Travel Analysis. Existing roads under Forest Service jurisdiction within the project area were studied by an interdisciplinary team; both authorized and unauthorized roads were evaluated. Roads that no longer served a purpose, were redundant, or had unacceptable effects on adjacent natural resources were recommended for decommissioning. Roads that were not anticipated to be used in the near future but would still serve a function were recommended for storage. Unauthorized roads that were expected to be beneficial to the area transportation system were recommended for inclusion in the Forest Service authorized road system, the remaining unauthorized roads were recommended for decommissioning.

All action alternatives propose to decommission 44.6 miles of Forest Service system roads and 31.0 miles of non-system roads. The effects on road density by drainage are displayed in Table 4.6 of the Watershed section. Additional non-system roads would be evaluated for decommissioning to further decrease road density.

Road Reconstruction and Maintenance: Road reconstruction work typically involves reshaping the road prism, stabilizing the road subgrade, culvert installation, road surfacing, and heavy brushing. Road reconstruction work typically involves reshaping the road prism, stabilizing the road subgrade, culvert installation, road surfacing, and heavy brushing.

Alternatives 2, 3 and 4 propose to reconstruct 21.0 miles, 14.9 miles, and 20.0 miles of existing roads, respectively. All of the action alternatives propose the same 29.6 miles of road reconditioning, of which 19.5 miles are currently maintained as part of the Forest road maintenance program and the remaining 10.1 miles would be maintained for timber harvest. The following table summarizes the road reconstruction and maintenance needs for each action alternative. A detailed list of the road work can be found in the Barnyard South Sheep Travel Analysis.

Table 4.43 – Road Needs by Alternative

	Alt 2 (Miles)	Alt 3 (Miles)	Alt 4 (Miles)
Total Reconstruction	**21.0**	**14.9**	**20.0**
Total Maintenance	**29.6**	**29.6**	**29.6**

Access Management: All action alternatives would implement proposed access management changes in the Barnyard South Sheep Travel Analysis. A major component of this action would be the decommissioning of select roads. Total project area system road miles would be reduced by 29% from 156 to 111 miles, and 31.0 miles of non-system roads would decommissioned for a total of 75.6 miles. Roads proposed for decommissioning have an array of existing access restrictions. After implementation, these roads would no longer be considered designated routes and would be subject to the Forest Supervisor's Order prohibiting wheeled motorized travel off of designated routes.

The only access management change proposed for the action alternatives that is not due to road decommissioning or intermittent storage is Tumble Lodge Road 5303, which would be changed from open seasonally all to restricted year round all for watershed protection or wildlife security.

Road 246 Fill Failures: During the spring of 2011, a rain on snow event caused substantial fill failures on Road 246 at mile posts 22.0 and 31.8. The fill failure at mile post 31.8 was repaired in the summer of 2012, however, the fill failure at mile post 22.0 still remains. This fill failure narrowly provides high clearance vehicle traffic, but does not provide for trailer or commercial haul traffic.

The Forest plans to repair the fill failure once funds are available. In its current state, this fill failure would have no impact on timber haul proposed under each action alternative. Timber harvest Units 20, 22, 23, and 24 are located south of the fill failure, and the timber harvested in these units can be hauled south on Road 246 to State Hwy 11 at Headquarters.

B. Cummulative Effects

Geographic Boundary: The cumulative effects analysis area for road transportation is the boundary of the Barnyard South Sheep analysis area and the National Forest System Roads and unauthorized roads wholly or partially within that boundary. It is at this project level scale that the proposed action and purpose and need can be addressed and analyzed with the appropriate level of detail.

Time Frame: The time frame for the evaluation is approximately 10 years, when all road activities are estimated to be implemented.

Past, Present and Foreseeable Actions: Past actions are included in the description of the existing condition. The Clearwater National Forest recently completed a Travel Management Plan to implement the 2005 Travel Management Rule. A component of this study is to consolidate travel management restriction dates across the Clearwater to a total number of eight. Those travel management restriction date periods have been incorporated into the Barnyard South Sheep Travel analysis, which reduced the road mileage in the project area for both system and unauthorized roads and established a minimum road system for the National Forest System Lands in the area.

Alternative 1: The cumulative effect of implementing Alternative 1 – no action would result in a transportation system that would remain static; road improvements through proposed reconstruction and relocation would not be implemented. An older, dated system would remain in place, road maintenance costs would not be reduced and a minimum road system would not be established.

Action Alternatives: All of the action alternatives would start the trend toward a smaller more maintainable road system. Historic roads that no longer serve a purpose will have been returned to natural resource production. Proposed reconstruction and road maintenance in all alternatives would address deferred maintenance items which have been accruing over time thus easing future maintenance responsibilities.

VIII. Economics (Ref: Barnyard South Sheep Socio Economic Report)

The scope of this analysis is focused on costs and revenues (stumpage value) associated with the implementation of the Barnyard South Sheep project. The project specific area of analysis is located within Clearwater County; however, timber harvested under any “action” alternative could be processed anywhere within the region. For the purpose of this analysis, the affected environment for economic direct, indirect, and cumulative effect considerations includes Clearwater, Latah and Nez Perce counties. Communities that may be affected include Elk River, Potlatch, Deary, Bovill, Juliaetta, Orofino, Pierce, Weippe, Kamiah, Kooskia, Troy, Lewiston, Moscow and Clarkston (WA).

This analysis includes costs and revenues associated with all harvest and activities proposed. The breakdown of specific cost and revenues is included in the detailed analysis which is located in the project record.

A. Analysis Method

The Clearwater National Forest Plan FEIS, p. IV-30-32, describes the economic impacts of implementing the Forest Plan (USDA Forest Service, 1987). This analysis tiers to the Forest Plan EIS Appendix B, specifically pages B-30 through B-62, which address the economic analysis process and values placed on non-consumptive items such as recreation opportunities, community stability, cultural resources, habitats, and populations. This economic analysis will not revisit the information presented in the Forest Plan and will focus only on those costs and revenues associated with implementing the proposed activities in the Barnyard South Sheep project area.

The purpose of the project is to restore white pine and larch to improve stand vigor and species diversity across the landscape to create stand conditions that are resilient and allow for rapid recovery after disturbances. This economic analysis assesses the economic viability and provides a relative financial comparison of implementing each alternative.

Economic conditions are constantly changing locally, regionally, and nationally while market prices fluctuate widely. The appraised value, the issue indicator of a cost efficient timber sale and possible funding of proposed watershed improvements, was determined by utilizing the Residual Value (RV) appraisal method. The RV method predicts the stumpage value through the use of several independent variables developed by predicting the value of the timber, on the stump, and reducing that value based on the costs associated with logging, environmental protection, reforestation, etc. Production costs for logging and associated work are periodically updated within the system. Current local Delivered Log Prices are entered manually by the user. The combination of these variables is reflected in the predicted stumpage rate. It should be noted that stumpage values fluctuate with the market, which would affect the advertised value and bidding for this project at the time a sale is ultimately offered in the future.

Also calculated, by using the Quicksilver financial efficiency analysis, was the present net value (PNV) of each alternative. The PNV compresses the flow of costs and benefits over time into an equivalent, single time period. An alternative with a positive PNV has benefit values exceeding costs, whereas, an alternative with a negative PNV has costs in excess of benefit values. It should be noted that the PNV includes the costs of the NEPA analysis and timber sale preparation and administration, which are sunken costs not affected by the appraised value of the timber sale offering.

