Sheep Fire Timber Salvage

ENVIRONMENTAL ASSESSMENT

BLM

Cottonwood Field Office, Idaho

Cottonwood Field Office

DOI-BLM-ID-C020-2013-0003-EA

June 2013

Bureau of Land Management
Coeur D'Alene District
3815 Schreiber Way
Coeur D'Alene, Idaho 83815
208-769-5000

http://www.blm.gov/id/st/en.html

Table of Contents

1 INTRODUCTION

The Bureau of Land Management, Cottonwood Field Office, is proposing to salvage merchantable dead and dying timber on BLM land within the 2012 Sheep Fire perimeter, and within portions of Sections 21, 28, 29, 30, 31 and 32-Township 26 North- Range 2 East, Idaho County, Idaho approximately 2.5 miles north east of Lucille, Idaho. Figure 1 shows the vicinity of the project area. The proposed action would harvest approximately 14.3 million board feet (MMBF) on 916 acres using approximately 2.28 miles of temporary road within the Wet Gulch and John Day Mountain area. An additional 52 acres would be reforested under this proposal.

The Sheep Fire ignited on September 6, 2012 and burned approximately 48,000 acres of public land including more than 5,000 acres administered by the Bureau of Land Management. The project area includes approximately 3,300 acres of timbered BLM lands with mortality rates reaching 80% or higher over a majority of the area.

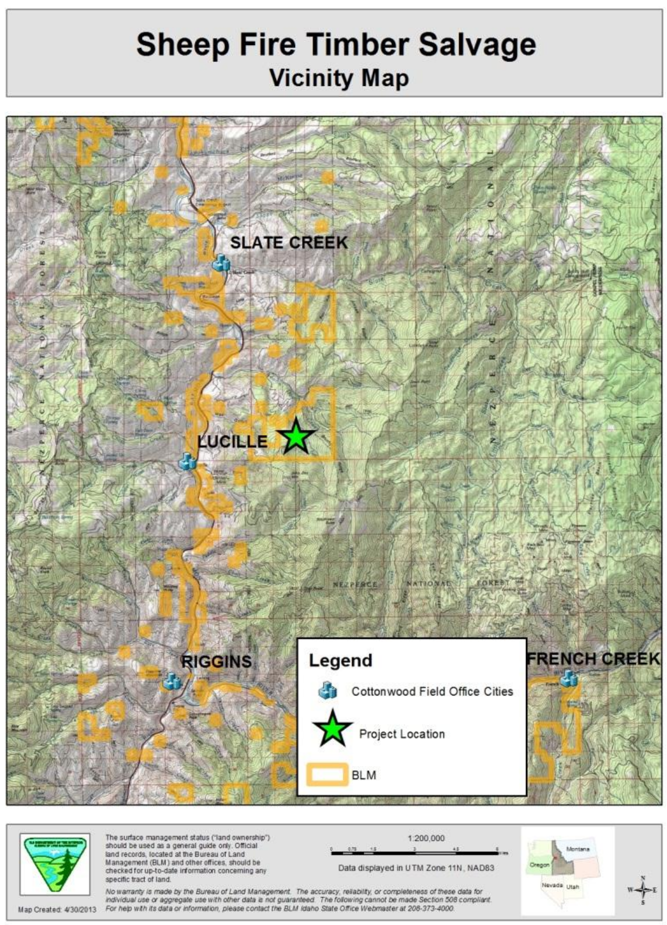

Figure 1. Vicinity map of project area

1.1 Purpose and Need

The purpose for the project is to salvage timber following the 2012 Sheep Fire. The Cottonwood Resource Management Plan (RMP) as approved on December 21, 2009 (USDI-BLM 2009) directs the BLM to expedite salvage to capture economic return as well as to work towards achieving Desired Future Conditions (DFC). This proposal is a direct result of the Sheep Fire.

The purpose of the proposed action (Section 2.1) is to address the following two goals as key components of the RMP:

Goal VF-1—Manage forests to maintain or improve forest health, composition, structure, and diversity consistent with site potential, and historical range of variability (HRV). The objectives are to:

1. Manage for forest health and/or habitat diversity in desired future condition (DFC) blocks of 1,000 or more forested acres.
2. In areas not included in DFC blocks, manage for multiple resource values.

To attain these objectives requires managing forest cover types and structure (size class, stand density and canopy layers) across the landscape. Stands need to be reforested as soon as possible and there is a definite lack of a seed source to provide for natural regeneration in the short term.

Goal FP-1—Provide forest products to help meet local and national demands.

The objectives are to:

1. Maintain a forest management program that complements resource objectives for other programs.
2. Prioritize vegetation treatment projects that will maximize forest commodity recovery by expediting salvage to capture economic return.

To attain these objectives requires treating as much of the area as quickly as possible given the logistical and resources constraints within the project area.

The need for the proposed action is generated by the difference between current conditions in the project area and the desired conditions for the two goals described above. Almost all of the project area lies within a desired future condition (DFC) block. At the broader landscape scale of John Day creek and Wet Gulch watersheds there is a disparity from the HRV. The most recent changes to the vegetation are the result of the severity of the Sheep wildfire within the project and:

- Approximately 3,370 acres of timber land was burned at a high or moderate severity resulting in greater than 80 percent mortality of the overstory vegetation.

- This has immediately altered stand conditions such that seral structural stages, grass/brush and seedling stands will be the dominant stand structure (early seral) for many years.

Although small portions of federal lands within and/or adjacent to the proposed project area have been harvested in the early 1980's through 2011, much of the federal lands within the proposed project area has never been harvested.

1.2 BLM Land Use Plan Conformance

The Federal Land Policy and Management Act of 1976 (FLPMA) requires an action under consideration be in conformance with the applicable BLM land use plan (the Cottonwood Approved Resource Management Plan (RMP)), and be consistent with other federal laws and state, local and tribal policies to the maximum extent possible.

The proposed action as described in Chapter 2 of this EA is in conformance with the Cottonwood Resource Management Plan (USDI-BLM, 2009). As described and analyzed in this EA, the proposed timber harvest and reforestation actions are consistent with the following decisions from the Cottonwood RMP and identified within Table 1.

Table 1. Cottonwood RMP Conformance

RMP Reference	Citation from 2009 Approved Cottonwood RMP
Forest Vegetation p. 22	**Objective VF-1.1-**Manage for forest health and/or habitat diversity in DFC blocks (Map 3, Desired Future Condition Blocks) 1,000 or more forested acres.
Forest Vegetation p. 22	**Action VF-1.1.1-**Design treatment project to enhance forest health and/or habitat diversity (consistent with **Appendix C**, Desired Future Conditions for Forest Vegetation/Wildlife Habitat).
Forest Vegetation p. 22	**Action VF-1.1.2-**To the extent practicable, emphasize retention of large tree size ponderosa pine (*Pinus ponderosa*), western larch (*Larix occidentalis*), and/or Douglas-fir (*Pseudotsuga menziesii*) in dry conifer sites.
Wildlife and Special Status Wildlife, p. 26	**Action WS-1.5.4-**Manage wildlife habitats using established BMPs and guides for BLM sensitive species. Use a species habitat guild approach (e.g., riparian, old growth, canyon grasslands, etc.) for identification of desired conditions, conducting analysis, and developing project and activity design measures. Development of project design measures should include conservation and restoration measures for BLM sensitive species, while striving for appropriate habitat diversity and achievement of project objectives.
Wildlife and Special Status Wildlife, p. 27	**Action WS-1.6.3-**Priority subwatersheds or areas where BLM programmatic management direction will support progress towards attainment of DFC for forest wildlife habitat vegetation includes BLM forested contiguous areas that are greater than 1,000 acres (**Appendix C**, Desired Future Conditions for Forest Vegetation/Wildlife Habitat; **Map 2**, Conservation and Restoration Watersheds).
Forest Products, p. 36	**Action FP-1.2.1—**Develop silvicultural treatments that support DFC for those stands identified as Desired Future Condition Blocks on Map 1.
Forest Products, p. 37	**Action FP-1.3.1**—In forest stands that are susceptible to or have outbreaks of forest insect or disease, or have mortality related to wildfire, expedite salvage to capture economic return.

The proposed treatments include developing silvicultural treatments to support progress towards attainment of DFC for wildlife habitat and forest products (Action WS-1.6.3. and Action FP 1.2.1). The project includes best management practices that protect soil and water and ensure reforestation for timber harvest activities (Objective FP-1.1), consistent with requirements of the Clean Water Act, Idaho State Water Quality Standards, Idaho Forest Practices Act of 1974, and Idaho Stream Channel Protection Act.

1.3 Scoping and Issues

Scoping letters were sent out to interested parties on November 13, 2012, describing the proposed action and preliminary issues. A letter was sent out to all adjacent landowners on November 15, 2012. Comments were requested back by December 17, 2012, but were accepted throughout the process. The BLM also met with representatives of the Idaho Conservation League on January 31, 2013, to discuss and clarify comments from that organization. The BLM made a presentation to the Resource Advisory Council (RAC) detailing the proposed action and alternatives on March 6, 2013.

1.3.1 Public Scoping

During the public scoping period, the BLM received nine comments identifying the following concerns:

- Effect of the proposed action on soils including erosion and compaction.
- The ecological value of snags.
- Habitat for sensitive, threatened and endangered species including the black-backed woodpecker and Canada lynx (*Lynx canadensis*).
- The potential to exacerbate noxious weed issues in the project area.
- The effect of the proposed action on fisheries especially any increased risk of soil erosion.
- The stability and density of existing roads and the proximity of harvest to the John Day Roadless Area.
- The length and possible sediment contribution of proposed temporary roads.
- The potential for mass movement as a result of the proposed action.
- The need to use a reliable and peer-reviewed process to determine whether a tree that is still green is likely to persist into the future and therefore be considered a live tree.
- A request to incorporate additional restoration measures into the proposed action
- Several comments urged the BLM to consider adding additional volume and to expedite the sale to capture more economic value.
- The potential of the area to reburn.
- Whether there is an ecological need to harvest timber post fire.
- The effects of wildfire suppression on the landscape.

1.3.2 Issues Analyzed in Detail

Considering public comments, the BLM determined that the issues warranting detailed analysis are:

- Forest Vegetation: The proposed action may affect existing vegetation, succession classes, and attainment of Desired Future Conditions.
- Soils: The proposed action may result in detrimental soil effects, reduce soil productivity, and cause adverse erosion and sediment.
- Water Resources: The proposed action may affect water quality and cause erosion and sediment.
- Wetland and Riparian Habitats: The proposed action may affect wetland and riparian habitats.
- Fisheries, Aquatic Habitats, and Special Status Species: The proposed action may affect aquatic habitats and special status fish (ESA-listed and BLM sensitive).
- Vegetation/Special Status Plants: The proposed action may affect special status plants and habitats.
- Invasive, Nonnative Species and Noxious Weeds: The proposed action may lead to an increase in invasive, nonnative species.
- Wildlife Habitat and Special Status Species: The proposed action may affect wildlife, migratory birds, preferred habitats, and special status species (ESA-listed and BLM sensitive).
- Livestock Grazing: Livestock grazing will temporarily be affected as a result of the Sheep Fire and proposed activities.
- Visual Resources: Locations designated as Visual Resource Management Class III and Class IV may be affected.
- Air Quality: Burning of slash piles may temporarily affect air quality in Airshed 13.
- Social/Economic: The project may impact social and economic resources by putting dollars into the economy as a result of implementation.
- Health and Safety: Use of herbicides may affect health and safety.

1.3.2 Issues Considered but not Analyzed in Detail

The BLM identified the following issues which will not be analyzed in detail for the reasons stated:

- Conservation of historic resources pursuant to Section 106 of the National Historic Preservation Act were identified as a potential issue when developing this proposal by BLM archeologist. An evaluation compliant with Section 106 was completed and no historic properties were identified. Provisions of the State Protocol Agreement between the Idaho BLM and the Idaho State Historic Preservation Office were followed and it has been determined by the BLM and concurred but the Idaho State Historic Preservation Office that there will be no historic properties affected. Therefore, cultural resources are not addressed further in this document.

- The potential for the project area to experience a second fire in the short term, commonly referred to as reburn potential, was analyzed by fuels specialists and forestry staff and was deemed to be very low based on the severity of the 2012 Sheep fire.

- The effects of wildfire suppression on resources are outside the scope of this analysis. Wildfire suppression is an emergency action and the emergency stabilization and rehabilitation (ESR) plan signed December 17, 2012 analyzes effects of suppression and the wildfire itself and makes recommendations on actions to mitigate or help reduce those impacts. Actions performed under the ESR plan are considered a cumulative impact.

2 ALTERNATIVES

This chapter describes the Proposed Action, a No Temporary Road Alternative and the No Action alternative. It also describes alternatives that BLM considered but eliminated from detailed analysis.

2.1 Proposed Action

The BLM is proposing to harvest approximately 14.3 million board feet of timber on 916 acres using 2.28 miles of new temporary road. Harvest would begin in the summer of 2013 and continue through 2013 and possibly into 2014. Reforestation, decommissioning of temporary roads, and some road rehabilitation work would begin as early as the spring of 2014 and continue for several years following.

2.1.1 Timber Harvest

Timber harvest would occur on 916 acres of dead and dying timber within 23 harvest units as shown in Table 2 and Figure 2. Harvest methods include tractor (ground-based) skidding on slopes less than 40% and cable yarding on slopes greater than 40%. In addition, short cable yarding would be utilized and is defined as cable corridors less than 400 feet in length and may be logged using a conventional cable system (yarder) or an off-road jammer (tong-tosser). Partial suspension of the log may not result in short cable yarding if a jammer is utilized. Harvest would retain a minimum of 4-6 trees per acre as snags (see 2.1.3 Snag Retention below). Those trees expected to survive both the initial and secondary impacts of the wildfire would not be harvested with the exception of temporary road prism or cable yarding corridor clearing. Determination as to whether a tree is dead or likely to be dead within a 1-year time period will be conducted using the methodology described in the “Factors Affecting Survival of Fire Injured Trees” (Scott et al. 2002, as amended 2006).

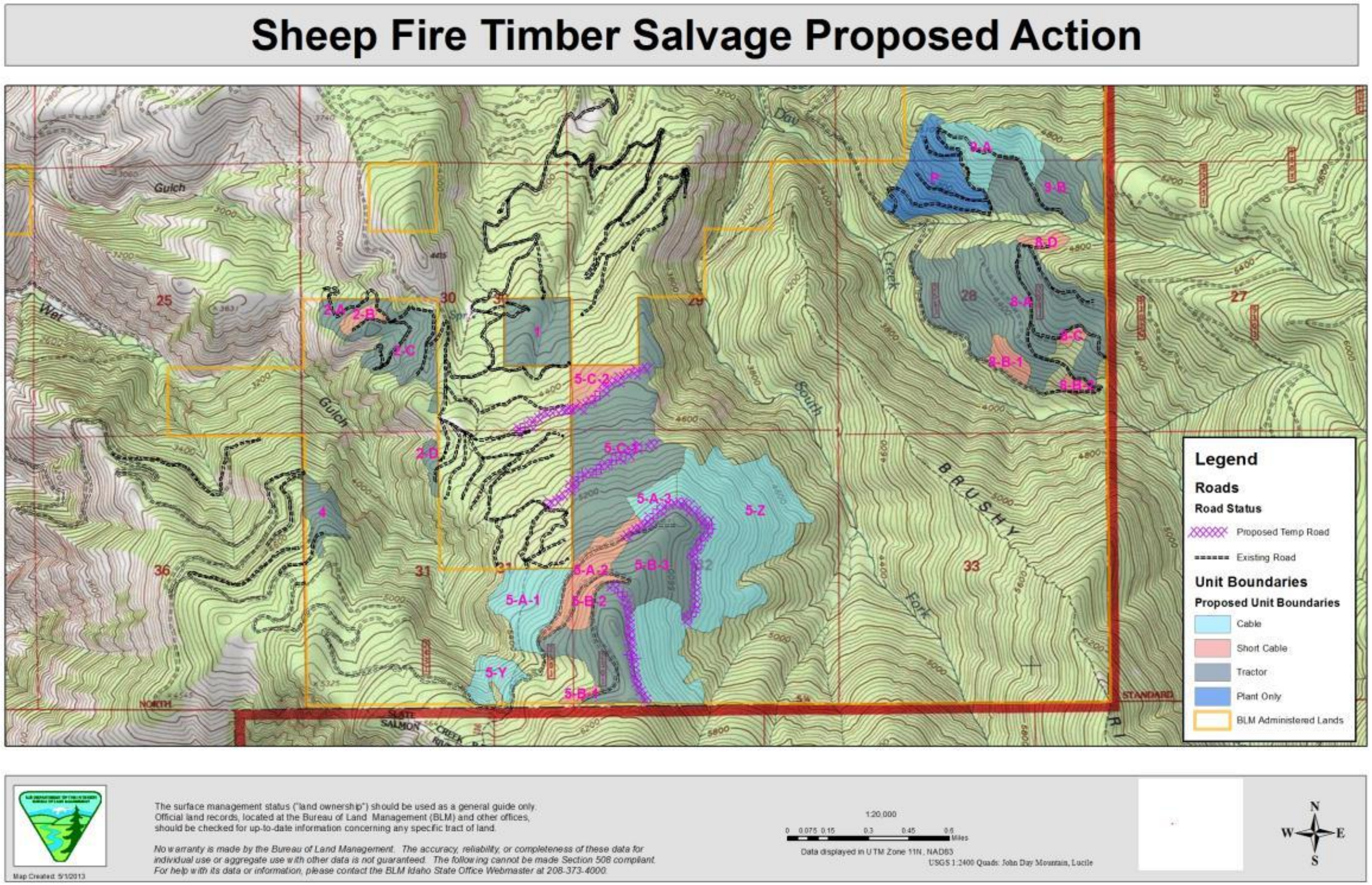

Figure 2. Sheep Fire Proposed Action

Table 2. Proposed Action Harvest Units, Harvest Methods, and Acres

Unit	Harvest Method	Acreage
1	Tractor	40
2-A	Tractor	10
2-B	Short Cable	6
2-C	Tractor	44
2-D	Tractor	6
4	Tractor	18
5-A-1	Cable	39
5-A-2	Short Cable	25
5-A-3	Cable	12
5-B-1	Short Cable	3
5-B-2	Short Cable	10
5-B-3	Tractor	115
5-C-1	Tractor	120
5-C-2	Short Cable	15
5-Y	Cable	18
5-Z	Cable	175
8-A	Tractor	148
8-B-1	Short Cable	10
8-B-2	Short Cable	4
8-C	Short Cable	3
8-D	Short Cable	6
9-A	Cable	36
9-B	Tractor	53
P-Plant Only	Plant only	52*
	Total Harvest Area:	**916**

* Not included in harvest total

2.1.2 Roads

The timber harvest would require construction of 2.28 miles of temporary road to facilitate harvest operations in addition to use and maintenance of approximately 12 miles of existing roads. As needed, road maintenance actions would include blading, providing road drainage (e.g., rolling dips, ditch cleaning, etc.), rocking/graveling low-water fords, and road clearing (e.g., logs, debris). Following post-harvest activities including planting, burning of slash piles and scattering of slash in line corridors, temporary roads would be obliterated (re-contoured); this includes seeding with desirable species and placing slash/woody debris. Temporary roads would be decommissioned as soon as possible following harvest. Units that require temporary roads for access would be prioritized to plant first to allow temporary roads to be decommissioned as soon as possible after harvest operations are complete. The mid-slope road that creates the western and top boundary of unit 5Z in the center of Township 26 North, Range 2 East, Section 32 would be decommissioned immediately following harvest, prior to post-harvest activities taking place.

2.1.3 Snag Retention

Snags would be retained for wildlife purposes as shown in Table 3 below for the Potential Vegetation Group 2 (Warm-Dry Douglas-fir/Moist Ponderosa Pine). Snags may be left as individuals scattered throughout the harvest unit or left as unharvested patches of varying size within a unit. Silvicultural prescriptions would identify retention of 3 snags per acre over 20 inches and 3 snags per acre between 10 inches and 20 inches across the harvested units.

Table 3. Snag Retention

Diameter Group	Snags per acre
10”-20”	1.8-2.7
>20”	0.4-3.0
Total:	**2.2-5.7**
Min. Height	**30’**

2.1.4 Reforestation

Reforestation would be planned for the harvested area (916 acres) depending on availability of funding and seed supply. In addition, a plant only unit of 52 acres would also be reforested. Tree planting areas requiring access from temporary roads would be prioritized highest to allow the timeliest decommissioning of these temporary roads. Planted species composition and planting density would be described in a silvicultural prescription for each unit, but in general would be planned to a density of 230 trees per acre, with species composed of Douglas-fir, ponderosa pine, and/or western larch.

In order to improve the success of planted conifers, the herbicide hexazinone may be used in areas of heavy grass and brush competition around tree seedlings. The herbicide would be applied in a 4-foot diameter spot treatment application directly around each planted tree. The use of herbicide would comply with the Cottonwood Integrated Weed Treatment Program, DOI-BLM-ID-C020-2011-0017-EA by incorporating applicable standard operating procedures, design features, and mitigation measures for the use of herbicides as described in the program document. The herbicide hexazinone was not included in the previously referenced EA, therefore, applicable standard operating procedures would be used and this document will contain site specific analysis and design measures for the use of this herbicide. Hexazinone use on BLM lands was analyzes as a component of the *Final Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement, 2007* (USDI-BLM 2007a) and approved for use in the Record of Decision (USDI-BLM 2007b). All applications of hexazinone would be in compliance with the herbicide product label. No herbicide would be applied within 200 feet of stream courses or shallow water tables (e.g., spring/seeps). It is unlikely that all trees would be treated; a maximum of 44 acres of herbicide treatment would occur over the total reforestation area of 968 acres (approximately five percent of the total reforestation area).

2.1.5 Slash Disposal

A minimum of fifteen (15) tons of residual slash per acre would be dispersed during harvest operations where possible to act as an erosion control measure and for nutrient cycling. Primarily, trees would be whole tree yarded to the landing; however, if 15 tons per acre is not being achieved, the contractor would process trees at the stump rather than at the landing to increase the residual slash. Breakage of brittle limbs and tops during felling and skidding would contribute most if not all of the slash needed. Slash piles at landings would be burned following the completion of harvest operations and after approval of a prescribed fire burn plan.

2.1.6 Road Easements

Legal access by temporary easement or a Memorandum of Understanding (MOU) for road use would be secured from the landowner prior to utilizing a road not administered by the BLM. Three landowner's property would be crossed to access harvest units 1, 2-A, 2-B, 2-C, 2-D, 5-C-1 and 5-C-2. Without permission from these 3 landowners, harvest of these units would not occur.

2.1.7 Road Closures and Rehabilitation

One road segment within the project area (figure 3) is designated as closed to motorized; this road would be closed; by installation of a barrier or metal gate. Route designations made in the RMP would not be changed as part of this project.

Approximately 4.76 miles of existing roads in the project area have been identified as closed to the public in the RMP or have no public access. These roads would be rehabilitated. Rehabilitation includes deep ripping of the road surface and seeding. Rehabilitation would improve water infiltration, reduce runoff, and reduce erosion associated with roads. Signs may be installed to inform users of the closed designations. Figure 3 shows the proposed road rehabilitation and location of the barrier installation.

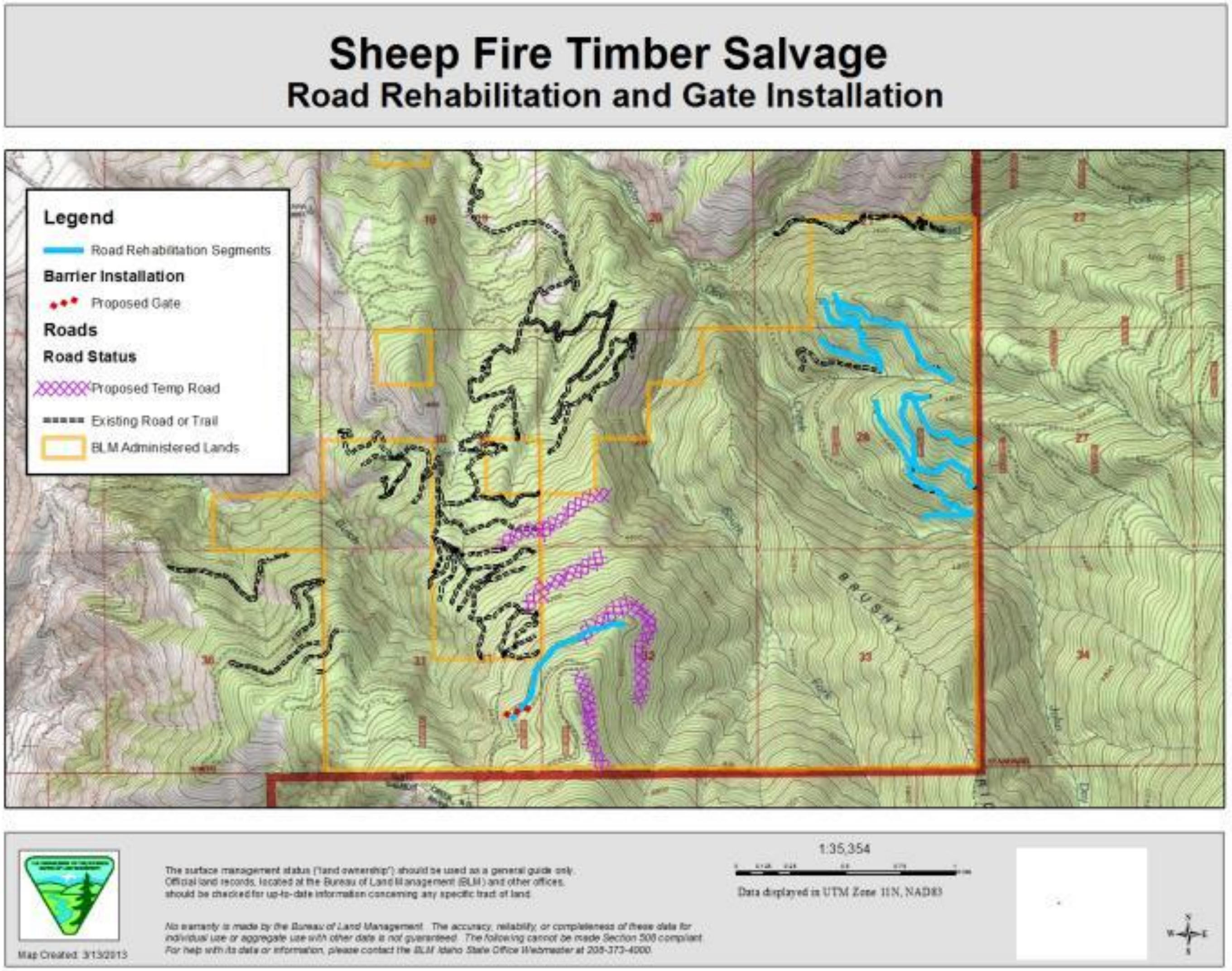

Figure 3. Road Rehabilitation and Road Barrier Installation

2.1.8 Grazing Leases

The John Day (36284), John Day Mountain (36345), and Wet Gulch (36112) Allotments are within the project area. Grazing use on BLM lands where reforestation is implemented would be modified to ensure livestock grazing does not impact the successful re-establishment of tree seedlings. Limited utilization would be allowed in planted areas until trees reach an average height of approximately 24 inches which is expected to be 2-3 years post planting. If damage to trees caused by livestock through grazing or trampling occurs following limiting utilization, a full closure of planted areas until the seedlings reach 24 inches in height would be implemented. No salting or feed supplements are to be placed in or adjacent to reforestation areas.

2.1.9 Environmental Design Features

All treatments in the proposed action and the No Temporary Road Alternative would follow established agency management plans, policies, and procedures, including the Idaho Forest Practices Act (Idaho Administrative Code, Title 38, Chapter 13). The following design features would be implemented to avoid or minimize potential impacts to resources:

Air Quality (Smoke Management)

- Conduct prescribed fires in accordance with the procedures outlined in the *Montana/Idaho State Airshed Group Operating Guide* (Montana/Idaho Airshed Group 2010) in order to minimize air quality impacts from smoke on local communities and individuals.
- Employ dust abatement measures on roads to reduce fugitive dust.

Forest Vegetation

- Develop silvicultural prescriptions in accordance with the Cottonwood RMP, Appendix C, Desired Future Conditions for Forest Vegetation/Wildlife Habitat (USDI-BLM 2009). Develop slash treatment and burn guidelines to meet desired stand conditions of species composition, structure, and watershed sediment guidelines.

Soils and Water Resources

- Prohibit timber harvest in areas of high landslide hazard as determined by resource specialists.
- Modify, via site-specific mitigation measure(s), timber harvest or temporary road construction in areas of moderate landslide hazard as needed to protect slope stability. Examples would include, but not be limited to, requiring partial suspension on cable logging; and/or constructing and applying mulch or slash on yarding corridors where bare soil is exposed.
- Restrict tractor skidding operations to the use of a tracked tractor. No rubber tire skidders would be used.

- Restrict activities when soils are wet to prevent resource damage (indicators include excessive rutting, soil displacement, and erosion).
- Construct slash filter windrows at the toe of fill slopes on newly constructed landings and roads concurrent with construction. Limit height of windrows to 3 feet. Provide breaks and limit length of windrow to allow easy passage of wildlife.
- Reduce road surface erosion by rocking the approach and departure of existing stream crossings as needed.
- Prepare and implement a Spill Prevention Control and Countermeasures Plan (40 CFR 112) that incorporates the rules and requirements of the Idaho Forest Practices Act Section 60, Use of Chemicals and Petroleum Products; and US Department of Transportation rules for fuel haul and temporary storage; and additional direction as applicable. Erosion control measures including removal of log culverts and construction of temporary cross drains, drainage ditches, dips, or berms will be required on all temporary roads before operations cease annually.
- Scarify non-excavated skid trails and landings that are compacted or entrenched 3 inches or more.
- Scarify and re-contour excavated skid trails and landings to restore slope hydrology and soil productivity.
- In the event of winter logging activities, snow plowing will maintain a minimum of two inches of snow on the road, leave ditches and culverts functional, side cast material will not include dirt and gravel, and berms will not be left on road shoulders unless drainage holes are opened and maintained.
- Buffer Riparian Conservation Areas from mechanical treatment.
- In the event an unknown seep, spring, or watercourse is discovered, apply Riparian Conservation Area buffers. .
- Place slash and woody debris as needed within cable logging corridors to inhibit erosion.
- Rip and/or mulch compacted areas (i.e., log landings) to inhibit them from generating overland flow and surface erosion, and maximizing their infiltration rate. Mulch may be straw or other materials and should provide at least 65 % soil cover, particularly in areas burned at high severity.
- Orient linear features created by logging operations, such as skid trails and cable rows, across slope to the maximum extent possible to inhibit any creation of new channels. Ensure waterbars are installed diagonally to skid trails and are larger than normal to promote enhanced inhibition of overland flow.
- Locate skid trails and landings prior to cutting operations, to minimize the delivery of surface runoff and sediment to the nearest stream channel, especially in areas burned at high and moderate severity. To the extent possible, harvest units should be located upslope of unburned areas or areas burned at a lower severity.

Invasive, Non-Native Species

- Treat existing noxious weed infestations along access roads prior to project implementation.

- Clean all off-road equipment of soil, plant parts, seeds, and other debris before entering the treatment units.
- Ensure all rock used for road surfacing is free of noxious weed seed. Borrow pits and stockpiles will not be used if it is determined they are infested with undesirable invasive plants.
- Inventory disturbed areas for new weed introductions and implement weed control treatments 1-year post project and followed up for a second year if staff and funding is available.
- Ensure any mulch or seed products used will be certified as noxious weed free.
- Revegetate, as needed, disturbed areas with an approved seed mix. If desired species in the mix are not available, substitutions may be made upon approval from the Cottonwood Field Office. Ensure the seed mix is certified noxious weed free. Target areas will be permanent and temporary roads, road rehabilitation areas, log landing areas, and severely disturbed cable corridors and skid trails.
- Accomplish seeding the first spring or fall after disturbance.

Table 4. Revegetation Seed Mix

Common Name	Scientific Name	Lbs./Acre
Mountain Brome (Bromar)	*Bromus marginatus*	2
Blue Wild Rye	*Elymus glaucus*	3
Streambank Wheatgrass (Sodar)	*Elymus lanceolatus*	3
Tufted Hairgrass	*Deschampsia caespitosa*	0.5
Annual Rye	*Lolium perenne ssp multiflorum*	1
Big Bluegrass (Sherman)	*Poa ampla*	1
Western Yarrow	*Achillea millifolium*	0.25
TOTAL		**10.75**

- All weed herbicide treatment will occur in accordance with the ROD for the Cottonwood Integrated Weed Treatment Program, DOI-BLM-ID-C020-2011-0017-EA available for review at the Cottonwood Field Office.

Wildlife

- Retain snags and snag replacement green trees and use coarse woody debris in accordance with the Cottonwood RMP, Appendix C, Desired Future Conditions for Forest Vegetation/Wildlife Habitat.
- Maintain existing motorized vehicle restrictions within the area for wildlife security purposes. Do not allow contractors or their representatives to hunt or trap while accessing federal lands using motorized vehicles on restricted routes. Use signs where needed to prohibit public use of roads that are closed to motorized public use, but open for logging use. Use signs where needed to prohibit public use of closed roads that are used for logging.
- Provide a 450 foot non-disturbance and non-treatment buffer (10-15 acres) around occupied nests for BLM sensitive raptor species. Provide a 300 foot buffer around occupied nest for all other raptors. Buffer size may be modified upon

review by BLM Biologist depending on potential for disturbance from an activity or project.

- Follow the requirements of the Bald and Golden Eagle Protection Act; BLM ID IB2010-039 (Seasonal Wildlife Restrictions and Procedures for Processing Requests for Exceptions on Public Lands in Idaho); and the 2008 US Fish and Wildlife Service Guidelines for Raptor Conservation in the Western United States.

  Seasonal restrictions for potentially disruptive construction or other human activities, will generally apply for raptors from February 1 through July 31 unless an exception is granted by the BLM field office manager. Temporary exceptions can be granted in situations where the raptor nest has been destroyed (e.g., by wind, wildfire, lightning), or is not currently active (i.e., young have fledged or if the nest is unused in the current nesting season). Exceptions or temporal deviations from the established February 1 - July 31 timeframe may also be granted based on species, variations in nesting chronology of particular species locally, topographic considerations (e.g., intervening ridge between construction activities and a nest) or other factors that are biologically reasonable. Biologists should review the Bald Eagle Management Guidelines, Draft Guidelines for Raptor Conservation in the Western United States, and Interim Golden Eagle Technical Guidance documents for additional details and protocols.

Aquatic and Riparian Habitat

- Prohibit log landings within RCAs.
- Prohibit fuel storage, equipment maintenance, or fueling within RCAs.
- Prohibit timber harvest and temporary road construction within RCAs. Prohibit removal of large woody debris within RCAs.
- Prohibit use of hexazinone herbicide within 200 feet of watercourses.

Threatened and Endangered, and Sensitive Species

- Notify BLM Biologist of threatened, endangered, or sensitive species sightings made by BLM employees or contractors. If needed apply appropriate conservation measures to minimize impacts to these species.

2.1.10 Monitoring

The BLM would conduct monitoring to determine effectiveness of the proposed harvesting, reforestation treatments, and the environmental design features. The BLM would conduct effectiveness monitoring to evaluate achievement of desired objectives for forest health and habitat diversity, soil and water resources, effectiveness of road closures, road decommissioning, fish habitat and riparian areas, and special status fish, wildlife, and plant resources.

The BLM would monitor livestock grazing to deter mine if, utilization levels in reforestation areas are being exceeded, unacceptable damage to reforestation seedlings is occurring, grazing closures are implemented, and to determine when revegetation and reforestation objectives have been met and it is acceptable to allow grazing restrictions to be lifted within the allotments.

The BLM would monitor for mass erosion or landslides within salvage units and along project roads. In addition, any other mass erosion or landslides within the project area would be documented. As needed, appropriate adaptive management and project modification would occur to mitigate or rehabilitate project related mass erosion or other adverse erosion events.

The BLM would conduct monitoring during the duration of the project (1 – 3 years) and follow-up monitoring after project completion to determine effectiveness of reforestation activities.

2.2 No New Temporary Road Construction Alternative

This alternative considers timber harvest using existing roads. Compared to the proposed action, only units that can be harvested without constructing temporary road would be included. .No temporary roads would be constructed.

2.2.1 Timber Harvest

Timber harvest would occur on 606 acres within 20 harvest units as shown in Table 5. Harvest units 5-C-1, 5-C-2 and 5-Z would not be harvested under this alternative. No temporary road would be constructed. Harvest methods would enlist those described in the proposed action. Snag retention measures and not harvesting live trees would be the same as in the proposed action. See Figure 4.

Table 5. No New Temporary Road Construction Alternative Harvest Units, Harvest Methods and Areas

Unit	Harvest Method	Acreage
1	Tractor	40
2-A	Tractor	10
2-B	Short Cable	6
2-C	Tractor	44
2-D	Tractor	6
4	Tractor	18
5-A-1	Cable	39
5-A-2	Short Cable	25
5-A-3	Cable	12
5-B-1	Short Cable	3
5-B-2	Short Cable	10
5-B-3	Tractor	115
5-Y	Cable	18
8-A	Tractor	148
8-B-1	Short Cable	10
8-B-2	Short Cable	4
8-C	Short Cable	3
8-D	Short Cable	6
9-A	Cable	36
9-B	Tractor	53
P-Plant Only	Plant only	52*
	Total Harvest Area:	**606**

* Not included in harvest total

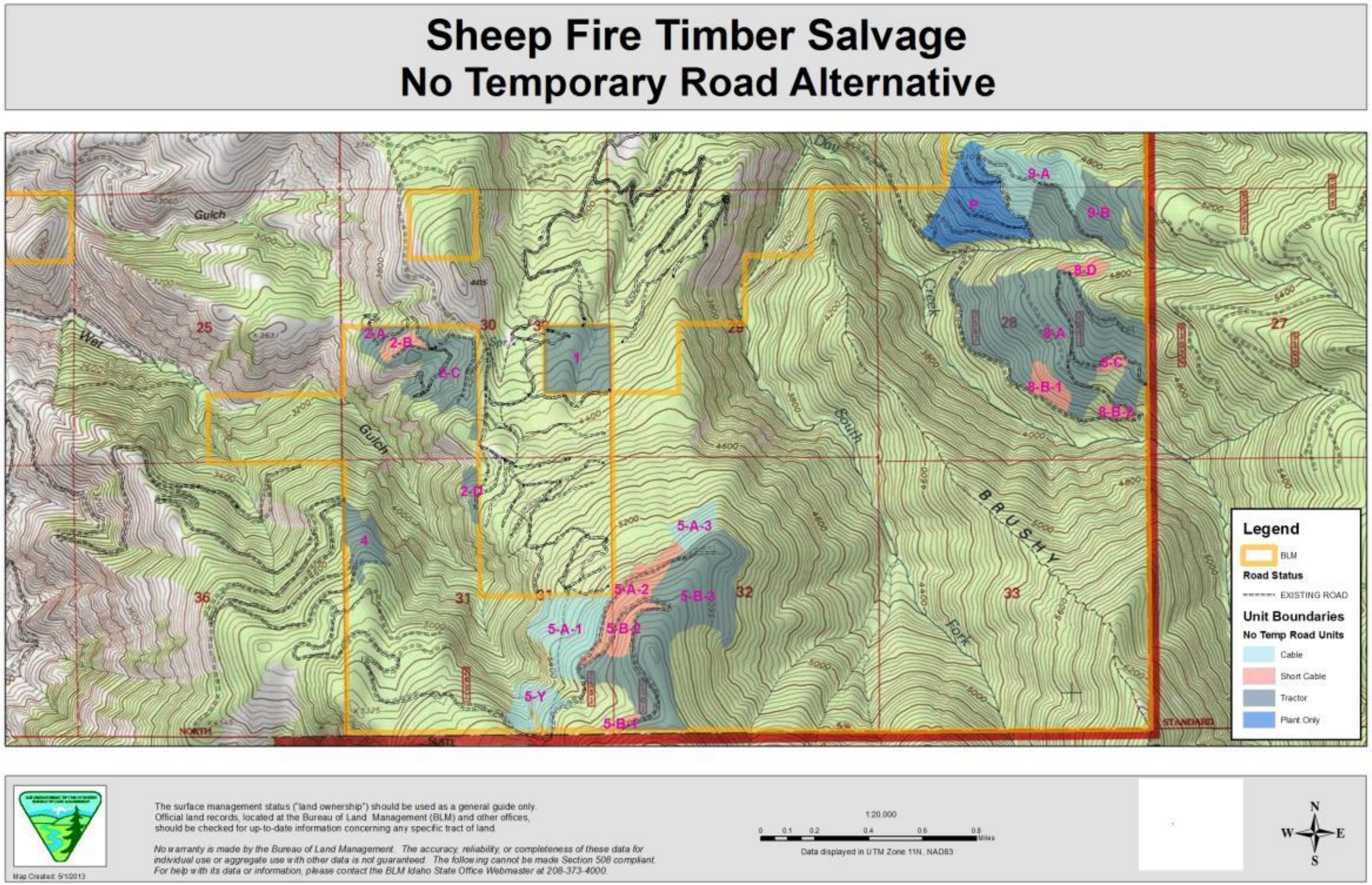

Figure 4. Sheep Fire No Temporary Road Alternative

2.2.2 Roads
No temporary roads would be constructed. Harvest would utilize approximately 12 miles of existing roads.

2.2.3 Snag Retention
Snag retention would be the same as described under the proposed action.

2.2.4 Reforestation
Reforestation would be the same as described under the proposed action except planting would occur on 658 acres.

2.2.5 Slash Disposal
Slash disposal would be the same as described under the proposed action.

2.2.6 Road Easements
Road easements would be the same as described under the proposed action. There would be no change in the number or length of roads required for legal access to the project.

2.2.7 Road Closures and Rehabilitation
Road closures would be the same as described under the proposed action, except no temporary roads would be constructed or obliterated.

2.2.8 Grazing Leases
Grazing leases would be modified as described under the proposed action. Since fewer acres are proposed for reforestation, fewer acres of the allotments would be subject to restrictions in grazing use related to reforestation.

2.2.9 Environmental Design Features
Environmental design features would be the same as described under the proposed action.

2.2.10 Monitoring
Monitoring would be the same as described under the proposed action.

2.3 No Action Alternative
The No Action Alternative would not harvest any timber. The standing dead timber would remain on site. No new temporary road construction would occur. Reforestation of the project area would not occur. Road closures and rehabilitation would not occur.

2.4 Alternatives Considered but Eliminated from Detailed Analysis

In September and October 2012, the BLM developed a proposal to harvest areas burned by the Sheep Fire. This proposal included harvesting 1,193 acres utilizing 5.69 miles of temporary roads. The team took a hard look at the proposal and developed a methodology for ranking the proposed units and road segments based on a variety of characteristics including: slope, miles of road needed, number of stream crossings, mass wasting hazard, erosion potential, compaction risk, and volume per acre. As a result of this ranking, the original proposal was pared down to the proposed action. Units were dismissed primarily due to the steepness of slopes, potential for erosion and mass wasting of soil, stream crossings, length of temporary road construction needed to access units, and the number of stream crossings needed in the temporary roads. Units were also reduced in size to buffer springs, seeps, and potential landslide prone areas. Because of these issues the original proposal did not meet the purpose and need for the project.