B. Direct and Indirect Effects

This economic analysis is based on static, average information in a dramatically fluctuating market and is provided to display the relative difference between alternatives. A variety of factors can change unexpectedly, increasing or decreasing the value of any alternative at any time. The analysis of all economic effects is limited to the analysis area.

The action alternatives have the potential to provide employment opportunities, some of which could possibly be available for members of the local communities. Although difficult to predict, local employment increases due to this project might include work in logging and fuel treatment projects, trucking activities, lumber mill workers, road maintenance and reconstruction, and possibly post-harvest service work.

The Barnyard South Sheep project, as with all timber harvest and restoration projects, is being considered all or in part as a Land Stewardship Project under the 2014 Farm Bill. Stewardship contracting is one of the tools that can be used to implement project activities but would allow flexibility in combining with traditional service and timber sale contract activities to more effectively accomplish ecosystem restoration through forest management. Mechanisms used in land stewardship approaches include: (1) bundling of a variety of management tasks within a single contract; (2) multiple-year contracts; (3) long-term cooperative agreements; and (4) contract performance based upon descriptive end-results. Flexibility in funding is also part of the process that can include partnerships or infusing appropriated or other funds into the contract in accomplishing the restoration work.

The use of stewardship contracting could add more jobs doing post-sale service work, both direct and indirect. However, stewardship projects would not contribute any revenue to the Treasury or to the 25% Fund for Clearwater County, as with traditional timber sale contracts.

The following table displays the costs and revenues generated by each alternative. Costs displayed for the timber harvest reflect stump-to-mill including harvest and associated activities. The unit of measure for activities related to forest timber product removal is CCF, which is defined as 100 cubic feet of solid wood. One cubic foot of solid wood is described as 1 foot wide, by one foot thick, by one foot long.

Table 4.44 – Advertised Value and non-sale related costs

Alternative	Volume (CCF)[12]	Stumpage Value[13]	Base Value[14]	Appraised Value[15]	Cost of non-timber sale activities[16]
Alt. 1 No Action	0	$0.00	$0.00	$0.00	$0.00
Alt. 2	29,868 (16,427 MBF)	$1,601,223	$842,277	$758,946	$1,350,000
Alt. 3	18,049 (9,927 MBF)	$982,046	$479,923	$502,123	$1,350,000
Alt 4	22,526 (12,389 MBF)	$1,060,073	$600,430	$459,643	$1,350,000

Alternative 1 – No Action: This alternative harvests no timber, generates no revenues, and incurs no expenses from timber sale preparation and administration. No jobs or income are generated.

Alternative 2: This alternative has a stumpage value of $1,601,223. After subtracting the base value that includes the costs of reforestation, the resulting appraised value equals $758,946. This represents

[12] Volume represents total Sawtimber volume expected to be harvested.
[13] Stumpage Value = appraised stumpage rate x volume (CCF); Stumpage rate = value of timber – (stump to mill costs + Environmental Protection costs).
[14] Base Value = Bate Rate x Volume (CCF); Base Rate represents the cost per CCF to cover Knutson – Vandenburg costs (reforestation).
[15] The appraised value represents the Stumpage Value - Base Value.
[16] Non-timber sale activities include road decommissioning, road storage, and replacement of undersized culverts for all action alternatives.

a **positive** sale offering. The financial viability of Alternative 2 suggests that value exists to entertain the opportunity to implement with an Integrated Resource Stewardship Contract and complete a portion of the non-sale related activities. Current guidance is to utilize up to 75% of the value above base rates for including mandatory service work items. The value above base rates for Alternative 2 is approximately $758,946, which would equate to approximately $569,210 available for mandatory service work.

Alternative 3: This alternative has a stumpage value of 982,046. After subtracting the base value, the resulting appraised value equals $502,123. This represents a **positive** sale offering. The financial viability of Alternative 3 suggests that value exists to entertain the opportunity to implement with an Integrated Resource Stewardship Contract and complete a portion of the non-sale related activities. Current guidance is to utilize up to 75% of the value above base rates for including mandatory service work items. The value above base rates for Alternative 3 is approximately $502,123, which would equate to approximately $376,592 available for mandatory service work.

Alternative 4: This alternative has a stumpage value of $1,060,073. After subtracting the base value, the resulting appraised value equals $459,643. This represents a **positive** sale offering. The financial viability of Alternative 4 suggests that value exists to entertain the opportunity to implement with an Integrated Resource Stewardship Contract and complete a portion of the non-sale related activities. Current guidance is to utilize up to 75% of the value above base rates for including mandatory service work items. The value above base rates for Alternative 4 is approximately $459,643, which would equate to approximately $344,732 available for mandatory service work.

Alternative 4 has the smallest above base value, but does treat 207 more acres than Alternative 3. Alternative 4 also accomplishes more watershed restoration directly associated with a timber sale, including 1.9 miles of system road storage, 4.1 miles of non-system road storage, and 0.6 miles of system road decommissioning, valued at approximately $57,000. This is not represented in the above base value of Alternative 3, and could only be accomplished as a mandatory service work item.

The financial assessment, as analyzed and displayed above, indicates that the alternatives represent positive sales (sales where revenue exceeds expenditures). However, a variety of factors can change unexpectedly, increasing or decreasing the value of any alternative at any time. All cost variables used in this assessment are estimates that reflect current market values and current cost estimates that are reasonable at this time.

PNV Analysis: The Quicksilver financial efficiency analysis was used to calculate the PNV of each alternative. The benefit value included the anticipated predicted high bid that represents the appraised value inflated with the Forest overbid. The PNV for each alternative is displayed in the following table:

Table 4.45 – Present Net Value

Alternative	Sawtimber Volume (CCF)	Benefit Value	Total Costs	PNV
Alt. 1 No Action	0	$0.00	$368,607[17]	($368,607)
Alt. 2	29,868	$2,161,735	$1,234,779	$926,956
Alt. 3	18,049	$1,328,767	$892,028	$436,739
Alt. 4	22,526	$1,492,798	$1,021,861	$470,937

As can be seen in the above table, each alternative has a positive PNV, in which benefit value of the project exceed cost values. Also, all three action alternatives surpass the sunken costs of the NEPA analysis, timber sale preparation, and administration.

C. Cumulative Effects

Geographic Boundary: Clearwater, Latah, and Nez Perce Counties.

Time Frame: 10 years after project implementation - the expected life of the project.

Past, Present, and Foreseeable Future Actions: All past timber harvest and related activities occurring within the analysis area contributed to the existing conditions. Forest products have historically been removed from the project area through timber sales/harvest. None of the present actions listed in Appendix A would directly or cumulatively affect the economics for this project.

Alternative 1: There are no cumulative effects related to the No Action alternative, since cumulative effects can only arise from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions. Since this alternative does not propose any timber harvest or other activities, it would not contribute cumulatively to the local community jobs and income.

Alternative 2: According to the Forest 5-year timber sale plan, Barnyard SS is planned for implementation in FY-2016-17. Compared to Alternatives 3 and 4, this alternative would have the most beneficial economic effects on the local communities by creating jobs and income, which could

[17] This represents the cost of the NEPA analysis, which is also included under Alternatives 2, 3, and 4.

put unemployed woods workers back to work or draw out of town workers to the communities. In the context of the Forests' 5-year Timber Sale Plan, this alternative would provide an estimated 8.2 MMBF[18]/FY or represent 14% of the timber sale program for FYs-2016-2017.