Other alternatives would not meet the BLM's purpose and need. Based on the considerations listed above, harvesting more acres is not feasible in a reasonable period of time. Based on public scoping the alternative action (Section 2.2) was developed that harvested fewer acres without constructing temporary road.

3 Affected Environment and Environmental Consequences

This chapter characterizes the resources and uses that have the potential to be affected by the proposed action and the no temporary road action alternative, followed by a comparative analysis of the direct, indirect, and cumulative impacts of the alternatives. Direct impacts are caused by the action and occur at the same time and place. Indirect impacts are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Cumulative impacts result from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions. Throughout this section impacts and effects are used interchangeably.

3.1 Scope of Analysis

Setting

The project area is located in the Lower Salmon River subbasin. The project area is approximately 2.5 miles north east of Lucille, ID; 6 miles south-south east of Slate Creek, ID; 25 miles south of Grangeville, ID; and 40 miles north of New Meadows, ID. Land ownership within the project area is approximately 3,300 acres of BLM lands that occur in the John Day Creek and Cow Creek – Salmon River 6th code HUCs (Hydrologic Unit Codes). The Cow Creek – Salmon River watershed area total approximately 19,354 acres and 3,392 acres (17.5 percent) (east side of Salmon River only) were within the burn perimeter. The John Day Creek watershed area totals approximately 14,019 acres and 12,749 acres (91 percent) were within the burn perimeter. Land ownership within this watershed is comprised of 47 percent Forest Service (FS) (6,529 acres); 27 percent private (3,815 acres); 19 percent Bureau of Land Management (BLM) (2,612 acres); and 6 percent Idaho Department of Lands (IDL) (895 acres). Private lands are dominant in the lower watershed, BLM lands are dominant in the mid watershed, while FS lands comprise the upper watershed.

John Day Creek is a fourth order tributary of the Salmon River and extends about 8 miles from the mouth to the headwaters. John Day Creek originates at an elevation of 7,300 feet and drops to 1,800 feet at its confluence with the Salmon River. Mean annual precipitation in the John Day watershed ranges from 18 to 50 inches with an average of about 34 inches (University of Idaho, 1993). The runoff regime is dominated by spring snowmelt, followed by gradual recession to baseflows.

The project area also includes Salmon River face drainages in the Cow Creek – Salmon River 6th code HUC. These drainages include Wet Gulch and Dry Gulch.

The project area is dominated with mixed conifer stands that have experienced moderate and high severity burn intensity and resulted in high mortality of trees. The common tree species within the project area include Douglas-fir (*Pseudotsuga menziesii*), grand fir (*Abies grandis*), ponderosa pine (*Pinus ponderosa*), larch (*Larix occidentalis*), Engelmann spruce (*Picea engelmannii*), and lodgepole pine (*Pinus contorta*). The general analysis area includes low elevation canyon grasslands, generally below 3,000 to 4,000 feet (south and west aspects) and forest/brush areas (east and north aspects) that are dominated by Douglas-fir and ponderosa pine. The mid-elevation areas (4,000 – 6,000 feet) include mixed conifer types, while the upper elevation areas (above 6,000 – 7,000 feet) include subalpine fir (*Abies lasiocarpa*) and whitebark pine (*Pinus albicaulis*). Pre-fire conditions for forested areas within the project area were primarily mid to late seral stands with medium and large sized trees. The 2012 Sheep Fire resulted in stand replacing fires which caused an abundance of dead (snags) and dying trees in areas that experienced moderate to high burn severity.

3.1.1 Affected Resources and Uses

During the analysis process, the interdisciplinary team considered several resources and supplemental authorities. Based on internal and external scoping, as well as knowledge of the project area, the interdisciplinary team determined that the resources discussed below would be affected by the proposed action or alternatives.

Table 6. Issues Analyzed

Section #	RESOURCE/USE	Issue Statement(s)
3.2.1	Forest Vegetation	Proposed action may affect existing vegetation, succession classes and attainment of Desired Future Conditions.
3.2.2	Soils	Action alternatives may affect existing soil conditions through compaction, displacement, and reduced soil productivity.
3.2.3	Water Resources	Action alternatives may affect water quality and cause increased erosion and sedimentation.
3.2.4	Wetland and Riparian Habitats	Action alternatives may affect wetland and riparian habitats.
3.2.5	Fisheries, Aquatic Habitats, and Special Status Species	Action alternatives may affect aquatic habitats and special status fish (ESA-listed and BLM sensitive).
3.2.6	Vegetation/Special Status Plants	Action alternatives may affect special status plants and habitats.
3.2.7	Invasive, Nonnative Species	Action alternatives may lead to an increase in invasive, nonnative species
3.2.8	Wildlife Habitat	Action alternatives may affect wildlife habitat.
3.2.9	Migratory Birds	Action alternatives may affect migratory birds
3.2.10	ESA Listed Wildlife	Action alternatives may affect ESA listed wildlife
3.2.11	BLM Sensitive Wildlife Species	Action Alternatives may affect BLM sensitive wildlife species
3.2.12	Livestock Grazing	Livestock grazing will temporarily be affected as a result of the action alternatives.
3.2.13	Visual Resources	Locations designated as Visual Resource Management Class III and Class IV may be affected.
3.2.14	Air Quality	Burning of slash piles may temporarily affect air quality in Airshed 13.
3.2.15	Social/Economic and Environmental Justice	The project may impact social and economic resources by putting dollars into the economy as a result of implementation.
3.2.16	Health & Safety	Use of herbicides may affect health and safety.

3.1.2 Past, Present and Reasonably Foreseeable Actions

The Council on Environmental Quality (CEQ) regulations (40 CFR 1500-1508) guide the analysis of proposed projects. As part of the analysis of projects, the CEQ regulations specifically indicate that direct, indirect, and cumulative impacts must be considered. The regulations (40 CFR 1508.7) state: "Cumulative impacts result from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions." This section describes past, present, and reasonably foreseeable actions that were considered in the analysis of impacts.

3.1.2.1 Past and Present Actions

Human caused and natural events have resulted in varying levels of change on the resources affected by the proposed vegetation project. The BLM has completed numerous past projects in the analysis area:

- John Day creek, 367 acres of ground based logging, in the 1960's and 1970's.
- Small sales on an isolated 40-acre parcel consisting of approximately 13 acres of ground based logging in the 1990's.
- Prescribed burning (aerial ignition) of approximately 65 acres in the South Fork John Day Creek (Brushy Ridge), in 1991.
- Conducted road rehabilitation of 1.5 miles of road in the Middle Fork of John Day Creek in 1998.
- Replaced an undersized culvert that was also a fish passage barrier at stream mile 0.5 in the East Fork John Day Creek with a large open bottom arch culvert in 2003.
- South Fork John Day Creek, 29 acres of helicopter logging, in 2006.
- Shaded fuel breaks, 76 acres on Brushy Ridge, 225 acres on ridge west of the South Fork John Day Creek, in 2003 and 2004.
- Wet Gulch, 48 acres of ground based and 61 acres helicopter logging, in 2008.
- Prescribed burning, 216 acres in the South Fork John Day Creek, in 2010 that included the 65 acres burned in 1991, the 29 acres of helicopter logging in 2006 and a portion of the fuel break created in 2003.
- John 40, an isolated 40 acre parcel north of the project area, harvested in 2011 and prescribed burned in the spring of 2012.
- Sheep Fire ignited on September 6, 2012 and burned approximately 48,000 acres of public lands.
- The BLM has authorized livestock grazing on the three allotments located within the project area and grazing use will continue as authorized after closures instituted as a result of the Sheep Fire have been lifted (Estimated fall of 2014, but based upon monitoring of vegetation recovery).

The US Forest Service has harvested numerous units of timber within the John Day Creek Watershed. It is estimated that these harvest activities total approximately 1150 acres in the last 50 years. In addition the Forest Service has decommissioned approximately 6.2 miles of roads in the watershed during 1997 and 1998.

The State of Idaho, Idaho Department of Lands completed two 80-acre regeneration harvests in 2011 in the John Day Watershed. An additional 700 acres of IDL ownership within the analysis area was harvested in the past and salvage logging operations following the Sheep Fire will target these acres again. IDL administers grazing leases on its lands within the analysis area. These areas are grazed in common with adjacent BLM and private lands.

Following the 2012 Sheep Fire several private landowners have commenced salvage logging operations on their ownerships. This logging will continue through 2013 and the majority of the logging is occurring within the John Day Creek watershed. Nonfederal timber harvest is expected to total approximately 1,100 acres including state lands. Indications are that much of this area will be reforested through tree planting.

Other activities within the analysis area include the following. Grazing occurs annually, primarily on private land north and northwest of the project area. Small scale historic exploration mining disturbances are scattered through the BLM lands. A small hydroelectric plant on John Day Creek went online in 1988, the diversion located at stream mile 3.9 and powerhouse located at stream mile 1.4. The area is used for recreational use by the public and hunting on BLM lands is common in the fall. The public also collects special forest products in the area, including firewood and mushrooms.

The BLM has made a decision to implement actions from the Sheep Fire Emergency Stabilization and Rehabilitation project. Actions anticipated to be completed within the next 3 years include:

- Seeding 10 acres with desired grass and shrub seed and plantings
- Inventory and control noxious weeds on 1,000 acres
- Replace 2 fence segments
- Maintain proper road drainage on 6 miles of road
- Temporarily close 5 grazing allotments
- Reforest 650 acres with conifer seedlings

3.1.2.2 Reasonably Foreseeable Actions

The BLM is planning to remove two washed-out culverts in the East Fork John Day Creek within next 2 years.

The Nez Perce National Forest has proposed the Roadside Hazard Tree Removal Project as a result of the Sheep Fire. This project would remove trees killed or weakened by the Sheep Fire within 200 feet of specific roads within the Sheep Fire perimeter for a total of approximately 813 acres. Some of this harvest may come within ¼ air miles of the proposed action. A total of 344.5 acres is proposed within the John Day Creek Watershed.

Local landowners continue to alter the fuels on their property and surrounding their private structures. Reforestation of private land affected by the Sheep Fire will likely continue for several years.

3.1.3 Geographic Scope

The geographic extent of resources and uses cumulatively affected by the proposed action and No Temporary Road Alternative varies by the type of resource and impact, as noted below.

Table 7. Impacts Analysis Areas

Section #	RESOURCE/USE	Area Description	Acres
3.2.1	Forest Vegetation	Project Area and Analysis Area	3,326 18,217
3.2.2	Soils	Action area, project area, and Analysis Area	968 3,326 18,217
3.2.3	Water Resources	Action area, project area, and Analysis Area.	968 3,326 18,217
3.2.4	Wetlands and Riparian Zones	Action area, subwatersheds and RCA	968 18,217
3.2.5	Fisheries, Aquatic Habitats and Special Status Species	Project Area, Analysis Area (watersheds)	968 18,217
3.2.6	Vegetation/Special Status Plants	Action and project areas	968 3,326
3.2.7	Invasive, Nonnative Species	Project footprint and access routes including road corridors	1,500
3.2.8	Wildlife Habitat	Species home range dependent; generally includes suitable habitat within action area, project area, or 6th code HUC, and subwatersheds.	968 3,326 18,217
3.2.9	Migratory Birds	Analysis Area	18,217
3.2.10	ESA Listed Wildlife	Species home range dependent; generally includes suitable habitat within action area, project area, Analysis Area	968 3,326 18,217
3.2.11	BLM Sensitive Wildlife Species	Species home range dependent; generally includes suitable habitat within action area, project area, Analysis Area	968 3,326 18,217
3.2.12	Livestock Grazing	Portions of allotments within project area	968
3.2.13	Visual Resources	Project area and 6th HUC watershed	18,217

Section #	RESOURCE/USE	Area Description	Acres
3.2.14	Air Quality	Idaho Airshed No. 13	4,526,802
3.2.15	Social/Economic Resources	Idaho County, Adams County	6,316,261
3.2.16	Health & Safety	Reforestation plantings	968

Figure 5 shows the project area, project units, and the John Day Creek watershed combined with the Wet Gulch and Dry Gulch subwatershed portions of the Cow Creek-Salmon River watershed. This geographic area is commonly referred to in this document as the analysis area (approximately 18,217 acres) for many resources.

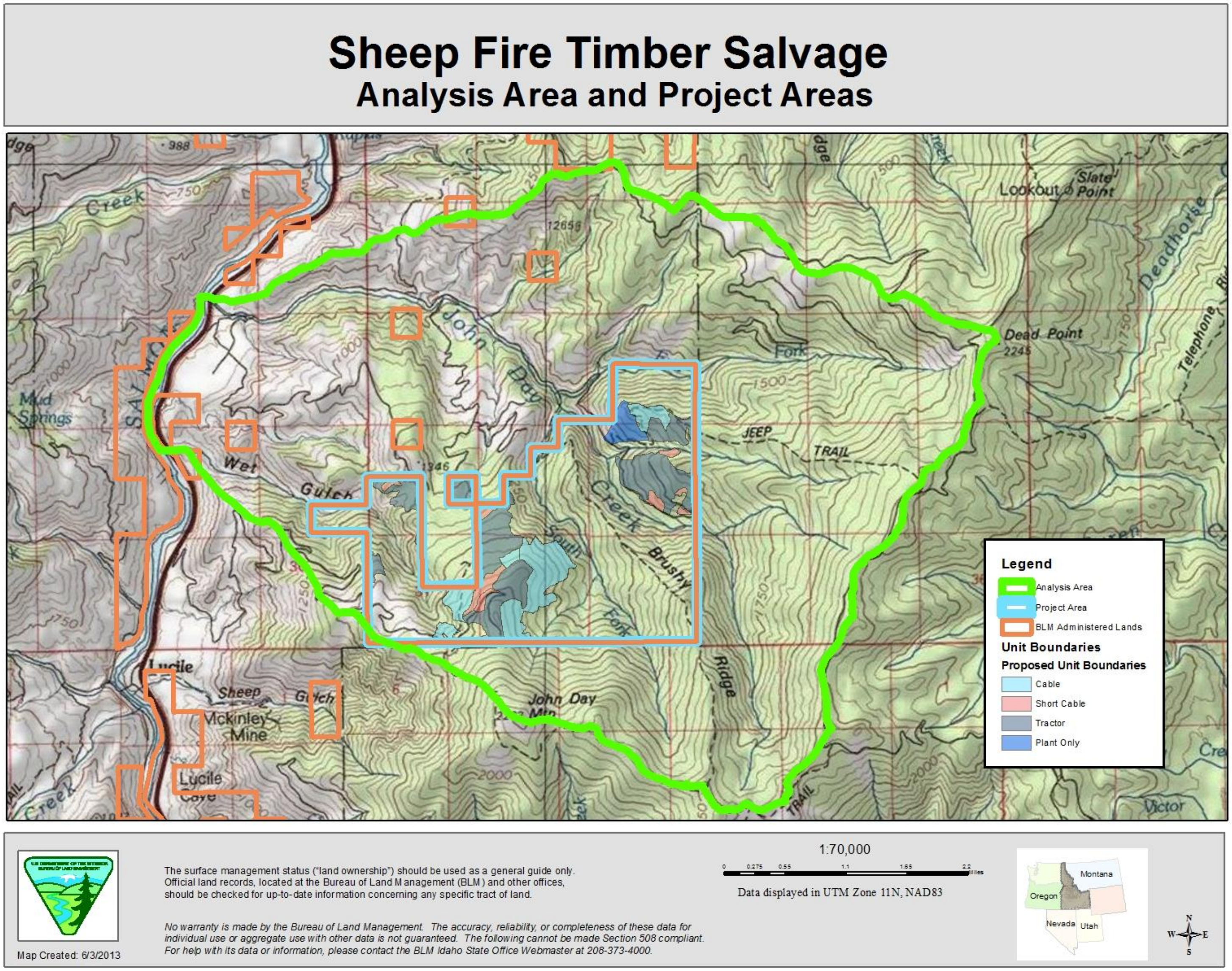

Figure 5. Project Area, Units and John Day Creek/Wet Gulch watershed analysis area

3.2 Effects of the Alternatives

The degree to which resources/uses are affected by the proposed activities are discussed in the following subsections. Each subsection includes discussion of the:

(1) Affected Environment (current condition) of the resource or use
(2) Direct and Indirect Effects of each alternative
(3) Cumulative Impacts.

3.2.1 Vegetation

3.2.1.1 Affected Environment

The geographic scope for the vegetation analysis considers the John Day watershed (13,851 acres) and Wet Gulch, Dry Gulch and Unnamed Tributary portion of the Cow Creek-Salmon River watershed that occurs east of the Salmon river (referred to as the Wet Gulch watershed) (4,366 acres). This 18,217 acre area is referred to as the analysis area as discussed in section 3.1.3. Project level analysis for existing condition and direct, indirect and cumulative effects of the alternatives is the 3,300-acre block of BLM lands defined as the project area. The indicators used for quantifying effects on the forest vegetation include pre-wildfire LANDFIRE existing vegetation, pre-wildfire LANDFIRE succession classes, and the Desired Future Conditions from the Cottonwood RMP. LANDFIRE data is regularly updated, however, there is a time lag of up to a couple of years in the data. Because of this time lag, pre-wildfire data is the best data available and will be used to show what the area looked like prior to the Sheep Fire. In addition, LANDFIRE biophysical settings, LANDFIRE fire regime condition class, and the US Forest Service's Burned Area Report burn severity map from the 2012 Sheep Fire are used to describe the affected environment. LANDFIRE data utilizes version 2008 (Refresh – LF 1.1.0) and represents the most recent data available through March 2013.

The affected environment, described in detail below, is a mature forested landscape in the river breaks above the Salmon River. The forest is generally comprised of Douglas-fir, grand-fir, western larch, lodgepole pine and Engelmann spruce. The forest is most often comprised of closed canopy stands and most stands have multiple age classes within them. A majority of the area was burned during the Sheep Fire. Thus, post-fire, the same overstory vegetative composition is present, however, the percentage of that overstory that is still alive depends greatly on the burn severity of the area.

Watershed Level (Analysis Area) LANDFIRE Analysis

Biophysical Settings

LANDFIRE Biophysical settings (BpS) represent the vegetation that may have been dominant on the landscape prior to Euro-American settlement and are based on both the current biophysical environment and an approximation of the historical disturbance regime. The LANDFIRE BpS models describe vegetation, geography, biophysical characteristics, succession stages, and disturbance regimes for each BpS and some of the major disturbance types affecting these ecosystems prior to significant alterations by European settlers (LANDFIRE 2013 and LANDFIRE 1.1.0 Biophysical Setting Layer 2013). Biophysical settings are synonymous with Potential Natural Vegetation Groups. The watershed analysis area, consisting of the John Day Creek and Cow Creek-Salmon River watersheds is comprised of the following major biophysical settings: grand fir-Douglas-fir-beargrass (26%), ponderosa pine (19%), ponderosa pine-Douglas-fir (12%), Idaho fescue-bluebunch wheatgrass (11%), Engelmann spruce-subalpine fir-Douglas-fir (10%), and riparian vegetation (3%). See figure 7.

Existing Vegetation

LANDFIRE existing vegetation represents the species composition currently present on a given site (LANDFIRE 1.1.0 Existing Vegetation Type Layer 2013). Existing vegetation is mapped using decision tree models, field data, Landsat imagery, elevation, and biophysical gradient data (LANDFIRE 2013). Pre-wildfire existing vegetation within the watersheds includes: Douglas-fir-ponderosa pine-lodgepole pine forest (28%), Douglas-fir forest (23%), spruce-fir forest (15%) and introduced perennial grassland (11%). See figure 8.

Succession Classes

Vegetation Seral Stages, or Succession Classes, characterize current vegetation conditions with respect to the vegetation species composition, cover, and height ranges of succession states that occur within each biophysical setting (LANDFIRE 1.1.0 Succession Class Layer 2013). Succession classes can also represent uncharacteristic vegetation components, such as exotic species, that are not found within the compositional or structural variability of succession classes defined for a biophysical setting. Succession classes represent vegetative states with unique succession or disturbance related dynamics (Barrett et al. 2010). Characteristic succession classes are:

Class A: early-seral, post replacement
Class B: mid-seral, closed canopy
Class C: mid-seral, open canopy
Class D: late-seral, open canopy
Class E: late-seral, closed canopy
Class UN: uncharacteristic native vegetation
Class NE: uncharacteristic non-native exotic vegetation.

Class UN in the forested BpS models generally represents a forest with greater than 80% canopy cover (LANDFIRE 1.1.0 Vegetation Dynamics Model 2013).

Pre-wildfire succession classes across the Analysis Area are well distributed across all classes. Figure 6 shows a pie chart of succession classes and percentages.

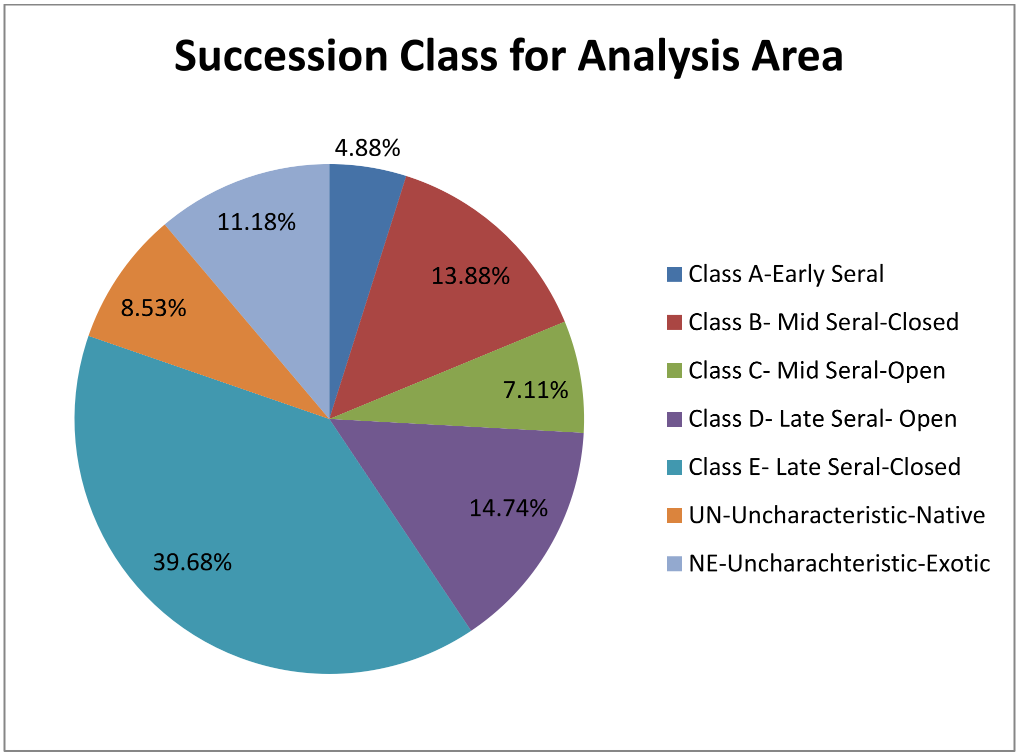

Figure 6. Succession Class breakdown pre-wildfire for the Analysis Area

Burn Severity

Approximately 16,125 acres of the 18,217-acre combined John Day Creek watershed and the Wet Gulch portion of the Cow Creek-Salmon River watershed burned, or approximately 79%. Of the area burned, burn severity was generally high. Burn severity was determined by the US Forest Service's Burned Area Emergency Response (BAER) team and was based on satellite Burned Area Reflectance Classification (BARC) mapping. Table 8 shows burn severity percentages of the watershed and of the burned area. Figure 10 shows a map of the burn severity.

Table 8. Burn Severity in John Day Creek and Wet Gulch Watersheds

Burn Severity	Acreage*	Burn Severity Composition within watersheds	Percent of Watersheds
Unburned	3,762	0%	21%
Low	3,517	25%	19%
Moderate	7,119	50%	40%
High	3,607	25%	20%

*Acreage totals may vary due to rounding of raster data from different sources

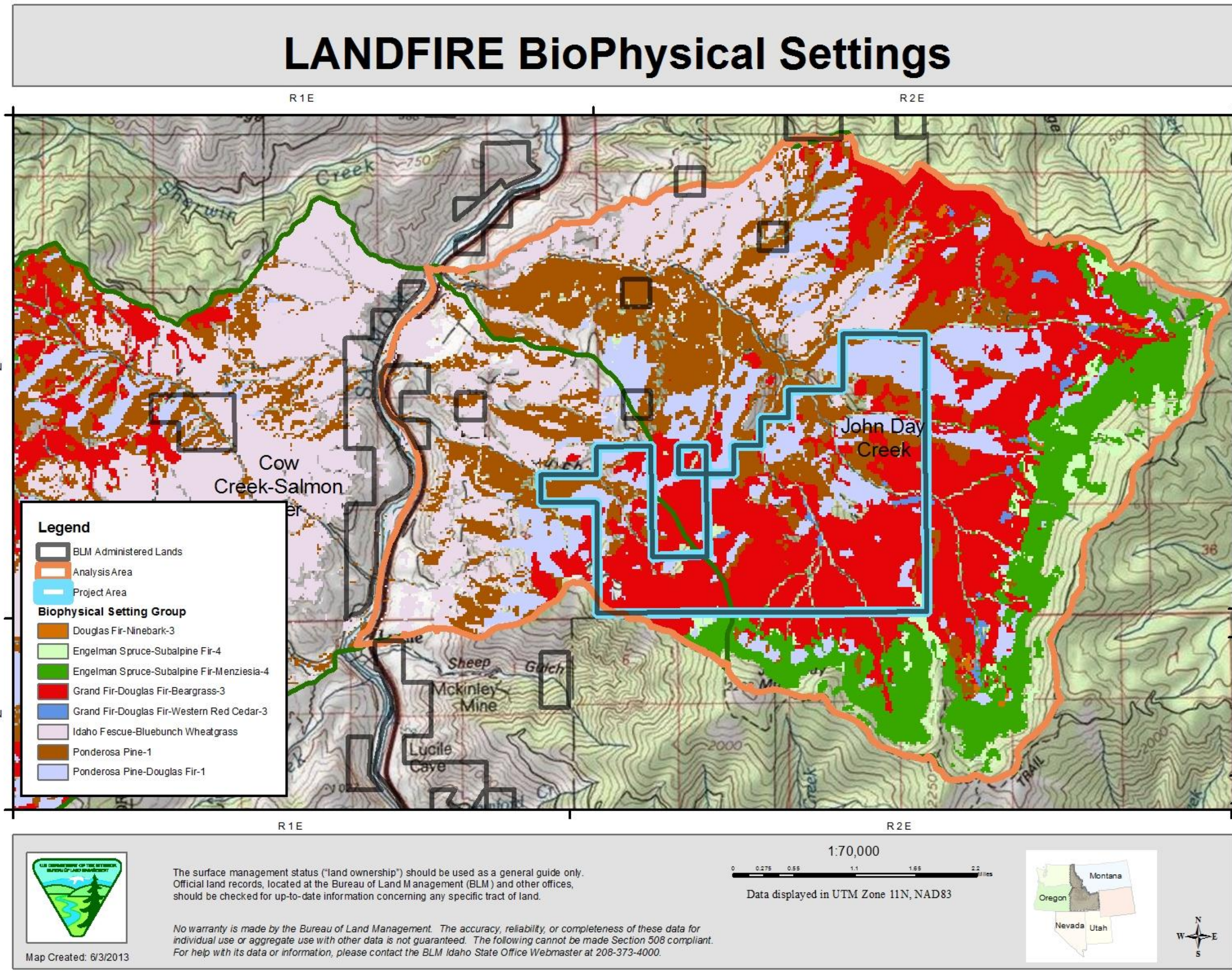

Figure 7. LANDFIRE Biophysical Settings for the Analysis Area

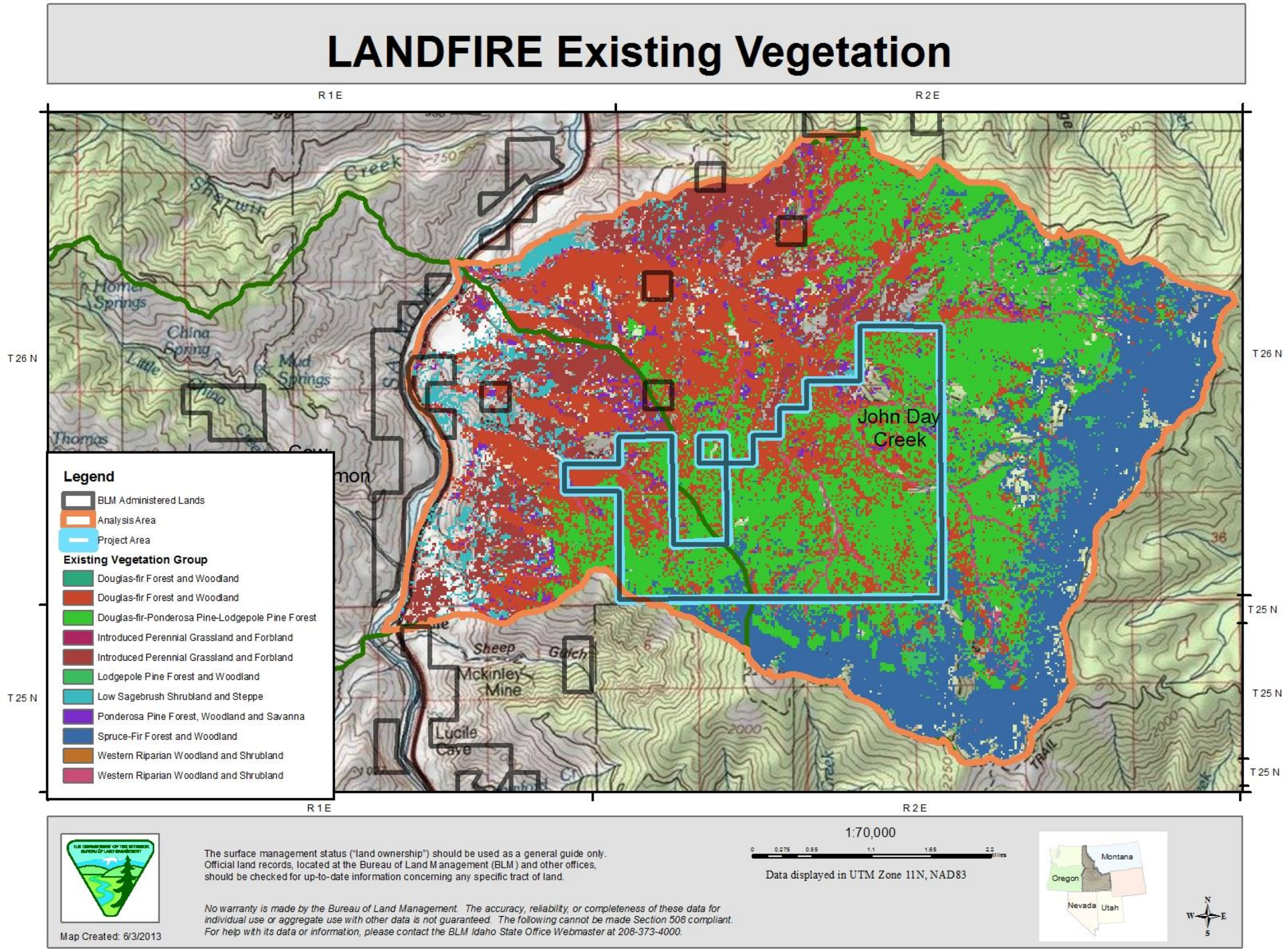

Figure 8. LANDFIRE Pre-wildfire Existing Vegetation for the Analysis Area

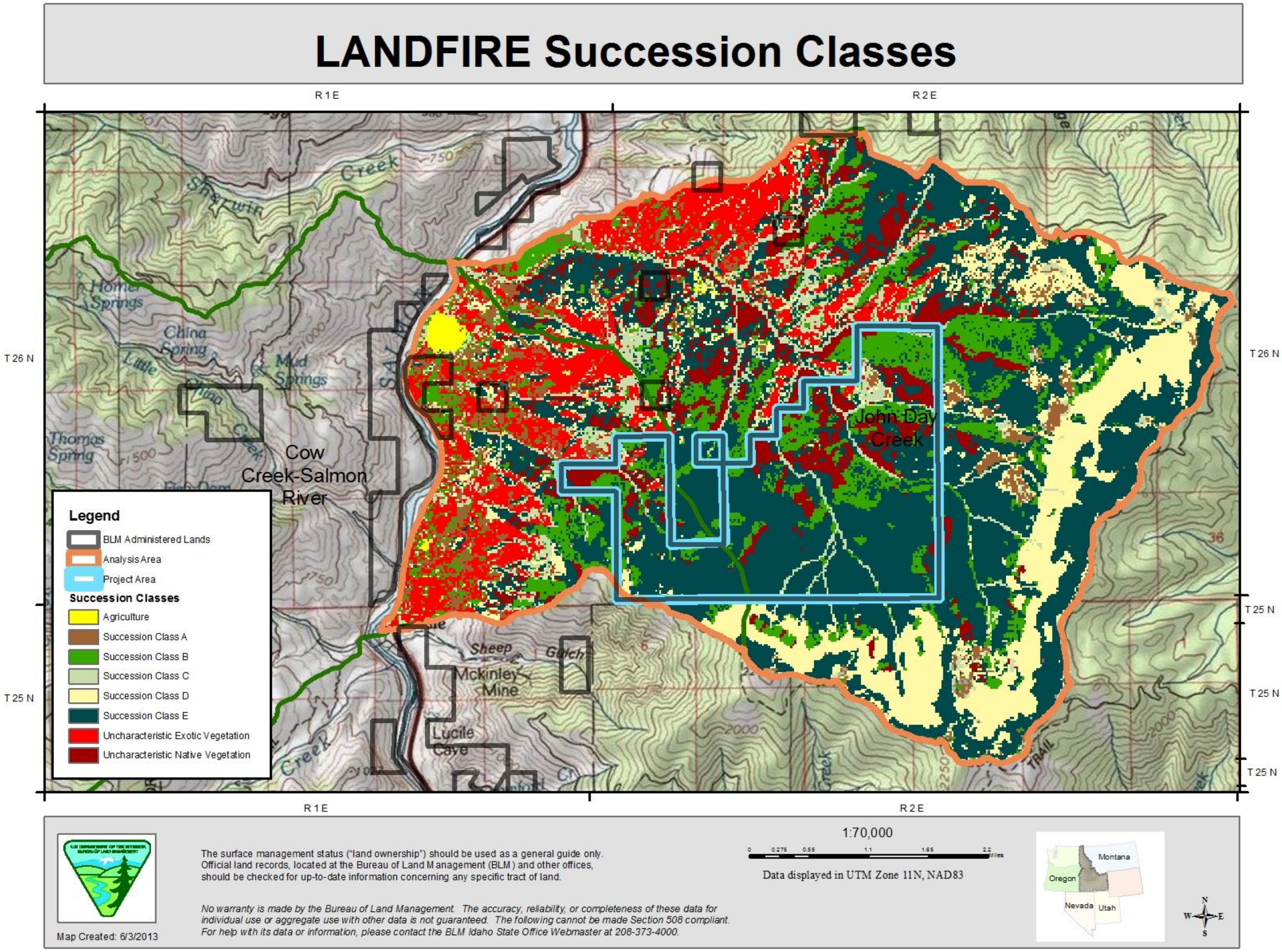

Figure 9. LANDFIRE Pre-Fire Succession Classes for the Analysis Area

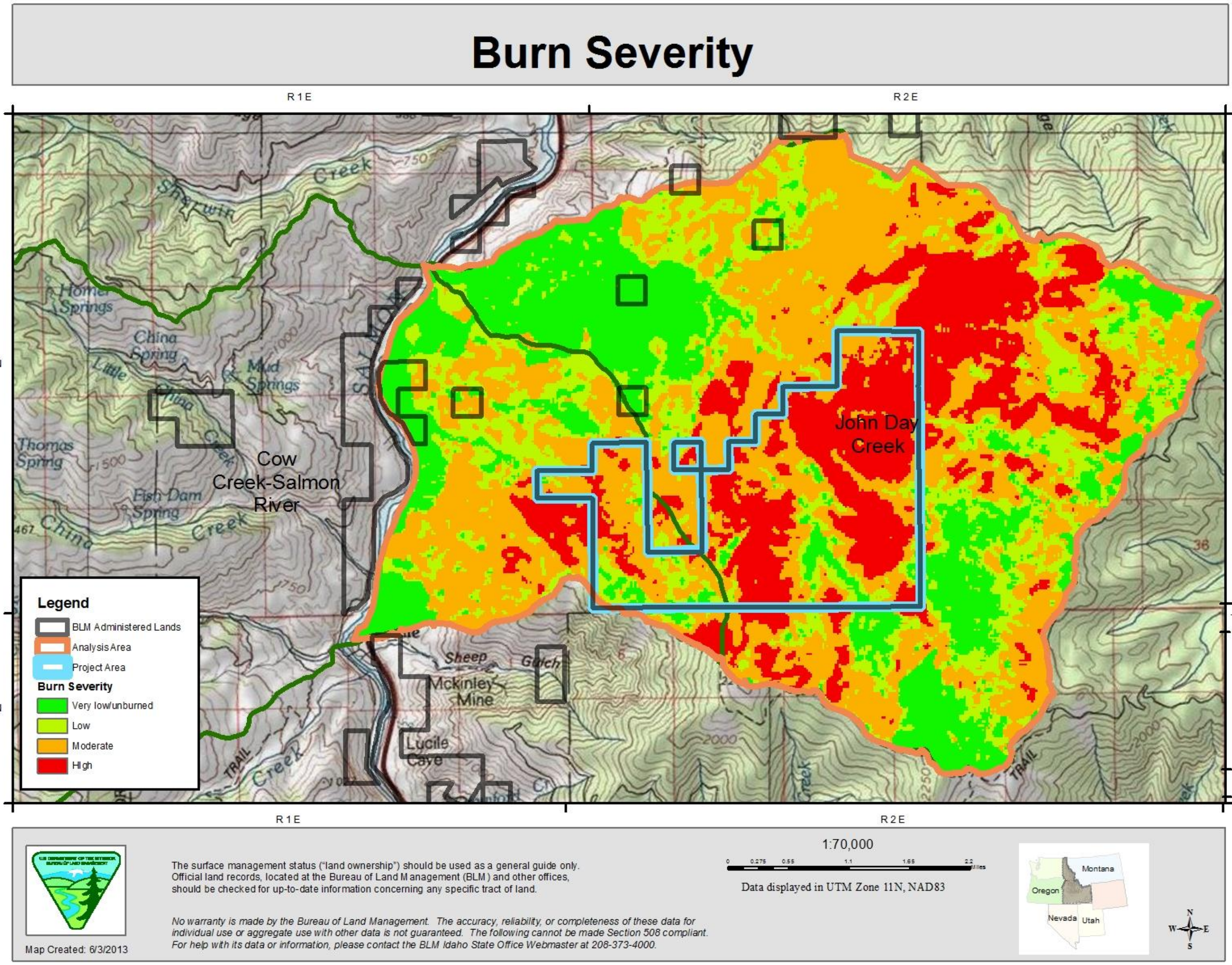

Figure 10. Sheep Fire Burn Severity across the Analysis Area

Project Area Analysis

Forested lands within the project area were primarily mature forest prior to the 2012 Sheep Fire. Past small scale logging dictate differences between single and multiple storied canopies and closed and more open forest conditions e.g. succession class B vs. C or D vs. E. Analysis for forest vegetation focuses on LANDFIRE products including Existing Vegetation, Biophysical Settings, and Succession Classes as well as the Desired Future Conditions in the Cottonwood RMP. In addition, the fire burn severity map is used to show changes from the pre-fire condition to the current condition. Effects of the alternatives on forest vegetation are for the current situation not the pre-burn conditions. However, it is important to understand how the area looked prior to the fire.

Fire Regime

Approximately 79% of the project area is within a fire regime III, described as having a fire return interval between 35 and 200 years with low or mixed severity fire. Approximately 16% of the project area is within fire regime I, less than 35 years fire return interval with low and mixed severity fire. However, conditions were such that approximately 70 % of the forested project area burned at a stand replacing severity in the Sheep Fire.

Fire Burn Severity

Burn severity of vegetation over the project area was generally high. Seventy percent of the area was burned at severity high enough to cause near total mortality (moderate and high severities). Approximately 30 percent of the project area burned at a low severity or was not burned as characterized by the BAER team following the fire and resulted in lower levels of mortality. The majority of the moderate severity area had rates of mortality nearing 100% as documented during field reconnaissance. The low severity portion of the fire resulted in conditions where some trees died immediately while many others will not die as a direct or even secondary result of the fire. Some trees experienced enough heat that death is likely within a short period of time, especially in thinner bark species such as grand fir and Engelmann spruce.

Biophysical Settings

Major BpS for the project area include grand fir-Douglas-fir-Beargrass (BpS model number 10453) (52 %), ponderosa pine-Douglas-fir (BpS model number 10451) (20%), and ponderosa pine (BpS model number 10530) (18%). Small components include Western Larch (3%) and Riparian Vegetation (4%).

Existing Vegetation

Pre-wildfire vegetation, based on LANDFIRE data and field reconnaissance, shows the major components of the project area were as follows in Table 9.

Table 9. Pre-wildfire Vegetation Composition for project area

Percentage of Area	Pre-fire Vegetation association	Pre-fire Vegetation name
56	Douglas-fir-ponderosa pine-lodgepole pine Forest	Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer
30	Douglas-fir Forest	Douglas-fir Forest Alliance
4	Spruce-fir Forest	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland
3	Riparian Woodland	Rocky Mountain Montane Riparian Systems
2	Ponderosa Pine Forest	Northern Rocky Mountain Ponderosa Pine Woodland

Succession Classes

LANDFIRE data combined and verified with field reconnaissance show that the project area was comprised primarily of mature forest with a closed canopy. Little early-succession forest was present prior to the fire. Post-fire all of the high severity burned forest and much of the moderate severity burned forest will be reverted to succession class A (approximately 88 % of the analysis area). Figure 11 shows the percentage of succession classes for the BLM lands prior to the fire. The UN (uncharacteristic native vegetation), based on field verification and LANDFIRE Biophysical Setting Model descriptions is forest land with greater than 80% canopy. The uncharacteristic NE succession class is comprised of non-native or exotic species.