Alternative 3: This alternative would have the least amount of beneficial economic effects on the local communities compared to that of Alternatives 2 or 4. In the context of the Forests' 5-year timber sale plan, this alternative would provide an estimated 9.9 MMBF or represent 15% of the timber sale program for FY-2016.

Alternative 4: This alternative would have beneficial economic effects on the local communities to a lesser degree than that of Alternative 2 and roughly the same benefits as Alternative 3. In the context of the Forests' 5-year timber sale plan, this alternative would provide an estimated 12.4 MMBF or represent 21% of the timber sale program for FY-2016.

Adverse Effects Which Cannot Be Avoided: None known or suspected.

D. Regulatory Framework and Management Direction

Executive Order 12898 requires an analysis of the impacts of the proposed action and alternatives on minority and low-income populations. The order is designed in part "…to identify, prevent, and/or mitigate, to the greatest extent practicable, disproportionately high and adverse human health or environmental effects of United States Department of Agriculture programs and activities on minority and low income populations…".

None of the action alternatives are expected to negatively affect the consumers, civil rights, minority groups, American Indians, women, or any United States citizen. Subsistence activities would not have a disproportionate impact on minorities or low-income individuals. No environmental health hazards are expected to result from implementation of any alternative. This project should not disproportionately affect income level.

Consistency with the Forest Plan and Environmental Law: The Forest Plan direction is presented in Chapter 1. There are no requirements in the Forest Plan for socio-economics. It is clear that there is a balancing act required to provide goods and services while protecting important values that flow from the conservation of Clearwater National Forest lands. All alternatives are expected to be consistent with the Forest Plan (see Table 4.46).

The following Forest-wide direction for natural resource products from among those listed within the Clearwater National Forest Plan applies to this project and would be met as follows:

Table 4.46 – Forest Plan Compliance

Goal #	Subject Summary	Compliance Achieved By
9a.	Provide a sustained yield of timber and other outputs at a level that is cost-efficient and that will help support the economic structure of local communities and will provide regional and national needs.	The Barnyard South Sheep project would provide forest material outputs and potential service or stewardship contract work.

[18] This number represents anticipated harvest volume for each sale, for a total of 2 projected sales. The volume indicates total volume (Sawtimber + Non-Sawtimber) projected to be harvested.

Goal #	Subject Summary	Compliance Achieved By
9b.	Select on the ground those silvicultural systems that will be the most beneficial to long-term timber production, but modified as necessary to meet other resource and management area direction.	Silvicultural prescriptions identified for the proposed treatment units are designed restore white pine and larch to improve stand vigor and species diversity across the landscape to create stand conditions that are resilient and allow for rapid recovery after disturbances.
Objective Number	**Subject Summary**	**Compliance Achieved By**
8	…The annual program of sale offerings may range from 120 million board feet to 200 million board feet during this period.	The Barnyard South Sheep project would contribute approximately 9.9 – 16.4 MMBF (alt 2 - 4 respectively) toward sale offerings as early as 2016-2017.
8b	Maintain a mix of sale offerings including various logging systems needed to implement the Forest Plan and support local and regional logging system capabilities.	Ground based (tractor or cut-to-length) and skyline/cable logging is currently economically efficient and Barnyard SS includes a mix of both of these logging systems.
Standard Number	**Subject Summary**	**Compliance Achieved By**
7a.	Require silvicultural examination and prescriptions before any vegetative manipulation takes place….	Silvicultural prescriptions would be completed before any sales are offered for sale.
7b.	Design timber sales to consider cost-effectiveness while maintaining the long-term sustained yield and protecting the soil and water resources.	The Barnyard South Sheep project has been designed to balance economical timber harvest with protection and/or enhancement of other resource values.
7g.	Perpetuate western white pine as a commercial tree species.	Silvicultural prescriptions identified for the proposed treatment units are designed to restore white pine and larch to improve stand vigor and species diversity across the landscape to create stand conditions that are resilient and allow for rapid recovery after disturbances.
Standard Number	**Subject Summary**	**Compliance Achieved By**
7h.	Plan for adequate restocking on all lands managed for timber within five years after final removal.	All stands identified for regeneration harvest would be planted with base rate collections from the timber sale or through mandatory service work with stewardship contracting.

Management Area Direction	Subject Summary	Compliance Achieved By
E1 Goals	Provide optimum, sustained production of wood products. Timber production is to be cost effective and provide adequate protection of soil and water quality. Manage viable elk populations within areas of historic elk use based on physiological and ecological needs. Manage a range of water quality and fish habitat potential….	The Barnyard South Sheep project would contribute approximately 9.9 – 16.4 MMBF (alt 2 - 4 respectively) toward future sale offerings. The project has been designed to balance economical timber harvest with protection and/or enhancement of other resource values.
E1 Standard a.	Schedule timber harvest using logging and silvicultural methods appropriate for the stand and the terrain.	The logging system analysis matched the logging system to the terrain. The Silviculturist has preliminary stand diagnoses that prescribe the appropriate treatment relative to the desired future condition, as represented in the purpose and need for this project.
E1 Standard b.	Maintain stocking control commensurate with the level of management intensity.	Reforestation needs identified in the SAI plan would match the diagnosis and ultimately the silvicultural prescription.
E1 Standard c.	Identify and maintain suitable old-growth stands and replacement habitats for snag and old-growth dependent species in accordance with criteria in Appendix H.	Old growth, replacement and step-down old growth have been identified, and there would be no effects from proposed activities to any of these old growth components.

IX. Other Required Disclosures

Effects of Alternatives on Social Groups - The alternatives do not differ in terms of effects on consumers, minority groups, Native American Indians, women, or civil rights of any American Citizen.

Effects of Alternatives on Prime Range Land, Farm Land, and Forest Land – All action alternatives are in compliance with the Federal Regulations for prime land. The definition of "prime" forest land does not apply to lands within the National Forest System. The project area does not contain any prime range land or farm land. Under any action alternative, Federal lands would be managed with appropriate sensitivity to the effects on adjacent lands.

Effects of Alternatives on Floodplains and Wetlands – None of the action alternatives would negatively change the functions or values of floodplains and wetlands as they relate to protection of human health, safety, and welfare; preventing the loss of property values, and; maintaining natural systems. Direct and indirect effects would occur on wetland areas and within project area during implementation of proposed activities. However, these effects, both undesirable and beneficial, are expected to be insignificant. This project meets the requirements of Executive Orders 11988 and 11990, which apply to protection of wetlands and floodplains. These features are protected through implementation of mitigation and design measures, as described in Chapter 2.