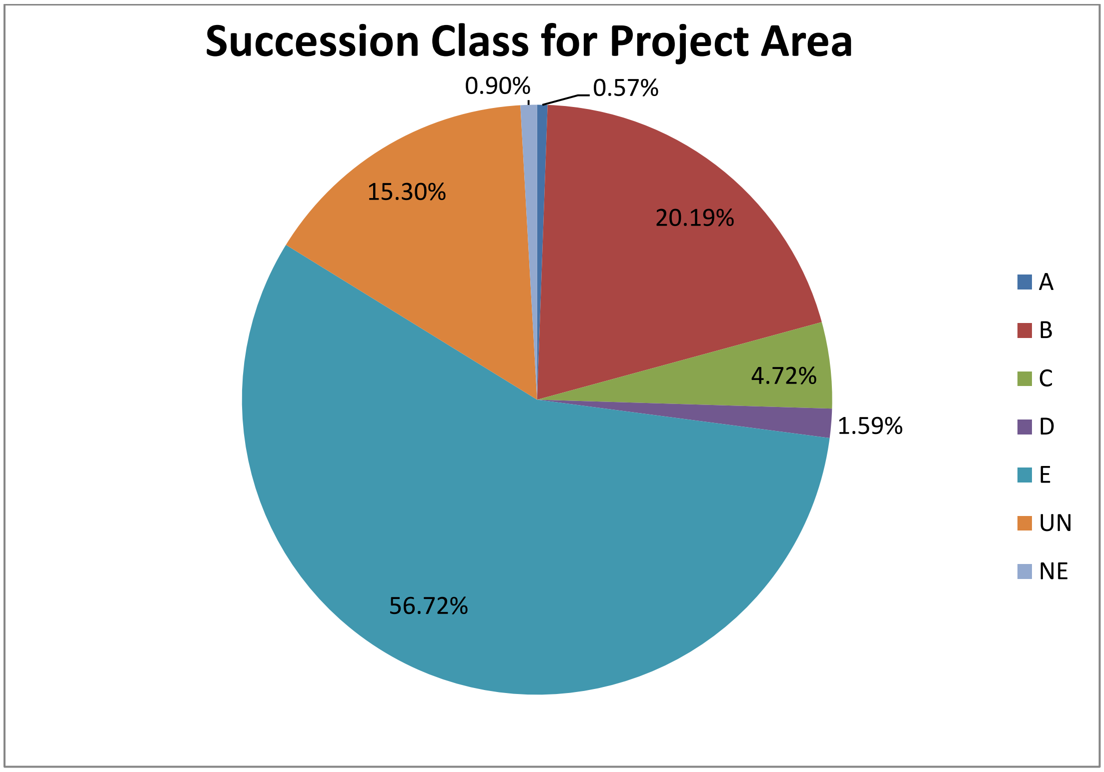

Figure 11. Pre-wildfire Succession Class breakdown for Project area

Desired Future Conditions

The Cottonwood RMP uses Desired Future Conditions (DFC) to describe how the BLM will manage forest at a large scale. Table 10 compares the desired future conditions to the forest vegetation structure of this block of BLM lands prior to the fire (Project Area – DFC Block).

Table 10. Desired Future Conditions and Succession Class Comparison Pre-Fire

Tree Size	Desired Future Condition %	Pre-fire condition %*	Succession Class
Grass/ Forb/Shrub/ Seedlings	5-7	1%	A
Saplings	3-7		
Small	5-21	25%	B, C
Medium	23-36		
Large	20-80	74%	D, E, UN
Old	10		

**Based on LANDFIRE*

A lack of early-seral forest vegetation was present prior to the Sheep Fire. Based on fire severity mapping, a majority of the forested land within BLM lands has been reduced to succession class A, corresponding to the desired future condition of grass/forb/shrub/seedling and saplings. Table 11 shows the estimated condition compared to the desired future condition post-fire.

Table 11. Desired Future Condition Estimate Post-fire for Project Area

Tree Size	Desired Future Condition %	Post-Fire Estimate %
Grass/ Forb/Shrub/ Seedlings	5-7	70
Saplings	3-7	
Small	5-21	7
Medium	23-36	
Large	20-80	23
Old	10	

A second part of the DFC for forest vegetation in the RMP is snag retention. The Cottonwood RMP states goals for number of snags per acre as shown in Table 3 in section 2.1.3, Snag Retention.

Post fire conditions exceed the snag retention guidelines throughout the analysis area.

3.2.1.2 Direct and Indirect Effects of Alternatives

<u>Proposed Action</u>

Existing Vegetation

Existing vegetation would remain in a grass/forb/shrub/seedling state for a few years within the analysis area until reforestation occurred. Following reforestation, the 30% of the project area proposed for harvest would divert from the succession path the remainder of the moderate and high burned severity areas would be on. The area harvested and reforested would quickly emerge from the grass/forb/shrub/seedling state and progress to the sapling state and be on a succession trajectory towards mature timber. The Cottonwood Field Office has been successful at reforestation efforts and has met, in nearly every instance, the goals set forth by the RMP and the Idaho Forest Practices Act for reforestation. Within 5 years of planting it can be expected that tree densities will exceed 170 trees per acre that are free to grow. The 70% of the analysis area that would not be reforested would continue to persist in an early-seral state for decades or longer as described under the no action alternative.

In the long term, vegetation composition in the reforested areas would be comprised of the species planted: western larch, ponderosa pine and Douglas-fir. Species composition of the areas not harvested and replanted would likely be composed of whatever seed source is available for natural regeneration, as described in the no action alternative but may persist as an early seral state for as long as 80 years or more in the upland areas farthest away from a seed source based on Forest Vegetation Simulator modeling. Riparian areas and areas closer to live seed trees would progress to later succession states at a faster rate.

Harvest would aim to leave a minimum of 15 tons per acre of slash (tops and limbs) on the ground where possible to reduce impacts of erosion and compaction. Reburn potential is low as determined by fuels specialists after on-the-ground reconnaissance. The benefit of reduced erosion and reduced compaction outweighs the risk of increased fuel loading in a reburn situation. Material removed from the harvest units would be piled on the landing and burned when conditions of an approved burn plan are met.

Succession Classes

Succession classes over the analysis area will be similar to one another for a period up to 30 years. Following that period, the 30% of the analysis area harvested and reforested under the proposed action would move to a mid-development succession class and then on to a late-development class following stand dynamics. These areas would become more diversified in succession classes over time as natural disturbance patterns take place. The area not harvested may remain in an early seral state for 80 years or more; the time it takes on average for a reforested stand to move from Succession Class A to Class B or C. Areas closer to seed sources and riparian areas would achieve later succession classes at a faster rate. Eventually the natural regeneration will rise above the competition and it too will begin to transition to mid development and eventually late development succession classes, however, the time to do so will be much longer than for the reforested portions of the analysis area. Figure 12 shows Succession Classes for a variety of time periods post-disturbance for the analysis area following implementation of the proposed action

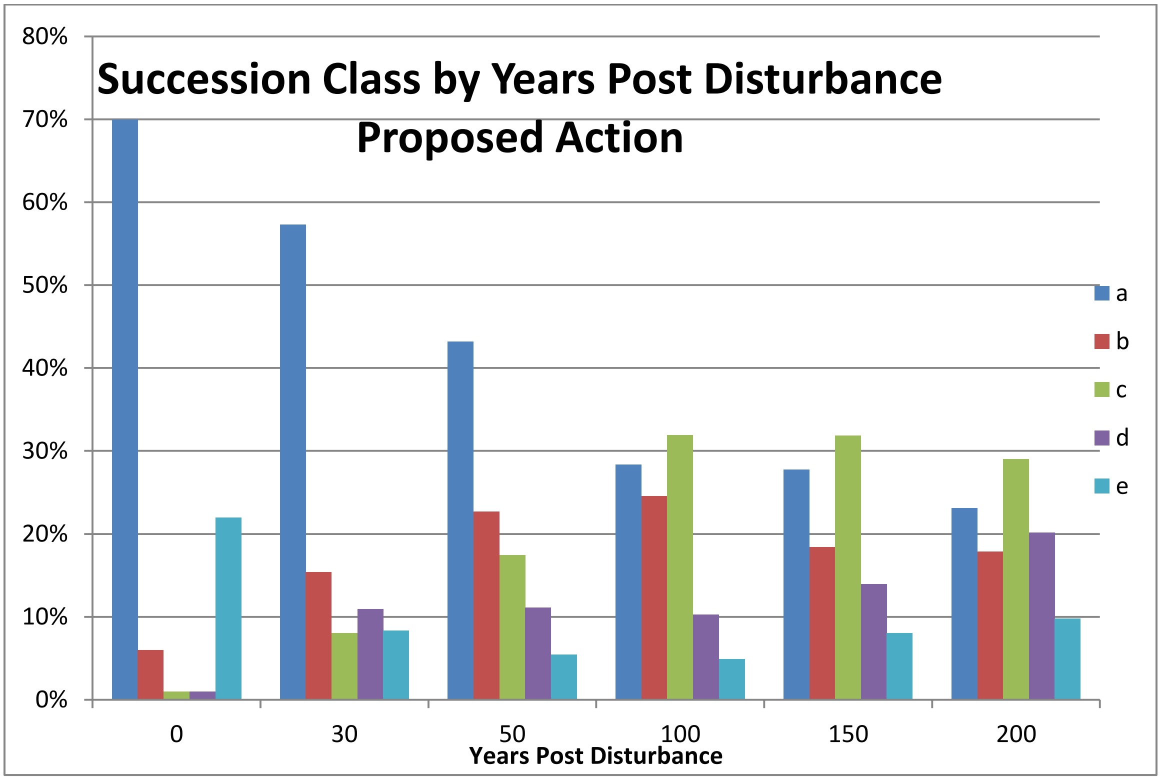

Figure 12. Succession Classes by Year Following Proposed Action

Desired Future Conditions

Desired future conditions will not be met over the analysis area for a period of a century or longer regardless of any action by the BLM due to the wildfire. However, due to the reforestation of harvested lands, the proposed action would allow for DFC to be reached faster than the no action alternative. Small, medium, and large forest conditions will be present at some quantity following disturbance. Table 12 shows succession classes by the number of years post-fire for the analysis area post implementation of the proposed action based on Vegetation Dynamics Development Tool (VDDT) modeling (LANDFIRE 1.1.0 Vegetation Dynamics Models 2013). Approximately 250 years would be required to reach the minimum 30% of the area in tree size large or old (succession classes D and E) to achieve DFC.

Table 12. Succession Class by Years Post Implementation of the Proposed Action

Tree Size	DFC %	Succession Class	Pre-fire condition %	Year 0 (%)	Year 30 (%)	Year 50 (%)	Year 100 (%)	Year 150 (%)	Year 200 (%)
Grass/ Forb/Shrub/ Seedlings	5-7	A	1	70	57	43	28	28	23
Saplings	3-7								
Small	5-21	B, C	25	7	23	40	56	50	47
Medium	23-36								
Large	20-80	D, E, UN	74	23	19	17	15	22	30
Old	10								

The number of snags would be reduced by salvage harvest. Based on the Cottonwood RMP, at least 3 snags per acre over 20 inches in diameter and 3 snags per acre between 10 inches and 20 inches in diameter will be retained across the harvested units. While these snags will decay over a period of approximately 50 years (based on FVS models), some new trees on replanted units will have grown large enough to meet the RMP definition of a small snags and will replace this class. However, it will take approximately 100 years for new trees to reach size requirements for large snags. Hence, the period of time between the snags no longer meeting the DFC criteria and trees becoming large enough to meet the criteria is approximately 50 years under the proposed action for areas harvested and reforested.

On lands not harvested as part of the proposed action, the large number of present snags within the Sheep Fire perimeter would eventually decay and fall as well sending snag numbers to zero over the next 50 years. Because the resultant stand would be much slower in reaching mature size, the time lag between the existing snags falling and regenerated trees achieving a size large enough to meet the requirements of a small snag will be much longer than in the reforested portions of the analysis area. It is estimated that no snags will be available within high severity portions of the Sheep Fire perimeter landscape between years 50 and 130 following fire in areas not harvest and reforested under the proposed action (and under the no action alternative).

<u>No New Temporary Road Construction Alternative</u>

Conditions following the no temporary road construction alternative would be largely the same as the proposed action, except rather than 30 percent of the analysis area being harvested and reforested in a short period of time, approximately 19% of the analysis area would be reforested as a result of the no temporary road construction alternative.

Existing Vegetation

The portion of the analysis area that would be planted under this alternative, approximately 19% would be comprised of conifer vegetation reflecting the species planted: Douglas-fir, ponderosa pine, and western larch. The remainder of the analysis area would be left to natural regeneration and would be dominated by grass, forbs, and shrubs for an extended period of time prior to conifers emerging as dominate. The species composition would reflect the seed source present in the vicinity as in the no action alternative.

Succession Classes

Approximately 19% of the analysis area will move on a succession track at a faster rate than the surrounding area. This area would move from Class A to Class B or Class C in 30 years or less as compared to the 80 to 110 years or more it may take the lands not planted.

Desired Future Conditions

The 19% of the analysis area that would be harvest and planted would achieve desired future conditions up to 80 years faster than the areas that were not planted. Table 13 shows the succession classes by year post implementation of the no temporary road alternative. These numbers favor later succession classes only slightly more than the no action alternative and very few classes at few time increments fall within the defined DFC percentages. It is anticipated that snag retention rates will be approximately the same as in the proposed action alternative.

Table 13. Succession Class by Years Post Implementation of the No New Temporary Road Alternative.

Tree Size	DFC %	Succession Class	Pre-fire condition %	Year 0 (%)	Year 30 (%)	Year 50 (%)	Year 100 (%)	Year 150 (%)	Year 200 (%)
Grass/ Forb/Shrub/ Seedlings	5-7	A	1%	70	62	48	31	30	25
Saplings	3-7								
Small	5-21	B, C	25%	7	19	36	54	48	45
Medium	23-36								
Large	20-80	D, E, UN	74%	23	19	17	16	22	31
Old	10								

<u>No Action</u>

Existing Vegetation

Forest vegetation under the no action alternative will remain in early-seral states for an extended period of time, up to 5 decades based on FVS and VDDT modeling. Vegetation composition in the long term will reflect the available seed sources in the area. Because much of the analysis area burned at a high enough intensity to kill seed trees, cones on the trees, and any seed already on the ground, much of the area will not be reforested naturally for many decades.

Composition of a regenerated forest will include a mixture of ponderosa pine, Douglas-fir, grand fir, western larch, Engelmann spruce, and lodgepole pine. It is anticipated that lodgepole pine will comprise a higher percentage of the species composition in the future due to the serotinous nature of the lodgepole pine cone. Serotinous cones require some amount of heat to release seeds and is generally a more fire tolerant cone making it more likely that a higher percentage of the 2012 lodgepole pine seed survived the fire and is available to regenerate. More surviving trees are found at higher elevations and thus it is likely that in areas within seed dispersal ranges of those areas the composition will mimic the current composition of the higher elevations—Engelmann spruce, grand fir, western larch, lodgepole pine, and Douglas-fir. Ponderosa pine will be very slow to regenerate due to the near 100% mortality of ponderosa pine trees at lower elevations and the shorter seed dispersal distance due to the larger seed of ponderosa pine.

In the short term the existing vegetation will be grass/forb/shrub dominated as succession takes its natural course. The resultant forest may take more than a century based on VDDT modeling to move from stand initiation, a stage characterized by active regeneration and readily available resources for tree growth, to stem exclusion, a stage in which available resources becomes limiting and trees compete with one another for those resources. Understory vegetation greatly decreases once stem exclusion is reached.

Succession Classes

Approximately 88 % of the analysis area was reset to succession class A. Under the no action alternative, the area currently in succession class A will persist in class A for a long period of time (100 years or more) while natural conifer regeneration competes with the grass, forbs, and shrubs that will quickly re-vegetate the analysis area. Eventually, the seedlings will become dominant and free to grow. At that time, the stand will begin to progress towards the mid development classes and eventually in several hundred years to the late development classes. Over time, natural disturbance patterns will diversify the succession classes found, accelerating some, reverting some back to earlier stages, and maintaining some where they are. Key drivers in succession path trajectories include: the time it takes to move out of class A to a mid-aged condition (determined primarily by competition and success of natural reforestation), and the period of time it takes to move from a mid-aged condition to a late aged condition (a deterministic time period of 150 years, depending on the biophysical setting, plus the probabilistic disturbances that may alter succession trajectories based on randomly occurring events within the VDDT model).

Figure 13 shows succession class percentages for several time periods based on natural regeneration only.

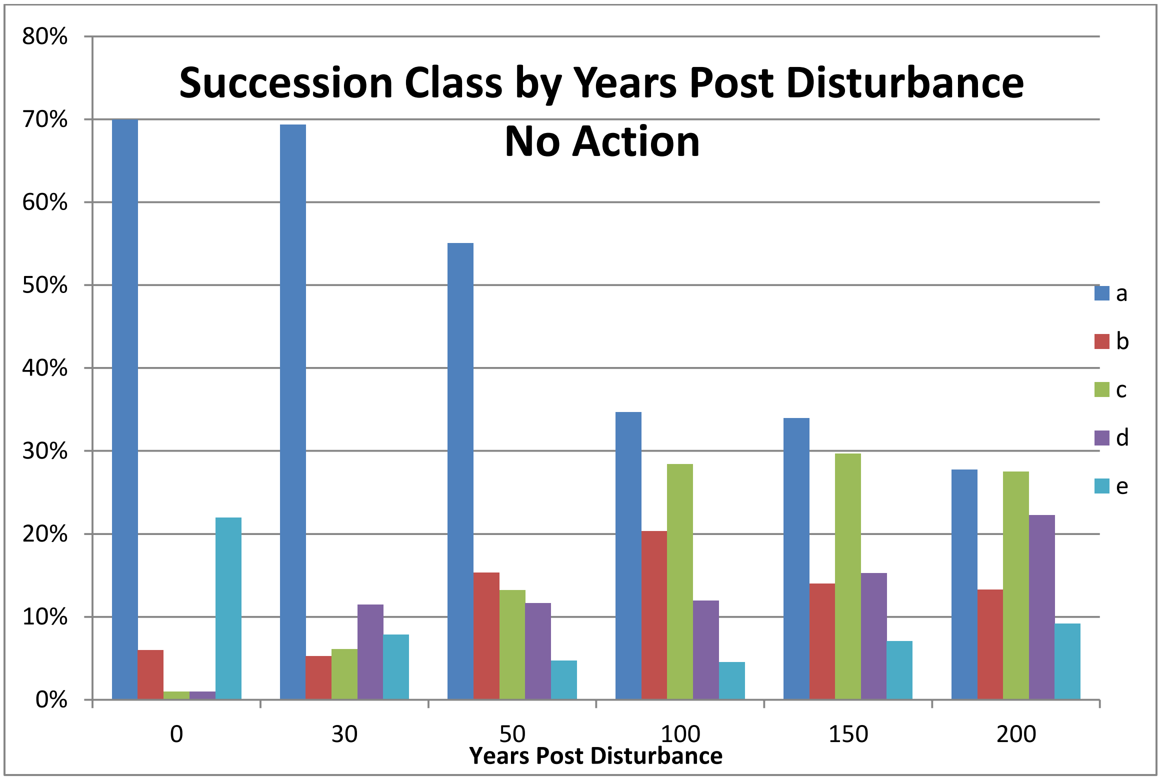

Figure 13. Succession Class Composition with Natural Regeneration

Desired Future Conditions

Current conditions would be greatly departed from the Desired Future Conditions for the analysis area for centuries under the no action alternative based on VDDT modeling. Natural regeneration would be allowed to take its course. VDDT models show that for 50 years a majority of the area would be in class A. At 200 years a backlog of acres is found in the mid-sized classes B and C, but not enough have grown to the large tree size classes (D and E) to meet DFC requirements there. VDDT suggests it may take 300 years or longer to satisfy having 30%-90% of the acres in succession classes D and E. Table 14 shows the DFC and succession class for period into the future.

Table 14. Succession Class Percent Composition Over Time-No Action Alternative

Tree Size	DFC %	Succession Class	Pre-fire condition %	Year 0 (%)	Year 30 (%)	Year 50 (%)	Year 100 (%)	Year 150 (%)	Year 200 (%)
Grass/ Forb/Shrub/ Seedlings	5-7	A	1%	70	69	55	35	34	28
Saplings	3-7								
Small	5-21	B, C	25%	7	11	29	49	44	41
Medium	23-36								
Large	20-80	D, E, UN	74%	23	19	16	17	22	32
Old	10								

There will be hundreds of snags per acre for a few decades. As these snags decay over time, snag numbers will decrease and eventually fall to near zero after burnt trees fall over a period of approximately 50 years. Replacement for these now dead snags will depend on natural regeneration growing to maturity. After the last snag falls, it may be decades or even centuries prior to trees having sufficient diameter to be considered a potential snag.

3.2.1.3 Cumulative Impacts

The cumulative effects study area (CESA) for forest vegetation is the Analysis Area described in section 3.1.3 that includes the 6th code HUC comprised of the John Day Creek Watershed and the Wet Gulch and unnamed tributary portions of the Cow Creek-Salmon River Face Watershed. In total this analysis area is approximately 18,217 acres. This cumulative effects analysis builds on the analysis above and uses the same indicators of existing vegetation, succession classes, and Desired Future Condition. LANDFIRE data takes past projects into account, so analysis that utilizes LANDFIRE data will concentrate on the present and reasonably foreseeable future actions. Present and reasonably foreseeable future actions that effect forest vegetation include salvage logging and reforestation on state and private land, 650 acres of reforestation on BLM land from the ESR project and 400 acres of hazard tree removal on forest service land with no associated reforestation efforts.

Existing Vegetation

Existing vegetation was altered on approximately 79% of the CESA. Approximately 60% of the CESA experienced high or moderate severity fire corresponding with high rates of mortality in overstory vegetation that greatly altered the vegetation going into the future. Future vegetation will largely depend on seed sources and how much of the area is replanted. The cumulative effects to forest vegetation of other past, present, and reasonably foreseeable future projects is primarily a result of planting. Harvest prior to the Sheep Fire has already been taken into account in LANDFIRE data for existing vegetation. Aside from salvage logging, no other present or reasonably foreseeable future projects are known within the analysis area. In general salvage logging efforts of state and private landowners are focusing on harvesting dead and dying trees, thus the existing overstory vegetation will not be greatly altered. However, replanting efforts will affect existing vegetation. Species composition, planting densities, and survival rates will be altered. Combined with the proposed action, approximately 19% of the CESA acres may be reforested, including 5% from the proposed action (4% from the No New Temporary Road Alternative), by one party or another. Planted species will likely be comprised primarily of ponderosa pine, Douglas-fir, and western larch although other species may be planted by other parties as minor components. Planting densities will vary, however 200-400 trees per acre could be expected.

Succession Classes

Following the Sheep Fire, approximately 63% of the analysis watershed is in a succession class A. These acres will generally follow one of two paths. They will either be planted and move in rapid succession to later stages, or they will be left to natural regeneration and the competition from other vegetation. The probability of remaining in a class A state for a longer period of time is higher for those acres naturally regenerated. VDDT models show a possible succession path over time in Figure 14. The VDDT model was run assuming 19% of the CESA is replanted (including known planned BLM, private, Forest Service and State plantings). This figure shows that succession class diversification occurs much more uniformly and rapidly than under any of the alternatives including the no action alternative. Tree mortality was highest in the area near BLM lands. When the entire analysis area is taken into consideration the initial post-fire succession classes are more diverse as are the succession classes at later points in time. Planting has the effect of increasing succession class diversity by more quickly promoting acres out of class A and into a later class. Approximately 1,600 acres within the CESA are anticipated to be replanted independently of this proposed project. The proposed action would bring the total to approximately 2,600 acres replanted while the No New Temporary Road Alternative being the total to approximately 2,300 acres. The more acres that are planted the more quickly conditions begin to approach a reference condition.

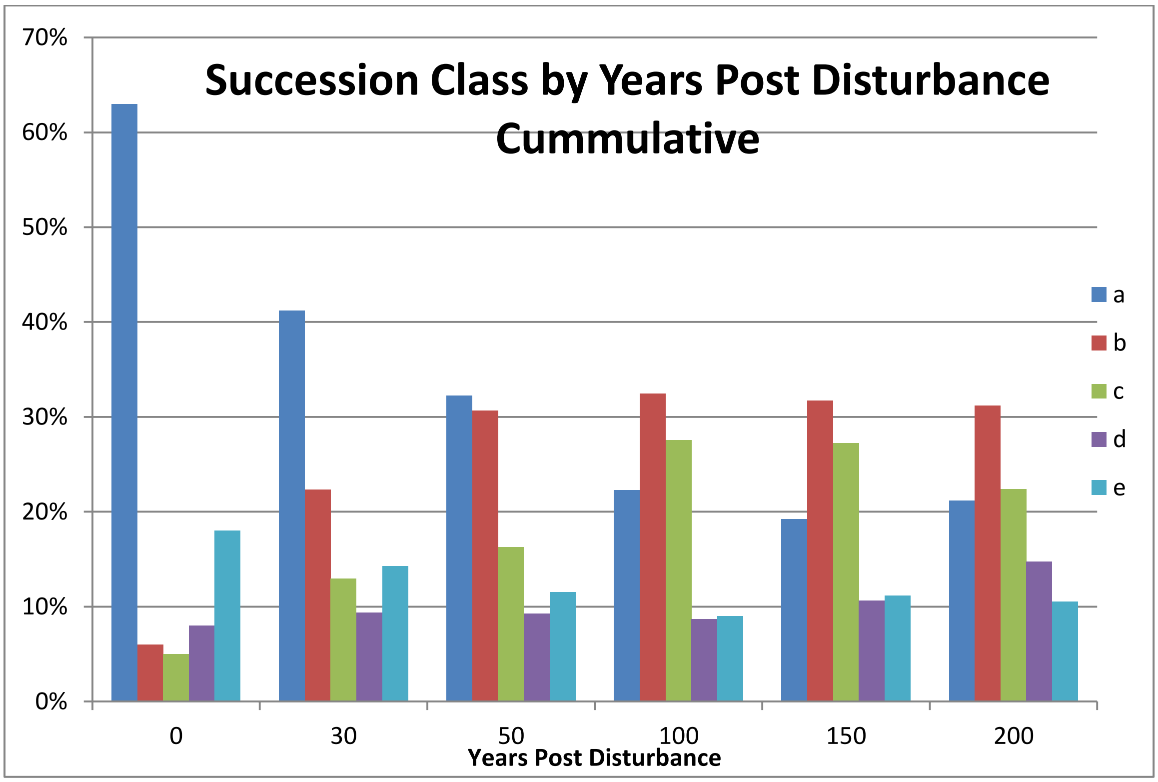

Figure 14. Succession Class by Years Post Fire for Cumulative Effects

Desired Future Condition

Table 15 shows the relation between succession classes and the BLM's DFC over time, including the effects of the proposed action. The No New Temporary Roads alternative would yield a similar table, however the percentages in Classes B, and C and classes D, E, and UN would each be a percentage or two lower especially for the first 100 years. Highlighted values are within the DFC for that particular size class. Compared to the analysis done for the 3,300-acre BLM land block, this figure shows more size class diversity as a result of less fire-related mortality on average, more acres of replanting post fire, and a more diverse pre-fire condition.

Table 15. Succession Classes over time based on DFC for cumulative watershed

<table>
<tr><th>Tree Size</th><th>BLM DFC %</th><th>Succession Class</th><th>Pre-fire condition %</th><th>Year 0 (%)</th><th>Year 30 (%)</th><th>Year 50 (%)</th><th>Year 100 (%)</th><th>Year 150 (%)</th><th>Year 200 (%)</th></tr>
<tr><td>Grass/ Forb/Shrub/ Seedlings</td><td>5-7</td><td rowspan="2">A</td><td rowspan="2">9</td><td rowspan="2">63</td><td rowspan="2">41</td><td rowspan="2">32</td><td rowspan="2">22</td><td rowspan="2">19</td><td rowspan="2">21</td></tr>
<tr><td>Saplings</td><td>3-7</td></tr>
<tr><td>Small</td><td>5-21</td><td rowspan="2">B, C</td><td rowspan="2">24</td><td rowspan="2">11</td><td rowspan="2">35</td><td rowspan="2">47</td><td rowspan="2">60</td><td rowspan="2">59</td><td rowspan="2">54</td></tr>
<tr><td>Medium</td><td>23-36</td></tr>
<tr><td>Large</td><td>20-80</td><td rowspan="2">D, E, UN</td><td rowspan="2">67</td><td rowspan="2">26</td><td rowspan="2">24</td><td rowspan="2">21</td><td rowspan="2">18</td><td rowspan="2">22</td><td rowspan="2">25</td></tr>
<tr><td>Old</td><td>10</td></tr>
</table>

Cumulatively the proposed action does not contribute to adverse effects of past, present and reasonably foreseeable future actions, and in fact may be slightly positive due to the increased acres of tree planting and the more diverse succession classes that result into the future.

3.2.2 Soils

The analysis area for direct, indirect and cumulative effects on soil resources encompasses all lands within individual treatment areas. The project area is located within the Lower Salmon River subbasin. Land outside of the analysis area described above is not considered for soil impacts because direct and indirect effects to soils are site-specific. From a geomorphic standpoint, the broader project area was considered for the Affected Environment to include analysis of landtypes and potential for mass wasting. Direct effects on soils from proposed activities were estimated by analyzing the effects of compaction, erosion and displacement on the soil surface that is the most productive layer and also the easiest to disturb through activities (Rone 2011). To determine whether proposed activities would detrimentally impact or have cumulative effects on soils, the potential disturbed acres are calculated by multiplying activity area size by coefficients that are based on soil monitoring data.

3.2.2.1 Affected Environment

Dominant Features and Processes

The following soil resource overview is incorporated from the John Day Creek Watershed Analysis (USDI-BLM, 1999). In areas of similar landtypes, the general descriptions of erosional processes would also apply to the other watersheds within the project area, as the geology, soils, drainage patterns and climate are similar.

Soils on gentle slopes and north aspects in the watershed have surface layers of mixed volcanic ash and loess. This material holds water and nutrients better than most residual geologic materials. It is susceptible to compaction but generally has a high infiltration capacity.

The surface soil of steep south-facing aspects and substratum of all the soils is derived from local geologic material. Basalt, andesite, and limestone, which are dominant in the lower elevation, western part of the watershed, weather into relatively fine textured, productive soils**.** The limestone soils are alkaline, and support some plant species unique to that substrate. The granite, gneiss, and schist of the upper, eastern portion of the watershed weather into coarser textured, less productive soils. Small areas of glacial till and alluvial soils also occur. The alluvial soils may be poorly drained, have high organic matter content and productivity, and support unique plant communities.

Erosion is a natural process which provides sediment to streams and helps form the landscape. Ongoing, gradual processes include geologic weathering and normal channel adjustments which produce sediment in low rates over long periods of time. Episodic processes include mass wasting events which produce large magnitudes of sediment over short time frames, recurring at infrequent intervals (Swanson et al. 1982). These are often triggered by very high precipitation events which create a failure plane (Swanston 1974). Surface water erosion, including sheet, rill, and gully erosion, generally corresponds directly to intensity of rainfall or snow melt events (Megahan et al. 1978). Soil erosion from wind, gravity (ravelling and soil creep), or mechanical actions such as use of equipment or animal traffic can also occur.

All of these processes occur in the John Day Creek watershed, though wind erosion is very negligible. The dominant natural process in the watershed is mass wasting from landslides and debris torrents (USDI-BLM, 1999).

The relative hazard of mass wasting and surface erosion is determined by a combination of surface geology, slope, vegetation type, soil characteristics, geomorphic processes, climatic events, and the disturbance regime. The John Day Creek watershed areas where high rates of natural mass wasting have occurred are generally steep concave slopes that have unstable geology. These breakland landtypes are scattered throughout the watershed. Several large ancient landslides are evident in the watershed.

Soil erosion and mass wasting have both on-site and off-site impacts. On-site impacts include loss of long-term productivity, organic matter, nutrients, and soil biological community activity; lower infiltration rates; more rapid runoff; and lower water holding capability. Off-site impacts include increased stream sedimentation, increased peak flows, and less water storage capacity in the watershed. The percentage of eroded material reaching the stream systems depends upon the slope, drainage density, size of mass wasting events, intensity of climatic event, and pattern of disturbance. The areas with the steepest slopes, highest drainage density, and stacked roads on lower portions of slopes deliver the most sediment to streams. Within the John Day Creek watershed, the East Fork, and to a lesser extent the Middle Fork, have experienced the highest percentage of eroded material entering the stream systems (USDI-BLM, 1999).

Analysis Methods Used for Determining Current Conditions

Landtypes and hazard ratings (Table 16) were gathered from landtype descriptions and characteristics described in the Soil Survey of Nez Perce National Forest Area (USDA, 1989). This provides relevant information regarding erosion processes, potential hazards, specific management concerns, and mitigation. This soil survey also contains information on the “limitations of lower soil layers for road construction and maintenance and landform properties affecting the hazards of sediment for roads (USDA, 1989)”. This landtype information was supplemented with an analysis of current conditions in the project area. Soil resource existing conditions (post- 2012 wildfire) were determined from the 2012 Burned Area Report (BAR), as well as past records, GIS data, and communication with other field personnel.

Landtype and soil descriptions provide useful information at the mapping unit scale. Information on inherent management limitations for example is used to aid in initial project layout. It is recognized that within a landtype mapping unit there may be variation of slope, soil type, rock outcrops, landslides, etc. that are too small to be accurately represented; these variations are best determined by onsite evaluation. For example, natural bench areas of gentler slopes (which can provide stable temporary road locations) are often too small to be accurately represented on a 7.5-minute topographic map, particularly in forested areas. Similarly, on the ground inspection helps identify localized indicators of slope instability, including jack-strawed trees, hummocky terrain, slumps, springs (and other areas to avoid) that may not be included at the scale of the landtype map. All proposed harvest units and temporary road locations were field verified and analyzed at a site–specific level. Springs and known landslides were also noted and mapped and are shown on Figure 15.

The watershed management concerns in the table below are for pre-fire conditions and may be appropriate for unburned and low burn severity areas. However, it may be expected that due to removal of ground cover by the wildfire, erosion hazards in high and moderate severity burn areas would have high hazards of erosion for at least 1 – 3 years, which is dependent on rates of natural re-vegetation.

Table 16. Project Area Landtype/Soil Units

Detailed Soil Map Unit*	Landform	Slope %	Parent Material ________ Representative profile	aspect	Watershed/ management concerns (unburned)*
31C3F	Dissected mountain slopes, moist	25-45	Andesite and basalt ________ Gravelly loams w/ 35-60 % rock fragments, overlying fractured bedrock at 40-60 inches	northerly	Logging skid trails, line skidding corridors, and firelines have moderate hazards of erosion. The material exposed by road construction has a slight hazard of erosion. Water storage capacity in fractured bedrock is high, and runoff is rare. Depth to water table > 80 inches
31D38	Dissected Mountain slopes	45-60	Granitics ________ Gravelly sandy loam w/ 0-50 % rock fragments, overlying fractured bedrock at 40-60 inches	all	Line skidding corridors and firelines have moderate hazards of erosion on southerly aspects and slight hazards of erosion on northerly aspects. The material exposed by road construction has moderate hazards of erosion. Seeps and springs are common on lower slopes.
32CHP	Moderately Steep mountain slopes	30-45	Andesite and basalt ________ Gravelly silt loams w/ 35-60 % rock fragments, overlying fractured bedrock at 40-60 inches	northerly	Logging skid trails, line skidding corridors, and firelines have moderate hazards of erosion. The material exposed by road construction has a slight hazard of erosion. Water storage capacity in fractured bedrock is high, and runoff is rare. Depth to water table > 80 inches

Detailed Soil Map Unit*	Landform	Slope %	Parent Material ________ Representative profile	aspect	Watershed/ management concerns (unburned)*
61E38	Stream breaklands	60-90	Granitics ________ Extremely gravelly sand 0-35% rock fragments	all	Line skidding corridors and firelines have moderate hazards of erosion. The material exposed by road construction has severe hazards of surface erosion.
61EH7	Dissected stream breaklands	60-80	Granitics ________ Extremely gravelly sand 0-35% rock fragments	all	Line skidding corridors and firelines have moderate hazards of erosion. The material exposed by road construction has severe hazards of surface erosion.
50EUU	Very steep landslide deposits	45-80	Well weathered rocks ________ Gravelly loam	all	This map unit is on very steep landslide deposits. Sag ponds or wet depressions are where drainage way channels have been blocked by landslides. The regolith water storage capacity is high and runoff is rare. Erosion hazard should be evaluated on site. Road construction may cause landslides.
50CUU	Moderately steep landslide deposits	25-80	Well weathered rocks ________ Very gravelly loam	all	This map unit is on moderately steep landslide deposits. Sag ponds are where the drainageway system has been blocked by landslides. The regolith water storage capacity is high and runoff is rare. Erosion hazards should be evaluated on site. Road construction may cause landslides; evaluating slope stability on site is recommended.

Detailed Soil Map Unit*	Landform	Slope %	Parent Material ________ Representative profile	aspect	Watershed/ management concerns (unburned)*
32 CHP	Moderately steep, convex mountain slopes	30-45	Andesite and basalt __________ Gravelly silt loam overlying fractured bedrock at 40 inches	all	Line skidding corridors, logging skid trails, and firelines have moderate hazards of erosion. The material exposed by road construction has slight hazards of erosion. A moderate percentage of roads constructed in this map unit are close enough to drainageway channels to be a source of sediment.
31D3F	Steep dissected Mountain slopes	45-60	Basalt ________ 35-60 percent rock fragments Gravelly slit loam Bedrock is within 20-40 inches	all	Line skidding corridors and firelines have moderate hazards of erosion.

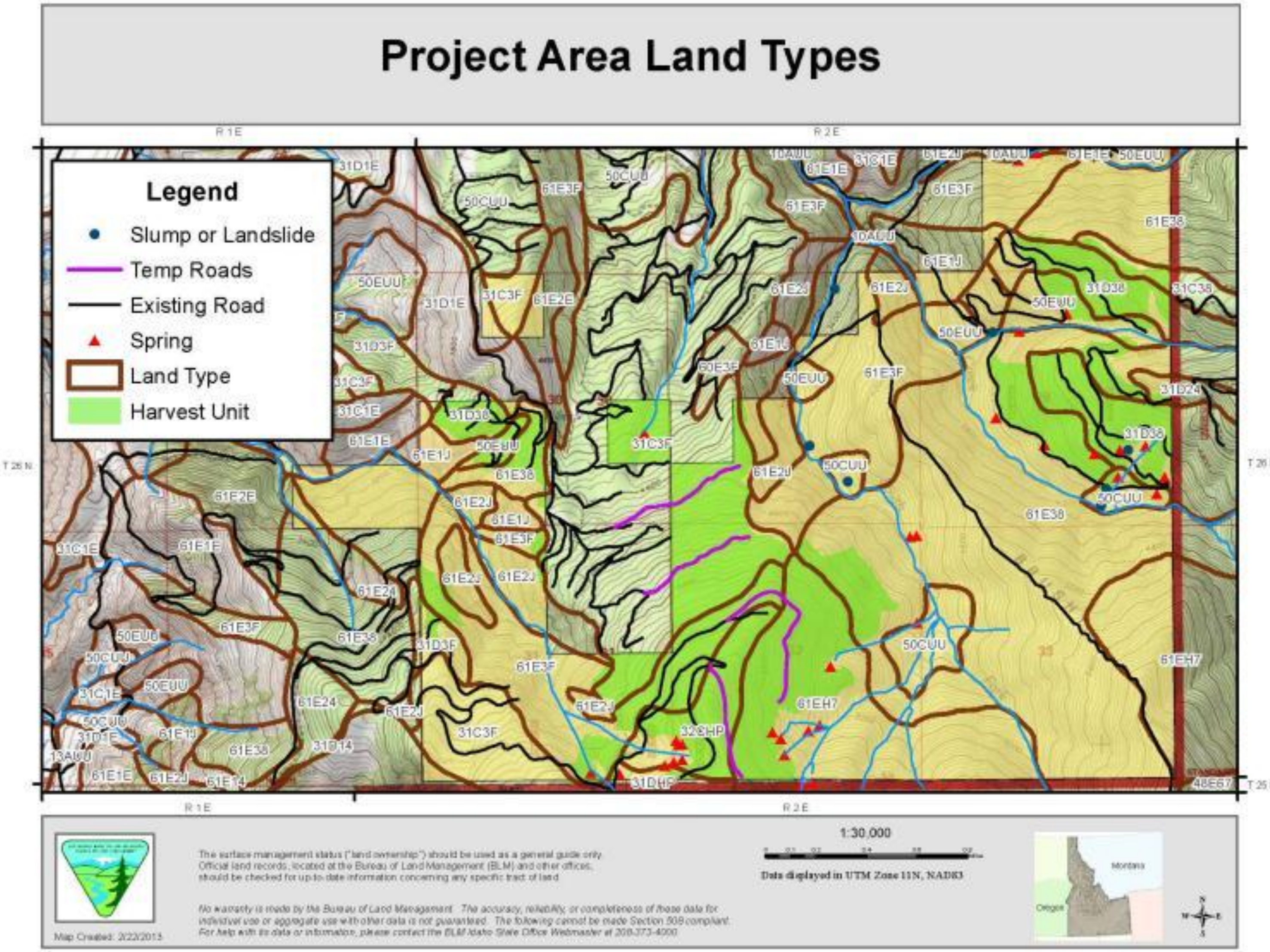

Figure 15. Project Area Landtypes, Springs, and Known Previous Landslides or Slumps

Soil productivity is the inherent capacity of a soil to support the growth of specified plants, plant communities, or a sequence of plant communities (USDA-NRCS, 1989). In order to estimate soil impacts and their effects to site productivity the distribution, duration, extent, and degree of disturbance is considered.

Disturbed Soil within Salvage Areas

Soil impacts are defined as the proportion of an activity area that may be subjected to displacement, compaction, rutting, erosion, or severe burning due to a particular management activity (such as harvest or fuels treatment), exclusive of dedicated resources (such as system roads). The soils in an activity area (harvest unit) are considered disturbed when displacement, compaction and loss of productivity exist as a result of forest practices/ forest operations (This would not include the large-scale disturbance impacts from the wildfire).

Soil compaction and displacement

Soils in the project area generally have surface layers formed in volcanic ash-influenced loess derived from the eruption of Mt. Mazama, and are easy to compact or displace at any moisture content (Page-Dumroese 1993). Soil response to disturbance depends not only on soil type, but topographic setting and slope hydrology. Landforms have characteristic slope shape, steepness, and stream dissection, which affect erosion and sediment delivery to streams.

Resistance to compaction

Resistance to compaction is a property that varies considerably between soil types. As described in the NRCS soil survey for the project area (USDA-NRCS, 1989), the resistance to compaction is predominantly influenced by moisture content, depth to saturation, percent of sand, silt, and clay, soil structure, organic matter content, and content of coarse fragments. "High and moderate resistance ratings" indicate that the soil has features that are favorable to resisting compaction. "Low resistance" indicates that the soil has one or more features that favor the formation of a compacted layer.

The areas of the proposed temporary roads and all harvest units have a "moderate" rating for resistance to compaction. This is primarily due to the large content of rock fragments.

Susceptibility to fire damage

The "susceptibility to fire damage" ratings represent the relative risk of creating a water repellant layer, volatilization of essential soil nutrients, destruction of soil biological activity, and vulnerability to water and wind erosion prior to reestablishing adequate watershed cover on the burned site. The ratings are directly related to burn severity (e.g. a low-moderate burn will not result in water repellant layer formation). Sandy soils are more susceptible to formation of a water repellant layer. High rock fragment content increases the rate of heat transfer to the soil. Steep slopes increase the vulnerability to water erosion. Susceptibility to formation of hydrophobic or water repellant layers varies by vegetation type. Hot, dry-south facing slopes are more susceptible to fire damage than cooler, north-facing slopes (USDA-NRCS, 1989). The soils within the project area are all mapped as having a "highly susceptible" rating for fire damage. This is primarily due to the large content of rock fragments, which contribute to heating of the soil and the high potential for erosion by water following a high burn severity.

Mass Wasting – Landslides

Mass wasting (e.g., a landslide), a category of natural landscape processes, occurs when large masses of soil are rapidly displaced downslope (Megahan and King, 2004). Landslides are episodic events and may be associated with rain-on-snow events, such as the January 1997 storm that caused many landslides in the Little Salmon River subbasin. Landslides can also result in on-site loss of soil productivity, as surface soils are translocated down slope.

Mass wasting in the general project area includes slumps, creep, debris avalanches or flows, and debris torrents.