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APPENDIX A

Past, Present, Foreseeable Future Activities

Past Actions:

Activity	Project name	Year	Acres/Miles	Impacts
FS Timber Harvest	Unnamed	1950s	164 clearcut, 826 shelterwood, 36 salvage, 183 natural changes – excluding fire.	Removal of timber, development of skid trails, slash disposal, burn piles, planting new trees, dozer piles
	Unnamed, Lower Washington Salvage	1960s	1,521 clearcut, 12 seedtree, 18 shelterwood, 36 selection cut, 374 liberation cut, 307 salvage, 17 natural changes.	Removal of timber, development of skid trails, slash disposal, burn piles, planting new trees, dozer piles
	Unnamed, Tumble Cedar, Shin Point	1970s	461 clearcut, 288 shelterwood, 557 seedtree, 144 selection cut, 436 liberation cut,558 sanitation.	Removal of timber, development of skid trails, slash disposal, burn piles, planting new trees, dozer piles
	Deadmule, E. Tumble Cedar, Lower Washington, Shin Point, Two Forks, Upper Deadmule, Wash Tub, Cowbell,Sheep Mtn. Quarry, Swanson Saddle, Work Center	1980s	96 clearcut,308 seedtree, 158 shelterwood, 85 selection cut, 13 improvement cut, 19 liberation cut, 54 commercial thin, 176 sanitation, 5 man-caused fire.	Removal of timber, development of skid trails, slash disposal, burn piles, planting new trees, Change to excavator or grapple piling for site preparation
	Trapper Cabin, Cabin Cleanup, Lower Washington, Barnyard,S. Sheep Salvagem Swanson Pulp	1990s	59 clearcut, 101 shelterwood, 11 seedtree, 36 selection cut, 22 improvement cut, 18 liberation cut, 124 sanitation, 3 salvage, 3 man-caused fire.	Removal of timber, development of skid trails, site preparation by excavator or grapple piling, slash disposal, burn piles, and planting new trees

Activity	Project name	Year	Acres/Miles	Impacts
FS Timber Harvest	Deadhorse Salvage, Little Washington Thinning	2000s	27 seedtree, 51 commercial thin	Removal of timber, constructed skid trails, site preparation by excavator or grapple piling, slash disposal, burn piles, and planting
Trails	Sheep Mtn. OHV Trail System	2007 - 2013	56 miles	Narrow strip of vegetation removal, intact canopy, soil compaction, drainage structures
Recreation	Camp 60 development	2008	10 acres	Installation of vault toilet to enhance resource protection
Roads			Approximately 165 miles of system roads; and 53 miles of non-system roads (mapped) and 55 miles of non-system roads (unmapped)	Vegetation removal, soil compaction, some areas of stream channelization
Noxious weed treatment		Ribes eradication 2-4-5-T from 1930s; late 1940s aerial spraying and DDT		
Noxious weed treatment	Annual chemical spraying	2001 to present	Approx. 4 application acres in analysis area each year.	Spot and roadside application of chemicals; required buffer from live water dependent on chemical used.
Watershed Improvements		1990s	6.6 miles of system roads and 3.0 miles of non-system roads decommissioned; 1.0 mile of system road converted to trail; and 1.4 miles of system road storage.	

Present Actions:

Activity	Acres	Impacts
Road/trail maintenance	56 miles	Drainage clearing for proper water channeling, removal of dead/down trees, removal of brush encroaching on trail tread.
Noxious weed treatment	Project area	Removal of noxious weeds, small chance of chemical introduction.

Foreseeable Future Activities:

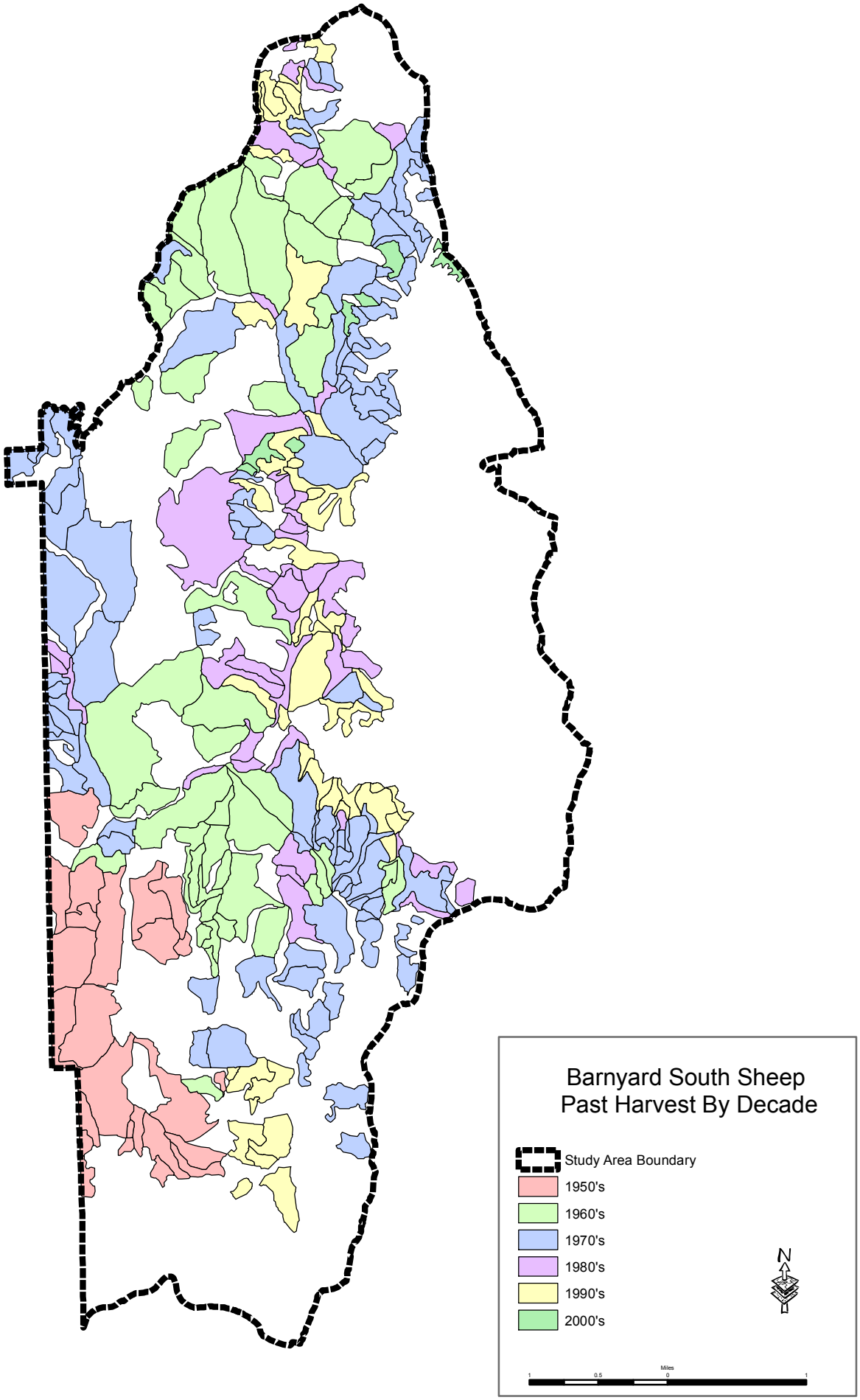
Activity	Location	Impacts
Noxious weed treatment	Project area	Removal of noxious weeds, small chance of chemical introduction.
Closure of user created ATV routes	Project area	Possible removal of drainage structures, soil decompaction, and increased wildlife security.
Lower Orogrande Project (see attached map)	South of the project area, however, unlikely to intersect area boundaries used by this project to analyze cumulative effects.	Watershed improvements, timber harvest, and road closures for wildlife security.

Foreseeable Future Activities on Other Ownerships within the Washington and Beaver Subwatersheds (54,243 of total 69,943 acres):

Landowner	Location	Activity
Potlatch Corporation	Road #246	Replace 2 undersized culverts

Landowner	Stand Successional Stages as of year 2013	Foreseeable Stand Successional Stages in year 2026
Private, owned entirely by the Potlatch Corporation (48,214 acres); and Idaho Dept. of Lands (6,029 acres)	31% - Stands < 24 yrs of age 16% - Stands 24-39 yrs of age 53% - Stands ≥ to 40 yrs of age	33% - Stands < 24 yrs of age 16% - Stands 24-39 yrs of age 51% - Stands ≥ to 40 yrs of age

Summary: The above table shows the natural flow of succession on the private land, owned by Potlatch Corporation (assumes future harvest of ≥40 year old stands at a rate similar to 2004-2013 period). The same is true for the State lands, except for the harvest of 1,407 acres of older harvest units and residual trees in previously partially-harvested units. The land harvested reverts back to young stands < 24 yrs of age.