Several examples of mass wasting events within the John Day Creek watershed include the following: Catastrophic debris torrents originating from roads in the East Fork of John Day Creek occurred during May 1995. These debris torrents resulted in extreme sediment loads in the East Fork John Day Creek and John Day Creek, and flowed into the Salmon River. The East Fork John Day Creek also experienced extreme stream channel and bank scouring and flushed out the majority of instream large organic debris. In 1982 a road caused slump/landslide (stream mile 1.60) located on BLM lands contributed sediment and debris to the Middle Fork John Day Creek and John Day Creek. Because of the potential for additional road failures within the drainage, the FS and BLM initiated road rehabilitation actions (1997-1998) on roads which had highest potential for failures. The most recent major event was spring 2009, which included a debris torrent and severe channel scouring of the lower portion of South Fork John Day Creek.

Natural soil-mass-movements on forested slopes in the Western United States can be divided into two major groups of closely related landslides (Megahan and King, 2004). The landslides of most importance include (1) debris slides, debris avalanches, debris flows, and debris torrents; and followed by (2) creep, slumps, and earth flows. Each type requires the presence of steep slopes, frequently in excess of the angle of soil stability (Megahan and King 2004). All characteristically occur under high soil moisture conditions and usually develop or are accelerated during periods of abnormally high rainfall. Further, all are encouraged or accelerated by destruction of the natural mechanical support on the slopes.

The 2012 Sheep Creek fire had substantial effects on vegetative cover and future root strength (natural decay is estimated at 5-7 years following mortality (Megahan and King, 2004.) in the project area. Refer to Figure 16 for map of activities and burn severity for the Proposed Action and refer to Figure 17 for map of activities and burn severity for the

No Temporary Road Alternative. In the summary of analysis, Part V of the Sheep Fire Burned Area Report (USDA-Forest Service 2012) the authors concluded "fire effects, modest snowmelt and rain events are likely to cause extensive erosion and mass movement on steep hillslopes throughout the burned area. Additionally, reduced canopy interception, combined with lack of groundcover and hydrophobicity will cause increased runoff response compared to pre-fire conditions."

Timber harvest, fuel treatments, and roads occurring on steeper slopes, may contribute at varying levels to initiation and acceleration of soil mass movements. Vegetation treatments contribute to mass wasting occurrences through: (1) destruction of roots, the natural mechanical support of slope soils, (2) disruption of surface vegetation cover which alters soil water distribution, and (3) road building or existing roads causing slope failures resulting largely from slope loading (from road fill and side-casting), over-steepened bank cuts, and inadequate provision for road drainage (Chatwin et al. 1994).

3.2.2.2 Direct and Indirect Effects of Alternatives

Methods, Assumptions, and Limitations

Effects on soils from proposed activities were estimated by analyzing compaction, erosion potential and displacement on the soil surface that is the most productive layer and also the easiest to disturb through activities. To determine what impacts proposed activities would on soils, the potential disturbed acres are calculated by multiplying activity area size by coefficients that are based on soil monitoring data.

The coefficients for estimating soil impacts are averages derived from monitoring data and information that is summarized in the IPNF Soil NEPA Analysis Process (Niehoff 2002). (See Table 17 soil disturbance).

Soil texture, amount of organic matter and ground cover, soil response to past projects, and the intensity of past projects are variable and difficult to estimate. Information contained in the soil survey has potential limitations because some of the mapped soil units contain inclusions of dissimilar soil types and possible localized hazards which are not depicted on the map. Thus, the exact location of all areas containing sensitive soils (for example wetlands or slumps) may not be complete or entirely displayed on analysis maps. Some of these areas have already been excluded based on field visits and observations. Additional removal of localized areas is likely (see environmental design measures, section 2.2.9) so that the numbers displayed in this analysis are considered an overestimate.

Design features to protect soil and site productivity would be implemented as part of the action alternatives. The effects of the action alternatives on the soil resource were assessed based on their potential to create adverse impacts and to affect long-term soil productivity. The temporal scales can be defined as long and short-term. For this evaluation, short-term effects are those that occur approximately within the first 10 years following proposed management activities; long-term effects are those that extend beyond 10 years (Rone, 2011). Table 17 shows an estimate of potential soil disturbance by alternatives.

<u>Proposed Action</u>

Disturbed Soil, Soil Compaction, and Displacement

The effects of the action alternatives on the soil resource were assessed based on their potential to create adverse soil impacts and to affect long-term productivity. Table 17 shows an estimate of potential soil disturbance by Alternatives. Soil compaction effects can last for decades but can improve. Recovery processes vary greatly with soil texture, clay content, rock content and their interaction with climatic processes such as freezing-thawing and wetting-drying (Dykstra and Curran 2002). Soil displacement that mixes or removes the ash surface layer, however, reduces soil moisture holding capacity and associated productivity (Rone, 2011).

Figure 15 shows landtypes (detailed soil map units), proposed harvest treatment units and temporary roads, together with known landslides and springs in the project area.
Under the Proposed Action, 2.28 miles of temporary road are proposed for construction to facilitate vegetation treatments. The majority of the temporary road construction occurs in the upper slope or is near ridge tops. No temporary road construction would occur within RCAs. Limited roadwork would occur on landtypes with "high" mass failure potential confined to existing roads that are stable.

Referring to Figure 15, one proposed temporary road segment (near the center of Section 32) is located on landtype unit 61EH7, dissected stream breaklands. As described in the soil survey (USDA-FS, 1989) "this landtype has narrow ridges, straight to slightly concave side slopes and shallow V-shaped draw bottoms. The dominant slopes have gradients of 60-80 percent." The John Day Watershed Assessment (USDI-BLM 1999) contains several maps developed from landtype associations, which are composites of finer scale landtypes, including one labeled "high mass wasting and debris torrent hazard areas." Within this broad map unit there are smaller scale, unmapped areas with slopes significantly less than 60 percent and side slopes that are more convex in shape, both factors lowering the mass wasting hazard. The proposed temp road alignment is one such case, as verified by on the ground inspection. Average slope gradient is about 40 percent or less and the proposed temporary road is located high enough on the slope to avoid any concave draws and to minimize upslope contributing drainage area.

Design features to reduce the risk of concentrating runoff from the road onto the slope below would include out-sloping and construction of a slash filter windrow. Upon completion of timber harvest in year one, the road would be fully re-contoured as described in the EA design features. All road construction would follow BMPs and design features described in Section 2.1.9 of this document.

The newly constructed temporary roads would only slightly increase road densities for approximately 2-4 years until they are obliterated. The temporary roads would contribute high natural resource management value with limited adverse risk by allowing temporary access to re-plant areas following timber harvest.

Temporary roads may contribute to an increased potential of surface erosion per acre of ground disturbance in the short term (typically until 1-3 years after the road is obliterated), but erosion potential would decline to negligible levels after road decommissioning. This alternative may have the highest impact on soils of the action alternatives, due to the higher acreage of harvest and the 2.28 miles of temporary road construction. Referring to the soil disturbance Table 17 above, there are more acres of harvest on high and moderate severity burn (with consequent reduction in ground cover and soil protection) under the proposed action than under the No Temp Roads Alternative.

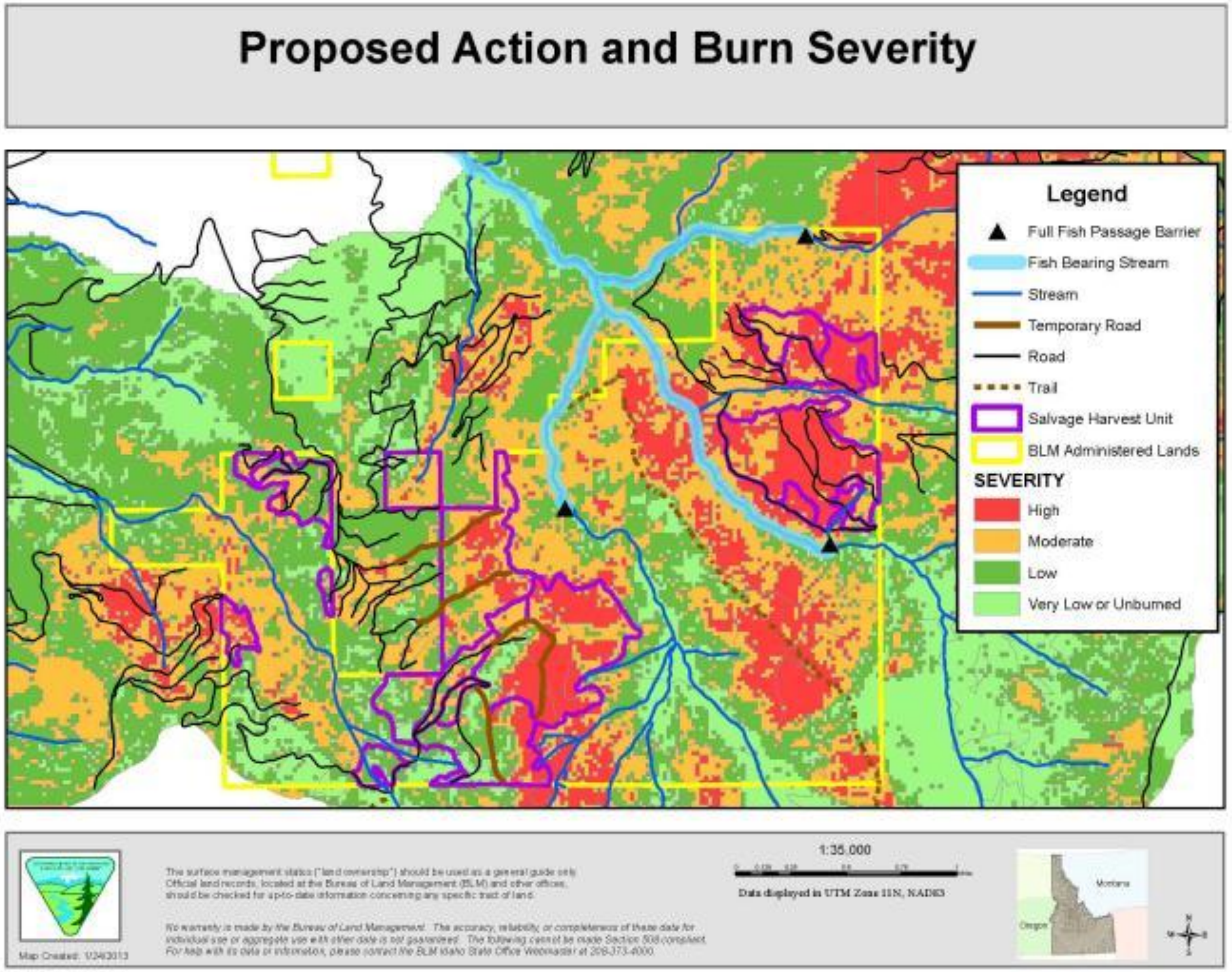

Figure 16. Proposed Action Burn Severity Map

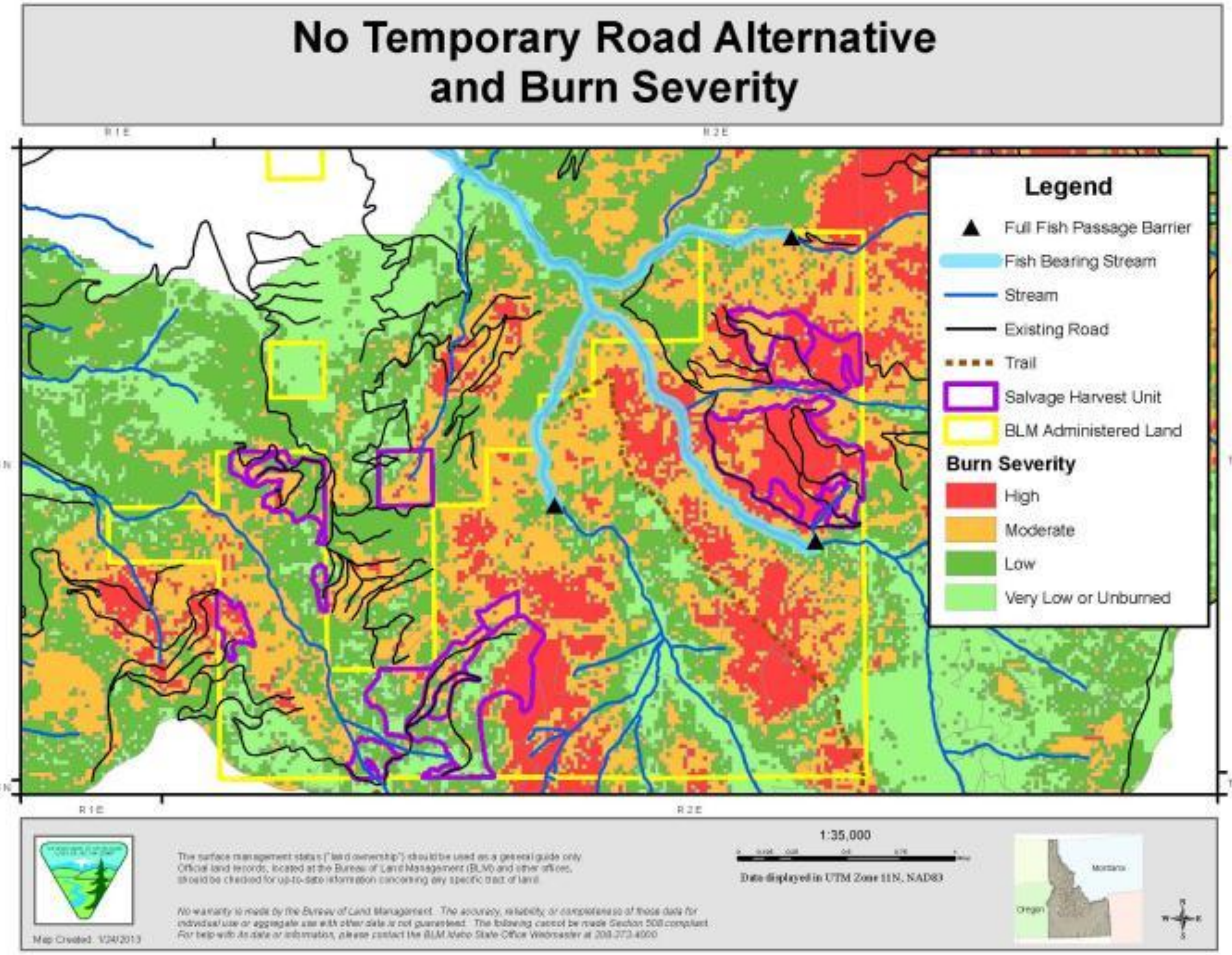

Figure 17. No Temporary Roads Alternative Burn Severity Map

Table 17. Comparison of Estimated Soil Disturbance by Alternative (note that acres of disturbance is weighted by type of logging system Tractor = 13%, cable = 2%, temp roads are added separately)

Unit	Activity Area Acres* (acres <u>not</u> in no temporary road alt. in parenthesis)*	Proposed Logging System	Temp road associated with harvest units (lineal feet)	Harvest Unit Burn Severity (acres)		Potential Soil Disturbance from Proposed Activities[#]			
						Proposed Action		No Temp Roads Alternative	
				Moderate	High	soil disturbance coefficient (%)	Disturbed Acres by harvest unit	Soil disturbance coefficient(%)	Dist. acres by harvest unit
1	40	T	-	25	2	13	5.2	13	5.2
2-A	10	T	-	6	0	13	1.3	13	1.3
2-B	6	SC	-	3	0	2	0.1	2	0.1
2-C	44	T	-	19	1	13	5.7	13	5.7
2-D	6	T	-	2	0	13	0.7	13	0.7
4	18	T	-	9	8	13	2.3	13	2.3
5-A-1	39	C	-	8	1	2	0.8	2	0.8
5-A-2	25	SC	-	13	2	2	0.5	2	0.5
5-A-3	12 (0)*	C	1056	10 (0)*	1 (0)*	9	1.1	-	-
5-B-1	3	C	-	0	0	2	0.1	2	.01
5-B-2	10	SC	-	4	1	2	0.2	2	0.2
5-B-3	115	T	-	18	28	13	15.0	13	15.0
5-C-1	120 (0)*	T	2745	65 (0)*	32 (0)*	15	17.8	-	-
5-C-2	15 (0)*	SC	3010	10 (0)*	2 (0)*	18	2.7	-	-
5-Y	18	C	-	2	0	2	0.4	2	0.4
5-Z	175 (0)*	C	5279	49 (0)*	107 (0)*	4	7.7	-	-
8-A	154	T	-	40	110	13	20.0	13	20.1
8-B-1	10	SC	-	1	9	2	0.2	2	0.2
8-B-2	4	SC	-	2	0	2	0.1	2	0.1
8-C	3	SC	-	1	2	2	0.1	2	0.1
9-A	36	C	-	20	15	2	0.7	2	0.7
9-B	53	T	-	9	44	13	6.9	13	6.9
Total Acres	**Proposed action- 916 ac** **No temp road alt- 606 ac**		2.28 miles (12,090 ft.)	Proposed action- 316 ac No temp road alt- 182 ac	Proposed action- 364ac No temp road alt- 223		**<u>Disturbed Ac.= 93</u>** Total percent of 916 activity acres **10.1%**		**<u>Dist Ac.= 64.0</u>** Total percent of 606 activity acres **10.6%**

Logging systems: T-Tractor, SC-short cable, C-skyline

Mass Erosion

All ground-based harvest treatments and temporary road construction would be avoided on high landslide hazard (i.e., landslide prone) areas. Where needed, actions occurring within moderate risk areas will have design features applied to minimize or avoid risks, such as identifying slope instability and adjusting buffers as necessary to avoid unstable areas. Site inspections will verify any need for additional protection measures to avoid or minimize potential for adverse effects attributed to mass wasting.

This alternative has a slightly higher risk of causing mass erosion when compared to the No New Temporary Road Construction Alternative. Although there is no temporary road construction or ground-based harvest occurring on high landslide prone areas in the proposed action, there are more overall acres of cable-yarding on steep, moderate to high burn severity slopes , as well as 2.28 miles of temporary road on low to moderate mass failure hazard areas associated with the proposed alternative. Design measures and mitigation are expected to effectively minimize risk of mass erosion in both action alternatives; however, the No Temp Road Construction alternative avoids road construction altogether and would have a slightly lower risk of channelizing runoff in cable-yarding corridors (as described in the paragraph below) due to the reduced acreage involved.

Harvest operations with cable yarding systems would be accomplished with full suspension or partial suspension where possible. By utilizing full suspension and/or partial suspension, potential soil disturbance and potential adverse changes to surface runoff and sheet flow drainage from cable yarding corridors are greatly reduced. Together these practices will help maintain natural slope drainage. In addition, as described in the Environmental Design Features (Section 2.1.9), several measures will be implemented specifically to mitigate potential gullying or other potential increases in soil erosion resulting from cable yarding. These measures include yarding at a cross-slope angle where possible to prevent vertical corridors. Also, as needed, slash will be placed in corridors to minimize concentration and channeling of runoff.

The Proposed Action and the No New Temporary Road Construction Alternative would include the potential to stabilize local mass erosion sites on 4.76 miles of road to be decommissioned.

Effects from temporary road construction are considered short-term, though sediment yield will typically drop substantially after one year as cutslopes and fillslopes revegetate. Similarly, temporary roads will have a short-term impact of 2-5 years after obliteration due to vegetative recovery. There would be 93 acres of detrimental soil disturbance associated with the proposed action. This accounts for about a 10 percent increase over the existing (post-fire) baseline conditions for the 916 project acres.

No New Temporary Road Construction Alternative

Disturbed Soil, Soil Compaction, and Displacement

The soil disturbance effects from the No Temporary Roads Alternative would be less than those described above for the Proposed Action alternative. Under this alternative there would be no sediment increase from temporary road construction, and overall less soil disturbance from harvesting: approximately 63 acres of disturbance in the no new temporary road construction alternative compared to 93 acres of disturbance under the proposed action. (see Table 18).

Under this alternative, there is less soil disturbance and as shown in Table 18 “Soil Effects”. Unit 5-Z would not be harvested, reducing the potential for erosion from relatively long cable corridors. There would be no additional potential short-term surface erosion from the construction of 2.28 miles of temporary road.

Mass Erosion

This alternative has a lower risk of mass wasting than the Preferred Alternative. It has less acres of cable logging on high hazard areas and no temporary road construction. The No Temp Road Construction alternative avoids road construction altogether and would have a slightly lower risk of channelizing runoff in cable-yarding corridors (as described in the paragraph below) due to the reduced acreage involved.

No Action Alternative

Disturbed Soil, Soil Compaction, and Displacement

Under this alternative, none of the management activities proposed in the project would be implemented. No vegetation management actions (salvage timber harvest, tree planting) road use and maintenance, and road rehabilitation would occur. Watershed restoration actions identified in the BLM *Sheep Fire Emergency Stabilization and Rehabilitation Plan* (ESR Plan) (USDI-BLM 2012) would occur.

No soil compaction or displacement would occur as a consequence of temporary road construction or timber harvest. Existing soil compaction and displacement would persist with natural recovery of surface layers of compacted soils.

Fire effects, modest snowmelt and rain events are likely to cause extensive erosion and mass movement on steep hillslopes throughout the burned area. Additionally, reduced canopy interception, combined with lack of groundcover and hydrophobicity will cause increased runoff response compared to pre-fire conditions (USDA Forest Service 2012).

Fire induced surface erosion processes would continue with slight abatement as slow natural vegetation recovery occurs. No new management sources of surface or substratum erosion would occur.

Mass Erosion

Under the No Action alternative, mass erosion processes would remain a factor in soil processes in the project area. Mass erosion from natural causes, including the 2012 wildfire, would be expected to continue at a base-line scale and rate. These processes would likely increase in 4-10 years as roots from fire-killed trees decay.

Table 18. Summary Comparison of Soil Effects by Alternative

	Proposed Action	**No Temporary Roads Construction Alternative**	**No Action Alternative**
Soils (Acres of total Compaction or Displacement)	93 acres	64 acres	0 acres
Estimated acres of soil disturbance from harvest and temp road construction	Higher impact on soil productivity and surface erosion due to increased acreage of harvest and temp road construction. Natural recovery of surface layers of existing compacted soils would continue	Lower impact to soil productivity and erosion due to reduced acreage of harvest and no temporary road construction. Natural recovery of surface layers of existing compacted soils would continue	2012 wildfire and previous road building, development, tractor logging, machine piling, and grazing have impacted soils in the project area. Natural recovery of surface layers of existing compacted soils
Surface and Substratum Erosion	Higher potential erosion effects due to higher acreage of harvest and 2.28 miles of temporary road construction.	Lower potential erosion effects due to no road construction and less harvest acres, particularly on mod-high severity burned areas.	No additional increase in potential erosion related to project
Harvest acres on moderate or high burn severity	Moderate - 316 acres High - 364 acres	Moderate- 182 acres High - 223 acres	0 acres 0 acres
Miles of temp road constructed	2.28 miles	0 miles	0 miles

3.2.2.3 Cumulative Impacts

No Action Alternative

With no new salvage activities, no new management-induced cumulative impacts to soils would occur in the Sheep Salvage project area.

Existing soil compaction and displacement would persist with slight natural recovery of surface layers of compacted soils. Fire effects, modest snowmelt, and rain events are likely to cause extensive erosion and mass movement on steep hillslopes throughout the burned area. Additionally, reduced canopy interception, combined with lack of groundcover and hydrophobicity will cause increased runoff response compared to pre-fire conditions (USDA Forest Service 2012.)

Fire induced surface erosion processes would continue with slight abatement as slow natural vegetation recovery occurs.

Action Alternatives

The action alternatives would have negligible contribution to cumulative effects of past, present and reasonably foreseeable future actions for soil compaction, displacement and loss of productivity.

Potential exists for interception and concentration of overland flow by skid trails and cable draglines. Design measures described in the document, including partial suspension of trees, avoiding convergence of cable corridors and other measures will help mitigate this effect. There may be a reduction in current and future ground cover relative to the no action alternative. Ground cover is particularly important to offset the increased runoff resulting from the fire. Design measures requiring leaving 10-15 tons of coarse woody debris per acre ground would help mitigate this loss.

Current understanding is that site quality will be maintained if less than 15% of an area is detrimentally impacted after disturbance (Page-Dumroese et al. 2000). The estimated increased soil disturbance acres are 10.1 percent and 10.6 percent for the Proposed Action Alternative and No Temporary Roads Alternatives, respectively. Forested lands within the project area were primarily mature forest prior to the 2012 Sheep Fire. Baseline disturbance was not evaluated in detail, but is estimated to be less than 2 percent, based on site reconnaissance (age of trees growing on old skid trails) and the long recovery time from much of the past logging.

The existing condition and trend for soils and erosion within the analysis (proposed project) area is primarily attributed to the 2012 Sheep Fire and past, present, and reasonable foreseeable future actions. These land use actions include the following: road management and use; riparian and upland timber harvest; dispersed recreation; invasive plants; and implementation of BLM ESR Plan.

Past, present, and reasonably foreseeable future activities

Other ongoing salvage logging outside of the project will not have site-specific impacts to the proposed BLM harvest units. The harvest methods, unit locations and associated potential soil disturbance associated with salvage logging on private and State land logging is not known, however, if it is assumed to be similar in impacts the1100 acres of harvest would result in an additional 116 acres of disturbed soil within the overall analysis area. The Forest Service is also proposing Roadside Hazard Tree Removal Project within the John Day Creek watershed. Forest Service hazard tree removal would focus on cutting dead and dying hazard trees that occur within 200 feet of several roads. Given the low level of potential soil impacts associated with the FS proposal, a rough estimate of additional soil disturbance acres from the hazard tree removal project would be about 15.

3.2.3 Water Resources

3.2.3.1 Affected Environment

<u>Physical setting</u>

The project area is located in the Lower Salmon River subbasin. Land ownership within the project area is approximately 3,300 acres of BLM lands that occur in the John Day Creek and Cow Creek – Salmon River 6th code HUCs (Hydrologic Unit Codes) (see Map 1).

John Day Creek is a fourth order tributary of the Salmon River and extends about eight miles from the mouth to the headwaters. John Day Creek originates at an elevation of 7,300 feet and drops to 1,800 feet at its confluence with the Salmon River. Mean annual precipitation in the John Day watershed ranges from 18 to 50 inches with an average of about 34 inches (University of Idaho, 1993). The runoff regime is dominated by spring snowmelt, followed by gradual recession to baseflows.

The project area also includes Salmon River face drainages in the Cow Creek – Salmon River 6th code HUC. These drainages include Wet Gulch and an unnamed tributary stream.

The John Day watershed has an area of 13,851 acres (approx.21.6 square miles) and includes the following sub-watersheds: Lower John Day Creek (4050 acres), Middle Fork (3,749 acres), East Fork (3580), and South Fork (2,472 acres). The streams within the project area are described in greater detail in section 3.2.5.

Cow- Creek Salmon River Face Drainages and Wet Gulch

The project/analysis area includes the Salmon River face drainages on the east side of the river (Cow Creek-Salmon River 6th code HUC). The Dry Gulch drainage totals 721 acres and the Wet Gulch drainage totals 1,780 acres. The lower reach of the Wet Gulch drainage has a channel with flowing water; upstream of this reach, the stream flows subsurface. The upper reaches within the Wet Gulch drainage do have stream channels with surface flows. The Dry Gulch drainage does not have a surface flow channel that flows into the Salmon River. The mid and upper reaches of the drainage do have surface flows (e.g., intermittent and perennial). Stream channels are lower gradient (<7-10 percent) in the lower reaches and upper reaches consist of steep gradient streams (>7-10 percent). Wet Gulch and Dry Gulch do not provide habitat for fish.

John Day Creek and its tributaries generally have high sediment transport capacity due to the high stream gradients. Although relatively resistant to typical annual peak flows and moderate disturbances, they can be scoured by infrequent peak flows and debris torrents. Flash floods can be expected to occur occasionally in this watershed. Typically, this type of event is triggered by a high intensity thunderstorm.

General landform groups

The Nez Perce National Forest has mapped the John Day watershed into four general landform groups (USDA-FS 1995). The following overview of landform groups incorporated from the John Day Creek Watershed Analysis (USDI-BLM, 1999). This provides descriptions of the inherent channel stability and channel shaping events. More detailed landtype descriptions within the project area, as well as a map, are presented in the soils section of this EA.

The Alpine, Glaciated Landform Group is found in the upper elevations at the headwaters of the John Day Creek watershed. This landform group makes up 27 percent of the watershed. Streams are all first and second order and are usually highly variable. Channels are prone to debris torrents and channel scour during periods of rapid snowmelt. In general, resilience of these streams is low because of the short growing season and harsh climate. Surface erosion hazard is moderate to high.

The River Breaklands Landform Group is characterized by steep stream breaklands and mountain slopes. Erosion hazard is high. This landform group makes up about 37 percent of the watershed. Stream channels generally have a high gradient and are confined in V-shaped or narrow, flat canyon bottoms. First and second order streams are prone to debris torrents and channel scour. Third through fifth order streams have well-armored stream banks which are resistant to damage. Channel stability is dependent on large woody debris and boulders. Resistance to change in these streams largely depends on bed and bank material size and riparian vegetation. First and second order streams are often scoured by high intensity thunderstorms; although resistance to change is relatively high, resilience is usually low, requiring many years to reestablish channel structure and stable vegetated banks.

The Dissected Stream Breaklands Landform Group is characterized by steep mountain slopes, stream breaklands, and mass wasted slopes. This landform group makes up about 39 percent of the watershed and is located on the lower reaches of the watershed. Erosion hazard is high. Beds and banks armored with boulders, large cobbles, and bedrock contribute to the relatively high resistance of streams in this landform group.

The Floodplains and Terraces Landform Group is characterized by gently sloping alluvial deposits along the Salmon River, including floodplains, terraces, and alluvial fans. This makes up less than 1 percent of the watershed and is located at the mouth of John Day Creek. Erosion hazard is moderate. Within this landform group, most high order streams, such as Lower John Day Creek, are well armored with boulders. Stream morphology is shaped by substrate and episodic events.

Existing roads/ road density

There are two main collector roads in the watershed: Forest Road 441 and County Road 460. Forest Road 441, a single-lane, gravel road with turnouts, is a ridge top road above the East and Middle Forks of John Day. Approximately 7 miles of this road is within the John Day watershed. County Road 460, a single-lane, gravel road with turnouts, begins at State Highway 95 near the mouth of John Day Creek and follows John Day creek for approximately 3 miles. It is maintained by Idaho County and provides access to the homes and property along the creek. Some segments of the road are immediately adjacent to John Day Creek. A private road then goes up the drainage bottom to the confluences of the East, Middle, and South Forks of John Day Creek. Segments of the East Fork road washed out during the 1995 debris torrents, and segments have been repaired. Current road access along the streams is restricted to approximately one-half mile of the East Fork John Day Creek, and mouth areas of the Middle and South Forks John Day Creek. The lower portion of the Middle Fork John Day Creek is accessed by this road. Most of the remaining roads in this watershed were constructed for timber sales in the East Fork and Middle Fork watersheds.

There are currently approximately 62.3 miles of roads in the John Day Creek drainage. Road density for the entire John Day watershed is approximately 2.8 miles per square mile. Road density for Dry Gulch is approximately 3.1 miles per square mile and road density for Wet Gulch is 3.4 miles per square mile.

The FS obliterated/rehabilitated 6.2 miles of roads during 1997-1998 in the East Fork John Day Creek drainage. The BLM rehabilitated 1.5 miles of road in the Middle Fork John Day Creek watershed and also conducted road rehabilitation in localized areas in the East Fork John Day Creek watershed. The BLM replaced an improperly sized culvert and a fish passage barrier at stream mile 0.5 in the East Fork John Day Creek with an arch culvert in 2003.

3.2.3.2 Direct and Indirect Effects of Alternatives

Methods, Assumptions, and Limitations

Water quality/sediment

Sediment inputs to stream channels occur as a complex series of pulses that are delivered and stored within low order, high gradient stream channels. Sediment accumulates for centuries within these channels before being transported or "flushed" downstream by episodic events with large increases in water yield (Kirchner et al. 2001). Large-scale stand replacing fires followed by floods would be considered episodic events

Forests generally have very low erosion rates unless they are disturbed (Elliot et al. 2000). The streams in the burned area generally maintain good water quality. Erosion from steep burned hillslopes will impact water quality through transport and depostion of fine sediment in fish bearing streams (i.e., John Day Creek, East Fork John Day Creek, Middle Fork John Day Creek, and South Fork John Day Creek.

In the summary of analysis, part V of the Sheep Fire Burned Area Report (USDA-Forest Service, 2012) the authors concluded "fire effects, modest snowmelt and rain events are likely to cause extensive erosion and mass movement on steep hillslopes throughout the burned area. Additionally, reduced canopy interception, combined with lack of groundcover and hydrophobicity will cause increased runoff response compared to pre-fire conditions. Thus, streams in and downstream of the burned area are likely to generate higher stormflows in the first few years following the fire. Larger flow events in part are a function of increased surface runoff from bare hillslopes. Furthermore, burned and exposed soils are more susceptible to entrainment and transport to stream channels."

In the short-term, the adverse effects of high-severity fires include decreased infiltration, increased overland flow, and excess sedimentation in streams which can be exacerbated by the soil disturbance caused by salvage logging (McIver and Starr, 2000). Fires can affect watershed conditions and stream systems through removal of forest litter and duff layers which increases erosion and sedimentation, and through changes in peak flows and water yields. In some instances, high-severity fires create physical and chemical changes that can cause "hydrophobic" soil layers that repel water infiltration, and lead to accelerated overland flow. All of these natural fire-related processes can increase surface water runoff, water yields and peak stream flows, leading to increased potential for erosion, landslides and floods, and subsequent sedimentation of streams. Research indicates that the net effect of high-severity wildfires is to increase the sensitivity of sites to further soil disturbance (McIver and Starr, 2000).

Land disturbances that change the hydrologic regime (e.g., reduced transpiration following timber harvest or fire) may increase the occurrence of mass wasting and harm aquatic habitats. Where mass wasting occurs near streams, the risk of sedimentation impacting aquatic habitat is far greater than where mass wasting occurs on hill slopes away from the channels that deliver sediment to streams. Sediment delivered to streams may comprise fine sediments, which could fill pools and decrease habitat, or larger rock and large organic debris, which could enhance stream habitat complexity.

To estimate potential increases in sediment yield from both action alternatives, the WEPP model developed by the Forest Service, was used. It is important to note that this model does not account for mass wasting.

Disturbed Water Erosion Prediction Project (WEPP)

The WEPP model is a physically based soil erosion model that provides estimates of soil erosion and sediment yield considering site-specific information about soil texture, climate, ground cover, and topographic settings (Elliot et al. 2000).

Common disturbances include timber harvest operations, roads, prescribed burning, and wildfires. Impacts which include soil erosion from these activities typically last 2-5 years before rapid revegetation covers the surface with protective plant litter (Elliot 2011, personal communication). However, not all impacts to soil erosion are short lived. The model and supporting documentation can be found at: http://forest.moscowfsl.wsu.edu/fswepp/.

The disturbed WEPP soil model (Elliot et al., 2000) is a tool to allow users to describe numerous forest and rangeland erosion conditions. Disturbed WEPP allows summary outputs, and presents the probability of a given level of erosion occurring the year following a given disturbance.

Values for disturbed WEPP modeling of the proposed projects, such as slope, and percent cover for different activities, were either collected in the field during the fall of 2012, or are estimates based on knowledge of the area, Burned-Area Report (BAR) burn severity map (Forest Service 2012), and GIS mapping. The accuracy of WEPP-predicted runoff or erosion rate may be plus or minus 50 percent.

Soil erosion potential and delivery of sediment to the channels, or at least to the bottom of modeled hill slopes, can be estimated by WEPP (USDA Forest Service, 2002). Climate data was taken from existing weather stations and modified for the project area using PRISM, a program provided within WEPP for adjusting existing data for elevation. The computer model calculates surface erosion (in units of tons per acre) from hillslopes using parameters of soil texture, vegetation cover type and age class, burn severity, percentage of cover, soil rock content, slope gradient and length and climate data. Results are related to certain frequency storms and calculated intensity (3-year recurrence interval, 10-year recurrence interval etc.). Ground related parameters for unburned baseline and existing burned condition were from observations on field verification of the proposed treatment areas. Soil type was set for the model runs as sandy loam and rock fragments at 20%. Activity on burn condition simulates harvest effects on burned slopes and was considered for slopes of 40%, which is the upper limit for ground-based methods and 60% for steeper areas that are proposed for cable logging. Tables 19 - 21 summarize, by subwatershed, the acres or miles of various activities that would occur on different burn severities.

Fall 2012 field observations (post-fire) estimated average ground cover ranges of 20% to 70%, over various burn severity areas within the proposed timber harvest units. Estimated burn severity in the John Day watershed as a whole is 37% severe to moderate, similar to the Middle Fork of John Day Creek. Within the East and South Fork John Day sub-basins, the figure is more than 50% severe to moderate.

Timber harvest is planned to occur within 1 year of the fire, consequently re-vegetation would not be substantial for some units prior to harvest activities. In the model runs, a 10-year recurrence interval was used with a return period analysis based on 100 years of climate. Cover class chosen to model were 30% (high severity) and 40 - 50% (moderate severity). These cover classes represent the majority of timber harvest occurring on high and moderate severity areas. Table 22 demonstrates that the most important factor to potential sediment is from the burn itself and loss of cover, with a secondary importance imparted by the slope gradient. These results are consistent with research as described in the Affected Environment sections above.

Changes in sediment yield values within the project area for the action alternatives over the time period affected by the project are summarized in Table 22.

Timber harvest prescriptions include design features to minimize soil disturbance (see Environmental Design Features, section 2.2.9) and to protect soil and water. Timing restrictions would ensure activities would only occur when soils are not saturated.

Estimated surface erosion sediment delivery rates from the Proposed Action harvest and post-harvest treatment activities are reflected in the WEPP sediment runs. WEPP estimates do not include mass wasting inputs. The erosional and sedimentation rates for wildfire have been documented in many locations-ranging from none to minimal for low intensity burns to catastrophic for high intensity burns (Megahan and King, 2004).

Proposed Action

Much of the proposed 2.28 miles of temporary road construction is located relatively high on the slope, where long slope distances to the drainage channels and generally straight to convex shaped slopes are factors that reduce sediment delivery efficiency to stream channels. There are no live water crossings associated with new temporary road construction. The increase in sediment production due to soil disturbance associated with temporary road construction and subsequent decommissioning would be short-term, as impact levels have been shown to drop to near zero by the third year due to vegetative recovery (Megahan and King 2004). The predicted increase in unrouted sediment yield (sediment delivered to the stream channel) would be short-term as impacts from road construction and harvest typically decrease substantially after the first year. As with changes to water yield, sediment impacts would be relatively minor under both action

alternatives in the affected 6th code HUCs watersheds due to the relatively small percentages of the project area within the larger HUC of John Day Creek.
WEPP modeling results predict that 5 years following completion of the project, including temporary road decommissioning, water quality impacts would decrease substantially below existing (first-year after fire) conditions. This decrease is due to primarily to natural recovery processes from the wildfire and to a lesser extent, obliteration of the temp roads.

No New Temporary Road Construction Alternative

The short-term effects from the no temporary road alternative would be similar to those described above for the Proposed Action. This alternative would have less soil disturbance, due to no proposed temporary road construction and less timber harvest, particularly on areas of moderate to high burn severity, compared to the proposed action. Tables 19 and 20 summarize the actions occurring on various burn severities that are proposed to occur within the project area 6th code HUCs and subwatersheds (see Figures 16 and 17).

Table 19. Proposed Action Subwatershed Actions by Burn Severity in John Day Watershed

Subwatershed	Actions[1]	Burn Severity			
		High	Moderate	Low	Very Low
Lower John Day	Tractor Logging (acres)	32.48	82.08	35.37	21.63
	Cable Logging (acres)	0.81	11.72	0.48	0.0
	Short Cable Logging (acres)	4.76	20.68	7.50	2.02
	Temp. Road Const. (miles)	0.19	0.71	0.40	0.08
	Road Rehabilitation (miles)	0.06	0.08	0.0	0.66
East Fork John Day	Tractor Logging (acres)	2.91	0.0	0.0	0.0
	Cable Logging (acres)	0.68	0.1	0.0	0.0
	Short Cable Logging (acres)	0.0	0.0	0.0	0.0
	Temp. Road Const. (miles)	0.0	0.0	0.0	0.0
	Road Rehabilitation (miles)	0.0	0.0	0.0	0.0
Middle Fork John Day	Tractor Logging (acres)	151.07	49.42	3.5	0.05
	Cable Logging (acres)	14.61	20.33	0.0	0.05
	Short Cable Logging (acres)	11.80	4.22	1.10	0.0
	Temp. Road Const. (miles)	0.0	0.0	0.0	0.0
	Road Rehabilitation (miles)	2.88	1.01	0.28	0.02
South Fork John Day	Tractor Logging (acres)	30.17	21.08	9.92	4.63
	Cable Logging (acres)	106.68	48.07	15.50	3.57
	Short Cable Logging (acres)	0.0	0.01	0.0	0.0
	Temp. Road Const. (miles)	0.42	0.12	0.23	0.13
	Road Rehabilitation (miles)	0.0	0.0	0.0	0.006[2]
John Day Watershed TOTAL	Tractor Logging (acres)	216.63	152.58	48.79	26.31
	Cable Logging (acres)	122.78	80.22	15.98	3.62
	Short Cable Logging (acres)	16.56	24.91	8.6	2.02
	Temp. Road Const. (miles)	0.61	0.83	0.63	0.21
	Road Rehabilitation (miles)	2.94	1.72	0.28	0.686

[1]Salvage Logging Actions = acres; Road Actions = Miles, [2]Only a trace amount of road rehabilitation within South Fork John Day Creek drainage, approximately 32 feet.

The No New Temporary Road Construction Alternative proposes a total of 606 acres for fire salvage and no temporary road construction would occur. Tables 20 and 21 identify proposed activities, burn severity, and subwatershed that specific actions would occur in for the No Temporary Road Alternative (see Figure 17). Activities identified for East Fork John Day Creek, Middle Fork John Day Creek, Wet Gulch, and Dry Gulch are the same for both action alternatives.

Table 20. Proposed Action and No New Temporary Road Construction Alternative Subwatershed Actions by Burn Severity in Salmon River Face Drainages

Subwatershed	**Actions[1]**	**Burn Severity**			
		High	**Moderate**	**Low**	**Very Low**
Wet Gulch	Tractor Logging (acres)	9.32	35.32	46.26	15.77
	Cable Logging (acres)	1.39	9.98	28.73	15.96
	Short Cable Logging (acres)	0.0	7.66	9.92	2.91
	Temp. Road Const. (miles)	0.0	0.0	0.0	0.0
	Road Rehabilitation (miles)	0.0	0.11	0.18	0.02
Dry Gulch	Tractor Logging (acres)	0.0	4.80	3.46	0.0
	Cable Logging (acres)	0.0	0.0	0.0	0.0
	Short Cable Logging (acres)	0.0	1.39	2.71	0.0
	Temp. Road Const. (miles)	0.0	0.0	0.0	0.0
	Road Rehabilitation (miles)	0.0	0.0	0.0	0.0
Salmon River Face Drainages TOTAL	Tractor Logging (acres)	9.32	40.12	49.72	15.77
	Cable Logging (acres)	1.39	9.98	28.73	15.96
	Short Cable Logging (acres)	0.0	9.05	12.63	2.91
	Temp. Road Const. (miles)	0.0	0.0	0.0	0.0
	Road Rehabilitation (miles)	0.0	0.11	0.18	0.02

[1]Salvage Logging Actions = acres; Road Actions = Miles

Table 21. No New Temporary Road Construction Alternative Subwatershed Actions by Burn Severity in John Day Watershed

Subwatershed	Actions[1]	Burn Severity Acres (Units) or Miles (Roads)			
		High	Moderate	Low	Very Low
Lower John Day	Tractor Logging (acres)	3.47	30.24	13.64	20.69
	Cable Logging (acres)	0.75	10.38	0.48	0.0
	Short Cable Logging (acres)	3.13	10.91	4.20	2.02
	Temp. Road Const. (miles)	0.06	0.08	0.0	0.66
East Fork John Day	Tractor Logging (acres)	2.91	0.0	0.0	0.0
	Cable Logging (acres)	0.68	0.1	0.0	0.0
	Short Cable Logging (acres)	0.0	0.0	0.0	0.0
	Temp. Road Const. (miles)	0.29	0.0	0.0	0.0
	Road Rehabilitation (miles)	0.0	0.0	0.0	0.0
Middle Fork John Day	Tractor Logging (acres)	151.07	49.42	3.5	0.05
	Cable Logging (acres)	14.61	20.33	0.0	0.05
	Short Cable Logging (acres)	11.80	4.22	1.10	0.0
	Temp. Road Const. (miles)	22.75	29.14	0.0	0.0
	Road Rehabilitation (miles)	2.88	1.01	0.28	0.02
South Fork John Day	Tractor Logging (acres)	27.30	7.79	9.44	4.63
	Cable Logging (acres)	0.0	0.0	0.0	0.0
	Short Cable Logging (acres)	0.0	0.0	0.0	0.0
	Temp. Road Const. (miles)	0.0	0.0	0.0	0.01
	Tractor Logging (acres)	184.75	87.45	26.58	20.69
	Cable Logging (acres)	15.36	30.71	0.48	0.0
	Short Cable Logging (acres)	14.93	45.94	5.3	2.02
	Temp. Road Const. (miles)	2.94	1.72	0.28	0.686

[1]Salvage Logging Actions = acres; Road Actions = Miles

Table 22 compares WEPP estimated sediment delivery for both action alternatives.

(*Note that within some sub-watersheds, there is no difference in the proposed action alternatives; therefore predicted sediment delivery is the same)

Table 22. WEPP Estimated Sediment Delivery Following Sheep Fire

Subwatershed	Subwatershed Sediment Delivery Ton/Year Following Fire[1]			
	Activity	1st Year	3rd Year	5th Year
Lower John Day Cr.	Existing – Post Fire	7,968 tons/yr	1,930 tons/yr	954 tons/yr
	Proposed Action Alt. Percent change	+64 tons/yr +0.8%	+15 tons/yr +0.8%	+8 tons/yr +0.8%
	No Temp. Road Alt. Percent change	+23 tons/yr +0.3%	+6 tons/yr +0.3%	+3 tons/yr +0.3%
East Fork John Day Cr.	Existing – Post Fire	14,447 tons/yr	2,708 tons/yr	921 tons/yr
	Action Alternatives* Percent change	Trace	Trace	Trace
Middle Fork John Day Cr.	Existing – Post Fire	11,084 tons/yr	2,819 tons/yr	1,145 tons/yr
	Action Alternatives* Percent change	+137 tons/yr +1.2%	+34 tons/yr +1.2%	+14 tons/yr +1.2%
South Fork John Day Cr.	Existing – Post Fire	8,877	1,478	836
	Proposed Action Percent change	+97 tons/yr +1.1%	+16 tons/yr +1.1%	+9 tons/yr +1.1%
	No Temp. Road Alt. Percent change	+19 tons/yr +0.2%	+3 tons/yr +0.2%	+2 tons/yr +0.2%

Subwatershed	Subwatershed Sediment Delivery Ton/Year Following Fire[1]			
	Activity	**1st Year**	**3rd Year**	**5th Year**
John Day Total	**Existing – Post Fire**	42,376 tons/yr	8,935 tons/yr	3,856 tons/yr
	Proposed Action **Percent change**	+297 tons/yr +0.7%	+63 tons/yr +0.7%	+27 tons/yr +0.7%
	No Temp. Road Alt. **Percent change**	+179 tons/yr +0.4%	+43 tons/yr +0.4%	+16 tons/yr +0.4%
Wet Gulch	Existing – Post Fire	5,980 tons/yr	1,388 tons/yr	606 tons/yr
	Action Alternatives* Percent increase	+59.8 tons/yr +1.0%	+13.9 tons/yr +1.0%	+6.1 tons/yr +1.0%
Dry Gulch	Existing – Post Fire	1,497 tons/yr	365 tons/yr	198 tons/yr
	Action Alternatives*	Trace	Trace	Trace
Wet Gulch and Dry Gulch Total	**Existing – Post Fire**	7,477 tons/yr	1,753 tons/yr	804 tons/yr
	Action Alternatives* **Percent change**	+59.8 tons/yr +0.8%	+14.0 tons/yr +0.8%	+6.4 tons/yr +0.8%

[1]Probability that sediment yield will be exceeded is 20%.

Sediment Effects from Road obliteration/Rehabilitation

Negligible amounts of sediment would be expected to reach channels from road maintenance and rehabilitation activities occurring outside of RCAs.

Short-term (1-year) negligible erosion/sediment would be expected from obliteration (decommissioning) of temporary roads (2.28 miles) and road rehabilitation (4.76 miles). Obliteration of temporary roads would include the re-contouring, deep ripping, mulching, seeding, and selective placement of woody debris. Road rehabilitation would include deep ripping, mulching, seeding, selective placement of woody debris, and closing road to public motorized use. Overall, long-term sediment reductions from the proposed road rehabilitation would improve water quality and stream channel conditions and reduce road-related chronic sources of sediment and move the streams toward improving conditions for beneficial uses.

A short-term increase of erosion/sediment from timber harvest and rehabilitation actions would occur. A long-term reduction of baseline sediment yield from chronic sediment sources (roads) would result from rehabilitation activities and support recovery of watershed and aquatic conditions.

Sediment Effects from Temporary Road Construction

The proposed action identifies a total of 2.28 miles of temporary road construction, which would occur in the Lower John Day Creek and South Fork John Day Creek subwatersheds. The majority of the temporary road construction occurs near ridge tops or in the upper third of the slope. None of the temporary road construction would occur within RCAs. No temporary road construction would occur on landtypes with "high" mass failure potential.

The newly constructed temporary roads would only slightly increase road densities for approximately 3 years until they are obliterated within the Lower John Day Creek and South Fork John Day Creek subwatersheds. No changes short term or long term would occur to the East Fork John Day Creek, Middle Fork John Day Creek, Wet Gulch, and Dry Gulch subwatersheds from temporary road construction.

The increase in sediment production due to soil disturbance associated with decommissioning of temporary roads would be short-term, as impact levels have been shown to drop to near zero by the third year due to vegetative recovery (Megahan and King 2004). Road decommissioning would not have a substantial adverse impact on sediment yield and water quality in the first year, and would have a net reduction in sediment yield from year two forward as vegetation (grasses and shrubs) re-establish.

3.2.3.3 Cumulative Impacts

No Action Alternative

No cumulative effects would occur from implementation of the No Action Alternative.

Proposed Action Alternatives

Post –fire (existing condition) WEPP modeling was done for the proposed actions occurring within the project area. When compared to a watershed level (i.e., 6^{th} code HUC and sub-watersheds), increases in sediment (excluding contributions from the 2012 fire) would be expected to increase sediment yield at less than two percent over post-2012 fire baseline for the project area sub-watersheds within the analysis area.

The erosional and sedimentation rates for wildfire have been documented in many locations-ranging from none to minimal for low intensity burns to catastrophic for high intensity burns (Megahan and King, 2004). Mass failures, debris flows and floods catalyzed by fire have been important in the history of many watersheds and may be primary drivers in the long-term sediment supply for those systems (Reeves et al. 1995; Benda et al. 2003; Moody and Martin 2009). Dramatic increases in erosion that follow some fires tend to decline within 10 years as vegetation is reestablished (Burton 2005; Luce 2005; Robichaud et al. 2009). The fire-hydrologic interaction has been characterized as an episodic pattern of disturbance and recovery that contributes to important variation of stream conditions in space and time (May and Gresswell 2003; (Miller et al 2003).

Specific burn locations, patterns and extents are important in determining watershed responses. If riparian areas remain intact, for example, key functions of sediment storage, evapotranspiration, and shade may persist to some extent. Extensive wildfires that consume both upland and riparian sites create conditions conducive to severe hydrologic response (Ice, et al., 2004).

As presented in Table 23 of the Wetland - Riparian Section of this ES, the East Fork, Middle Fork, and South Fork John Day Creek subwatersheds were 100 percent within the 2012 Sheep Fire. Many of the riparian zones within the Sheep Fire were rated as having high to moderate burn severity: John Day Creek had 11.1 stream miles (27 percent of total) and Wet Gulch had 1.8 miles (38%). The East Fork of John Day Creek had the most extensive riparian zone burned, with 4.8 stream miles (55% of total) rated as high to moderate severity. The photographs in Figures 21, 24 and 26 are representative of the widespread impacts to riparian function and the potential sediment increases from stream bank erosion, ravel, channel incision and other natural, post-fire effects.

As described below, sediment impacts to water resources would be relatively minor from the action alternatives and the past, current, and future foreseeable actions, compared to the effects of the fire. In contrast to the efficient delivery of fire-caused sediment described above, the design measures and BMPs will effectively minimize sediment delivery to streams from harvest related activities. As described in both the action alternatives, and in the affected environment section, none of the proposed harvest would occur in riparian areas. The majority of harvest activities would require a minimum stream buffer of 300 feet slope distance. The only exception is a 100-foot buffer in units 9-A and 9-B. Slope distances to live water exceed 1000 feet in much of the project area.

Past, ongoing, and reasonably foreseeable future activities

This discussion focuses on past, ongoing, and reasonably foreseeable future activities that are expected to have additive effects to wetland and riparian habitats. See list of actions in Section 3.1.2.

The existing conditions and trends for water resources within the analysis area is primarily attributed to the 2012 Sheep Fire as well as past, ongoing, and reasonably foreseeable future lands uses. These land use actions primarily include: road management and use; riparian and upland timber harvest; Forest Service Roadside Hazard Tree Removal Project; livestock grazing; and implementation of the BLM ESR Plan. Ongoing salvage logging on private or State lands primarily involves the use of existing roads, re-opening existing roads, and constructing skid trails. Surface rocking of native surface roads reduces the potential for sediment production.

Salvage logging on State and private lands is known to have occurred and is ongoing as a result of the 2012 Sheep Fire. It is estimated that approximately 1,100 acres of salvage logging is occurring on non-federal land within the analysis area. The extent of past private and State land logging within riparian areas is not known.

Logging on all ownerships in Idaho is subject to the regulations of the Idaho Forest Practices Act (FPA). Forest Service and BLM requirements often exceed FPA rules (or example stream buffer widths) therefore it would be reasonable to estimate a slightly higher(though unknown) overall increase in sediment yield per acre from private or state logging relative to the WEPP modeled estimates for BLM. If a conservative estimate was applied and it was assumed that sediment yield increases per acre were twice that of

BLM (1.5 % for 916 acres), the 1100 acres of non-federal logging within the analysis area would add less than 4 percent within John Day Creek watershed, compared to existing post-fire conditions (year one).

The Forest Service is also proposing Roadside Hazard Tree Removal Project within the John Day Creek watershed, which is expected to have negligible effects within RCAs or to increased sediment yield. (USDA-Forest Service 2013). Forest Service hazard tree removal would focus on cutting dead and dying hazard trees that occur within 200 feet of several roads. The addition of salvage logging on State, private, and Forest Service lands would cumulatively add to sediment and large woody debris recruitment with RCAs. The Forest Service estimates only a minimal increase in predicted sediment yield related to this project (4 percent for East Fork John Day Creek subwatershed and 1 percent for Middle Fork John Day Creek subwatershed over baseline conditions). The BLM estimates this would contribute an additional one percent over post-fire conditions (year one) for the entire John Day Creek watershed.

Watershed restoration actions identified in the BLM *Sheep Fire Emergency Stabilization and Rehabilitation Plan* (ESR Plan) (USDI-BLM 2012) would occur. Actions identified in the ESR Plan include planting conifer trees and riparian trees and shrubs, and seeding desired species within RCAs. Other actions identified in the ESR Plan include road maintenance and improvements to reduce adverse erosion and replacing two small fence segments that burned. The ESR Plan also identified the removal of two culverts and restoration of stream crossings (East Fork of John Day Creek). One of the East Fork John Day culverts is a partial/full fish passage barrier and is a chronic source of erosion and sediment. Planting of trees in uplands and within RCAs was also identified in the ESR Plan (up to 650 acres). The primary long term benefits would occur from planting of conifer trees within RCAs that experienced high and moderate burn severity. ESR road improvement or maintenance actions would reduce road related erosion/sediment impacts in the short term, but overall beneficial effects would be low.

Past and foreseeable future livestock grazing on private, State, and federal lands has impacted riparian and wetland habitats to varying levels. Livestock grazing on private lands that have moderate or high burn severity may retard riparian recovery in localized areas, which is dependent on amount of livestock grazing and season of use. The majority of high and moderate severity burn areas within riparian areas occur on federal lands, where grazing would be curtailed in the short term to support vegetation recovery. No livestock grazing is authorized on Forest Service lands within the analysis area subwatersheds.

In addition to past, current and future foreseeable actions, the 2012 Sheep Fire affected a large proportion of the project and analysis area watersheds, and as displayed in the WEPP model results in Table 22, increased estimated first year sediment yield by orders of magnitude. Currently desired conditions are not being achieved in regards to channel substrate conditions for analysis area watersheds. The BLM Cottonwood RMP (2009) identifies desired conditions for substrate conditions (e.g., deposited sediment) and RMP identifies that desired optimum conditions may not always be achieved during the 15-20-

year life of the RMP. However, short-term effects from project authorization could occur if such would not retard or prevent achievement of desired conditions in the long term (BLM 2009). Short-term effects are expected to occur from implementation of the action alternatives. Natural recovery and reduced sediment from uplands and riparian areas would also occur over time within areas impacted by the 2012 Sheep Fire.

The action alternative activities would have negligible contribution to cumulative effects of past, current, and future foreseeable actions for erosion sediment supply and water quality within the cumulative analysis area. With the addition of the state and private salvage logging, as well as the USFS Roadside Hazard Tree Removal Project, total short-term (year one) estimated increase in post-fire sediment yield would be less than 7 percent for the entire John Day Creek watershed.

3.2.4 Wetland and Riparian Habitats

3.2.4.1 Affected Environment

Wetland and riparian areas within the project and analysis area occur within the Cow Creek-Salmon River and John Day Creek 6th code HUCs (see Figure 18). The project area includes six subwatersheds within the above two 6th code HUC watersheds (see Figure 18). The Cow Creek – Salmon River watershed area (east side of Salmon River only) totals approximately 19,354 acres and 3,392 acres (17.5 percent) were within the burn perimeter. The John Day Creek watershed area totals approximately 14,019 acres and 12,749 acres (91 percent) were within the burn perimeter.

The Cow Creek – Salmon River watershed area includes a total of 81.5 miles of streams and 11.2 miles (13.7 percent) experienced low to high burn severity from the Sheep Fire (see Table 23). The John Day Creek watershed area includes a total of 41.8 miles of streams and 37.0 miles (88.5 percent) experienced very low to high burn severity from the Sheep Fire (see Table 23). The associated riparian areas or wetlands that experienced moderate or high burn severity and high levels of vegetation mortality are in an early succession stage and severely burned areas are rated as Functional at Risk. Low and very low burn severity areas were also impacted from the fire, but to a lesser extent. Stream/riparian segments that had high and moderate burn severity are more prone to increased infestation of invasive/noxious plants, poor stream bank stability, increased erosion/sediment, reduced shading of streams, and risk of stream channel scouring from high flow events. The effectiveness of Riparian Conservation Area (RCA) buffers and functional riparian areas was reduced by the loss of live vegetation and ground cover. Some riparian areas experienced a lesser burn severity (e.g., low burn severity) than adjacent uplands and these areas will recover faster with existing vegetation and re-growth of new vegetation, than other riparian areas with high burn severity which are lacking seed source and live vegetation.

Table 23 below summarizes burn severity for stream miles/riparian areas within and outside the 2012 Sheep Fire perimeter for the analysis and project area subwatersheds.

Many of the tributary streams have a narrow riparian vegetation zone confined by steep canyon walls. Springs and seeps also occur within the drainages and have small wetland/riparian areas associated with the shallow water table areas. Refer to Figure 19 for locations of streams and springs that occur in proximity to areas identified for treatments (e.g., salvage timber harvest, temporary road building, and tree planting). High and moderate burn severity resulted in high mortality to overstory trees and streamside vegetation and removal of protective ground cover (e.g., vegetation, woody debris, litter). Low and very low burn severity areas also experienced similar effects as described above, but to a lesser extent. Riparian areas within the 2012 Sheep Fire perimeter have an abundance of dead (snags) and dying trees and subsequently, large woody debris (LWD) recruitment will increase with time.

John Day Creek (Lower to Mid Elevation)

The dominant overstory riparian vegetation in lower John Day Creek is white alder (*Alnus rhombifolia*), black cottonwood (*Populus trichocarpa*), black hawthorn (*Crataegus douglasii*), and black locust (*Robinia pseudo-acacia*). Scattered Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine (*Pinus ponderosa*), and grand fir (*Abies grandis*) also become more common at mid elevation. Common understory vegetation includes currant (*Ribes sp.*), red-osier dogwood (*Cornus stolonifera*), chokecherry *(Prunus virginiana*), syringa (*Philadelphus lewisii*), ocean spray (*Holodiscus discolor*), snowberry (*Symphoricarpos albus*), blackberry (*Rubus discolor*), Rocky Mountain maple (*Acer glabrum*), willow (*Salix sp.*), elderberry (*Sambucus cerulea*), horsetail (*Equisetum* sp.), mountain brome (*Bromus marginatus*), and a variety of forbs, grasses, and *Carex* sp. Mosses and liverworts occur on rocks and streambanks. Average riparian width varies from 25 feet to 80 feet on each side of the creek. Perennial and intermittent non-fish bearing tributary streams flow into John Day Creek and have narrower riparian widths (e.g., 10 to 20 feet each side of the stream). Within the Lower John Day Creek subwatershed, approximately 13 percent of the stream miles experienced high and moderate burn severity, and 32 percent was outside the 2012 Sheep Fire perimeter (see Table 23 below).

Table 23. Stream Miles Outside and Within 2012 Sheep Fire Perimeter by Watershed

Watershed - Subwatershed	Outside 2012 Sheep Fire Perimeter	Within 2012 Sheep Fire Perimeter			
		High Burn Severity	Moderate Burn Severity	Low Burn Severity	Very Low Severity
JOHN DAY CREEK WATERSHED					
Lower John Day 14.93 miles	4.81 miles (32%)	0.26 miles (2%)	1.62 miles (11%)	4.11 miles (27%)	4.13 miles (28%)
East Fk John Day 8.59 miles	0.00 miles (0%)	1.06 miles (12%)	3.73 miles (43%)	2.87 miles (33%)	0.93 miles (11%)
Middle Fk John Day 10.27 miles	0.00 miles (0%)	0.90 miles (9%)	1.61 miles (16%)	2.74 miles (27%)	5.02 miles (49%)
South Fk. John Day 6.69 miles	0.00 miles (0%)	0.70 miles (10%)	1.20 miles (18%)	1.67 miles (25%)	3.12 miles (47%)

Watershed - Subwatershed	Outside 2012 Sheep Fire Perimeter	Within 2012 Sheep Fire Perimeter			
		High Burn Severity	Moderate Burn Severity	Low Burn Severity	Very Low Severity
JOHN DAY TOTAL **40.48 miles**	4.81 miles (12%)	2.92 miles (7%)	8.16 miles (20%)	11.39 miles (28%)	13.2 miles (33%)
COW CREEK-SALMON RIVER					
Cow Cr.-Salmon R. 73.37 miles	68.80 miles (94%)	0.0 miles (0%)	0.28 miles (<1%)	3.14 miles (4%)	1.15 miles (2%)
Wet Gulch 4.63 miles	0.55 miles (12%)	0.29 miles (6%)	1.49 miles (32%)	1.30 miles (28%)	1.00 miles (22%)
Dry Gulch 3.42 miles	0.97 miles (28%)	0.00 miles (0%)	0.00 miles (0%)	0.96 miles (28%)	1.49 miles (44%)
COW CR.-SALMON RIVER TOTAL 81.42 miles	70.32 miles (86%)	0.29 miles (<1%)	1.77 miles (2%)	5.4 miles (7%)	3.64 miles (5%)

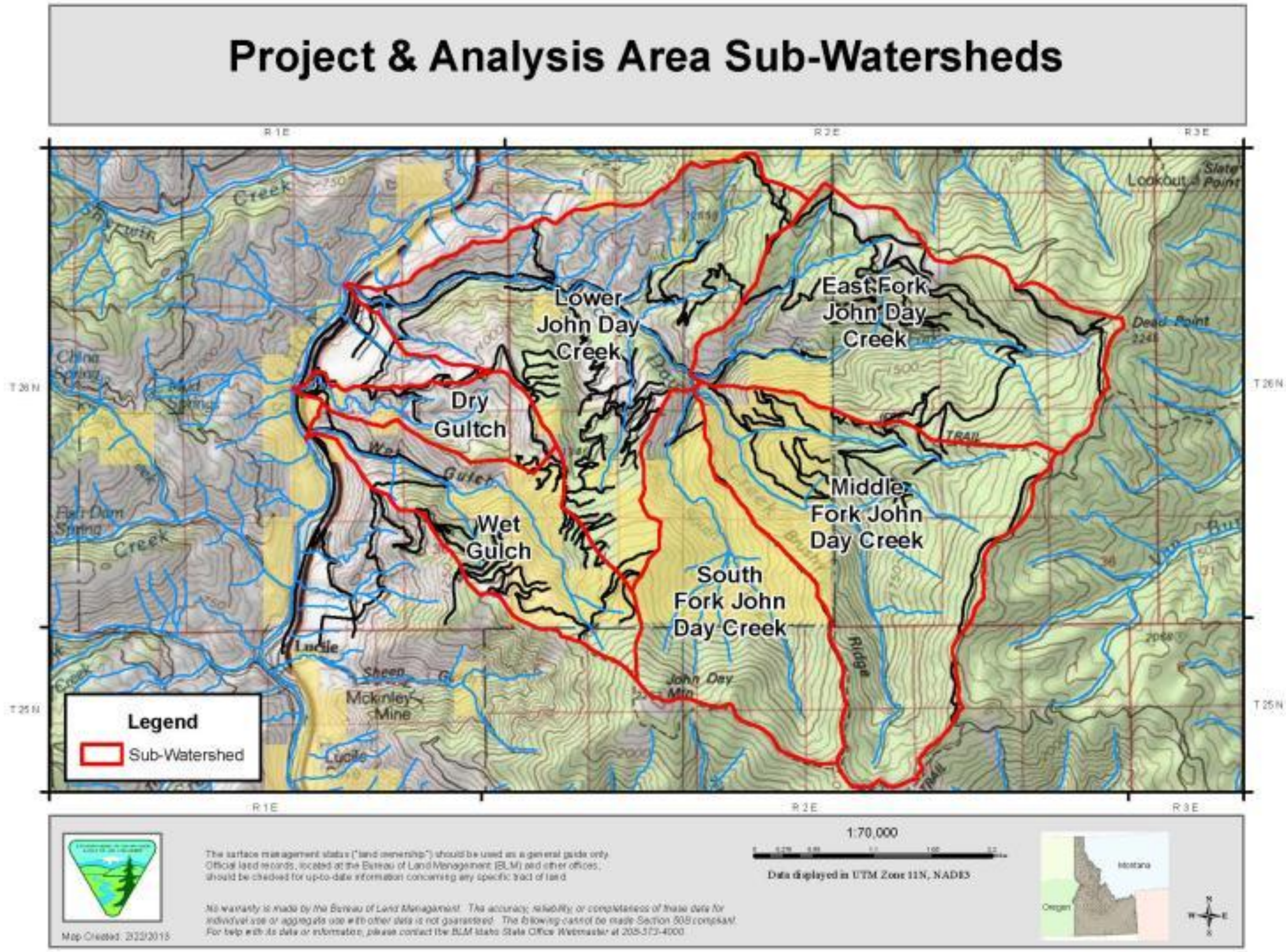

Figure 18. Project and Analysis Area Sub-Watershed

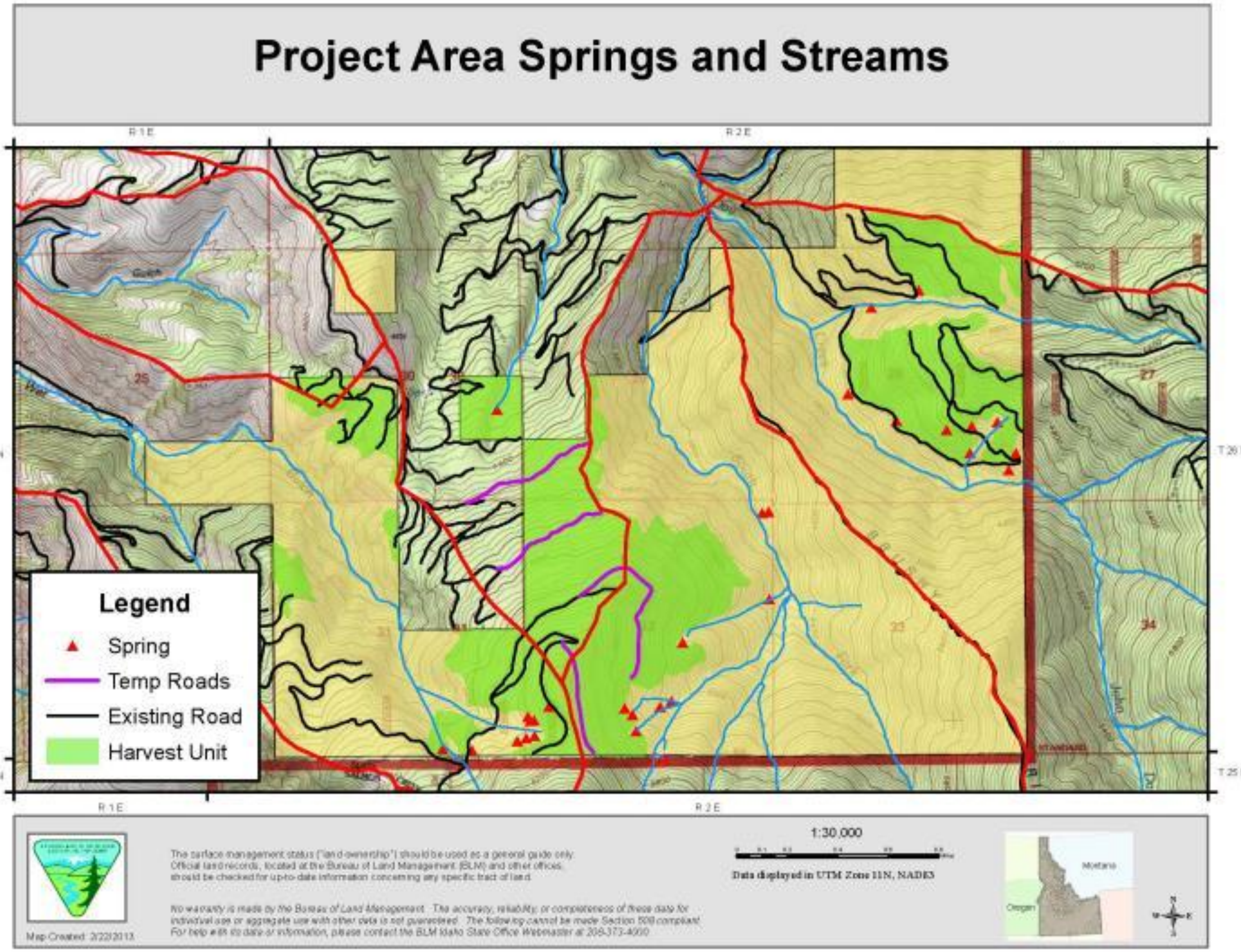

Figure 19. Project Area Springs and Streams

Figure 20. Reaches of Lower John Day Creek were outside the 2012 Sheep Fire perimeter, view of lower John Day Creek stream crossing (county road). Photo taken October 3, 2012

East Fork, Middle Fork, and South Fork John Day Creek (Mid to High Elevation)

The East Fork, Middle Fork, and South Fork John Day Creek drainages comprise the majority of the mid to higher elevation areas within the John Day Creek watershed. Common overstory trees include grand fir, Douglas-fir, ponderosa pine, and subalpine fir (*Abies lasiocarpa*) at higher elevations. Common understory vegetation includes alder (*Alnus* sp.), water birch (*Betula occidentalis*), red-osier dogwood, Rocky Mountain maple, syringa, Pacific yew (*Taxus brevifolia*), chokecherry, snowberry, ocean spray, black hawthorn, western thimbleberry (*Rubus parviflorus*), elderberry, *Rosa* sp., sweet-scented bedstraw (*Galium triflorum*), beadlily (*Clintonia uniflora*), starry solomon-plume (*Smilacina stellata*), twisted stalk (*Streptopus amplexifolius*), lady fern (*Athyrium filix-femina*), monkshood (*Aconitum columbianum*), miner's lettuce (*Montia perfoliata*), horsetail (*Equisetum* spp.), mountain brome, and a variety of forbs, grasses, and *Carex* sp. Mosses and liverworts commonly occur on rocks and streambanks. Average riparian width varies from 15 feet to 50 feet each side of the stream. Perennial and intermittent non-fish bearing tributary streams flow into the East Fork, Middle Fork, and South Fork of John Day Creek and have narrow riparian widths (e.g., 10 to 20 feet each side of the stream). The East Fork, Middle Fork, and South Fork John Day Creek subwatersheds were 100 percent within the 2012 Sheep Fire. The East Fork John Day Creek had the highest amount of fire effects, with 44 percent of the stream miles having high and moderate burn severity, South Fork John Day Creek had 28 percent of the stream miles with high and moderate burn severity (see Figure 21), and the Middle Fork John Day Creek had 25 percent of the stream miles with high and moderate burn severity.

Figure 21. Tributary stream to South Fork John Day Creek that burned at a high severity during the 2012 Sheep Fire. Photo taken October 31, 2012.

<u>Salmon River Face Drainages – Wet Gulch and Dry Gulch</u>

The project/analysis area includes Salmon River face drainages on east side of the river (Cow Creek-Salmon River 6^{th} code HUC). Dry Gulch joins the Salmon River at river mile 73.7 and Wet Gulch flows into the Salmon River at river mile 74.1. The lower reach of the Wet Gulch drainage has a surface flow channel; however, upstream from this reach the stream flows subsurface. The upper reaches within the Wet Gulch drainage do have stream channels with surface flows. The Dry Gulch drainage does not have a surface flow channel that flows into the Salmon River. The mid and upper reaches of the drainage do have surface flows (e.g., intermittent and perennial). The riparian vegetation within Wet Gulch and Dry Gulch are similar to the lower John Day. Common vegetation in the lower reaches is comprised of black hawthorn, netleaf hackberry, poison ivy (*Rhus radicans*), syringa, and invasive species. The subsurface flow reaches have no defined stream channel or riparian/wetland vegetation communities.

Human Caused Characteristics

A variety of land uses have impacted riparian and wetland habitats. These lands uses include: road encroachment in RCAs, riparian areas and stream channels; livestock grazing, timber harvest; prescribed burning; a small hydroelectric project; dispersed recreation; rural homes and ranches; and invasive weed infestations (USDI-BLM 2013, USDI-BLM 2000, USDI-BLM 1999).

3.2.4.2 Direct and Indirect Effects of Alternatives

Effects to riparian and wetland areas would occur from actions that occur within RCAs. The Proposed Action and No New Temporary Road Construction Alternative would not salvage timber harvest or construct temporary roads within RCAs. However, haul routes, road maintenance, low-water ford crossings (see Figure 22), and other stream crossings (e.g., culverts, bridges) would occur within RCAs.

Figure 22. Perennial stream crossing ford (non-fish bearing). This stream flows into the Middle Fork of John Day Creek. The action alternatives identify that low-water ford crossings and approaches would be rocked and graveled (Photo taken September 28, 2012).

There is potential for indirect or direct effects to riparian areas, stream channels and aquatic habitats from upslope salvage timber harvest, temporary road construction, use and maintenance of existing roads, and road rehabilitation. Rocking/graveling low water ford and road approaches would minimize potential for erosion and sediment delivery from use of these stream crossings. Primary effects include erosion/sediment and effects from detrimental soil disturbance and compaction. Negligible direct or indirect effects to riparian vegetation are expected to occur from road maintenance actions within RCAs. For additional analysis information regarding erosion/sediment, water quality, and aquatic habitats and potential direct or indirect effects to RCAs and riparian habitats refer to the Soils Resource Section 3.2.2, Water Resources Section 3.2.3, and Fisheries Section 3.2.5. The following Table 24 identifies various activities that would occur within RCAs from implementation of the action alternatives.

Table 24. Activities in RCAs in the Proposed Action and No Temporary Roads Alt.

Proposed Activity	John Day Creek Watershed	Salmon River Face Drainages	Total
Haul Routes Within RCAs	6.3 mi	0.36 mi	6.66 mi
Haul Road - Low Water Ford Crossings[1]	3	0	3
Culvert Stream Crossings – Fish Bearing	3	0	3
Culvert Stream Crossings – Non-Fish Bearing	8	8	16

[1]The three low water fords crossing all occur in non-fish bearing tributary streams to Middle Fork of John Day Creek.

<u>Proposed Action and No New Temporary Road Construction Alternative</u>

Harvest activities and temporary roads (Proposed Action only) would occur in six subwatersheds, which include two small tributary drainages to the Salmon River and four subwatersheds in the John Day Creek watershed (see Figure 18). Refer to Section 2.1 and Section 2.2 (New Construction which provide specific activity descriptions and design features that would occur. Design features would minimize or avoid adverse effects that would be expected to occur to wetland and riparian habitats.

No timber harvest or temporary road construction is proposed to occur within any Riparian Conservation Areas (RCAs) or within riparian/wetland habitats. However, timber harvest activities would include the use of existing roads that occur within RCAs or cross streams. The same level of activity would occur within RCAs for both action alternatives (see Table 24 above). Less use of roads would occur under No Temporary Road Alternative, because less salvage harvest would occur. All areas identified for tree planting occur outside of RCAs. Tree planting in the uplands would support long term recovery for watersheds, which would support faster reforestation in high severity burn areas. A total of 968 acres of tree planting are identified for Proposed Action and 658 acres of tree planting would occur under the No Temporary Road Alternative. With the exception of 52 acres (no salvage logging), tree planting is only proposed to occur where salvage timber harvest is proposed. Tree planting would support watershed recovery in the long term, primarily from long term benefits to hydrologic regimes (reduced ECA), improved slope stability. Improved watershed conditions in the uplands would have direct and indirect beneficial effects to RCAs and riparian areas.

Increased erosion and sediment from road use would have varying effects on aquatic and riparian resources. However, overall such activities would result in potential discountable new soil or vegetation disturbances within RCAs and riparian habitats. Overall, riparian and RCA effects are expected to be negligible. In summary, with the exception of increased road use and maintenance occurring within RCAs, effects to riparian habitats would be similar to what is described in the no action alternative.

No Action

No vegetation management actions (salvage timber harvest, tree planting) road use and maintenance, and road rehabilitation would occur.

Ecosystem functions and processes would continue to influence riparian and wetland habitat quality in the absence of management activities within the affected subwatersheds. Stream reaches that experienced high or moderate severity burn effects from the 2012 Sheep Fire would be in early seral condition and more prone to channel effects and infestations of invasive plant species. Natural recovery for riparian and wetland habitats would vary, dependent on burn severity and post-fire conditions. High and moderate burn severity riparian areas have more shrub and tree mortality, stream banks are more prone to high flow erosion and scouring, and these areas are at higher risk for invasive plant establishment. Regrowth of surviving vegetation and establishment of new vegetation from residual seedbanks are expected to restore protective ground cover, riparian structure, streambank stability, and stream shading over time. Some initial tree and shrub recovery (e.g., sprouting and seedlings) and herbaceous species revegetation would start to occur in the short term (1-5 years), however, complete riparian functional condition recovery would be longer and is dependent on site specific factors identified above (e.g., burn severity, existing conditions, land uses, etc.), particularly in regards to post-fire tree and shrub mortality.

3.2.4.3 Cumulative Impacts

The discussion focuses on past, ongoing, and reasonably foreseeable future activities that are expected to have additive effects to wetland and riparian habitats. See list of actions in Section 3.1.2.

Effects Common to All Alternatives

The existing conditions and trends for wetland and riparian areas within the analysis area is primarily attributed to the 2012 Sheep Fire and past, ongoing, and reasonably foreseeable future lands uses. These land use actions primarily include: road management and use; riparian and upland timber harvest; Forest Service Roadside Hazard Tree Removal Project; livestock grazing; dispersed recreation; invasive plants; and implementation of the BLM ESR Plan.

Existing roads have encroached on wetland and riparian habitats and RCAs, use and maintenance of existing roads would continue. Ongoing salvage logging on private or State lands primarily involves the use of existing roads, re-opening existing roads, and constructing skid trails. Surface rocking of native surface roads reduces the potential for sediment production. Approximately 0.84 miles has been surfaced with rock along Lower John Day Creek associated with salvage logging on private land. The salvage logging and associated road management on private and State lands would contribute to effects already associated with present wetland and riparian conditions and trends or effects of the BLM proposed salvage logging of this project.

Past and current logging within the project and analysis area subwatersheds is documented, with some occurring within riparian areas. Salvage logging on State and private lands is known to have occurred and is ongoing as a result of the 2012 Sheep Fire. It is estimated that approximately 1,100 acres of salvage logging is occurring on non-federal lands within the analysis area. The extent of past private and State land logging within riparian areas is not known, salvage logging on private lands in RCAs has/or is occurring in moderate to high severity areas; the exact extent is unknown but has been estimated for this analysis. It is estimated that salvage timber harvest within RCAs includes 0.82 miles on Lower John Day Creek, 0.63 miles on East Fork John Day Creek, 0.12 miles on Middle Fork John Day Creek. Such effects from private or State land salvage harvest is primarily from harvest of dead and dying trees within RCAs and associated erosion/sediment.

The Forest Service is also proposing Roadside Hazard Tree Removal Project within the John Day Creek watershed, which is expected to have negligible effects within RCAs or to aquatic habitats (USDA-Forest Service 2013). Forest Service hazard tree removal would focus on cutting dead and dying hazard trees that occur within 200 feet of several roads, however, areas within RHCAs would have discountable disturbance because cut trees would be left on site and no adverse disturbances would occur. The addition of salvage logging on State, private, and Forest Service lands would cumulatively add to sediment and large woody debris recruitment with RCAs.

Watershed restoration actions identified in the BLM *Sheep Fire Emergency Stabilization and Rehabilitation Plan* (ESR Plan) (USDI-BLM 2012) would occur. Actions identified in the ESR Plan include planting conifer trees and riparian trees and shrubs, and seeding desired species within RCAs. Other actions identified in the ESR Plan include road maintenance and improvements to reduce adverse erosion and replacing two small fence segments that burned. The fences excluded cattle from BLM Area of Critical Environmental Concern and a Habitat Management Plan area. The ESR Plan also identified the removal of two culverts and restoration of stream crossings (East Fork of John Day Creek). One of the East Fork John Day culverts is a partial/full fish passage barrier and is a chronic source of erosion and sediment. Planting of trees in uplands and within RCAs was also identified in the ESR Plan (up to 650 acres). Implementation of the ESR Plan would support restoration of riparian habitats along treated reaches, however, only a small percentage of riparian areas that had moderate or high burn severity from the 2012 Sheep Fire would be treated and would focus on fish bearing stream reaches. The primary long term benefits would occur from planting of conifer trees within RCAs that experienced high and moderate burn severity. ESR road improvement or maintenance actions would reduce road related erosion/sediment impacts in the short term, but overall beneficial effects would be low.

Past and foreseeable future livestock grazing on private, State, and federal lands has impacted riparian and wetland habitats to varying levels. Livestock grazing on private lands that have moderate or high burn severity may retard riparian recovery in localized areas, which is dependent on amount of livestock grazing and season of use. The majority of high and moderate severity burn areas within riparian areas occur on federal lands, where grazing would be curtailed in the short term to support vegetation recovery. No livestock grazing is authorized on Forest Service lands within the analysis area subwatersheds.

Dispersed recreation has affected wetland and riparian habitat within the analysis area. Within portions of the analysis area, public access is limited by few roads, many of which have no public access. Recreational use is considered low and primary use areas occur in areas accessible by roads. Recreation in the area includes hunting, camping, hiking, and other activities. The effects of dispersed recreation are low and only occur in a few areas due to lack of public access. Any soil or vegetation disturbance from recreational activities is negligible. Existing travel plans for BLM and Forest Service restrict motorized use to existing roads. For one to two years after the fire, increased mushroom hunting (commercial and private) would occur and road accessible areas would have increased fire wood cutting of dead trees. These effects are not expected to have an additive impact to the effects of the proposed action or alternative.

Invasive plants are present in the wetland and riparian habitats within the analysis area. The Sheep Fire has increased the potential for weed introduction and spread in these areas. Past, ongoing, and reasonably foreseeable future activities that occur in wetland and riparian habitats and cause vegetation or soil disturbance have the ability to contribute to the spread of invasive plants in these areas if adequate prevention measures are not incorporated into the activity. The action alternatives incorporate prevention measures to avoid introduction of invasive species as well as measures for inventory of the project area for weed introduction and treatment if necessary. In addition, no disturbance, other than road use, would occur in RCAs as a result of the action alternatives. Implementation of the action alternatives is not expected to contribute cumulatively to weed spread in wetland and riparian areas.

3.2.5 Fisheries, Aquatic Habitats and Special Status Species

3.2.5.1 Affected Environment

The project and analysis area for fisheries, aquatic habitats, and special status fish species includes the Cow Creek – Salmon River and John Day Creek 6th code Hydrologic Unit Code (HUC) watersheds (Figure 18, section 3.2.4). The analysis was conducted at the watershed and the subwatershed level which includes the following: Wet Gulch and Dry Gulch, which are small non-fish bearing tributaries of the Salmon River that occur within the Cow Creek – Salmon River watershed (Salmon River face drainages); and Lower John Day Creek, East Fork John Day Creek, Middle Fork John Day Creek, and South Fork John Day Creek, occur in the John Day Creek watershed (Figure 18).

The Lower Salmon River provides aquatic habitat for 23 native fish species and 9 non-native fish species. Native fish species include anadromous and resident salmonids that are federally listed or are BLM sensitive species. Other native species include the white sturgeon, northern pikeminnow, dace, sculpins, and chiselmouth. Common non-native species include smallmouth bass, and carp. Special status fish occurring within the analysis area include five Endangered Species Act (ESA) – listed species and three BLM sensitive fish species. The Soils (3.2.2), Water Resources (3.2.3), and Wetland and Riparian Habitats (3.2.4) sections of this chapter include additional information pertinent to the affected environment, environmental consequences, and analysis for aquatic species and habitats, specifically in regards to detrimental soil impacts, erosion/sediment, water quality, and riparian habitats; which have the potential to result in direct or indirect effects to aquatic habitats for fish bearing streams.