Barnyard South Sheep
Past Harvest By Decade
Study Area Boundary
1950's
1960's
1970's
1980's
1990's
2000's
N
Miles
1
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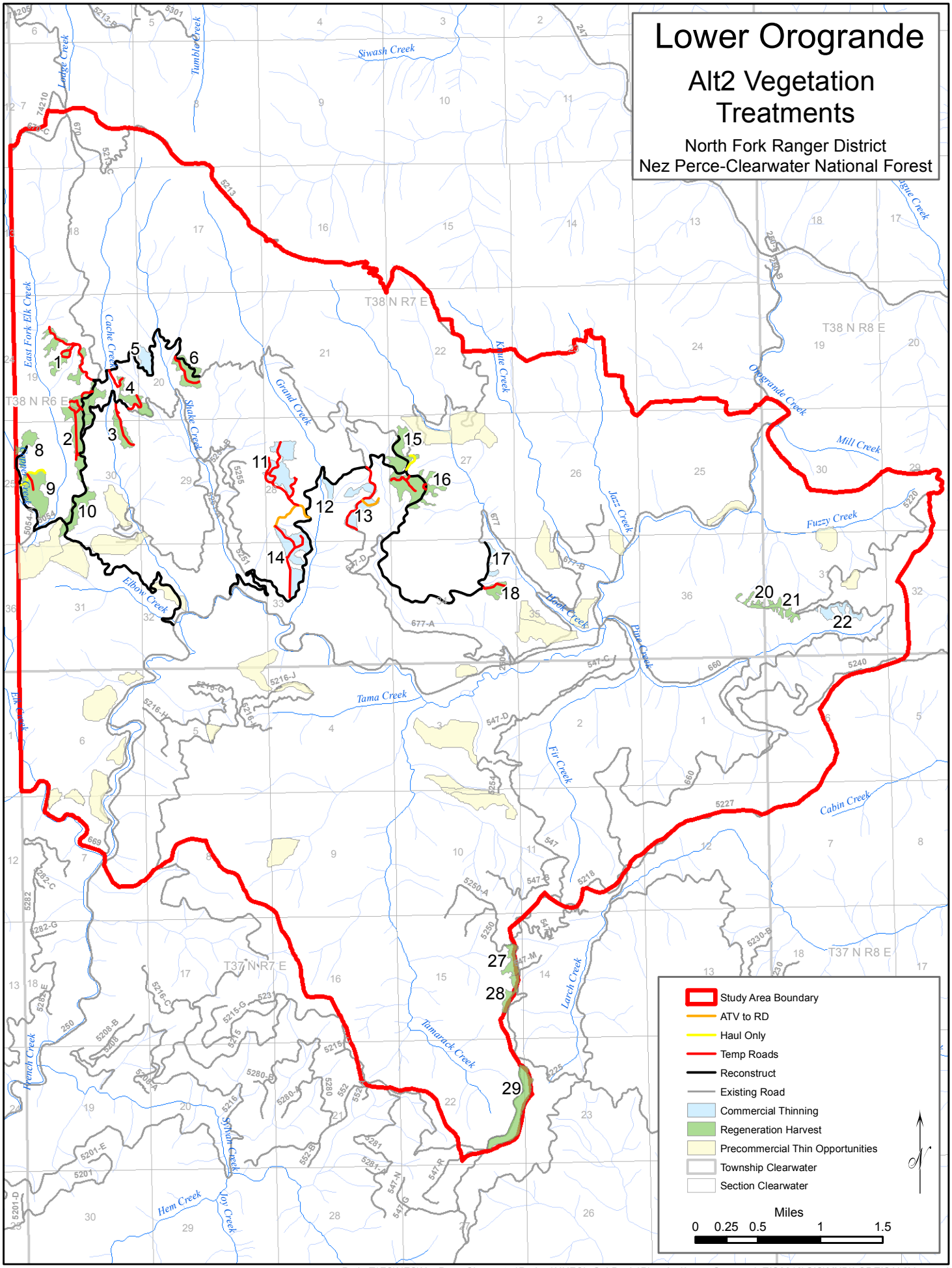
1



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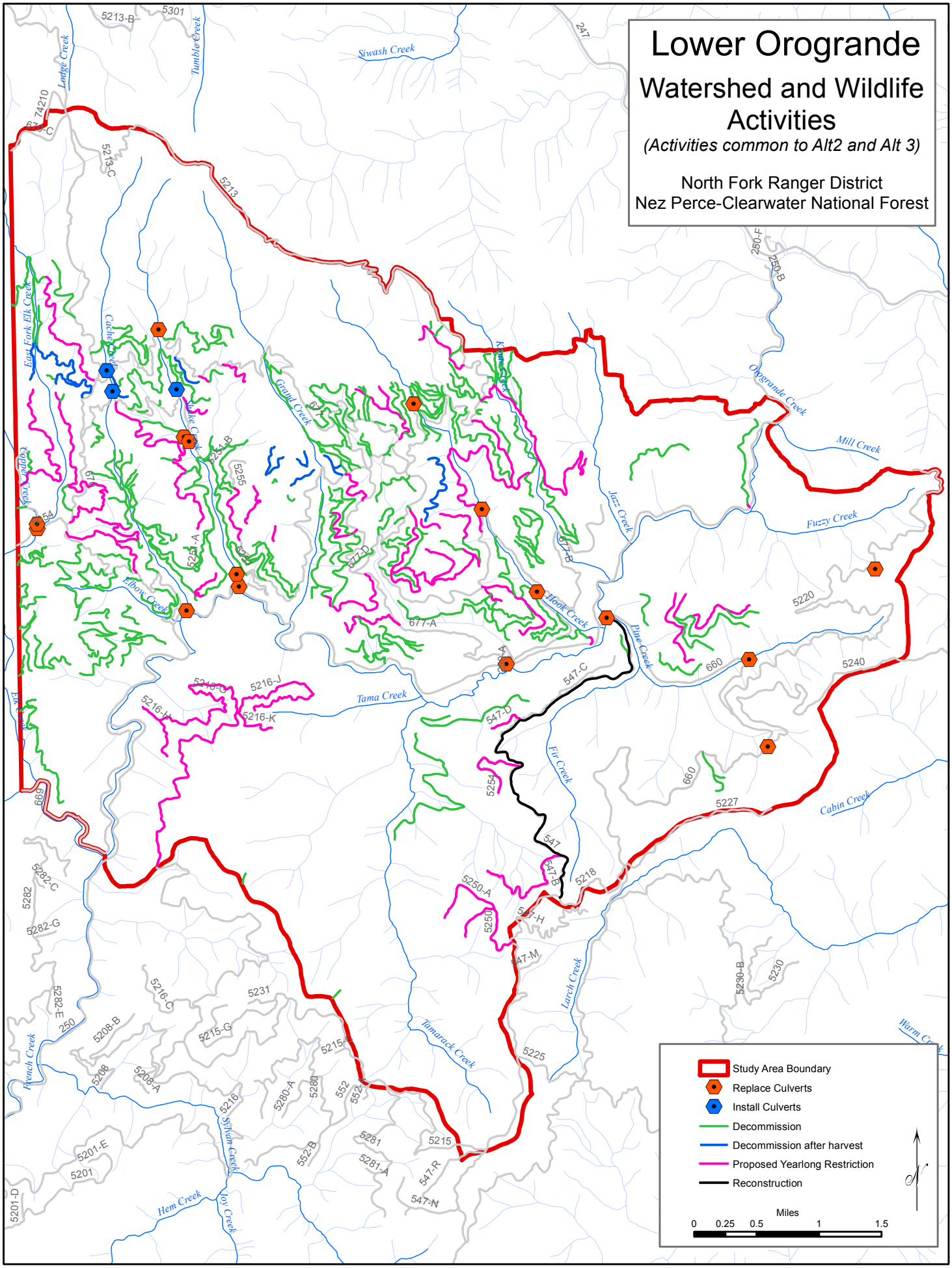