<u>ESA-listed Fish</u>

ESA-listed fish occurring within the project and analysis area include Snake River sockeye salmon (*Oncorhynchus nerka*), Snake River fall Chinook salmon(*Oncorhynchus tschawytscha*), Snake River spring/summer Chinook salmon (*Oncorhynchus tschawytscha*), Snake River steelhead trout (*Oncorhynchus mykiss*), and bull trout (*Salvelinus confluentrus*). These species occur in the Salmon River and John Day Creek watershed. Refer to Figure 23 for a John Day Creek fish distribution and a fish passage barrier map. Protection of these species afforded by the ESA (Section 7(a) (2)) requires the BLM to ensure that all actions authorized or funded by the agency are not likely to jeopardize the continued existence of the species, or result in destruction or adverse modification of critical habitat of listed species. For more detailed information regarding ESA-listed fish, and their habitats occurring within the project analysis area, refer to the Biological Assessment (BA) of the Sheep Fire Salvage Timber Sale Project (BLM 2013).

There are four species under the jurisdiction of National Oceanic Atmospheric Administration, National Marine Fisheries Service (NMFS) which are listed under the ESA. These listed species include the Snake River sockeye salmon, fall Chinook salmon, spring/summer Chinook salmon, and steelhead trout.

The Snake River sockeye salmon was listed as endangered on November 20, 1991 (Federal Register, Vol. 56, 58619). Critical habitat was designated for Snake River sockeye salmon on December 28, 1993 (Federal Register, Vol. 58, 68543), effective on January 27, 1994, and includes the Salmon River. No spawning or rearing for sockeye salmon occurs within the Cottonwood Field Office management area, however, they use the Salmon River as upstream and downstream passage corridors. Sockeye salmon spawn in Redfish Lake and upper headwater Salmon River tributary streams in September and October. Sockeye salmon do not utilize John Day Creek.

The Snake River fall Chinook salmon was listed as threatened on May 22, 1992 (Federal Register, Vol. 57, 14653). Critical habitat was designated for fall Chinook salmon on December 28, 1993 (Federal Register, Vol. 58, 68543), effective on January 27, 1994, and includes the Salmon River. Fall Chinook salmon are mainstem river spawners, utilizing the Salmon River for spawning and juvenile rearing; they also use the river for upriver and downriver passage corridors. Fall Chinook salmon do not utilize John Day Creek.

The Snake River spring/summer Chinook salmon was listed as threatened on May 22, 1992 (57 FR 14653). Critical habitat was designated for spring/summer Chinook salmon on December 28, 1993 (58 FR 68543), effective on January 27, 1994, and includes the Salmon River and John Day Creek. Spring/summer Chinook salmon use the Salmon River as a juvenile and adult migration corridor, and to a limited extent for juvenile rearing habitat. John Day Creek is used by spring/summer Chinook salmon for juvenile rearing.

The Snake River steelhead trout were listed as threatened on October 17, 1997 (62 FR 43937). Critical habitat for Snake River Basin steelhead trout was designated on September 2, 2005 (70 FR 52630). The Salmon River and John Day Creek are designated critical habitat for steelhead trout. Steelhead trout use the Salmon River as a juvenile and adult migration corridor, for adult over-wintering, limited spawning occurs, and for juvenile rearing habitat. Steelhead trout use tributary streams such as John Day Creek, which provides suitable and accessible stream habitat for spawning and juvenile rearing.

Bull trout is under the jurisdiction of U.S. Fish and Wildlife Service (USFWS). On July 10, 1998, the USFWS listed the Klamath and the Columbia River population segment of the bull trout as threatened (63 FR 31647). Bull trout critical habitat was re-designated on November 17, 2010 (75 FR 63898). The Salmon River and John Day Creek, including East Fork John Day Creek, Middle Fork John Day Creek, and South Fork John Day Creek, are designated as bull trout critical habitat below fish passage barriers (e.g., falls, steep gradient cascades). Bull trout use the Salmon River as a migration corridor and for adult and subadult foraging habitat. The population of bull trout utilizing John Day Creek is a resident population. The extent of fluvial (migratory) bull trout use in lower John Day Creek is not known, however, if such use occurs it would be expected to be incidental or very low.

Pursuant to Section 305(b)(2) of the Magnuson-Stevens Act, Federal agencies must consult with NOAA Fisheries regarding any actions authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken that may adversely affect Essential Fish Habitat (EFH) for Chinook salmon within the Lower Salmon River subbasin. The Salmon River and John Day Creek drainage provides aquatic habitat utilized by Chinook salmon. The Magnuson-Stevens Act, Section 3, defines EFH as "those waters and substrate necessary for fish for spawning, breeding, feeding, or growth to maturity." Federal agencies may incorporate an EFH Assessment into ESA Biological Assessments.

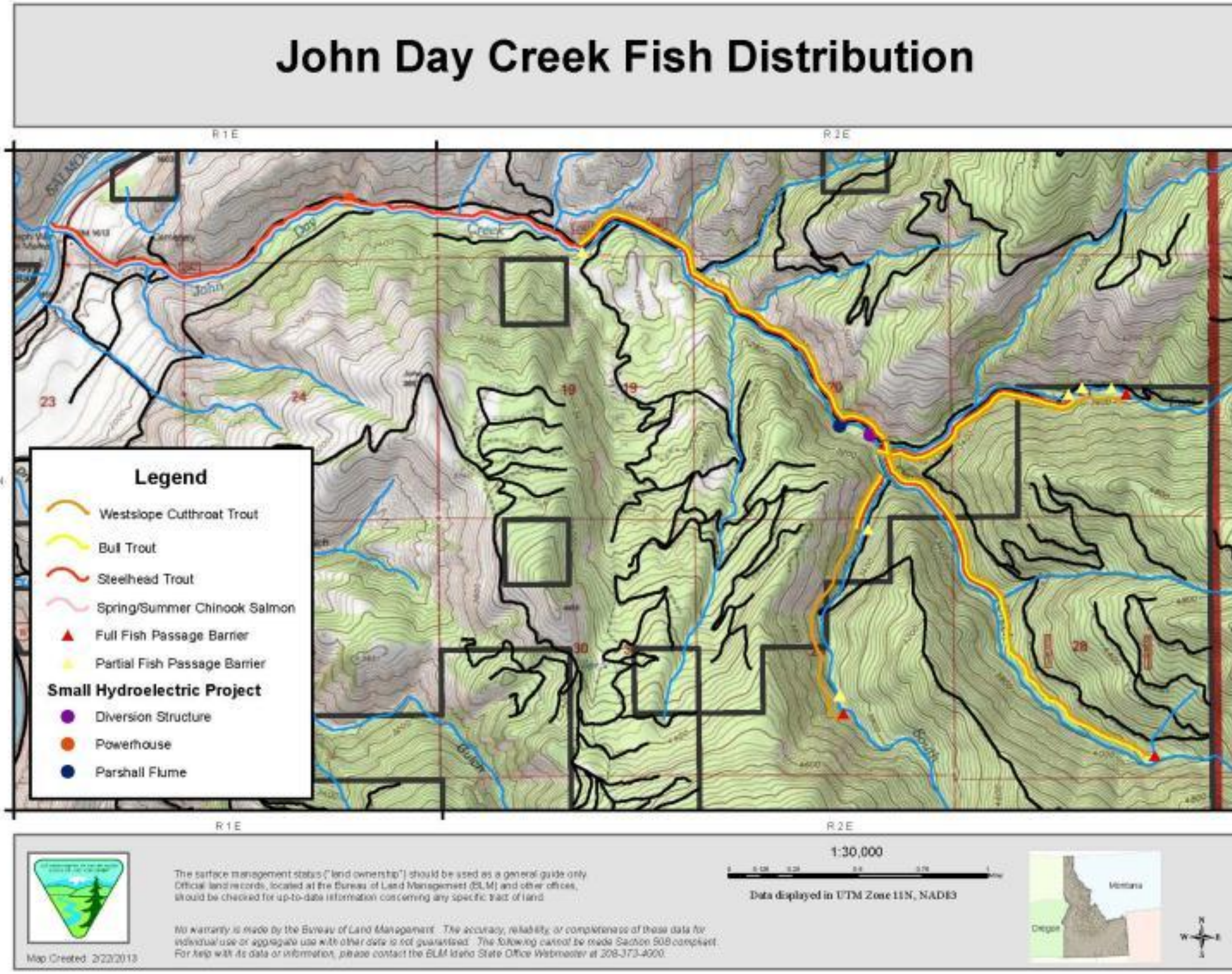

Figure 23. John Day Creek Fish Distribution

BLM-Sensitive Fish

There are three BLM sensitive fish species that occur within the analysis area. These sensitive fish species are westslope cutthroat trout (*Oncorhynchus clarki lewisi*), redband trout (*Oncorhynchus mykiss* spp.), and Pacific lamprey (*Lampetra tridentata*). Sensitive species are managed to ensure that BLM actions will reduce or eliminate threats to Bureau sensitive species to minimize the likelihood of and need for listing of these species under the ESA.

Westslope cutthroat trout use the Salmon River as a migration corridor and for adult foraging and rearing habitat, and to a lesser extent for juvenile rearing. Spawning occurs in a few Salmon River tributary streams, such as John Day Creek which provides suitable habitats, and migratory fish may spawn in lower reaches of the same streams used by resident fish. The westslope cutthroat utilizing upper John Day Creek is a resident population. The primary westslope cutthroat trout use occurring in John Day Creek drainage is upstream from a full/partial barrier located at stream mile 2.3. Westslope cutthroat trout are the most common fish species occurring in the East Fork, Middle Fork, and South Fork of John Day Creek. The extent of fluvial (migratory) westslope cutthroat trout use in lower John Day Creek is not known, however, if such use occurs it would be expected to be incidental or very low. Overall, the Lower Salmon River subbasin has low populations of fluvial (migratory) or resident westslope cutthroat trout populations.

Redband trout (non-anadromous rainbow) in the Upper Columbia River basin have been divided into two groups. One group evolved in sympatry with steelhead trout, and one group evolved outside the historical range of steelhead trout. The Lower Salmon River is used as a migration corridor by redband trout and is also used for juvenile rearing. Spawning and primary juvenile rearing occurs in tributary streams providing suitable and accessible stream habitat, such as the John Day Creek drainage. Within the project area, redband trout have evolved in sympatry with steelhead trout because they are downstream of partial/full barrier falls and cascades.

Pacific lamprey adults enter freshwater (Columbia River) between July and September and migrate more than 400 miles to Idaho. They spawn in sandy gravel immediately upstream from riffles between April and July and die soon after. Eggs hatch in two to three weeks and the ammocoetes (larval lamprey) spend up to 6 years in soft substrate as filter-feeders before emigrating to the ocean. They remain in the ocean for 12 to 20 months before returning to freshwater to spawn. Diatoms appear to be a primary food supply for ammocoetes. The Salmon River and John Day Creek provide suitable habitat for Pacific lamprey. The primary potential for Pacific lamprey use in John Day Creek would occur in the lower reaches, however, no known documentation of occurrence is known.

Redband trout utilizing John Day Creek would have similar spawning and incubation/emergence as steelhead trout, however, they would not out migrate (smolt emigration). Table 25 identifies the time of year when each species and lifestage is present within the analysis area (John Day Creek or Salmon River). Because life stages similar for steelhead trout (see above discussion) and no effect determination for sockeye salmon and fall Chinook, these species not included in Table 25.

Table 25. ESA-Listed and BLM Sensitive Fish Species Lifestages

Lifestage	Sp/Summer Chinook Salmon	Steelhead Trout	Bull Trout	Westslope Cutthroat Trout	Pacific Lamprey
Adult Migration	APR-JUL Salmon R.	AUG-APR Salmon R.	JUN-AUG Salmon R.	JUL-OCT Salmon R.	JUL-OCT Salmon R.
Adult Spawning	AUG-SEP Trib. Streams	MAR-JUN John Day Cr.	Late AUG-SEP John Day Cr.	MAR-JUN John Day Cr.	APR-JUL Salmon R. Trib. Streams
Adult Overwintering	N/A	NOV-MAR Salmon River	NOV-MAR Salmon River	NOV-MAR Salmon R. John Day Cr.	NOV_MAR Salmon R.
Adult/Subadult Rearing	N/A	N/A	YEARLONG Salmon R. & John Day Cr.	YEARLONG Salmon R. John Day Cr.	N/A
Incubation & Emergence	SEP-MAY Trib. Streams	MAR-JUN John Day Cr.	SEP-MAY John Day Cr.	MAR-JUN John Day Cr.	APR-JUL Salmon River & Trib. Streams
Juvenile Rearing	1 Year Trib. Streams John Day Cr.	1-3 Years Trib. Streams	2 - 3 Years John Day Cr.	1 - 3 Years John Day Cr.	4-6 Years Salmon R. & Trib. Streams
Smolt Emigration	APR-JUL	APR-JUL	N/A	N/A	APR-JUL

<u>RMP Management Guidance</u>

The Cottonwood RMP Aquatic and Riparian Management Strategy provides guidance and programmatic direction for watersheds, riparian, and aquatic habitats (USDI-BLM 2009, Appendix D). This strategy also provides for the establishment of Riparian Conservation Areas (RCAs), and management emphasis for aquatic and riparian dependent resources, which is described as:

- 300 feet on each side of the stream channel for fish-bearing streams
- 150 feet on each side of the stream channel for permanently flowing non-fish-bearing streams and from the edge of water body for ponds, lakes, reservoirs, and wetlands >1 acre
- 100 feet on each side of the stream channel for seasonally flowing or intermittent streams and wetlands <1 acre in size.

The Cottonwood RMP (USDI-BLM 2009) identifies the John Day Creek watershed (includes all subwatersheds) as a high priority restoration watershed. High priority criteria and restoration designation were given to watersheds that have habitat potential for highly productive or unique fish communities with restoration efforts. Restoration watersheds were identified because biological and physical processes and functions do not reflect natural conditions because of past and long-term land disturbances. The John Day Creek watershed provides designated critical habitat for three ESA-listed fish species (i.e., spring/summer Chinook salmon, steelhead trout, and bull trout) and also provides aquatic habitat for BLM sensitive fish species. In addition to natural events (e.g., wildfire, floods), past land uses have altered watershed and aquatic resources.

The 2012 Sheep Fire encompassed a large majority of the John Day Creek watershed and Salmon River face drainages (Wet Gulch and Dry Gulch). Burn severity of the watersheds and subwatersheds is summarized in Table 26, see previous Figures 16 and 17 in section 3.2.4 for map of burn severity, project area, and analysis area watersheds.

Table 26. Watershed Acres and Burn Severity Outside and Within 2012 Sheep Fire Perimeter

Watershed - Subwatershed	Outside 2012 Sheep Fire Perimeter	Within 2012 Sheep Fire Perimeter			
		High Burn Severity	Moderate Burn Severity	Low Burn Severity	Very Low or No Burn Severity
JOHN DAY CREEK WATERSHED					
Lower John Day 4,128 acres	1270 acres (31%)	78 acres (2%)	578 acres (14%)	1497 acres (36%)	705 acres (17%)
East Fk John Day 3,629 acres	0 acres (0%)	624acres (17%)	1324acres (37%)	1175acres (32%)	506acres (14%)
Middle Fk John Day 3,798 acres	0 acres (0%)	478 acres (13%)	915 acres (24%)	1075 acres (28%)	1329 acres (35%)
South Fk. John Day 2,464 acres	0 acres (0%)	366 acres (15%)	852 acres (35%)	695acres (28%)	552 acres (22%)
JOHN DAY TOTAL 14,019 acres	1270acres (9%)	1545acres (11%)	3669 acres (26%)	4443 acres (32%)	3093acres (22%)
COW CREEK-SALMON RIVER WATERSHED					
Cow Cr.-Salmon R. 16,853 acres	15,804acres (94%)	<1 acres (<1%)	181 acres (1%)	710 acres (4%)	158 acres (1%)
Wet Gulch 1,780 acres	65 acres (4%)	112 acres (6%)	521 acres (29%)	769 acres (43%)	313 acres (18%)
Dry Gulch 721 acres	92 acres (13%)	0 acres (0%)	24 acres (3%)	409 acres (57%)	196 acres (27%)
COW CR.-SALMON RIVER TOTAL 19,354 acres	15,961 acres (82%)	112 acres (<1%)	726 acres (4%)	1,888 acres (10%)	667 acres (3%)

Refer to section 3.2.4 *Wetland and Riparian Habitats*, Table 23, for a summary of burn severity ratings for the streams that occurred within the fire perimeter. Post-fire increases in stream discharge coupled with the absence of bank vegetation dramatically alters the morphology of many streams and subsequently reduced bank stability in burned watersheds (Silins et al. 2009). In regards to fish-bearing subwatersheds, the three subwatersheds in upper John Day Creek had the highest burn severity impacts from the 2012 Sheep Fire. High and moderate burn severity occurred along 55 percent of East Fork John Day Creek, 28 percent of South Fork John Day Creek, 25 percent of Middle Fork John Day Creek, and 13 percent of Lower John Day Creek stream miles. The entire John Day Creek watershed had 27 percent high and moderate burn severity along streams (includes Lower John Day Creek). The Salmon River face drainages are non-fish bearing, and Wet Gulch sub-watershed stream miles had 38 percent high and moderate burn severity. The Dry Gulch sub-watershed had no high or moderate burn severity along streams. However the Dry Gulch drainage had low and very low burn severity along 72 percent of the stream miles.

Figure 24. Tributary stream to Middle Fork John Day Creek with a potential to have reduced bank stability and increased erosion as a result of 2012 Sheep Fire (photo taken October 4, 2012).

The 2012 Sheep Fire has resulted in high tree mortality within high and moderate burn severity areas (see Table 26). Removal of forest canopy by timber harvest, road construction, or natural processes (such as wildfire) can affect the quantity and timing of stream flow. Increases in water yield may indirectly affect fish habitat through increased bank erosion, channel down cutting, increased accumulation of larger streambed materials, reduction in number of pools, overall reduction of habitat complexity, and changes in number, size, or frequency of large woody debris (LWD).

Equivalent Clearcut Acres (ECA) is a term used to describe the total area within a watershed that would exist in a clearcut condition. Forest removal increases water yield because of the following: a reduction of transpiration, a reduction of interception, and more efficient conversion of snowpack to streamflow. Removal of vegetation also makes more water available for stream flow by reducing interception losses. Evaporative losses from water intercepted by trees are greater than losses from the ground surface under a canopy. The results of the water yield analysis (ECA) are used for evaluating potential impacts to fish habitat from altered flow regimes. Stand replacing fires and timber harvest both have the capability of affecting ECA. Table 27 below summarizes ECA pre-fire and post-fire conditions as a result of the 2012 Sheep Fire.

Table 27. Subwatershed ECA for Pre-Fire and Post-Fire Conditions

Subwatershed - Watershed	Area (Acres)	Pre-Fire ECA	Post-Fire ECA
Lower John Day	4,128	15%	26%
East Fork John Day	3,629	25%	45%
Middle Fork John Day	3,798	7%	35%
South Fork John Day	2,464	5%	42%
JOHN DAY TOTAL	14,019	14%	36%
Wet Gulch	1,780	7%	35%
Dry Gulch	721	5%	19%
WET GULCH AND DRY GULCH TOTAL	2,501	6%	31%

Refer to Sections 3.2.2 Soils, 3.2.3 Water Resources, and 3.2.4 Wetland and Riparian Habitats for additional information regarding specific characteristics for the project and analysis area sub-watersheds.

<u>John Day Creek Watershed</u>

The John Day Creek watershed occurs within the Lower Salmon River subbasin. John Day Creek flows into the Salmon River at river mile 72.4. Other tributaries of John Day Creek include the East Fork John Day Creek, Middle Fork John Day Creek, and South Fork John Day Creek. The John Day Creek watershed is 14,019 acres in size.

The Lower John Day Creek sub-watershed is 4,128 acres in size. A partial/full fish passage barrier occurs at stream mile 2.3, refer to Figure 23 for a map of fish distribution within the watershed and fish passage barriers. Primary steelhead trout and redband trout spawning and rearing occurs downstream from the barrier, however, use has been documented upstream also. Juvenile spring/summer Chinook salmon rearing has been documented in the lower reaches of John Day Creek below the barrier at stream mile 2.3. Other species that occur in the Lower John Day Creek include bull trout and westslope cutthroat trout, primary use by these species is upstream of the barrier at stream mile 2.3. Pacific lamprey may potentially occur in Lower John Day Creek, however, no use has been documented.

Table 28 below summarizes substrate monitoring (deposited sediment) that was evaluated at permanent monitoring stations and field verified during an inspection of stream reaches (fall 2012) within the John Day Creek watershed.

Table 28. Deposited Sediment for John Day Creek Watershed

Subwatershed	Cobble Embeddedness	Percent Surface Fines	Percent Fines by Depth for Spawning Gravels (% Less than 6.3 mm)
Lower John Day Creek	39% - 46%	8% - 11%	25% - 27%
East Fork John Day Creek	43% - 56%	9% - 14%	22% - 24%
Middle Fork John Day Creek	41% - 52%	7% - 12%	20% - 23%
South Fork John Day Creek	45% - 66%	15% - 25%	25% - 30%

Overall, the drainages have elevated levels of deposited sediment. Ratings are poor for cobble embeddedness, poor to fair for surface fines, and poor to fair for percent fines by depth for spawning gravels. Elevated cobble embeddedness levels result in suboptimal conditions for juvenile winter rearing habitat, primarily by limiting available habitat for juvenile fish using interstitial spaces (e.g., spaces between cobble/boulders) that occur in stream bottom substrate. The percent fines by depth (e.g., fine sediment in spawning gravels) indicate relatively fair to low fair conditions for the streams. Increased levels of sediment in spawning gravels have adverse effects on fish egg incubation and emergence of fish fry from the gravels after hatching and elevated deposited sediment within the John Day Creek drainage has resulted in fair spawning conditions.

Table 29 provides a summary of Lower John Day Creek fish habitat parameters, which were field inspected during the fall 2012 for changes that occurred from the Sheep Fire.

Table 29. Habitat Analysis for Lower John Day Creek

Habitat Pot.	Cobble Embed.	Spawning Gravels %<6.3	Pool Rif. Ratio	Summer Temp. C°	Active Debris & Pot. Debris 100m.	Pool Qual.	Instream Cover	Bank Cov.	Bank Stab.
Natural	<22%	<19%	1:4	<=16	25+/60+	5.0	11%+	5%+	95%+
Exist.	39 - 46%	25 - 27%	1:15	16C	15/45	4.5	10%	5%	85-90%
%Nat.	50 - 60%	60 - 70%	70%	90%	60%/70%	80%	90%	90%	80%

1/ Stream survey conducted is a modified Hankins and Reeves survey protocol (1988) (Field Verified 2012).

East Fork John Day Creek Watershed

The East Fork John Day Creek is a steep gradient second order stream that flows into the mainstem John Day Creek at stream mile 4.0. The subwatershed contains a total of 3,629 acres and comprises 26 percent of the John Day Creek watershed. Two 6-foot barrier falls occur at stream mile 1.1 and restrict upstream fish passage. Several partial fish passage barriers occur downstream from the barrier falls. The East Fork John Day Creek has documented occurrences of bull trout, cutthroat trout, and redband/steelhead trout in the lower reaches. Historically, steep gradients, cascades, and falls restrict upstream fish passage in stream segments above stream mile 1.0. Refer to Figure 23 for a map of fish distribution and fish passage barriers occurring within the watershed.

During 1995, landslides and debris torrent events originating from slopes and roads located in the upper watershed resulted in severe channel scouring and substantial contributions of sediment. Previous slumps and debris torrents have been documented for this subwatershed.

Table 30 provides a summary of East Fork John Day Creek fish habitat parameters, which were field inspected during the fall 2012 for changes that occurred from the Sheep Fire.

Table 30. Habitat Analysis for East Fork John Day Creek

Habitat Pot.	Cobble Embed.	Spawning Gravels %<6.3	Pool Rif. Ratio	Summer Temp. C°	Active Debris & Pot. Debris 100m.	Pool Qual.	Instream Cover	Bank Cov.	Bank Stab.
Natural	<22%	<19%	1:4	<=16	25+/60+	5.0	11%+	5%+	95%+
Exist.	43 - 56%	22 - 24%	1:20	16-17C	25+/50+	4.0	10%	1%	50-70%
%Nat.	50 - 60%	70 - 80%	60%	80%	100%/100%	70%	90%	60%	60%

1/ Stream survey conducted is a modified Hankins and Reeves survey protocol (1988) (Field Verified 2012).

Middle Fork John Day Creek Watershed

The Middle Fork John Day Creek is a steep gradient second order stream that flows into the mainstem John Day Creek at stream mile 4.15. The Middle Fork John Day Creek and South Fork John Day Creek flow together to form John Day Creek. The subwatershed contains a total of 3,798 acres and comprises 27 percent of the John Day Creek watershed. In 1982 a road caused slump/landslide (stream mile 1.60) contributed substantial amounts of sediment and debris to the stream. A 12-foot barrier falls occurs at stream mile 1.7 (see Figure 25). Several partial fish passage barriers occur downstream from this barrier. Westslope cutthroat trout are the most common fish species found in this stream, other documented fish species include bull trout and redband/steelhead trout. Refer to Figure 23 for a map of fish distribution and fish passage barriers occurring within the watershed.

Table 31 provides a summary of Middle Fork John Day Creek fish habitat parameters, which were field inspected during the fall 2012 for changes that occurred from the Sheep Fire.

Table 31. Habitat Analysis for Middle Fork John Day Creek

Habitat Pot.	Cobble Embed.	Spawning Gravels %<6.3	Pool Rif. Ratio	Summer Temp. C°	Active Debris & Pot. Debris 100m.	Pool Qual.	Instream Cover	Bank Cov.	Bank Stab.
Natural	<22%	<19%	1:4	<=16	25+/60+	5.0	11%+	5%+	95%+
Exist.	41 - 52%	20 - 23%	1:19	16-17C	25+/50+	4.0	10%	1%	60-80%
%Nat.	50 - 60%	80%	60%	80%	100%/100%	70%	90%	60%	60%

1/ Stream survey conducted is a modified Hankins and Reeves survey protocol (1988) (Field Verified 2012).

Figure 25. Photo of 12-foot full passage barrier falls (stream mile 1.7) located in Middle Fork of John Day. This stream segment was within fire perimeter; however, burn severity rated as unburned or very low (photo taken September 28, 2012).

South Fork John Day Creek Watershed

The South Fork John Day Creek is a steep gradient second order stream that flows into the mainstem John Day Creek at stream mile 4.15. The subwatershed contains a total of 2,464 acres and comprises 18 percent of the John Day Creek watershed. Refer to Figure 26 for a photo of burn effects to stream channel and riparian habitats in lower reach of South Fork John Day Creek. A 12-foot falls and a 25-foot cascade blocks upstream fish passage at stream mile 1.0. Several partial fish passage barriers occur downstream from this barrier. Westslope cutthroat trout are the most common species found in this stream, primarily occurring in the lower reaches. Other species occurring in the drainage include bull trout and rainbow/steelhead trout. Fish density is very low for this stream. Refer to Figure 23 for a map of fish distribution and fish passage barriers occurring within the watershed.

Figure 26. Photo of lower South Fork John Day Creek taken September 25, 2012. This photo shows moderate burn severity effects to stream channel and riparian habitats and residual effects of severe channel and bank scouring debris torrent that occurred during the spring of 2009.

In the past, localized headwater stream channel scouring and debris torrents have occurred in some head water first order tributaries. A rock and debris slide occurred during the mid-1980s and covered up the stream channel at stream mile 0.35 and the stream formed a new channel around the slide area. Previous to 2009 the South Fork John Day Creek had no defined stream channel from stream mile 0.40 to 0.60 and flowed subsurface through a cavern/faults (full fish passage barrier at stream mile 0.4). During the spring of 2009, a high flow scouring event and debris torrent occurred in the drainage. The 2009 debris torrent severely scoured the stream channel and formed a new surface perennial stream channel in the reach that previously flowed subsurface. Consequently, additional South Fork John Day Creek stream reaches are now accessible to fish.

Table 32 provides a summary of South Fork John Day Creek fish habitat parameters, which were field inspected during the fall 2012 for changes that occurred from the Sheep Fire.

Table 32. Habitat Analysis for South Fork John Day Creek

Habitat Pot.	Cobble Embed.	Spawning Gravels %<6.3	Pool Rif. Ratio	Summer Temp. C°	Active Debris & Pot. Debris 100m.	Pool Qual.	Instream Cover	Bank Cov.	Bank Stab.
Natural	<22%	<19%	1:4	<=16	25+/60+	5.0	11%+	5%+	95%+
Exist.	45 - 66%	25 - 30%	1:20	14 C	25+/50+	3.5	10%	2%	50-70%
%Nat.	50 - 60%	60 - 70%	60%	100%	100%/100%	60%	90%	70%	50-60%

1/ Stream survey conducted is a modified Hankins and Reeves survey protocol (1988) (Field Verified 2012).

Salmon River Face Drainages – Wet Gulch and Dry Gulch

The project/analysis area includes Salmon River face drainages on the east side of the river (Cow Creek-Salmon River 6th code HUC). Dry Gulch joins the Salmon River at river mile 73.7 and Wet Gulch flows into the Salmon River at river mile 74.1 (see Figure 18). The Dry Gulch drainage totals 721 acres and the Wet Gulch drainage totals 1,780 acres. Wet Gulch and Dry Gulch are not occupied by fish and contain perennial and intermittent non-fish bearing streams.

The lower reach of the Wet Gulch drainage has a channel with flowing water; however, up-drainage from this reach the stream flows subsurface. The upper reaches within the Wet Gulch drainage do have stream channels with surface flows. The Dry Gulch drainage does not have a surface flow channel that flows into the Salmon River. The mid and upper reaches of the drainage do have surface flows (e.g., intermittent and perennial). Stream channels are lower gradient (<7-10 percent) in the lower reaches and upper reaches consist of steep gradient streams (>7-10 percent). Wet Gulch and Dry Gulch do not provide habitat for fish.

Human Caused Characteristics

Primary human-caused physical characteristics within the analysis area are attributed to livestock grazing, timber harvest, small hydroelectric development, roads, invasive weed infestations, prescribed burning, and residences (USDI-BLM 2013, USDI-BLM 2000, USDI-BLM 1999).

There are approximately 62.3 miles of roads in the John Day Creek drainage. Road density for the John Day watershed is approximately 2.8 miles per square mile. Total road miles for Salmon River face watershed are 18.5 miles and road density is 4.7 miles per square mile. Refer to Table 33 for road density for specific subwatersheds occurring within the analysis area. During the period of 1997-1998 the Forest Service and BLM completed road rehabilitation within the watershed (USDI-USDA 1996a & b).

Table 33. Road Mileage and Densities - John Day Creek Subwatersheds

Subwatershed and Watershed	Acres (miles$^{2)}$)	Road Miles	Road Density (mi/mi$^{2)}$)
Lower John Day Creek	4,128 (6.45 mi^2)	30.1	4.7 mi/mi^2
East Fork John Day Creek	3,629 (5.67 mi^2)	19.3	3.4 mi/mi^2
Middle Fork John Day Creek	3,798 (5.93 mi^2)	12.9	2.2 mi/mi^2
South Fork John Day Creek	2,464 (3.85 mi^2)	<0.1	0.0 mi/mi^2
JOHN DAY CREEK TOTAL	**14,019 (21.9 mi^2)**	**62.3**	**2.8** mi/mi^2
Wet Gulch	1,780 (2.78 mi^2)	14.3	5.1 mi/mi^2
Dry Gulch	721 (1.13 mi^2)	4.2	3.7 mi/mi^2
SALMON RIVER FACE DRAINAGES TOTAL	**2,501 (3.91 mi^2)**	**18.5**	**4.7 mi/mi^2**

A hydroelectric project occurs in the mainstem John Day Creek; it went on line in 1988. This project diverts water from John Day Creek at stream mile 3.9 into an 18-inch penstock (see Figure 27). The buried penstock delivers water to the powerhouse at stream mile 1.4, where it is discharged into the main stream channel. Within the diverted reach (stream mile 1.4-3.9) a minimum instream flow of 4.5 cfs (cubic feet per second) must be maintained from July 15 to April 15, and a minimum of 12 cfs is maintained during the remainder of the calendar year. The hydroelectric facility has a maximum capacity of 25 cfs. A Parshall flume was constructed (stream mile 3.8) for calibration and control of flows in the diverted reach. This flume is a partial/full fish passage barrier.

Figure 27. View of Lower John Day Creek small hydroelectric project diversion structure (stream mile 3.9). Photo taken October 3, 2012.

Fisheries Analysis Indicators

This section describes how existing conditions for fish and fish habitat were determined. Review of existing monitoring and surveys and the FS Burned Area Report (USDA-FS 2012) and BLM Sheep Fire Emergency Stabilization and Rehabilitation Plan (ESR Plan) (USDI-BLM 2012) was conducted. In addition, field investigations and validations were conducted during the fall of 2012 regarding current aquatic habitat conditions and changes that occurred as a result of the 2012 Sheep Fire.

The analysis focuses project effects on six indicators of fish habitat and how indicators are predicted to change as a result of project implementation. Indicators include: sediment/stream substrate condition, large woody debris, water quality/temperature, water yield, RCA and stream channel function, and watershed condition.

Indicator 1 – Sediment/Stream Substrate Condition

Loss of effective ground cover is the single most important change that can greatly increase erosion and runoff. Soil and vegetation disturbance can cause increased erosion and sediment. Deposited sediment in fish bearing stream channels can adversely affect all life's stages of fish (e.g., spawning, incubation, juvenile rearing, food production, etc.). Mapping and field investigations to determine post-fire burn severity and preparation of a post-fire severity map was prepared after the Sheep Fire (see Figures 16 and 17). This mapping effort is an important first step to prioritize field reviews and locate burned areas that may pose a risk to values within or downstream of the burned areas. This mapping effort was used to assess the post-fire watershed conditions.

Wondzell and King (2003) documented that where riparian zones burned, sedimentation rates were expected to be higher than normal over the next two to three years as stream flow removes sediments that were retained by organic debris prior to the fire. Robichaud (2005) reported that sedimentation rates which increased due to wildfire are likely return to background conditions within seven to fourteen years as vegetation recovers and stabilizes the mobile sediment.

In the short term, the adverse effects of high-severity fires include decreased infiltration, increased overland flow, and increased excess sedimentation in streams which can be exacerbated by the soil disturbance caused by salvage logging (McIver and Starr, 2000). Fires can affect watershed conditions and stream systems through removal of forest litter and duff layers which increases erosion and sedimentation, and through changes in peak flows and water yields. In some instances, high-severity fires create physical and chemical changes that can cause "hydrophobic" soil layers that repel water infiltration and lead to accelerated overland flow. All of these natural fire-related processes can increase surface water runoff, water yields and peak streamflows, leading to increased potential for erosion, landslides and floods, and subsequent sedimentation of streams. Research indicates that the net effect of high-severity wildfires is to increase the sensitivity of sites to further soil disturbance (Helvey, 1980).

Sediment inputs to stream channels occur as a complex series of pulses that are delivered and stored within low order, high gradient stream channels. Sediment accumulates for long periods of time within these channels before being transported or "flushed" downstream by episodic events with large increases in water yield (Kirchner et al. 2001). Large-scale stand replacing fires followed by floods would be considered episodic events. Transport of sediment plays a fundamental role in the natural function of forested watersheds. In excess, suspended sediment degrades aquatic and fish habitat, disrupts hyporheic connection (the saturated sediment environment below a stream that exchanges water, nutrients, and fauna with surface flowing waters), enhances the transport of absorbed pollutants, and increases treatment costs associated with municipal water withdrawal (Rehg et al. 2005). Forests generally have very low erosion rates unless they are disturbed (Elliot et al. 2000).

Short term "pulse disturbance" increases in turbidity and sediment would result from project implementation for most actions, however, restoration efforts would focus on long term reductions in chronic or "press disturbance" sediment. "Pulse disturbance" like most fires, floods, and some droughts are within the range of natural disturbances to which an ecosystem is adapted, are temporary in time and often patchy in space, and natural recovery is usually possible without assistance. "Press disturbance" alters the long-term resilience of an ecosystem, like sediment from permanent roads or channel alteration from mining or grazing. The "press disturbance" described in this assessment are generally chronic, often widespread (e.g., roads), and may exceed the capacity for recovery without assistance. The 2012 Sheep Fire attributed surface erosion and sediment delivery to streams would be expected to contribute large amounts of sediment during the first 3 years, with gradually improving trends occurring with vegetation establishment. On high and moderate severity burn areas a large percentage of trees were killed (e.g., 80 percent or more). Within areas that have a moderate or high risk for landslides and subsequent loss of root strength with decay of roots from fire killed trees, these areas will become more prone to landslides with time.

Refer to section 3.2.2, Soils for a discussion of mass wasting and landslides.

Salmonids are typically negatively affected by increasing amounts of sediment (Bjornn and Reiser 1991). A review of studies related to the effects of fine sediment on salmonids by Chapman and McLeod (1987) concluded that survival to emergence decreases as fine sediment increases in the spawning gravels, the loss of pool volume due to sediment deposition reduces the suitability of a stream for adults, macroinvetebrates decrease in biomass and diversity, and winter carrying capacity decreases. Sedimentation of deep pools and coarse substrate limits the physical space available to juvenile fish for rearing and overwintering. The summer or winter carrying capacity of a stream for fish declines when sediment fills the interstitial spaces of the substrate (Bjornn and Reiser 1991).

Fine sediment (less than 6.33 mm) deposited in spawning areas can trap or smother eggs and embryos, reducing reproductive success of spawning adults. In spawning areas, egg deposition, development, and survival become limited when sediment fills the spaces between gravel, preventing the flow of oxygen and the flushing of metabolic wastes.

Indicator 2 – Large Woody Debris

Large woody debris (LWD) is an important source of habitat and cover for fish populations in streams (MacDonald et al. 1991 p. 129). LWD increases fish habitat complexity, which helps ensure that cover and suitable habitat can be found over a wide range of flow and climatic conditions (MacDonald et al. 1991 p. 128). Large wood has a major impact on channel forming in smaller streams (Sullivan et al. 1987). The location and orientation of LWD can influence channel meandering and bank stability (Swanson and Lienkaemper 1978; Cherry and Beschta 1989). LWD is often the most important structural agent forming pools in small streams (MacDonald et al. 1991). Bilby (1984) and Rainville et al. (1985) found that 80 percent of pools in small streams in Washington and the Idaho Panhandle, respectively, were wood associated. LWD also influences sediment transport in streams by forming depositional sites (MacDonald et al. 1991). Wood was responsible for storing half the sediment in several small streams in Idaho (Megahan and Nowlin 1976). LWD can also provide storage sites for leaves, twigs, and other organic material (MacDonald et al. 1991). In small streams in forested areas, this fine organic material can provide the bulk of the energy and materials entering into aquatic food web (MacDonald et al. 1991).

LWD is a component of habitat quality and complexity and is an important contributor to stream productivity, cover, and food production for fish and other aquatic organisms. Large wood in the streams also contributes to channel stability in small, low order streams, and is an important element even in streams where fish are not present. Under natural conditions, large wood is contributed to streams from the surrounding riparian areas as trees fall over and may be recruited slowly over time or in large numbers over a short period of time. The latter often occurs in response to a disturbance event, such as wildfire or extreme weather where floods or debris torrents wash large amounts of material into the stream. Stream restoration for LWD deficient streams often includes felling trees into streams, hauling LWD to the stream, and selective placement in the stream.

The amount of LWD in a stream is usually measured in the field during stream surveys by counting the number of large woody pieces present in the stream. Future woody debris recruitment is estimated by counting the number of trees in the riparian area that could fall into the stream.

Increases in water yield and high flood flows have the potential to scour stream channels and streambanks. These increased stream flows also may potentially move and flush embedded or anchored LWD from a stream reach. LWD may be moved downstream to a larger stream or river reaches where LWD may not have the same important function for instream cover.

Most woody debris recruitment in this landscape comes from the streamside zone. Robison and Beschta (1990) found that when the distance from a tree to a stream was more than one effective tree height, the probability of the tree contributing LWD approached zero. The effectiveness of riparian forests along stream channels to deliver LWD is low at distances greater than one tree height away from the channel (McDade et al. 1990). The 2012 Sheep Fire will result in large increases in LWD to streamside zones and channels, and will increase in time over the next decade as dead trees/snags rot and decay and fall down (see Figure 28).

Figure 28. The 2012 Sheep Fire will result in recruitment of large woody debris to stream channels and riparian areas as dead and dying trees fall down. View of Middle Fork of John Day Creek (photo taken September 29, 2012).

Indicator 3 – Water Quality/Temperature

Toxics

A spill hazard exists wherever roads are near streams or road drainage enters streams (Furniss et al. 1991). Fuel spills may negatively affect a fish-bearing stream biologically through direct poisoning of fish and invertebrates, a food source. Fuels and fuel oils are moderately to highly toxic to salmonids, depending on the concentration and exposure time (Gutsell 1921). Free oil and emulsions may adhere to gills and interfere with respiration and heavy concentration of oil can suffocate fish. The fate of oil in water includes spreading, movement, evaporation, solution, emulsification, photo-chemical oxidation, microbial degradation, sedimentation, and hydrocarbons deposited in sediments which may persist for long periods (Saha and Konar 1986). Water quality analysis includes potential risks for introduction of toxic materials. This assessment does not include predictions of the amount of toxic materials entering streams. The project proposal identifies measures that minimize potential risks of toxic materials entering streams.

The two factors determining the degree of risk from toxic materials are the toxicity of the chemical and the likelihood that non-target organisms would be exposed to toxic doses (Norris et al. 1991). Toxicity alone does not make a chemical hazardous; exposure to a toxic dose must also occur. Chemicals may enter water by one or more of the following routes: direct application, drift, and mobilization in ephemeral stream channels, overland flow, and leaching (Norris et al. 1991).

Water Temperature

Stream temperatures are the net result of a variety of transfer processes, including radiation inputs, evaporation, convection, conduction, and advection (Brown 1983). Removal of vegetation along streams may result in instream temperature increases during summer months, and in the loss of insulating vegetation that can contribute to colder winter stream temperatures. Water temperature influences the metabolism, behavior, and mortality of fish and other organisms in their environment (Mihurksy and Kennedy 1967).

Unsuitable temperatures can lead to disease outbreaks in migrating and spawning fish, altered timing of migration, and accelerated or retarded maturation. Unsuitable temperatures can also force adult and rearing juvenile fish to find thermal refuge in tributaries where there may be increased risk of predation and/or competition for food, potentially affecting a fish's fitness, thus its survival going into winter. Fish can often survive short durations of temperatures above or below their preferred range, growth is reduced at low temperatures because all metabolic processes are slowed, and at high temperatures, because most or all food must be used for maintenance (Bjornn and Reiser 1991).

Measured buffer strip shading shows that a buffer strip 85 feet wide shades a stream as well as an average undisturbed canopy in late-succession, old-growth forests in the Western Cascades Steinblums 1977). In a study of small streams, Brazier and Brown (1973) found the maximum shading ability of the average buffer strip was reached with a width of 80 feet.

Colder water temperatures due to loss of insulating vegetation can lead to the formation of frazil or anchor ice on stream bottoms. Incubating embryos can be killed when frazil or anchor ice forms in streams and reduces water interchange between stream and redd (Bjornn and Reiser 1991).

Generally spawning temperature is not as high of a concern for steelhead and redband/rainbow trout, which spawn in the spring, or bull trout, which spawn in the in the fall when stream temperature are typically cooler. High summer temperatures can affect summer rearing habitat for all federally listed or BLM sensitive fish species, and the spawning success for spring/summer Chinook salmon that spawn in August to mid-September.