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Appendix B

Watershed Improvements

Because of the large mileage of roads proposed for storage and decommissioning for the Barnyard South Sheep project, implementation would likely be phased through multiple projects/contract mechanisms. It is recommended that decommissioning and storage be implemented on a watershed area basis (i.e. all roads addressed within the same drainage area at the same time, or within in logical areas of adjacent drainages at the same time). If only portions of drainages are addressed at one time, it would be best for work to proceed from an up-drainage to a down-drainage manner. Prioritization could be given on the basis of road densities (Table 4 of this report), and also to Tumble Creek, which was 303(d) listed for sediment prior to TMDL analysis. When the Idaho DEQ delisted Tumble Creek for sediment, the recommendation was made "[i]n the interest of water quality, the CNF should address [sediment … from logging roads]" (IDEQ 2003, p. 84).

1. Road Decommissioning

The following roads in the Barnyard South Sheep project area will be decommissioned and were included in the Barnyard South Sheep Roads Analysis process. Decommissioning may range from complete recontouring to abandonment, and involves removal of culverts and fill material in draws, and other actions as necessary to address slope stability and access needs. Before decommissioning the roadbeds would be treated for noxious weeds. Accomplishment may be through Stewardship contracts, allocated dollars, KV Other, or grants. See *Figure 2*, for a map of watershed improvements.

Table D-1. Roads to be decommissioned in Barnyard South Sheep.

Road Number	Miles	Road Number	Miles
246-B	0.1	831011	0.3
246-C	0.7	831013	0.2
246-H	1.0	831015	0.6
5213	1.2	831016	1.5
5301-A	2.0	831017	0.1
5317-A	0.6	831018	0.3
5317-B	0.6	831019	0.2
5317-D	1.9	831020	0.2
5323-A	0.7	831021	0.0
5379	0.5	831022	0.5
5380	0.9	831023	0.7
6004-A	0.5	831025	0.2
6004-B	0.5	831026	0.1
6004-C	0.7	831028	0.1
6004-D	0.8	831029	0.2
6004-E	0.3	831031	0.3
6014-B	0.4	831032	0.4
6014-C	0.2	831034	0.4
6014-D	0.6	831035	0.1
6020	0.3	831036	0.3
6069	2.7	831037	0.1
6071	0.8	831041	0.6

Road Number	Miles	Road Number	Miles
6072-A	0.1	831042	0.2
6073-B	0.1	831043	0.6
681-A	0.6	831044	0.4
683-A	0.7	831045	1.6
724-C	0.7	831047	0.1
726-A	0.4	831048	0.8
74168	1.0	831050	1.0
74169	1.0	831056	0.2
74176	0.5	831061	0.3
74187	0.4	831063	0.4
74192	1.0	831065	0.5
74194	1.0	831066	0.1
74201	0.1	831067	0.1
74205	1.9	831070	0.1
74206	0.4	831071	0.2
74222	0.6	831072	0.5
74223	0.3	831073	0.8
74224	0.3	831074	0.7
74226	0.1	831082	0.4
74227	0.4	831085	0.2
74232	0.3	831086	0.2
74238	0.5	831087	0.9
74243	0.4	831088	0.5
74244	0.4	831089	0.3
74248	0.7	831092	0.4
74249	0.4	831093	0.3
74271	0.3	831094	0.1
74279	1.8	831095	0.4
74289	0.4	831099	0.4
74291	0.8	831100	0.8
74295	0.9	831102	0.3
74312	0.9	831103	0.4
74315	0.2	831105	0.2
74329	0.1	831106	1.2
74330	0.6	831107	0.2
74334	0.6	831108	0.1
74337	0.3	831109	1.3
74351	0.1	831110	0.7
74352	1.5	831111	0.4
74357	0.3	831112	0.4
74360	0.9	831113	1.2
74374	0.7	831154	0.1
74388	1.2	834176	0.3
831003	0.5	NonSys_NoID*	0.1
831004	0.4	74192*	0.4
831005	0.5	74193*	0.4
831006	0.2	831152*	0.1
831007	0.1	831153*	0.2
831008	0.2		
831009	0.4		
831010	0.5		

*Decommission after use in timber sale.

2. *Roads to be placed in Storage.*

These are roads that are needed for the long-term transportation plan, but have several more years until they are utilized. Generally, culverts would be removed; road prisms left in place but would include likely would include decompaction or slight outsloping. Closure at the beginning of the road would occur to prohibit motorized use. Before treatment these roads would have noxious weed inventory and treatment. Accomplishment may be through Stewardship contracts, KV Other, allocated dollars or grants. These roads were included in the Roads Analysis.

Table D-2. Roads to be placed in storage in Barnyard South Sheep.

Road Number	Miles	Road Number	Miles
246-J	0.5	831078	0.1
5311	0.1	831079	0.3
5317-A	0.1	831080	0.2
5317-C	1.2	831081	0.6
5379	0.2	831084	0.4
6004-A	0.2	831090	0.3
6004-B	0.7	831091	0.6
6014-A	0.3	831096	0.4
6014-B	0.8	831097	0.3
6044	2.6	831098	1.0
6071	2.0	831101*	0.6
6071-A	0.1	831104*	0.5
6072	0.3	831114	0.2
6073-A	0.3	831115	0.1
683-A	1.1	831116	0.2
724-B	2.2	831117	0.2
724-D	0.1	831118	0.8
726	2.1	831119	0.3
74176	0.5	831120	0.3
74192	0.2	831121	0.2
74195	1.9	831122	0.3
74205	0.3	831123	0.3
74224	0.2	831124	0.0
74226	0.2	831125	0.5
74239	0.3	831126	0.1
74242	0.2	831127	0.3
74247	1.4	831128	0.4
74248	0.5	831129	0.5
74250	0.2	831131	0.6
74295	0.9	831132	0.2
74312	2.2	831133	0.4
74315	1.9	831134	0.0
74329	1.0	831135	0.1
74376	0.5	831136	0.1
74388	0.3	831137	0.0
831002	0.2	831138	0.0
831038	0.1	831139	0.9
831064	0.3	831140*	0.8
831075	0.1	831141*	0.5
74187	1.0	831142*	0.2
831000*	0.8	831143*	0.2
831001	0.4	831144	0.1

831014	0.1	831145*	0.6
831027	0.4	831146*	0.5
831030	0.1	831147*	0.2
831039	0.0	831148*	0.3
831049	0.5	831149	0.4
831055*	0.2	831150	0.2
831060*	0.2	831151	0.1
831076	0.2		

*Priority for treatment due to known or potential for stream interaction.

3. *Proposed Road and Stream Crossing Improvements.*

The following table is a result of project road surveys focused primarily on stream crossings along major roads within the project area. Culvert improvements could be accomplished through Stewardship contracts, allocated dollars, KV Other, or grants.

More detailed information, such as photographs, field survey forms, and additional site descriptions are available in the Watershed project file and have been shared with project Engineering staff. These data would be used to develop road maintenance, reconditioning, and reconstruction needs on roads used for timber haul.

Table D-3. Road-Stream crossing recommendations for Barnyard South Sheep.

Site_ID (GIS ID)	Road	Drainage	Pipe Width (ft)	Stream Width (ft)	Recommendation	Priority	Replacement Rank	Removal Rank*
246-2	670	Lodge	5.7	8	Replace with 10ft AOP structure (minimum width)	High	1	
5301-26	5301	Tumble	4	12	Replace with 14ft AOP structure (minimum width) and bioengineer streambank work on outlet end	High	2	
246-31	246	Deadhorse	3	10	Replace with 12ft AOP structure (minimum width)	High	3	
246-10	246	Deadmule-Burro	2.5	6.5	Replace with 8.5ft AOP structure (minimum width and confirm with fisheries biologist for fish presence), correct road drainage/fillslope failure, armoring above outlet likely needed here	High	4	
246-35	246	Swanson	2	7	Replace with 84" culvert set to grade (~20%), AOP structure may be needed here (confirm with fisheries biologist)	High	5	
246-36	246	Swanson	3	7	Replace with 84" culvert set to grade, AOP structure may be needed here (confirm with fisheries biologist)	High	6	1
246-32	246	Deadhorse	2	5	Replace with 7ft AOP structure (minimum width)	High	7	
722-1	722	Tumble	7.6	12	Replace with 14ft AOP structure (minimum width) or trail bridge (ATV trail)	High	8	
680-9	680	Deadhorse	1.5	4	Add 24" culvert just up road from stream to carry water from seep area, replace existing crossing with 48" culvert, disconnect ditch from stream	High	9	
246-1	246	Tepee	5.8	9.5	Replace with 12ft AOP structure (minimum width)	High	10	
246-3	246	Lower Washington	1.5	3	Replace stream crossing with 36" culvert and add 24" culvert to SW to drain perennial seep,	High	11	

Site_ID (GIS ID)	Road	Drainage	Pipe Width (ft)	Stream Width (ft)	Recommendation	Priority	Replacement Rank	Removal Rank*
					disconnect ditch from waterways and correct road drainage/fillslope failure			
5301-17	5301	Tumble	1.5	2.25	Add 24" culvert at stream crossing (~10ft from existing culvert) and rock below culvert outlet to dissipate energy, disconnect ditch from stream crossing, replace 18" ditch relief culvert	High	12	
680-6	680	Deadhorse	1	2	Replace with 24" culvert set to grade, disconnect ditch from crossing, improve road drainage	High	13	
680-15	680	Deadhorse	1	2	Install 24" culvert at stream and disconnect ditch from crossing	High	14	
5301-29	5301	Tumble	1.5	3	Replace with 36" culvert set to grade (~20%), fillslope above culvert outlet will likely need armoring, correct road drainage	High	15	
5301-12	5301	Tumble	1	2	Replace with 30" culvert set to appropriate grade (~7%), aligned with drainage and disconnect ditch from crossing	High	16	
246-6	246	Lower Washington	2	3.5	Remove redundant crossing. If keeping this crossing, need to upgrade to 42" culvert.	High	17	2
246-5	246	Lower Washington	1.5	2.5	Replace stream crossing with 36" culvert and add 24" culvert, disconnect ditch from waterways and correct road drainage/fillslope failure	High	18	
680-8	680	Deadhorse	1.5	2.5	Replace with 36" culvert set to grade, disconnect ditch from crossing, improve road drainage including armoring fillslope over culvert, remove old culvert materials in vicinity	High	19	
680-7	680	Deadhorse	1	1.5	Replace with 24" culvert set to grade (~35%), disconnect ditch from crossing, improve road drainage including armoring fillslope over culvert	High	20	
5301-20	5301	Tumble	1.5	2	Add 30" culvert set to grade (~55%) at stream crossing and disconnect ditch, replace ditch relief culvert if maintaining inslope ditch and improve road drainage	High	21	
5301-13	5301	Tumble	1.5	2	Replace with 30" culvert set to appropriate grade (~35%) and disconnect ditch from crossing, additional 18" culvert needed to drain wet ditch/roadbed	High	22	
5301-22	5301	Tumble	1.5	2	Add 30" culvert set to grade (~25%) at stream crossing and disconnect ditch, replace ditch relief culvert if maintaining inslope ditch and improve	High	23	

Site_ID (GIS ID)	Road	Drainage	Pipe Width (ft)	Stream Width (ft)	Recommendation	Priority	Replacement Rank	Removal Rank*
					road drainage including hardening on fillslope drainage outlets			
5301-19	5301	Tumble	1.5	2	Add 24" culvert set to grade and aligned with stream to carry perennial flow, disconnect ditch from stream crossing, clean inlet and rock outlet of existing cross drain culvert, consider replacing cross drain pipe	High	24	
680-16	680	Deadhorse	1.5	2	Install 24" culvert at stream and disconnect ditch from crossing, improve road drainage including armoring fillslope over culvert	High	25	
680-10	680	Deadhorse		1.5	Install 24" culvert at stream and disconnect ditch from crossing	High	26	
680-11	680	Deadhorse		1	Install 24" culvert at stream and disconnect ditch from crossing	High	27	
680-12	680	Deadhorse		1	Install 24" culvert at stream and disconnect ditch from crossing	High	28	
680-13	680	Deadhorse	1.5		Replace ditch relief culvert if maintaining inslope ditch and improve road drainage including hardening on fillslope drainage outlets	High	29	
5301-9	5301	Tumble	1		3 culverts are needed in this area, two 18" for ditch relief on either side of stream and one 24" for the stream which starts at the road cut, outlet ditch relief pipes on forest floor so as not to connect to stream	High	30	
5301-30	5301	Tumble	1.5	1.5	Replace with 24" culvert set to grade (~18%), fillslope above culvert outlet will likely need armoring	High	31	
5301-21-Stream	5301	Tumble		2	Add 24" culvert set to grade (~55%) to carry perennial flow and disconnect ditch from stream crossing	High	32	
5301-14	5301	Tumble	1.5	1.5	Add 24" culvert at stream crossing (~20ft up road from existing culvert), additional 18" culvert needed to drain wet ditch before new culvert, trim branches at existing culvert outlet and rock below existing culvert to dissipate energy	High	33	
5301-31	5301	Tumble	1.5	1.5	Replace with 24" culvert set to grade (~50%), fillslope above culvert outlet will likely need armoring, disconnect ditch from crossing, correct road drainage	High	34	