Potential increases in stream temperature are addressed by assessing the degree of activities in riparian areas that may result in increased or decreased solar radiation to streams. No fire salvage timber harvest or temporary road construction is proposed in RCAs.

Indicator 4 – Water Yield

The 2012 Sheep Fire is expected to change water yields and base flows within the analysis area and some streams would be at higher risk from high flow scouring events. Fire salvage of dead and dying trees, temporary road construction, and road rehabilitation will be assessed in regards to additional effects to water yield and base flows.

Increased water yield is a rough predictor of potential changes in channel condition and aquatic habitats. The 2012 Sheep Fire resulted in high tree mortality within high and moderate burn severity areas. Removal of forest canopy by timber harvest, road construction or natural processes (such as wildfire) can affect the quantity and timing of stream flow. Increases in water yield may indirectly affect fish habitat through increased bank erosion, channel down cutting, increased accumulation of larger streambed materials, reduction in number of pools, overall reduction of habitat complexity, and changes in number, size, or frequency of LWD. Equivalent Clearcut Acres (ECA) is a term used to describe the total area within a watershed that would exist in a clearcut condition. Forest removal increases water yield because of the following: a reduction of transpiration, a reduction of interception, and more efficient conversion of snowpack to streamflow. Removal of vegetation also makes more water available for stream flow by reducing interception losses. Evaporative losses from water intercepted by trees are greater than losses from the ground surface under a canopy. The results of the water yield analysis (ECA) are used for evaluating potential impacts to fish habitat. Stand replacing fires and timber harvest both have the capability of affecting ECA.

The National Marine Fisheries Service (NOAA Fisheries (NMFS) 1995) suggests that an ECA of 15 percent is cause for concern in priority watersheds. The Matrix of Pathways and Indicators of Watershed Condition (NOAA Fisheries et al. 1998) identifies less than 15 percent ECA as a high quality habitat condition; 15–20 percent ECA as moderate quality habitat condition; and greater than 20 percent as low quality habitat condition. These thresholds were identified to provide a conservative approach to water yield that would avoid the following undesirable effects on stream habitat condition: accumulation of streambed materials (aggradation), channel braiding, channel down cutting, and increased bank erosion (NOAA Fisheries et al. 1998). The above may collectively or singularly contribute to increased width/depth ratio, decreased number of pools, decreased pool quality, and overall simplification of instream habitat (Chamberlin et al. 1991).

Increases in water yield are highly variable in time and space because they are dependent on climate, topography, soils, vegetation, and other environmental factors. This high degree of variability makes it difficult to quantifiably determine an outcome as a result of timber harvest activities. Stream channel types and stability rating were used in conjunction with percent increases in ECA to assess the risk that project-associated water yield increases may cause channel changes.

Stream channel stability is determined through an inventory procedure developed by Pfankuch (1978, p. 1). He developed a procedure to assess entire channel systems within a watershed, and to use the results in conjunction with other hydrologic analyses. Stream channels are rated based on their ability to withstand increase in stream discharge associated with decreases in the density and areal extent of vegetation. A stream with a “poor” rating has a higher risk of sustaining damage from increased peak discharge than a stream rated “good” or “excellent”. Scores are the sum total of stability indicator classes for streambanks and stream bottoms (Pfankuch 1978, pp. 5 – 6). Stability ratings are the result of a scoring system where:

- Excellent: less than 38.
- Good: 39 – 76.
- Fair: 77 – 114
- Poor: greater than or equal to 115

Overall, pre-fire stream reach inventory and channel stability evaluations had a poor to good rating for streams within the project/analysis area. However, stream channel/riparian areas that had high or moderate burn severity rating from the Sheep Fire are at higher risk for post-fire adverse erosion/scouring impacts. The potential impact from water yield changes to stream channel conditions, pools, and LWD are discussed under those indicators.

Indicator 5 – Riparian Conservation Area (RCA) and Stream Channel Function

The most common biological features establishing or affecting the relationships of channel and valley slope have been native pioneer species of riparian vegetation (Smith and Prichard 1992). High energy runoff and its associated transported sediment have been moderated by dissipation, through spreading across floodplains, vegetative entrapment, development of sinuous meander patterns, and seasonal recharge of ground-water aquifers and riparian bank storage. Healthy riparian areas are noted for having adequate vegetation, landform, or large woody debris to dissipate energy during high-flow events, limit erosion, and improve water quality. Healthy riparian and wetland areas also filter sediment and capture bedload, which aids floodplain development and enhances flood-water retention and ground-water recharge. In addition, healthy riparian–wetland areas also produce diverse ponding and channel characteristics that provide habitat necessary for fish production, water bird breeding, wildlife habitat, and other uses (Prichard et al. 1996).

Erman et al. (1977) reported that the composition of benthic invertebrate communities in streams with buffers greater than 100 feet were indistinguishable from those in streams flowing through unlogged watersheds.

Road construction is one of the land use influencing riparian habitats and stream channels within the analysis area, and is followed by timber harvest and livestock grazing within localized areas. Roads have encroached on riparian areas and stream channels. Road fords, bridges, and culverts exist at stream crossings, and these stream crossings alter stream channels and may be a chronic erosion and sediment source.

Indicator 6 – Watershed Condition

Watershed condition indicators are a series of metrics that can be used to index the level of disturbance in a watershed. They are usually expressed as densities or discrete amounts of various disturbances within a watershed. For example, road density expressed in miles of road per square mile (mi/mi2) of watershed area is a common watershed condition indicator.

Extensions of that include road density within RCAs or landslide prone terrain. Other indicators include various forms of timber harvest density, such as percent of the watershed harvested, percent of RCAs harvested, and percent of landslide prone terrain harvested.

Various guidelines have been employed to rate watershed condition based on these indicators. One local version is a matrix that rates watersheds into low, moderate, or high condition based on assembling a broad array of indicators (NOAA-NMFS et al., 1998, USDI-BLM 2009, Appendix H). Within the matrix, road density is one of several criteria used to rate watershed condition.

3.2.5.2 Direct and Indirect Effects of Alternatives

The effects analysis focuses on direct and indirect effects that may occur from implementation of alternatives to John Day Creek and Cow Creek-Salmon River watersheds/subwatersheds and ESA-listed species. Table 38 at the end of this section provides a comparison summary on fisheries indicators discussed below.

Indicator 1 - Sediment/Stream Substrate Condition

Proposed Action and the No New Temporary Road Construction Alternatives

The differences between the action alternatives is primarily one regarding acres of salvage logging and type of treatments, miles of temporary road constructed, tree planting acres, and treatments or actions that occur on various burn severity areas. Primary concerns occur for actions that occur on high and moderate burn severity sites and potential for increased erosion and sediment.

The proposed action identifies a total of 916 acres would have fire salvage and the construction of 2.28 miles of temporary road would occur, previous Tables 19 and 20 identify various proposed activities, burn severity and sub-watershed that actions would occur in (see previous Figures 16 and 17). Temporary roads proposed for construction under the Proposed Action only occur in the South Fork John Day Creek and Lower John Day Creek sub-watersheds. Both alternatives propose the same activities for Salmon River face drainages.

The No New Temporary Road Construction Alternative proposes a total of 606 acres would have fire salvage and no temporary road construction would occur. Previous Tables 20 and 21 identify various proposed activities, burn severity and subwatershed that specific actions would occur in for the No Temporary Road Alternative (see previous Figures 16 and 17). Activities identified for East Fork John Day Creek, Middle Fork John Day Creek, Wet Gulch, and Dry Gulch are the same for both action alternatives.

Table 26 summarizes acres burned and burn severity within the analysis area. Post-fire effects, and the important values associated with retention of snags and potential large woody debris occurs as dead trees fall down and provide beneficial effects by reducing erosion and supporting recovery of ecosystems. Large woody debris reduces erosion by trapping sediment and reduction of surface run-off, and also improves soil productivity and provides favorable sites for regeneration of trees. Proposed salvage logging would reduce the amount of snags and potential large woody debris which may be retained on site. Project design features identify a minimum of 6 snags per acre and 15 tons of coarse woody debris per acre would be retained. The recommended distribution is to provide coarse wood in the largest size classes, preferably over 15 inches in DBH (>75%), which provide the most benefit for both wildlife and soil productivity.

Ground-based logging equipment can change soil properties in ways that adversely affect subsequent plant growth (Reynolds 2011). Soil disturbance caused by logging equipment include compaction, churning (incorporating organic debris), topsoil removal and displacement, and topsoil mixing with subsoil (Reynolds 2011). Compaction and churning reduce amount and continuity of macropore space, and thereby reduce exchange of gas and moisture. Reductions in volume and continuity of large pores also reduce infiltration rates (Greacen and Sands 1980), slow saturated water flux, reduce gaseous flux (Grable 1971), increase thermal conductivity and diffusivity (Willis and Raney 1971), and increase soil resistance to penetration (Sands et al. 1979). Reynolds et al. (2011) evaluated soil risks associated with severe wildfire and ground-based logging. Reynolds et al. (2011) identified a need for mitigative measures, such as avoiding use of rubber-tired skidders, scheduling logging when soils are dry or covered with deep snow, stopping equipment operation where soil is wet or very moist, placing a protective layer of logging slash before trafficking, designating skid trails, or optimizing the yarding pattern.

Increased erosion and sediment would occur from salvage logging activities and construction of temporary roads on high and moderate burn severity sites (see Table 34). Several design features that would reduce levels of erosion and sediment include: no timber harvest or temporary road construction within RCAs, designating skid trail locations, placement of logging slash in cable corridors, use of tracked equipment to reduce adverse compaction in tractor logging units, and partial suspension of logs in cable harvest units. A review by Belt et al. (1992) of studies in Idaho and elsewhere concluded that non-channelized sediment flow rarely travels more than 300 feet and that 200–300 foot riparian “filter strips” are generally effective at protecting streams from non-channelized sediment flow. In a review of past studies, Broderson (1973) noted that a stream buffer width of 200 feet had been found to control overland flows of sediment under the most extreme conditions. The effectiveness of stream buffers will not be as effective with the fire caused loss of live vegetation cover, woody debris, and litter; which is dependent on burn severity. Live vegetation, woody debris, and litter reduce overland flows and erosion/sediment from reaching stream channels.

Channelized flow can travel in excess of 1,000 feet (Belt et al, 1992). RCAs no treatment buffers would reduce, but not eliminate the risk of channelized sediment reaching streams. Previous surveys and field verification has taken place during the fall of 2012 to delineate perennial, intermittent, and ephemeral streams, seeps, springs, and wetlands to ensure all RCAs are designated, mapped, and protected. If an unknown seep or spring or water course is identified during salvage sale layout, such would be buffered accordingly.

Short cable logging corridors may not have partial suspension of logs and these units would be more prone to soil disturbance than cable units with partial suspension. Harvest of only dead or dying trees is proposed, with the exception of clearing for temporary roads and cable yarding corridors. Specific guidance would be used to determine dead and dying trees that would be harvested (Scott et al. 2002, as amended 2006). Table 34 shows activities by alternative on high and moderate burn severity areas.

Table 34. Activities on High and Moderate Severity Burn Areas

Watershed	Tractor Logging (acres)	Cable[1] Logging (acres)	TOTAL HARVEST (acres)	Temporary Road Construction (miles)
Proposed Action				
John Day Creek	369.21	244.47	613.68	1.44
Salmon River Face Drainages	49.44	20.42	69.86	0.0
TOTAL	418.65	264.89	683.54	1.44
No Temporary Roads Alternative				
John Day Creek	272.2	106.94	379.14	0.0
Salmon River Face Drainages	49.44	20.42	69.86	0.0
TOTAL	321.64	127.36	449.0	0.0

[1]Includes cable logging and short cable logging systems.

The Middle Fork of John Day Creek sub-watershed has the largest amount of harvest proposed to occur on high and moderate severity burn areas for both action alternatives (251.45 acres), and the highest potential for detrimental soil disturbance from tractor logging. The South Fork of John Day Creek sub-watershed under the Proposed Action has the second most salvage harvest proposed on high and moderate severity burn areas (186 acres), however, salvage harvest would be reduced to 35 acres under the No New Temporary Road Construction Alternative.

Refer to Soils 3.2.2, Table 17 for a summary detrimental soil disturbance which may occur from implementation of the alternatives. The Proposed Action would have 93 acres of detrimental soil disturbance and the No Temporary Road Alternative would have 64 acres of detrimental disturbance (31 percent less). Both action alternatives would affect approximately 10 to 11 percent (detrimental soil disturbance) of the area where salvage harvest occurs.

Disturbed Water Erosion Prediction Project (WEPP)

Refer to Section 3.2.3 Water Resources regarding WEPP modeling protocols and discussion. The disturbed WEPP soil model (Elliot et al. 2000) is a tool to allow users to describe numerous forest and rangeland erosion conditions. Disturbed WEPP allows summary outputs, and presents the probability of a given level of erosion occurring the year following a given disturbance. Disturbed WEPP is designed to predict runoff and sediment yield from:

- Young and old disturbed forests
- Skid trails and harvested forests
- Prescribed and wildfires

In comparison to the 2012 Sheep Fire, project related-related increases comprise are low. With the exception of the Lower John Day Creek and South Fork John Day Creek sub-watersheds, predicted sediment increase would be the same for the action alternatives (see Table 22). In summary, the Proposed Action would increase existing sediment yield (includes 2012 Sheep Fire) in the John Day Creek watershed about 0.7%; and increases of 1.2 percent for Middle Fork John Day, 1.1 percent for South Fork John Day, 0.8 percent for Lower John Day, and trace for East Fork John Day.

The No New Temporary Road Construction Alternative predicted project related increases in sediment yield for John Day Creek would be 0.4% for the entire watershed; and increases of 1.2 percent for Middle Fork John Day, 0.2 percent for South Fork John Day, 0.3 percent for Lower John Day, and trace for East Fork John Day (Table 22).

Salmon River face drainage project related increases in sediment yield would be the same for both action alternatives. Predicted project related increases in sediment yield would be 0.8% for both Salmon River face subwatersheds; and increases of 1.0 percent for Wet Gulch and a trace increase for Dry Gulch (Table 22).

Erosion/sediment yield predictions from harvest units would primarily vary by slope, burn severity, ground cover conditions, and buffers; salvage harvest occurring on burned slopes would increase erosion/sediment yields by 6 to 17 percent across the harvest units.

Temporary Road Construction and Road Rehabilitation

RCAs buffers are expected to be effective at protecting streams from non-channelized sediment when burn severity is low or very low. Because of the loss of protective ground cover within moderate and high burn severity areas, RCAs may not be as effective at reducing non-channelized sediment production or channelized flow. Temporary road construction occurring on moderate and high severity burn areas would be more prone to erosion/sediment than activities on more moderate slopes with low burn severity. Road maintenance and use occurring within RCAs would have the highest potential for short-term erosion and sediment delivery, implementation of design features would minimize potential for adverse effects, refer to Table 24 for activities occurring in RCAs.

Refer to Figure 3 for location of temporary roads (Proposed Action) and roads identified for road rehabilitation (both action alternatives). Short-term negligible erosion/sediment would be expected from road construction and obliteration (decommissioning) of temporary roads (2.28 miles) and road rehabilitation (4.76 miles). Obliteration of temporary roads would include the re-contouring, deep ripping, mulching, seeding, and selective placement of woody debris. Road rehabilitation would include deep ripping and seeding desired species. One road that is accessible to the public would be gated to prevent motorized use. Overall, long-term sediment reductions from the proposed road rehabilitation would reduce erosion and sediment from roads that were re-opened for salvage logging purposes. Segments of roads proposed for rehabilitation were overgrown or had sloughing occurring that prevented use by logging trucks.

The proposed action identifies a total of 2.28 miles of temporary road construction, which occurs in the Lower John Day Creek and South Fork John Day Creek subwatersheds (see Figure 18). Temporary road construction occurs in areas where long slope distances to stream channels and generally straight to convex shaped slopes are factors that reduce sediment delivery efficiency to stream channels. The majority of the temporary road construction occurs at midslope or is near ridge tops. None of the temporary road construction would occur within RCAs. No temporary road construction would occur on land types with "high" mass failure potential. For these reasons, negligible amounts of sediment would be expected to reach channels for road related activities occurring outside of RCAs (see discussion below regarding road use and maintenance and proximity to stream channels).

Two of the road crossings (low water fords) occur in segments of roads that were rehabilitated ('put-to-bed") for the purpose of stabilizing a road drainage caused landslide/slump area. After salvage timber harvest related activities are finished, these two road crossing would be re-contoured and included in road segments that are proposed for rehabilitation. A segment of road crossing land slide prone land type (approximately 150 feet), where previous slumps occurred and rehabilitation in 1998 stabilized conditions would have improved drainage structures constructed to reduce risk of mass erosion.

The increase in sediment production due to soil disturbance associated with decommissioning of temporary roads would be short-term, as impact levels have been shown to drop to near zero by the third year due to vegetative recovery (Megahan and King 2004). Road decommissioning of temporary roads and rehabilitation of existing would result in low levels of increased erosion/sediment and water quality in the first year, and would have a net reduction in sediment yield in the long term. Road decommissioning and restoration would occur primarily in areas outside of RCAs and design measures would be implemented to minimize potential for adverse erosion and sediment. Typical design measures include seeding, placement of woody debris, mulching, do construction work during dry periods, etc.). Road decommissioning of temporary roads would be full obliteration (e.g., roads would be re-contoured to near natural slopes).

The predicted increase in unrouted sediment yield (sediment delivered to the stream channel) would be short-term as impacts from road construction and harvest typically decrease substantially after the first year. However, because logging would occur on burned area it is acknowledged that these areas are more sensitive to erosion, particularly the high and moderate severity burn areas.

Road Use and Maintenance and Proximity to Stream Channels

Table 24 identifies road use and maintenance that would occur within RCAs, which would be similar for both alternatives. Roads and stream crossings can be major sources of sediment to streams from channel fill around culverts during construction (Furniss et al. 1991). Unnatural channel widths, slope and streambed shape occur upstream and downstream of stream crossings (Heed 1980), and these alterations in channel morphology may persist for long periods. Channelized stream sections from rip rapping of roads adjacent to stream channels directly impact stream channel morphology and encroaches on riparian habitats. Road maintenance affects sediment from side casting, snow removal, and road grading; such activities can trigger fill slope erosion and failures. Lack of road maintenance and poor drainage are chronic sources of erosion and sediment.

Roads can affect streams directly by accelerating erosion and sediment loading, altering channel morphology, and by changing the runoff characteristics of watersheds. These processes interact to cause secondary changes in channel morphology. All of these changes affect fish habitat (Furniss et al. 1991). The bare, compacted soils on roads exposed to rainfall and runoff are a potential source of surface erosion. Roads and ditches form pathways for sediment transport to stream channels (Chamberlin et al. 1991).

Roads contribute more sediment to streams than any other land management activity (Gibbons and Salo 1973; Meehan 1991). The majority of sediment from timber harvest activities is related to roads and road construction (Chamberlin et al. 1991; Dunne and Leopold 1978; Furniss et al. 1991; Megahan and Kidd 1972 and MacDonald and Ritland 1989) and subsequent increases in erosion rates (Beschta 1978; Gardner 1979; Meehan 1991; Reid and Dunne 1984; and Swanston and Swanson 1976).

Roads within 100 feet of a stream channel (approximately one tree height) can negatively affect sedimentation, stream shading, large woody debris contributions, and pool frequency (Spence et al. 1996).

The proposed action would implement design features to minimize adverse rill erosion attributed to timber harvest and road related erosion. Rocking and graveling the approaches to four low-water fords would minimize adverse erosion/sediment from these crossings. Rock and gravel would be placed at the approaches of the existing East Fork John Day Creek stream crossing (existing culvert). Rocking of live water crossings would reduce road surface erosion an estimated 79% at stream crossings (Burroughs and King, 1985).

Mass Wasting - Landslides

Road construction is the main destabilizing activity related to forest management actions. Megahan et al. (1978) found that 58 percent of management-related landslides were related solely to roads, while forest vegetation removal accounted for only 9 percent of landslides. Roads in combination with logging or wildfire accounted for 88 percent of all management-related landslides. No temporary road construction is proposed for high risk landslide areas.

Where mass wasting occurs near streams, the risk of sedimentation impacting aquatic habitat is far greater than where mass wasting occurs on hill slopes away from the channels that deliver sediment to streams. Sediment delivered to streams may comprise fine sediments, which could have negative impacts, or larger rock and large organic debris, which could enhance stream habitat complexity.

Timber harvest and roads occurring on steeper slopes, may contribute at varying levels to initiation and acceleration of soil mass movements. Movement may be accelerated by high moisture levels, undercutting of toe slopes, or loss of tree rooting strength, among other factors (Chatwin et al. 1994). Fire salvage timber harvest of dead and dying trees is not expected to result in increased slope instability from a loss of tree rooting strength. Salvage harvest may result in routing of water, contributing to increased erosion/sediment, loss of protective ground cover, compaction, loss of large woody debris, and effects to site productivity; which may directly or indirectly affect slope stability.

As noted previously the proposed action identifies a total of 2.28 miles of temporary road construction, which occurs in the Lower John Day Creek and South Fork John Day Creek subwatersheds (see Figure 18). Temporary road construction occurs in areas where long slope distances to stream channels and generally straight to convex shaped slopes are factors that reduce sediment delivery efficiency to stream channels. The majority of the temporary road construction occurs at midslope or is near ridge tops. None of the temporary road construction would occur within RCAs. No temporary road construction would occur on land types with “high” mass failure potential. See section 3.2.2.2 for a detailed discussion of mass wasting – landslides wherein project design features and their affects are discussed.

No Action Alternative

Increased volumes of fine sediment may enter the drainages over the next 5 years (see Table 22), whether directly to fish-bearing reaches or directly through delivery to upstream non-fish bearing reaches. Channel erosion (including gullying of draws), surface erosion, primarily from steep severely burned slopes and secondarily from the road network, are expected to be the dominant processes for sediment delivery to stream channels during the first 3 years post-fire. Stream channels and watersheds with high and moderate burn severity will be at highest risk for increased erosion and sediment (see Tables 23 and 26). Stream channels at the base of severely burned steep slopes or at road crossings are likely to be impacted by immediate delivery of eroded material from surface erosion and roads. Thereafter, needle cast from dead and dying trees, regrowth of surviving vegetation, and establishment of new vegetation from residual seedbanks are expected to restore protective cover over time and are expected to drop closer to pre-fire levels. Revegetation will be slower in areas of high burn severity that have high levels of mortality, and lack seedbank sources. Consequently, adverse erosion/sediment and recovery to pre-fire sediment levels will be slower (e.g., 5 to 10 years).

Increased potential risk for mass wasting will occur with increased overland flow, water yields, and loss of root strength slope stability attributed to root rot and decay, which may be expected to be more frequent 4 to 10 years after the fire. There is a risk of a sediment pulse following a large stand replacement wildfire, however, recovery for deposited sediment (i.e., cobble embeddedness, fines by depth – spawning gravels, and surface fines) would decrease over time as revegetation occurs, large woody debris recruitment increases with snags falling down within riparian areas and channels, and subsequent high flow events sort substrate and wash fines out of the system.

Indicator 2 - Large Woody Debris

The cumulative effects analysis area for large woody debris is the John Day Creek drainage sub-watersheds and the Wet Gulch and Dry Gulch sub-watersheds within the Cow Creek-Salmon River watershed. Natural and man-caused activities occurring within RCAs have the highest potential to result in direct and indirect effects to large woody debris recruitment in riparian habitats and stream channels. The 2012 Sheep Fire will result in substantial recruitment and increases of LWD, particularly in areas that had high and moderate burn severity (see Tables 21 and 22).

Proposed Action and No New Temporary Road Construction Alternative

Research indicates that with the established RCA buffers, harvest activities would be expected to have negligible effects on large woody debris recruitment (Bragg et al. 2000, Murphy and Koski 1989, Bottom et al. 1983). Murphy and Koski (1989) in a study of seven Alaskan watersheds determined that almost all (99%) identified sources of LWD were within 100 feet of the streambank. Bottom et al. 1983 as cited by Budd et al. (1987) confirm that in Oregon most woody structure in streams is derived from within 100 feet of the bank. Buffers at a minimum would be 100 feet from perennial non-fish bearing streams, 150 feet from perennial non-fish bearing streams, and over 300 feet from perennial fish bearing streams. Established buffers are adequate for ensuring no adverse effects to LWD recruitment would occur, and this is particularly true with increased levels of LWD recruitment attributed to Sheep Fire.

Because no timber harvest or temporary road construction would take place within any RCAs, salvage timber harvest activities would be expected to present a negligible risk of retarding attainment of LWD riparian management objectives (RMOs) or causing adverse impacts to this indicator. Actions occurring within RCAs include road use and maintenance, and such uses are summarized in Table 24 and described in detail in the Wetlands and Riparian Habitat Section 3.2.4.

Effects from implementation of the proposed action or alternative are unlikely to contribute to reduction of LWD, when considered cumulatively with past contributors to the existing condition. No additional streamside roads would be constructed adjacent to or cross any streams. No tree harvest would occur within any RCAs and no LWD would be removed from channels. No restoration actions or road decommissioning occurring within RCAs is proposed under the action alternatives. Both action alternatives are similar regarding haul roads within RCAs and streams crossings. In addition, increased natural LWD recruitment is expected to continue as a direct result of the 2012 Sheep Fire.

No Action Alternative

Under this alternative, none of the management activities proposed in the project would be implemented. Stream reaches that experienced high or moderate severity burn effects from the 2012 Sheep Fire would have large amounts of increased LWD recruitment (see Tables 23 and 26).

Indicator 3 - Water Quality/Temperature

Proposed Action and No New Temporary Road Construction Alternative

Toxics

The action alternatives identify that no salvage timber harvest, landings, or temporary road construction would occur within RCAs.

Fueling and storage of fuels is addressed with specific design features. Transport of fuels is regulated through design features that minimize the risk of accidents or accidental introduction of these materials to streams.

The design features identified for equipment fueling and maintenance would minimize the risks associated with accidents, spills, or introduction of fuels to fish bearing waters. Therefore, fuel delivery to streams is unlikely to occur

All weed (invasive species) control actions and use of herbicides would be in accord with design measures identified in the Decision Record for *Cottonwood Integrated Weed Treatment Program* (USDI-BLM 2013), and the associated BA (USDI-BLM 2011) and NMFS and USFWS Biological Opinions (NMFS 2012, USFWS 2012). The EA specifically assessed the use of 10 herbicides for use within the Cottonwood Field Office management area.

In order to improve the success of planted conifers, the herbicide hexazinone may be used in areas of heavy grass and brush competition around Douglas-fir and ponderosa pine seedlings. The herbicide would be applied in a 4-foot diameter spot treatment application directly around each planted tree. Consequently, if tree planting sites of 240 trees per acre (4- foot diameter spot treatment) were treated with hexazinone, this would compute to approximately 3,014 square feet per acre (approximately 7 percent of an acre). However, it is unlikely that all trees would be treated.

All application of the herbicide hexazinone would be in compliance with the product label. Typical application rate of 1 to 3 lbs. active ingredient per acre (range 0.45 to 6 lbs. per acre) is used for forestry. Consequently, it is expected active ingredient per acre would be less than 0.45 lb. per acre, with spot treatment around individual trees only. No use of hexazinone would occur within 200 feet of stream courses, springs/seeps/wetlands, or shallow water table areas. Overall, the expected buffer would be far exceeded for the majority of areas where hexazinone would be applied.

Hexazinone is of moderate to high persistence in the soil environment. Hexazinone is mobile in soil. Measured field half-lives range from less than 30 to 180 days, with a representative value of 90 days (USDA-Forest Service 1984). The rate of breakdown under natural field conditions will depend on many site-specific variables, including sunlight, rainfall, soil type, and rate of application. Hexazinone is slightly toxic to fish and other freshwater organisms. Lethal Concentration 50 (LC50) refers to the concentration in water having 50 percent chance of causing death to aquatic life. Some of the reported 96-hour LC50 values include: rainbow trout, 320 mg/L; bluegill, 370 mg/L, fathead minnow, 274 mg/L (Kidd and James 1991, Weed Science Society of America 1994). The 48-hour LC50 for hexazinone in the water flea, Daphnia magna, is 151 mg/L (Weed Science Society of America 1994).

Because of the small amount of active ingredient applied per acre and no treatment occurring with 200 feet of streams, no adverse or negligible potential for effects to riparian areas, aquatic habitats, and aquatic species are expected to occur from the use of hexazinone.

Water Temperature

The action alternatives identify no salvage timber harvest, temporary road construction, or landings within RCAs. Road use and maintenance of roads within RCAs would occur (see Table 24). Some incidental hazard or danger tree removal (dead or dying trees) may occur along some of the haul routes that occur within RCAs, and the risk of adverse effect to stream shading and stream temperature is discountable. It is expected that such hazard tree removal would only include a few trees and is not included in the action alternatives.

Overall, implementation of the action alternatives is expected to have minimal potential to result in adverse effects to stream shading and water temperature.

<u>No Action Alternative</u>

Under this alternative, none of the management activities proposed in the project would be implemented. Stream reaches that experienced high or moderate severity burn effects from the 2012 Sheep Fire would have highest potential for water quality effects, which would be attributed to loss of shade (i.e., water temperature increases).

Indicator 4 - Water Yield

<u>Proposed Action and No Temporary Road Alternative</u>

Because of the elevation zone of the project area, and historic rain on snow events causing landslides and debris torrents, several streams within the project area have had high flow scouring events which contributed large amounts of sediment to fish-bearing streams. Existing high ECA levels in these watersheds would make them susceptible to high flow scouring events and/or debris torrents. Post-fire ECAs for these small tributary streams have been affected by the 2012 Sheep Fire.

An estimate of existing ECA, as well as post-project ECA, was calculated for each of the six subwatersheds and the John Day Creek and the Salmon River face watersheds, see Table 35 (see Figure 18).

Table 35. ECA for Pre-Fire, Post-Fire, and Proposed Action

Subwatershed - Watershed	Area (Acres)	Pre-Fire, Post-Fire, and Proposed Action ECA Comparisons		
		Pre-Sheep Fire 2012	Post-Sheep Fire 2012[1]	Post-Fire and Proposed Action[1]
Lower John Day	4,128	15%	26%	27%
East Fork John Day	3,629	25%	45%	45%
Middle Fork John Day	3,798	7%	35%	36%
South Fork John Day	2,464	5%	42%	43%
JOHN DAY TOTAL	14,019	14%	36%	37%
Wet Gulch	1,780	7%	35%	36%
Dry Gulch	721	5%	19%	19%
WET GULCH AND DRY GULCH TOTAL	2,501	6%	31%	32%

[1]Includes existing conditions and 2012 Sheep Fire effects.

Changes to ECA would be negligible at a watershed level and would be expected to be less than 0.5 – 1.0 percent for the proposed action. The No Temporary Road Alternative would have the same effects identified in Table 35 above, except the Lower John Day Creek and South Fork John Day Creek would have no effect to ECA, and the entire John Day Creek ECA would be less than 37%. Any potential changes to ECA would be attributed to harvest of dying trees, skid trail and temporary road construction. Overall, project related effects to ECA are considered to be no effect or discountable at a watershed level, because the harvest of dead or dying trees is not expected to have measurable effects on ECA. Decommissioning of temporary roads and road rehabilitation contribute to a reduction in compaction, thus improving infiltration and reducing surface runoff. There would be no large canopy openings created by timber harvest, therefore, changes to snow accumulation patterns, snowmelt rates, and flow regime should be minor. Large canopy openings have been created by the 2012 Sheep Fire, which will affect snow accumulation patterns and snow melt rates. Fire related increases in ECA would be reduced in the long term by tree planting and natural recovery through vegetation regrowth in all watersheds.

There are four subwatersheds that have an estimated post-project ECA at 30 percent or higher. However, Lower John Day main channel ECA and water yield effects include entire watershed (see John Day Total – Table 35). A qualitative assessment was made of the risk of channel (and property) impacts, including debris torrents, as well as sediment delivery to fish bearing streams for these subwatersheds. Methods used included analysis of burn severity mapping, aerial photo interpretation, as well as field inspection of channel stability, slope steepness, and past landslide activity in the area.

Stream channel evaluation conducted during the fall of 2012 found that most streams within the project and analysis area that experienced high or moderate burn severity may be at potential risk for withstanding predicted increases in water yield. Several stream reaches were determined to have a poor rating because of past scouring events and degradation to channel and riparian habitats. All RCAs are buffered from mechanical treatments. Riparian vegetation recovery overtime will improve streambank and channel conditions. In summary, action alternatives are expected to result in no effect or discountable effects to increased ECA and water yield from the harvest of dead and dying trees.

No Action Alternative

Based upon the assessment noted above five of the six subwatersheds were determined to be at varying levels of risk from channel impacts and delivering sediment to the fish bearing streams. Regardless of the proposed action it is expected that increased water yield would be similar to the no action alternative. Because of the 2012 Sheep Fire, channel stability ratings for the various water courses reaches range from poor to good.

Indicator 5 - RCA and Stream Channel Function

Proposed Action and No New Temporary Road Construction Alternative

Since fire salvage harvest of timber or temporary road construction within streamside RCAs is not proposed, the risk of adverse effect from mechanical treatments is negligible and unlikely to occur. Rehabilitation and storage of roads within riparian areas would improve conditions in the long term.

The approaches to three stream crossings (fords) would be rocked and graveled. One stream crossing (East Fork John Day Creek culvert) would have road approaches rocked and graveled.

Approximately 600 feet of road that occurs in a RCA is proposed for rehabilitation and storage after timber harvest related activities are completed. Short term negligible effects (1-2 years) from erosion and sediment would occur, however, long term beneficial effects would occur from reduction of road related erosion/sediment sources.

No Action Alternative

No activities identified for the action alternatives would occur, which includes salvage harvest, temporary road construction, road rehabilitation, or tree planting. No potential for adverse effects to riparian areas or stream channels would occur from project related activities. Current conditions and trends for riparian areas and stream channels would continue.

Indicator 6 - Watershed Condition

Proposed Action and No New Temporary Road Construction Alternative

Under the action alternatives the rehabilitation of 4.76 miles of roads that were re-opened (some road segments previously overgrown or sloughed in) to provide access for salvage harvest would be beneficial in the reduction of project caused road related erosion or sediment. Short term negligible erosion/sediment would occur from opening roads and rehabilitation actions, however long term reductions in road related erosion/sediment would occur after rehabilitation. However, such will not change any watershed condition indicators for road density, RCA road density, and landslide prone road density. Post-project prescription watershed condition categories (NOAA-NMFS, 1998), based on road density would not change (good and fair condition ratings).

Under the Proposed Action, the newly constructed temporary roads would slightly increase road densities for approximately 3 years until they are obliterated within the Lower John Day Creek and South Fork John Day Creek subwatersheds (see Table 36). No changes short term or long term would occur to the East Fork John Day Creek, Middle Fork John Day Creek, Wet Gulch, and Dry Gulch subwatersheds.

Table 36. Short Term Changes in Road Density from Construction of Temporary Roads

Subwatershed and Watershed Name	Subwatershed and Watershed Acres	Existing Road Miles		Temporary Road Construction		
		Road Miles	Road Density (mi/mi^2)	Temporary Road Miles	Total Road Miles	Road Density (mi/mi^2)
Lower John Day Creek	4,128	30.1	4.7	1.38	31.5	4.9
South Fork John Day Creek	2,464	<0.1	0.0	0.91	0.9	0.2
TOTAL JOHN DAY CREEK	**14,019**	**62.3**	**2.8**	**2.28**	**64.6**	**2.95 (+5%)**

Upon the completion of the harvest treatments, post-harvest treatments, road decommissioning of temporary roads, and subsequent road rehabilitation; no decrease in overall road densities would occur in the long term.

<u>No Action Alternative</u>

No road-related activities would occur. Current conditions and trends for watershed indicators would continue.

Summary Tables

Table 37 briefly summarizes the activities proposed within watersheds and RCAs for each action alternative.

Table 37. Activities Proposed in Watersheds and RCAs for Action Alternatives

Proposed Activity	Proposed Action			No Temporary Roads		
	John Day Creek Watershed	Salmon River Face Drainages	Total	John Day Creek Watershed	Salmon River Face Drainages	Total
Tractor Logging (acres)	444.31	105.61	449.92	319.47	105.61	452.08
Cable Logging (acres)	222.6	56.06	278.66	46.55	56.06	102.61
Short Cable Logging (acres)	52.09	22.59	74.68	68.19	22.59	90.78
TOTAL SALVAGE LOGGING (acres)	719.00	184.26	**916**[2]	434.21	184.26	**606**[2]
Temporary Road Construction (miles)	2.28	0.0	2.28	0.0	0.0	0.0
Tree Planting (acres)	773.28	184.26	**968**[2]	433.21	184.26	**658**[2]
Road Rehabilitation (miles)	4.45	0.31	4.76	4.45	0.31	4.76
Haul Routes Within RCAs (miles)	6.3	0.36	6.66	6.3	0.36	6.66
Haul Road - Low Water Ford Crossings[1]	3	0	3	3	0	3
Culvert Stream Crossings – Fish Bearing	3	0	3	3	0	3
Culvert Stream Crossings – Non-Fish Bearing	8	8	16	8	8	16

[1]Three of the low water ford crossing all occur in non-fish bearing tributary streams to Middle Fork of John Day Creek.

[2]Due to GIS mapping and acreage rounding, totals may not exactly equal sum of rows or columns. .

Table 38 compares action alternatives activities and effects for several indicators.

Table 38. Comparison of Actions and Effects on Aquatic and Watershed Indicators

Aquatic and Watershed Indicators	Proposed Action Alternative	No Temporary Roads Alternative
Total salvage harvest	916 acres	606 acres
Salvage harvest on moderate and high severity burn areas	680 acres	405 acres
Miles of road rehabilitation.	4.76 miles	4.76 miles
Miles of temporary road construction on high and moderate burn severity (total miles)	1.44 miles (2.28 miles)	0 miles (0 miles)
Project exacerbation risk for accelerated surface erosion or mass soil erosion.	Low +	Low -
Detrimental soil disturbance	93 acres	64 acres
Project related increases of erosion/sediment that would occur on harvest units from logging.	6% - 17%	6% - 17%
Sediment yield project related increase (percent) for John Day Creek sub-watersheds (total).	Trace – 1.2% (0.7%)	Trace – 1.2% (0.4%)
Sediment yield project related increase (percent) for Salmon River face sub-watersheds (total)	Trace – 1.0% (0.8%)	Trace – 1.0% (0.8%)
Project related increased deposited sediment.	Negligible	Negligible
Increased water yield effects (primarily attributed to temp. roads, skid trails, dying tree/dead tree removal.	No Effect - Discountable <0.5-1%	No Effect - Discountable <0.5%
Potential impacts to riparian areas or RCAs.	Negligible	Negligible
Large woody debris	None	None
Water quality	Low Risk	Low Risk
Road densities	Low (short term)	None

3.2.5.3 Cumulative Impacts

Indicator 1 - Sediment/Stream Substrate Condition

Other past, current, and foreseeable future activities have been considered for their cumulative effects on erosion, sediment, and substrate conditions (deposited sediment). Natural and human caused effects include: wildfires, floods/debris torrents, road construction, road management and use; timber harvest, livestock grazing, and prescribed burning. Short term (<5 years) existing conditions and trends for erosion/sediment within the analysis area is primarily attributed to the 2012 Sheep Fire. The following discussion focuses on past, ongoing, and reasonably foreseeable future activities that may contribute effects to erosion and sediment. See list of potential cumulative actions in Section 3.1.2.

The existing conditions and trends for erosion/sediment within the analysis area is primarily attributed to the 2012 Sheep Fire, and past and ongoing lands uses and natural events.

Existing roads within wetland and riparian habitats and RCAs are a chronic source of sediment delivery to streams. Use and maintenance of existing roads would continue. Sediment delivery to streams is highest in areas with high road density (i.e., >3 miles of road/square mile) in the RCAs. The number of road stream crossings also influences erosion and sediment delivery. Placing rock/gravel on native surface roads reduces the potential for sediment production.

Approximately 0.84 miles has been surfaced with rock/gravel along Lower John Day Creek associated with salvage logging on private land. An additional 2.6 miles of upland roads have also been surface rocked as part of the same effort.

Past, current, and foreseeable future logging within the subwatersheds is documented, with some occurring within RCAs. Salvage logging on State and private lands is known to have occurred and is ongoing as a result of the 2012 Sheep Fire. It is estimated that approximately 1,100 acres of salvage logging is occurring on non-federal lands within the analysis area. Ongoing salvage logging on private or State lands primarily involves the use of existing roads, re-opening existing roads, and constructing skid trails. With the exception of recent fire salvage timber harvest, the extent of past private and State land logging within RCAs is not known. Salvage logging on private lands in RCAs has/or is occurring in moderate to high severity areas. Private land fire salvage logging (2012-2013) within RCAs has occurred along approximately 0.82 mile on Lower John Day Creek, 0.63 mile on East Fork John Day Creek, and 0.12 mile on Middle Fork John Day Creek. The Forest Service is proposing Roadside Hazard Tree Removal within the John Day Creek watershed, which is expected to have negligible effects to aquatic habitats. Forest Service hazard tree removal would focus on cutting dead and dying hazard trees that occur within 200 feet of several roads. This project would include 256.4 acres (along 6.2 miles of road) within East Fork John Day Creek drainage, and 88.1 acres (along 2.6 miles of road) within Middle Fork John Day Creek drainage (USDA-Forest Service 2013). Refer to 3.2.3.3 Cumulative Impacts (Water Resources) for additional erosion/sediment cumulative effects analysis.

Landslide hazard is variable within the project area, and instances of mass erosion have occurred which include slumps and landslide that occurred along roads, as well as under natural conditions. Historic and more recent (within last 5 years) mass wasting events have included large events and small scale-events with minor or moderate impacts. Past debris torrents and associated scouring of stream channels and localized mass wasting events have impacted stream channels and aquatic habitats to varying levels within the analysis area which have been discussed above.

Livestock grazing has occurred in the past in the project area and is an ongoing activity that is expected to continue. BLM and IDL lands have been closed to grazing use to allow for recovery of burned vegetation post fire. Once vegetation has recovered, grazing will again be occurring on these lands. It is unlikely that private lands will receive post fire rest from grazing. Short term erosion and sediment from livestock grazing on private lands is expected to be minor in the short term, and would primary occur from localized areas occurring within RCAs that experienced moderate or high burn severity.

Dispersed recreation effects to wetland and riparian habitat has varying levels of effects within the analysis area. Recreational activities that occur within RCAs are most likely to influence effects to RCAs and riparian habitats and such use is considered low. The addition of dispersed recreation does not appear to significantly contribute to effects already associated with present erosion/sediment conditions and trends or proposed actions (alternatives) of this project due to the low level of recreation in RCA’s.

Implementation of BLM ESR Plan (USDI-BLM 2012) would reduce erosion in localized areas. However, ESR Plan activities would have little effect in year one at reducing fire related erosion and sediment. Road maintenance and improvements would reduce chronic road related sediment sources. The BLM ESR plan identifies that approximately 650 acres of burn areas would be planted with conifer trees (also includes RCAs). Consequently, long term benefits from tree planting and faster succession for reforestation would be expected to occur. This would be beneficial in the long term for areas with high and moderate burn severity, lacking a seed source.

No cumulative effects would occur from implementation of the No Action Alternative.