Site_ID (GIS ID)	Road	Drainage	Pipe Width (ft)	Stream Width (ft)	Recommendation	Priority	Replacement Rank	Removal Rank*
680-17	680	Sheep Mountain	1.5	1	Install 24" culvert at stream and disconnect ditch from crossing, improve road drainage	High	35	
246-18	246	Deadmule-Burro	1.5	5.5	Replace with 66" culvert set to grade (~3%)	High-Moderate	36	
246-19	246	Deadmule-Burro	1.5	4.5	Replace with 54" culvert set to grade (~3%)	High-Moderate	37	
680-2	680	Sheep Mountain	1.5	4.5	Replace with 54" culvert set to grade (~25%) and rip rap outlet, disconnect ditch, remove old corduroy crossing just upstream of culvert	High-Moderate	38	
680-3	680	Sheep Mountain	3	8	Replace with 96" culvert set to grade (~20%), remove old culvert just upstream of existing crossing	High-Moderate	39	
246-16	246	Deadmule-Burro	1.5	3	Replace with 36" culvert set to grade (~6%)	High-Moderate	40	
246-28	246	Deadhorse	3.5	6.5	Replace with 78" culvert set to grade (~5%), AOP structure may be needed here (confirm with fisheries biologist)	High-Moderate	41	
680-4	680	Sheep Mountain	3	5.5	Replace with 66" culvert set to grade (~8%), disconnect ditch from crossing, improve road drainage	High-Moderate	42	
246-25	246	Deadhorse	2	3	Replace with 36" culvert set to grade (~17%) and disconnect ditch from crossing	High-Moderate	43	
246-9	246	Deadmule-Burro	1.5	2	Replace stream crossing with 30" culvert	High-Moderate	44	
246-30	246	Deadhorse	1.5	2	Replace with 24" culvert aligned with stream and set to grade	High-Moderate	45	
246-7	246	Lower Washington	3	3.5	See comments for 286-6. This appears to be the main 246 crossing. Culvert should be upgraded to 42" and short term maintenance would be to clear inlet entry with handtools	High-Moderate	46	
5301-28	5301	Tumble	1.5		Replace with new culvert if maintaining inslope ditch, outlet and fillslope will need armoring, implement BMPs for working adjacent to Tumble Creek	High-Moderate	47	
5301-23	5301	Tumble	1.5		Replace with 24" culvert set at a steeper grade with rock at outlet, correct road drainage	High-Moderate	48	
5301-21	5301	Tumble	1.5		Clean inlet and rock outlet of existing cross drain culvert, consider replacing cross drain pipe (see	High-Moderate	49	

Site_ID (GIS ID)	Road	Drainage	Pipe Width (ft)	Stream Width (ft)	Recommendation	Priority	Replacement Rank	Removal Rank*
					also 5301-21-stream comments)			
5301-24	5301	Tumble	1.5	1	Replace with 24" culvert set to grade (~65%) to carry perennial flow, correct road drainage	High-Moderate	50	
5301-27	5301	Tumble	1.5		Replace with new culvert if maintaining inslope ditch, outlet will need armoring	High-Moderate	51	
5301-16	5301	Tumble	1.5		Rock culvert outlet to dissipate energy, increase drainage frequency along road and consider outsloping where possible (avoid concentrating flow in ditch for long stretches of road by increasing cross drains and/or alternating with drivable dips, armoring of drainage outlets is advised)	High-Moderate (road drainage/ maintenance)	52	
5301-18	5301	Tumble			Add 24" culvert to carry intermittent flow in wet swale, disconnect ditch from new crossing, improve road drainage	High-Moderate	53	
246-8	246	Lower Washington	1.5	1.5	Replace stream crossing with 24" culvert and redirect adjacent ditch relief through road bed to outlet on fillslope (likely needs armoring on outlet)	High-Moderate	54	
246-29	246	Deadhorse	1.5	1	Replace with 24" culvert set to grade and stabilize headcutting	High-Moderate	55	
680-5	680	Sheep Mountain	1.5	1	Replace with 24" culvert set to grade, rip rap outlet, disconnect ditch from crossing	High-Moderate	56	
680-18	680	Sheep Mountain	2	1.5	Install 24" culvert at stream and armor outlet, disconnect ditch from crossing, improve road drainage	High-Moderate	57	
246-38	246	Swanson	1.5	3	Install 36" culvert and disconnect ditch from crossing	Moderate	58	
246-37	246	Swanson	1	1.5	Install 24" culvert aligned with stream and disconnect ditch from crossing, correct road drainage/fillslope failure	Moderate	59	
246-24	246	Deadhorse	1.5	2	Replace with 24" culvert set to grade (~15%)	Moderate	60	
680-1	680	Sheep Mountain	1.5	2	Disconnect ditch from crossing, upgrade to 24' culvert and rip rap outlet	Moderate	61	
246-40	246	Swanson	1.5	1.5	Install 24" culvert and disconnect ditch from crossing	Moderate	62	
246-11	246	Deadmule-Burro	2	2	Replace with 24" culvert set to proper grade (~9%)	Moderate	63	
246-33	246	Swanson	1.5	1.5	Replace with 24" culvert set to grade (~30%) and	Moderate	64	

Site_ID (GIS ID)	Road	Drainage	Pipe Width (ft)	Stream Width (ft)	Recommendation	Priority	Replacement Rank	Removal Rank*
					disconnect ditch from crossing			
246-42	246	Swanson	2	2	Install 24" culvert and disconnect ditch from crossing	Moderate	65	
246-43	246	Swanson	2	1.5	Install 24" culvert and disconnect ditch from crossing	Moderate	66	
246-34	246	Swanson	1.5	1	install 24" culvert aligned with stream and disconnect ditch from crossing, correct road drainage/fillslope failure	Moderate	67	
246-45	246	Deadhorse	1.5	1	install 24" culvert and disconnect ditch from crossing	Moderate	68	
246-39	246	Swanson	1.5	1	Install 24" culvert and disconnect ditch from crossing, correct road drainage/fillslope failure	Moderate	69	
5301-15	5301	Lower Washington		1.5	Add at least two 24" culverts (1 at existing site and 1 appx. 200 ft towards 246 jct.) to connect wet meadow to Washington Creek floodplain, set to grade with meadow and rock at inlet and outlet of culverts to prevent headcutting	Moderate	70	
680-19	680	Sheep Mountain	3	1.5	Install 24" culvert at stream and armor outlet, disconnect ditch from crossing, improve road drainage	Moderate	71	
5301-6	5301	Tumble	2	2.5	Short term: clean inlet and outlet of debris and disconnect ditch so that runoff does not enter at stream crossing; Long term: replace with newer 30" culvert set to grade	Moderate-Low	72	
5301-1	5301	Tumble	1.5	1.5	Short term: clean inlet and outlet of debris and disconnect ditch so that runoff does not enter at stream crossing; Long term: replace with newer 24" culvert set to grade	Moderate-Low	73	
5301-7	5301	Tumble	1.5	1	Replace with newer 24" culvert	Moderate-Low	74	
246-20	246	Deadmule-Burro	1.5	1.5	Replace with 24" culvert, Short term: locate and clear culvert outlet	Moderate-Low	75	
246-13	246	Deadmule-Burro	2	2	Short term: clear alder from blocking inlet and rock below outlet to dissipate energy, Long term: replace with 24" culvert set to proper grade (~3%)	Moderate-Low	76	
246-15	246	Deadmule-Burro	2	1.5	Short term: clear alder from blocking inlet and rock below outlet to dissipate energy, Long term: replace with 24" culvert set to proper grade	Moderate-Low	77	

Site_ID (GIS ID)	Road	Drainage	Pipe Width (ft)	Stream Width (ft)	Recommendation	Priority	Replacement Rank	Removal Rank*
					(~15%)			
246-17	246	Deadmule-Burro	1.5	1	Replace with 24" culvert set to grade (~5%)	Moderate-Low	78	
246-12	246	Deadmule-Burro	1		Replace with 18" culvert and rock outlet	Moderate-Low	79	

*Removals are for unmapped crossings on redundant roads.