In addition to past, current, and future foreseeable actions, the 2012 Sheep Fire affected a large proportion of the project and analysis area watersheds; which would alter sediment yields and deposited sediment. Currently desired conditions are not being achieved in regards to channel substrate conditions for analysis area watersheds. The BLM Cottonwood RMP (2009) identifies desired conditions for substrate conditions (e.g., deposited sediment) and desired optimum conditions may not always be achieved during the life of the RMP (e.g., 15-20 years). However, short term effects from project authorization could occur if such would not retard or prevent achievement of desired conditions in the long term (BLM 2009).

Short term erosion and sediment effects (<5 years) are expected to occur from implementation of the action alternatives which is expected to result in negligible effects to deposited sediment and desired conditions (e.g., surface fines, fines by depth in spawning gravels and cobble embeddedness). It is expected that in the long term, erosion and sediment would be at pre-fire conditions in 10 years. Erosion control project design measures and BMPs, and specifically no tree harvest or temporary road construction within RCAs is expected to minimize potential for erosion and sediment delivery to stream channels. Natural recovery and reduced sediment from uplands and riparian areas would also occur over time within areas which have been impacted by the 2012 Sheep Fire. Implementation of the action alternative activities would have negligible contribution to cumulative effects for measurable increases of surface fines, fines by depth in spawning gravels and cobble embeddedness. State-of-the art deposited sediment monitoring is not expected to detect increased deposited sediment attributed to implementation of action alternatives and is also not expected to retard or prevent achievement of desired conditions in the long term. Refer to 3.2.3.3 Cumulative Impacts (Water Resources) for additional erosion/sediment cumulative effects analysis.

Indicator 2 - Large Woody Debris

The 2012 Sheep Fire will result in large increases in LWD recruitment to riparian habitats and stream channels as dead trees fall down. Riparian encroachment by roads has affected streamside conditions in the watersheds, including large woody debris. The presence of streamside roads generally results in the permanent removal of large woody debris, sometimes all the debris, that otherwise could be recruited into streams. Riparian areas throughout the watershed have been affected by past streamside road construction, residences, domestic livestock grazing, and timber harvest. Rural home construction and development has encroached on riparian habitats in several localized areas along John Day Creek. The continued existence of streamside roads generally translates into reduced ability of streams to recruit wood.

Ongoing salvage logging on private and State lands involves the use of existing roads, re-opening existing roads, and constructing skid trails. The additional salvage logging and associated road management on private lands has impacted some of the RCA areas. Private land fire salvage logging (2012-2013) within RCAs has occurred along approximately 0.82 mile on Lower John Day Creek, 0.63 mile on East Fork John Day Creek, and 0.12 mile on Middle Fork John Day Creek. LWD recruitment has been affected with the removal of standing dead trees in the RCA.

The Forest Service is proposing Roadside Hazard Tree Removal Project within the John Day Creek watershed, which is expected to have no effect on LWD recruitment. The Forest Service is proposing no hazard tree removal within Riparian Habitat Conservation Areas (RHCAs). Hazard trees occurring within RHCAs that are cut would be left on site, which would contribute to LWD recruitment and erosion control (e.g., trap sediment).

Watershed restoration actions identified in the BLM *Sheep Fire Emergency Stabilization and Rehabilitation Plan* (ESR Plan) (USDI-BLM 2012) would occur. Actions identified in the ESR Plan include planting conifer trees and riparian trees and shrubs, and seeding desired species within RCAs. Tree planting of conifers would occur within uplands and RCAs. Other actions identified in the ESR Plan include road maintenance and improvements to reduce erosion.

The action alternatives are unlikely to contribute to changes of LWD, when considered cumulatively with past contributors to the existing condition. With the exception of road use and maintenance within RCAs (see Table 24). No tree harvest or temporary road construction would occur within any RCAs and no LWD would be removed from channels. Overall, the action alternatives would not increase or decrease LWD recruitment. Consequently, no cumulative impact of the project on LWD would occur.

Indicator 3 - Water Quality/Temperature

The cumulative effects analysis area for water quality is the John Day Creek watershed and small Salmon River face drainages (see Figure 18).

Toxics

There are a number of past, present, and reasonably foreseeable activities in the John Day Creek watershed and two small Salmon River face drainages (i.e., Wet Gulch and Dry Gulch) which include BLM, Forest Service, State of Idaho, and private lands. Projects and other activities expected to affect water quality and toxics include herbicide application on private and public lands, private land timber harvest and road construction, and hauling or storage of fuels. Risks do occur for an accidental hazardous material spill or toxic materials reaching live waters, consequently streamside uses of toxic material in close proximity to riparian areas and streams have higher risks. Safe guard measures generally are used when using large quantities of hazardous or toxic materials.

Project design measures for action alternatives would result in low risk from hazardous or toxic materials (e.g., fuels, herbicides, etc.). Effects from implementation of the proposed action are unlikely to contribute to increased risks to water quality from toxic materials, even when considered cumulatively with past, ongoing, and foreseeable actions.

Water Temperature

There are a number of past, present, and reasonably foreseeable activities in Salmon River face drainages (i.e., Wet Gulch and Dry Gulch) and John Day Creek watersheds involving BLM, Forest Service, State of Idaho, and private lands. A variety of projects and other activities affect water temperature (e.g., riparian conditions, stream shading, and water yield) within the analysis area and include public and private land timber harvest and fuel treatments, road construction within RCAs, restoration actions, private land small hydro project, and livestock grazing.

Encroachment by roads has affected streamside/riparian conditions in the analysis area which impacts shading and water temperatures. The presence of streamside roads generally results in the permanent removal of riparian vegetation and associated stream shading. Riparian areas throughout the watershed have been affected by past streamside road construction, domestic livestock grazing, and timber harvest. Rural home construction and development has encroached on riparian habitats in localized areas.

Domestic livestock grazing continues to occur within the watersheds on private, State, and BLM lands. Within the John Day Creek drainage, livestock grazing occurs within lower and mid elevation areas on BLM, private, and State lands. Some private land grazing still occurs at levels that result in localized adverse impacts to riparian vegetation and streambanks, which have minor to discountable direct and indirect effects on water temperature.

Watershed restoration actions identified in the BLM *Sheep Fire Emergency Stabilization and Rehabilitation Plan* (ESR Plan) (USDI-BLM 2012) would occur. Actions identified in the ESR Plan include planting conifer trees and riparian trees and shrubs, and seeding desired species within RCAs. Other actions identified in the ESR Plan include road maintenance and improvements to reduce adverse erosion. Tree planting in RCAs would provide for faster recovery and stream shading, particularly the planting of conifers.

Effects from implementation of the proposed action or alternative are not expected to adversely affect water temperature within the analysis area, when considered cumulatively. No tree harvest would occur within any RCAs, consequently no effects to stream shading and water temperature. The action alternatives would have none or discountable effects on ECA and water yield which could affect water temperature with changes to flow regimes. In addition, natural recovery to riparian areas and improved shading would also occur over time from riparian areas that have been impacted by the 2012 Sheep Fire.

Indicator 4 - Water Yield

The cumulative effects analysis area for water yield includes the Cow Creek – Salmon River and John Day Creek 6^{th} code HUCs, and the six specific subwatersheds.

Timber harvest, road construction, fires, and development activities have affected ECA in the analysis area. There are a number of past, present, and reasonably foreseeable activities in the six subwatersheds involving BLM, Forest Service, State, and private lands. Timber harvest, road construction, and restoration projects on Forest Service, BLM, State, and private lands would have varying effects on ECA. Primary effects would occur in the Lower John Day Creek and Wet Gulch subwatersheds where private and State salvage timber harvest is occurring (approximately 1,100 acres), an additional 1 percent increase in ECA may occur in these drainages.

The BLM ESR plan identifies that approximately 650 acres of burn areas would be planted with conifer trees (also includes RCAs). Consequently, long term benefits from tree planting and faster succession for reforestation would be expected to occur in the same priority areas. High and moderate severity areas (lacking a seed source) planted with trees would recover faster than areas left to natural regeneration.

Effects from implementation of the action alternatives would be expected to result in negligible impact to ECA. Overall, the harvest of dead and dying trees would have no effect to discountable effect to ECA at the watershed level (<1 percent). The proposed project activities would have no effect or discountable contribution to ECA cumulative effects of past, present, and future management actions for water yield within the cumulative analysis area.

Indicator 5 - RCA and Stream Channel Function

The cumulative effects analysis area for riparian areas and stream channels is the six subwatersheds (see Figure 18).

There are a number of past, present, and reasonably foreseeable activities in the six subwatersheds involving BLM, Forest Service, State of Idaho, and private lands. A variety of projects and other activities would affect the riparian habitat and stream channel indicator, and include public land timber harvest and fuel treatments, proposed BLM restoration actions, private land timber harvest and road construction, firewood cutting, and urban and rural development.

Domestic livestock grazing occurs within the subwatersheds on private, State, and BLM lands. Some private land grazing occurs at levels that impact localized riparian vegetation and stream banks.

Watershed restoration actions identified in the BLM *Sheep Fire Emergency Stabilization and Rehabilitation Plan* (ESR Plan) (USDI-BLM 2012) would occur. Actions identified in the ESR Plan include planting conifer trees and riparian trees and shrubs, and seeding desired species within RCAs. Other actions identified in the ESR Plan include road maintenance and improvements to reduce adverse erosion. Conifer tree planting within RCAs with moderate or high severity burn effects would result in faster reforestation. The moderate or high severity burn areas may be lacking a good seed source for natural reforestation.

No adverse effects would occur from implementation of the No Action Alternative.

Effects from implementation of the action alternatives would not contribute to long-term adverse impacts to riparian habitats and stream channels, when considered cumulatively with past contributors to the degraded condition. No fire salvage tree harvest or temporary road construction would occur within any RCAs.

Indicator 6 - Watershed Condition

The changes in road density from past, present, and reasonably foreseeable actions at the scale of the analysis watershed are summarized in Table 36. Primary effects would occur in the Lower John Day Creek and Wet Gulch subwatersheds where private and State salvage timber harvest is occurring and where past human activities have been more prevalent. These drainages also have high road densities of 4.7 m/m^2 for Lower John Day Creek and 5.1 m/m^2 for Wet Gulch. The proposed project activities would have negligible or discountable contribution to cumulative effects of past, present, and future management actions for watershed condition indicators (e.g., road density, ECA, timber harvest, etc.) within the cumulative analysis area. The action alternatives would have no long term adverse effects on several watershed indicators which include road density, new stream crossings and ECA.

Effects to ESA-listed and BLM Sensitive Fish Species

Table 39 displays a summary of determinations for ESA-listed fish species, designated critical habitats, and BLM sensitive fish species. A Biological Assessment (BA) has been prepared for the proposed project (USDI-BLM 2013). For more specific and additional information regarding effects to ESA-listed fish species and critical habitats refer to the referenced BA.

Table 39. ESA-Listed Species, Critical Habitat, and BLM Sensitive Fish Determination

Species Status	Proposed Action	No Temp. Roads Alternative	No Action
Sockeye Salmon *Endangered*	NE (Species) NE (CH)	NE (Species) NE (CH)	NE (Species) NE (CH)
Fall Chinook Salmon *Threatened*	NE (Species) NE (CH)	NE (Species) NE (CH)	NE (Species) NE (CH)
Spring/Summer Chinook Salmon *Threatened*	MA-LAA (Species) MA-LAA (CH)	MA-LAA (Species) MA-LAA (CH)	NE (Species) NE (CH)
Steelhead Trout *Threatened*	MA-LAA (Species) MA-LAA (CH)	MA-LAA (Species) MA-LAA (CH)	NE (Species) NE (CH)
Bull Trout *Threatened*	MA-LAA (Species) MA-LAA (CH)	MA-LAA (Species) MA-LAA (CH)	NE (Species) NE (CH)
Westslope Cutthroat Trout	MII	MII	NI
Redband Trout	MII	MII	NI
Pacific Lamprey	MII	MII	NI

ESA-Listed: NE=No Effect; MA-NLAA="*May Affect, Not Likely to Adversely Affect*"; MA-LAA="*May Affect, Likely to Adversely Affect*"
Critical Habitat: CH
Idaho BLM Sensitive: NI=No Impact; MII="*May impact individuals or habitat* "

A "*likely to adversely affect"* determination was made for Essential Fish Habitat (EFH) (see analysis rationale for listed fish below). Pursuant to section 305(b)(2) of the Magnuson-Stevens Act, Federal agencies must consult with NOAA Fisheries regarding any of their actions authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken that may adversely affect EFH. The Magnuson-Stevens Act, section 3, defines EFH as "those waters and substrate necessary for fish for spawning, breeding, feeding, or growth to maturity". The BA (USDI-2013) incorporated an EFH Assessment into the analysis.

The BA was prepared cooperatively with NOAA Fisheries and USFWS and contains the proposed project description, analysis information, ESA-listed species and critical habitat determinations, and Level 1 Team agreements for the proposed project (see proposed action alternative and project design measures). The BLM has submitted the referenced BA and a request to NOAA Fisheries and USFWS for a Biological Opinion (BO) regarding the analysis and ESA determinations contained in the BA (transmittal letter dated April 10, 2013). Upon receipt of the BOs any terms or conditions would be included in the final project Record of Decision.

Concerns for landslides and debris torrents have been identified within the project and analysis area and have been discussed previously. All salvage harvest treatments would avoid high hazard areas. During project layout, site specific inventory would be conducted to identify areas that are rated moderate risk for slope instability that have not previously been identified. If such areas are found, site specific design features would be implemented to avoid or minimize potential for adverse effects. Limited practices may include but are not limited to: reducing level of disturbance or harvest, avoiding the area, or implementing additional erosion control measures.

The proposed project has design features to minimize or avoid potential effects to fish bearing streams, however, all risks cannot be completely avoided. The primary rationale supporting the "*likely to adversely affect"* determinations for ESA-fish, designated critical habitats, and EFH is in regards to the following:

1. Amount of salvage harvest and temporary road construction that would occur on moderate and high severity burn areas. These areas are at increased risk for erosion.
2. Amount of salvage harvest and temporary road construction that occur on high or very high erosion hazard areas.
3. Project caused increased erosion or increased overland flow that may exacerbate increased erosion in high erosion hazard areas and/or moderate or high risk mass wasting areas.
4. Even though low risk, potential for project related mass wasting event may contribute large amounts of sediment and debris to streams with ESA-listed fish.

No salvage logging or temporary road construction would occur within RCAs. Design features have been incorporated into all treatments, roadwork, and rehabilitation to avoid or minimize potential for adverse effects occurring from erosion/sediment and mass wasting events. However, the project area occurs in an area with sensitive soils/land types, climatic events, and has been subject to past events that have resulted in flood damage and mass wasting events. Even though risks for mass wasting may be low from project related actions, the effects from mass wasting or debris torrents may be substantial if such occurs.

Action alternative increases in erosion and sediment are expected to be short term and negligible for the above discussed fisheries analysis indicators, which include erosion/sediment, LWD, water quality, water yield, RCAs and stream channels, and watershed condition (e.g., road density).

3.2.6 Vegetation/Special Status Plants

3.2.6.1 Affected Environment

There are two plant species, listed as Threatened under the Endangered Species Act (ESA 1973), that occur on lands managed by the Cottonwood Field Office: MacFarlane's four-o'clock (*Mirabilis macfarlanei*) and Spalding's catchfly (*Silene spaldingii*), and one plant listed as candidate, Whitebark pine (*Pinus albicaulis*). Although whitebark pine occurs at higher elevations to the east and south of the project area; none of these federally listed or candidate plants are known to occur in the project area. The project area has little suitable habitat for MacFarlane's four-o'clock or Spalding's catchfly. BLM has identified sensitive plant species – designated by the State Director under 16 USC 1536 (a) (2). BLM Manual 6840, Special Status Species Management, requires that sensitive plant species be managed with the same level of protection as candidate species, to avoid being listed as threatened or endangered in the future. There are several BLM sensitive plants that the project area has suitable habitat for. These species, their habitat, and Idaho BLM status are listed in Table 40.

Table 40. Potential BLM Sensitive Plants and Habitats Which May Occur in Project Area

Common Name *Scientific Name*	**Habitat**	**Idaho BLM Type***
Candystick *Allotropa virgate*	Limited to forest habitats in which lodgepole pine are dominant or in a few cases at least a significant component.	3
Payson's milkvetch *Astragalus paysonii*	Early- to mid-succession sites dominated by lodgepole pine with scattered Douglas-fir and western larch present. Found on north, northeast, and east aspects on flat to moderate slopes (up to 45 percent). Elevation generally between 4,600 and 5,800 feet.	3

Common Name ***Scientific Name***	**Habitat**	**Idaho BLM Type***
Deer-fern *Blechnum spicant*	Occurs at lower elevations (less than 4,200 feet) within moist to wet heavily shaded forests, in *Abies grandis*, *Thuja plicata* and *Larix occidentalis* habitats usually on northern aspects and moderate slopes (10 to 60 percent). Associated species include: *Rubus parviflorus*, *Menziesia ferruginea*, *Cornus canadensis*, *Tiarella trifoliata*, *Viola glabella*, *Polystichum munitum*, *Athyrium filix-femina*, *Pteridium aquilinum*, and *Gymnocarpium dryopteris*.	3
Broad-fruit mariposa lily *Calochortus nitidus*	Endemic to the Palouse Prairie and canyon grasslands and associated with canyon rims, ridges and upper slopes. It also occurs within natural forest openings and open ponderosa pine and/or Douglas-fir communities in forested uplands. The plant is shade-intolerant that occurs on flat to gentle or occasionally steep slopes, on all aspects.	2
Clustered lady's-slipper *Cypripedium fasiculatum*	Often found on north-facing aspects in moist, dense forest, generally in the *Thuja plicata* and *Abies grandis* habitat types. It is often found growing with *Cypripedium montanum*.	3
Phantom orchid *Eburophyton austiniae*	Found in moist mature forest, typically within the *Abies grandis* and *Thuja plicata* habitat types.	3
Puzzling halimolobos *Halimolobos perplexa* var. *perplexa*	Found in the main Salmon River and Little Salmon River drainages and their tributaries. Found in dry and open Douglas-fir, ponderosa pine, and bluebunch wheatgrass habitats. Often occurs in shallow sandy loam or gravel-based soils, rock outcrop sites, and disturbed soil areas.	5
Western ladies-tresses *Spiranthes porrifolia*	Typically occurring in seeps in Douglas-fir stands at lower timberline near transition to grasslands.	3

* In Idaho, the BLM has defined and further clarified the management of special status plants by designating species as either BLM Sensitive or Watch. The following categories are recognized:

Type 1: Federally Listed, Proposed and Candidate Species: Includes species that are listed under the Endangered Species Act, proposed or candidates for listing.

Type 2: Rangewide/Globally Imperiled Species - High Endangerment: Includes species that are experiencing declines throughout their range with a high likelihood of being listed under the Endangered Species Act in the foreseeable future due to their rarity and significant endangerment factors.

Type 3: Rangewide/Globally Imperiled Species - Moderate Endangerment: Includes species that are globally rare with moderate endangerment factors. Their global rarity and inherent risks associated with rarity make them imperiled species.

Type 4: Species of Concern: Includes species that are generally rare in Idaho with currently low endangerment threats.

Type 5: Watch List: Includes species that are not considered Idaho BLM sensitive species, but current population or habitat information suggests that species may warrant sensitive species status in the future.

3.2.6.2 Direct and Indirect Effects of Alternatives

Common to All Action Alternatives

Primary differences between the actions alternatives is the acres of fire salvage (i.e., 916 acres for Proposed Action and 606 acres for No Temporary Roads Alternative) and miles of temporary road constructed (2.28 miles for Proposed Action), and potential to affect suitable habitat or BLM sensitive species which may potentially occur within the project area. No recent plant surveys have been conducted prior to the 2012 Sheep Fire.

There would be no effect on any federally-listed threatened, endangered, or candidate plant species through implementation of any action alternative because it is unlikely any of these species occur in the project area due to the lack of suitable habitat.

Noxious and other weeds will compete with any BLM sensitive plant species that do occur in the project area for pollinators, light, water, and/or nutrients. In addition to construction of 2.28 miles of temporary road, a total of 310 acres (34 percent) of more ground disturbance (salvage logging) would occur for the Proposed Action compared to the No Temporary Road Alternative. See section 3.2.7 for more detailed discussion on noxious and other invasive weed species.

Therefore, all action alternatives "*may impact sensitive plant individuals and/or their habitats but is not likely to cause a trend toward Federal listing*" (see Table 40).

No Action
Under this alternative there would be no additional impacts on any federally-listed threatened, endangered, candidate plant species, or to sensitive plant individuals, subpopulations, populations, or habitat. Effects from the fire would still occur.

3.2.6.3 Cumulative Impacts

The analysis area for cumulative impacts is the project area.

Common to All Action Alternatives

There would be no cumulative effects to threatened or endangered plants, because, it is unlikely any of these species occur in the project area due to the lack of suitable habitat.

Cumulative effects for the sensitive plants that may occur in the analysis area are addressed through consideration of past, present, and reasonably foreseeable actions. It is not possible to directly quantify effects of specific past activities that are several years or decades old on species of concern today, because the status and occurrence of sensitive plants was not known for much of the management history of the analysis area. If any of the eight BLM Sensitive plants species listed in Table 40 above do occur in the project area, fire effects would depend on fire severity and what type of root system the plants have (bulbs, small tap root, creeping rhizomes, tuberously thickened, etc.) that would allow them to survive the fire. Several of the BLM Sensitive plant species (Deer-fern, Clustered lady's-slipper, and Phantom orchid) are only found in dense or dense and moist forested areas. If any of these three plants species survived the fire, it is doubtful they could continue surviving for long post fire and post proposed logging because their preferred habitats are heavily shaded, moist and dense forest and not the current open stands of dead and dying trees.

Historically the changes in condition and abundance of specific habitats important to these species in the analysis area are also unknown. Therefore, the effects of past projects can only be qualified through general discussions. However, the results of past projects contribute to the current existing condition, which can be used to discuss and quantify effects of proposed activities on this group of potentially occurring plant species.

In general, the following cumulative effects have or could be expected to occur in the analysis area:

- Introduction of competitive weedy species into disturbed areas from airborne seeds and seeds brought in from future vehicle use of roads in the analysis area.
- Impacts to any BLM Sensitive plant species that do occur in the project area from future herbicide spraying of noxious and other weeds, especially along road corridors.

3.2.7 Invasive, non-native species

3.2.7.1 Affected Environment

The project is within the Salmon River Weed Management Area (SRWMA) and has been inventoried and treated in accordance with priority efforts by partners since 1994. The terms invasive, non-native species and weeds are interchangeable for the purposes of this discussion. Weed inventories were conducted during the summer of 2012 prior to the fire on the Wet Gulch road. The inventory did not note any new weed populations on BLM lands but did note four previously detected sites of spotted knapweed that had been treated on the road system and one each of Russian knapweed and plumeless thistle. Russian knapweed and plumeless thistle are priority one weeds that are treated with the goal of eradication. Other weeds included houndstongue, St. Johnswort, and Canada thistle. The John Day portion of the project area has not been recently inventoried, but previous weed treatment sites include spotted knapweed and houndstongue. Dalmation toadflax, rush skeletonweed and yellow starthistle are located in the general area but have not been noted within the project area. Typical weed sites are along roads and open areas as the forested canopy limited the opportunity for weed establishment and persistence. The removal of forested overstory by the fire has opened much of the area to potential weed colonization or expansion of existing weed populations. In addition to colonization of the fire area by weeds already present, there is concern that new weeds may have been brought in during suppression activities on vehicles from firefighting forces from outside the general area. Invasive species concerns were addressed through the emergency stabilization and rehabilitation program. Measures have been undertaken to fund inventory and treatment crews to detect, and treat if necessary new sites of weeds found post fire.

3.2.7.2 Direct and Indirect Effects of Alternatives

Proposed Action

The major factor influencing the establishment and expansion of noxious weeds in the project area is the disturbance resulting from the Sheep Fire and suppression efforts. This disturbance factor exists whether the burned timber is salvaged or not.

The main factor contributing to the risk for introduction or increase in weed populations is the amount of ground disturbance resulting from the proposal. The proposed action implements timber harvest on 916 acres, construction of 2.28 miles of temporary road and the use of approximately 12 miles of existing road. The proposed action also implements prevention measures as design features to minimize the potential for the establishment of new weed species or expansion of existing species. With implementation of design features, disturbance taking place during the proposed action is not expected to appreciably increase the opportunity for invasive plant species establishment or expansion over that already resulting from the impact of the Sheep Fire itself. Improved access into the project area by improvement of existing roads and access provided on temporary roads would increase the effectiveness of inventory and treatment activities during the project. As temporary roads are obliterated, seeding the disturbed area should reduce the opportunity for weed establishment and persistence. The disturbed areas would continue to be inventoried for weed establishment for two years post disturbance and treatment undertaken if necessary.

The proposed action implements reforestation activities on approximately 968 acres. Implementing reforestation treatments would likely have the greatest positive long-term impact in reducing the opportunity for weed establishment. Prior to the Sheep Fire, the forested overstory reduced the opportunity for weed establishment as the invasives did not appear to be competing well in shaded areas under the forest canopy. It is expected that a successful reforestation effort as described in the proposed action would lead to a decrease in the size of weed populations and reduce the persistence of weed populations quicker than that which would happen if the areas were left to revegetate naturally.

<u>No Temporary Road Alternative</u>

Alternative 1 includes harvest of 606 acres and use of the existing 12 miles of road. This alternative results in 313 less acres of potential ground disturbance due to harvest activities and 2.28 less miles of road construction disturbance. Alternative 1 incorporates the same prevention measures as the proposed action so it is expected that impacts in relation to invasive plant species would be similar. Since no temporary roads would be built, access into the 313 acres would be less efficient and decrease the effectiveness of weed inventory and potential control of weeds established as a result of the Sheep Fire disturbance.

Alternative 1 implements approximately 310 fewer acres of reforestation plantings. As mentioned in the proposed action, the forest overstory which existed prior to the Sheep fire tended to prevent weed establishment and successful persistence. Fewer acres reforested mean it would be a longer period of time before these acres revegetated naturally. There would be a higher risk of successful establishment and persistence of weeds on these acres until reforestation occurs.

<u>No Action</u>

There would be 916 acres less potential disturbance in harvest units and 2.28 miles less road construction disturbance. 968 acres of reforestation would not occur. This alternative would eliminate the potential increase in the risk of weed introduction and spread as a result of the action alternatives. There would be no benefit from reforestation efforts in decreasing the completive ability of weeds in the area disturbed by the fire until natural reforestation occurs. Existing roads leading into the project area would not be maintained as a result of the action. As a result it is likely that access would be reduced in the area due to falling snags, rock slides and soil movement closing roads. There would be no benefit to invasive species inventory and control efforts from temporary roads. There would be an overall reduction of access into areas where seeds of invasive species may have been transported by firefighting equipment could be detrimental to efficient inventory and treatment efforts.

3.2.7.3 Cumulative Impacts

In relation to the risk of weed establishment and spread, the primary event influencing cumulative impacts is disturbance of vegetation caused by the Sheep Fire and resulting suppression efforts. The impacts of this event exist and will be the overriding risk factor in the establishment and spread of weeds until desirable vegetation recovers and can provide competition with weeds in the burned area. Other more minor, yet existing factors include impacts from livestock grazing use, recreation use, wildlife use, and other potential disturbance factors or vectors of weed spread. Because the action alternatives implement design features aimed at reducing the potential for weed introduction, inventory the area for introduced weed populations, and treat any found weeds, it is not expected that implementation of the proposed action would result in more than a low level of increased risk of weed introduction and spread when paired cumulatively with other actions occurring in the project area.

3.2.8 Wildlife Habitat

The majority of wildlife project and cumulative analysis area occurs within the 2012 Sheep Fire perimeter, consequently fire effects to wildlife species and habitats will be assessed for baseline conditions, project caused changes, and expected trends. Wildlife species were evaluated in relation to existing habitat quality and quantity occurring within the project area and expected changes from implementation of alternatives. Where appropriate the cumulative analysis area included the project area or was extended to the watershed level (6^{th} code HUCs) and subwatersheds. The project area occurs in the John Day Creek 6^{th} code HUC and Cow Creek-Salmon River 6^{th} code HUC. Primary actions occur in four subwatersheds of the John Day Creek drainage and two small subwatersheds of the Cow Creek-Salmon River drainage area (see Figure 18).

Table 41. Project and Cumulative Analysis Area Descriptions

Project and Analysis Areas	Acres
2012 Sheep Fire – Analysis Area Watersheds	48,000
Project Area – RMP Desired Future Conditions	3,326
Lower John Day	4,128
East Fork John Day	3,620
Middle Fork John Day	3,798
South Fork John Day	2,464
Total Acres – John Day Creek Watershed	14,019
Wet Gulch	1,780
Dry Gulch	721
Total Acres – Wet/Dry Gulch	2,501

The analyses for wildlife species and habitats will focus on snags and large down wood, habitat fragmentation and connectivity, and four generalized wildlife species habitat guilds based on primary habitat associations or dependency relationships. The four specific wildlife habitat associations and guilds include: (1) riparian and aquatic habitats and dependent species; (2) late seral and old growth habitats and dependent species; (3) early seral habitats and dependent species; and (4) elk habitat and security dependent species.

Outputs from the habitat suitability index model for north Idaho (Leege 1984) were used to analyze summer elk habitat within the project area. The analysis of effects on elk is based on the proposed modification to the current condition of elk habitat quality and security in the John Day Elk Analysis Unit (EAU).

Analysis will also address species and habitat effects for Migratory Birds, Endangered Species Act (ESA)-listed wildlife, proposed, candidate, and BLM sensitive species.

The scope of this analysis and extent of cumulative effects varies depending on each species relative home range size and critical habitat niches. For certain species, the amount (acres) of potentially suitable habitat that would be modified within the project area will be the primary indicator for analysis and will be addressed for each alternative. Direct, indirect and cumulative effects will be addressed predominantly within the project area, and where applicable extend beyond the project area to the sub-watershed or watershed level.

3.2.8.1 Affected Environment

The most common pre-fire wildlife habitats within the project area were mid-aged to mature mixed conifer stands. Common overstory trees within the project area include Douglas-fir, grand fir, ponderosa pine, and a lesser abundance of western larch, Engelmann spruce, and lodgepole pine. Table 42 identifies Forested Potential Vegetation Groups (PVG) found within the project area.

Table 42. Potential Vegetation Groups Within Project Area

Potential Vegetation Groups (PVG)	
PVG 2	Warm Dry Douglas-Fir/Moist Ponderosa Pine
PVG 3	Cool Moist Douglas Fir
PVG 4	Cool Dry Douglas Fir
PVG 5	Dry Grand Fir
PVG 6	Cool Moist Grand Fir

Burn severity was field verified by the US Forest Service's Burned Area Emergency Response (BAER) team and was based on satellite Burned Area Reflectance Classification (BARC) mapping (USDA-FS 2012). The 2012 Sheep Fire burned area (BARC) maps were used to estimate fire severity and effects to forested vegetation and wildlife habitats for this analysis. The 2012 Sheep Fire resulted in changes to structure of the forested habitats. Areas that had high and moderate burn severity had stand replacing fires which converted mid-aged and mature stands to early seral conditions. Table 43 below summarizes burn severity for the cumulative effects subwatersheds of the John Day Creek watershed and the Cow Creek – Salmon River face analysis face drainages (see Figures 16 and 17).

Table 43. Summary of Watershed Acres and Burn Severity Outside and Within 2012 Sheep Fire Perimeter[1]

Watershed - Subwatershed	**Outside 2012 Sheep Fire Perimeter**	**Within 2012 Sheep Fire Perimeter**			
		High Burn Severity	**Moderate Burn Severity**	**Low Burn Severity**	**Very Low or No Burn Severity**
JOHN DAY CREEK WATERSHED					
Lower John Day 4,128 acres	1270 acres (31%)	78 acres (2%)	578 acres (14%)	1497 acres (36%)	705 acres (17%)
East Fk John Day 3,629 acres	0 acres (0%)	624acres (17%)	1324acres (37%)	1175acres (32%)	506acres (14%)
Middle Fk John Day 3,798 acres	0 acres (0%)	478 acres (13%)	915 acres (24%)	1075 acres (28%)	1329 acres (35%)
South Fk. John Day 2,464 acres	0 acres (0%)	366 acres (15%)	852 acres (35%)	695acres (28%)	552 acres (22%)
JOHN DAY TOTAL **14,019 acres**	1270acres (9%)	1545acres (11%)	3669 acres (26%)	4443 acres (32%)	3093acres (22%)
COW CREEK-SALMON RIVER					
Cow Cr.-Salmon R. 16,853 acres	15,804acres (94%)	<1 acre (<1%)	181 acres (1%)	710 acres (4%)	158 acres (1%)
Wet Gulch 1,780 acres	65 acres (4%)	112 acres (6%)	521 acres (29%)	769 acres (43%)	313 acres (18%)
Dry Gulch 721 acres	92 acres (13%)	0 acres (0%)	24 acres (3%)	409 acres (57%)	196 acres (27%)
COW CR.-SALMON RIVER TOTAL 19,354 acres	15,961 acres (82%)	112 acres (<1%)	726 acres (4%)	1,888 acres (10%)	667 acres (3%)

[1]Total acres within and outside Sheep Fire perimeter and burn severity acres and percentages summarized for each watershed or subwatershed.

Table 44 below summarizes burn severity for stream miles/riparian areas within and outside the 2012 Sheep Fire perimeter for the analysis and project area subwatersheds. For detailed and additional information regarding current conditions for riparian habitats, streams, and spring/seeps within the project area refer to previous sections 3.2.4 *Wetland and Riparian Habitats* and 3.2.5 *Fisheries, Aquatic Habitats, and Special Status Species*; and Figures 19 and 23.

Table 44. Watershed Summary of Stream Miles Outside and Within 2012 Sheep Fire Perimeter[1]

Watershed - Subwatershed	Outside 2012 Sheep Fire Perimeter	Within 2012 Sheep Fire Perimeter			
		High Burn Severity	**Moderate Burn Severity**	**Low Burn Severity**	**Very Low or No Burn Severity**
JOHN DAY CREEK WATERSHED					
Lower John Day 14.93 miles	4.81 miles (32%)	0.26 miles (2%)	1.62 miles (11%)	4.11 miles (27%)	4.13 miles (28%)
East Fk John Day 8.59 miles	0.00 miles (0%)	1.06 miles (12%)	3.73 miles (43%)	2.87 miles (33%)	0.93 miles (11%)
Middle Fk John Day 10.27 miles	0.00 (0%)	0.90 (9%)	1.61 (16%)	2.74 (27%)	5.02 (49%)
South Fk. John Day 6.69 miles	0.00 (0%)	0.70 (10%)	1.20 (18%)	1.67 (25%)	3.12 (47%)
***JOHN DAY TOTAL* 40.48 miles**	4.81 miles (12%)	2.92 miles (7%)	8.16 miles (20%)	11.39 miles (28%)	13.2 miles (33%)
COW CREEK-SALMON RIVER					
Cow Cr.-Salmon R. 73.37 miles	68.80 miles (94%)	0.0 miles (0%)	0.28 miles (<1%)	3.14 miles (4%)	1.15 miles (2%)
Wet Gulch 4.63 miles	0.55 miles (12%)	0.29 miles (6%)	1.49 miles (32%)	1.30 miles (28%)	1.00 miles (22%)
Dry Gulch 3.42 miles	0.97 miles (28%)	0.00 miles (0%)	0.00 miles (0%)	0.96 miles (28%)	1.49 miles (44%)
COW CR.-SALMON RIVER TOTAL 81.42 miles	70.32 miles (86%)	0.29 miles (<1%)	1.77 miles (2%)	5.4 miles (7%)	3.64 miles (5%)

[1]Total miles of streams within and outside Sheep Fire perimeter and burn severity stream miles and percentages summarized for each watershed or subwatershed.

Cottonwood RMP (USDI-BLM 2009) identified priority subwatersheds or areas were BLM programmatic management direction would support progress towards attainment of desired future condition (DFC) for forest and wildlife habitats. The project Area occurs within a DFC management tract of BLM lands and burn severity for this tract of land is summarized below in Table 45. Future reference to project area within this section (3.2.8) will also include the same DFC management area.

Table 45. Project Area Burn Severity – John Day DFC Management Block

Burn Severity	Acres
High	816.11
Moderate	1,307.26
Low	797.80
Very Low or Unburned	404.62
TOTAL	3,325.79

Field reconnaissance, LANDFIRE data and the Vegetation Dynamics Development Model were used to estimate general succession status (pre-fire) for the DFC management area (project area). The 2012 burn severity GIS mapping effort was used in conjunction with pre-fire conditions to estimate post-fire conditions for the DFC management/project area. Refer to Table 46 for a comparison of stand structure and succession characteristics regarding DFC (Cottonwood RMP – USDI-BLM 2009), pre-fire conditions, and post-fire conditions.

Table 46. Desired Future Conditions (Stand Structure – Succession Class), Pre-Fire Conditions, and Post-Fire Conditions for the Project Area

<table>
<tr><th>Stand Structure
Tree Size</th><th>Desired Future
Conditions %</th><th>Pre-Fire</th><th>Post-Fire</th></tr>
<tr><td>Grass/Forb/Shrub/Seedlings</td><td>5-7</td><td rowspan="2">1%</td><td rowspan="2">70%</td></tr>
<tr><td>Saplings</td><td>3-7</td></tr>
<tr><td>Small</td><td>5-21</td><td rowspan="2">25%</td><td rowspan="2">7%</td></tr>
<tr><td>Medium</td><td>23-36</td></tr>
<tr><td>Large</td><td>20-80</td><td rowspan="2">74%</td><td rowspan="2">23%</td></tr>
<tr><td>Old Forest</td><td>10</td></tr>
</table>

[1]Old growth is a component of, and not in addition to, the large tree component

For additional information regarding forest vegetation within the project and cumulative analysis area refer to section 3.2.1 *Vegetation*. Overstory tree mortality varied by burn severity, with some stands experiencing complete stand replacement (post-fire early seral condition); very low and low severity burn areas maintained same stand structure and seral condition with additional snags (dead and dying trees) (see Figure 29 below).

The project area and cumulative effects watersheds provide year-long or seasonal habitat for a variety of big game, upland game, non-game species, and special status species (approximately 185 different species). Common big game species found in the analysis area include elk, white tailed deer, mule deer, black bear, mountain lion, moose, and incidental rare use by bighorn sheep. The analysis area provides a variety of habitats from low elevation canyon grasslands to high elevation sub-alpine habitats. Primary effects analysis will occur in mixed elevation forest lands within the project area. The 2012 Sheep Fire converted a large percentage of large trees and mature forest stands to early seral condition (Table 46).

Figure 29. Very low and low severity burn areas had overstory tree mortality that may be less than 25 percent. Fire killed trees resulting in more open canopy cover, the same stand structure and seral condition exists with more snags (e.g., dead or dying trees). Large woody debris may not have been consumed by the fire and exists on the ground.

Snags and Large Down Wood

The 2012 Sheep Fire resulted in an abundance of dead and dying trees (e.g., snags) and as dead trees fall down an abundance of large down wood within the project area and cumulative effects watersheds and subwatersheds. Areas that experienced high and moderate severe burn intensity resulted in high tree mortality (snag increase) and also consumed a large amount of the large down wood. Similar effects were not as prevalent in the low and very low severity burn area, however, tree mortality did occur resulting in an increase in available snags. The fire resulted in post-fire habitats that are preferred by a variety of snag dependent species. Tables 43 and 45 summarize burn severity for the subwatersheds and project area.

Snags, broken-topped live trees, downed logs, and other woody material are required by a wide variety of wildlife species for nesting, denning, roosting, perching, breeding, and cover. The number, species, size, and distribution of available snags strongly affect snag-dependent wildlife (Bull et al. 1997). Although smaller creatures can use many sizes of dead trees, larger birds and mammals require larger snags and down logs. Large diameter logs provide long-term habitat structures. In the project area, large western larch, ponderosa pine, and Douglas-fir snags are the most valuable for snag-dependent species.

Downed trees and other woody material are also important for many species (Bull 2002). Downed logs and stumps provide resting and denning for species hunting below the snow in winter (Buskirk and Ruggiero 1994) and are used as travel cover. Pine marten and lynx dens are associated with down logs. Amphibians and reptiles use large woody debris for shelter and breeding sites (Bull et al. 1997). Down wood also provides habitat for insects and other invertebrates that form an important forage base for larger species. Large diameter logs provide long-term habitat structures.

Primary cavity excavators use burned forest habitats and green forest habitats differently. Fire hardened snags and non-fire hardened snags or soft snags provide different niches for various woodpecker species. Snag habitats in post-fire environments are unique for several reasons: 1) early post-fire forests and associated insect outbreaks result in a rapid increase in nest sites and food supplies, 2) initially, most of the new snags are "hard" snags consisting of sound sapwood that may delay use by species that prefer "soft" snags, 3) many woodpecker species appear to respond positively to burned habitats, with some species using them as source habitats, and 4) stand replacement fires leave few or no green trees for future snag replacements.

The abundance of cavity-using species is directly related to the presence or absence of suitable cavity trees. Habitat suitability for cavity-users is influenced by the size (diameter and height), abundance, density, distribution, species, and decay characteristics of the snags. In addition, the structural condition of surrounding vegetation determines foraging opportunities (Rose et al. 2001). Not every stage of the snag's demise is utilized by the same species, but rather a variety of species use the snag at various stages or conditions. Uses of snags include nesting, roosting, preening, foraging, perching, courtship, drumming, and hibernating.

BLM Sensitive Species, Lewis woodpecker and BLM Watch List Species, black-backed woodpecker are strongly associated with post-fire habitats, particularly, stand-replacement events. Other species that are strongly associated with post-fire habitats (e.g., stand-replacement events) include three-toed woodpecker, hairy woodpecker, and northern flicker. BLM Sensitive Species, white-headed woodpecker and Williamson's sapsucker prefer mixed fire mortality conditions associated with light to moderate intensity burns. Species such as pileated woodpeckers, downy woodpeckers and red-naped sapsuckers have much lower associations with post-fire habitats (Saab and Dudley 1997, Hutto 1995, Sallabanks 1995). Many of the species that use dead wood habitat are secondary cavity users, such as the western bluebird and mountain bluebird, which depend on primary cavity nesters to excavate cavities for their use. By addressing available habitat and effects to primary cavity excavators, it is expected that habitat for secondary cavity users will be provided.

It is evident that most cavity nesting birds benefit from high fire mortality and high post-fire snag density. Many cavity nesting birds exhibit marked increase in abundance after the occurrence of stand replacing fires (Hutto 1995, Hutto 2006). The most dramatic increases are for species that are timber drillers and aerial foragers. Bark beetles and wood-boring beetles are key prey species for many woodpeckers, and often colonize fire-killed or injured trees in high densities. Although temporary, stand-replacement fires create a rich and concentrated foraging resource in areas where nest site potential also increases. It is thought that many cavity-nesting species are dependent upon both the spatial and temporal occurrence of severe burns to maintain their populations (Hutto 1995, Hutto 2006). What remains unclear is the range of effects that occur depending on the size of the fire, the amount of salvage harvest, and the distribution and sequencing of the many fires and salvage harvest activities occurring over time.

The Cottonwood RMP (USDI-BLM 2009) identifies desired range of snags, coarse woody debris, and green tree snag replacement per acre for each PVG. Based on the PVGs occurring within the project area, following is a summary of the desired range of snags per acre, coarse woody debris, and green tree snag-replacement guidance (USDI-BLM 2009; Table 47). Overall, post-fire habitats are providing abundant small to large sized snags in the project area. Many stands are also lacking desired large sized green tree snag-replacement (i.e., 4 trees/acres ≥ 20 inches dbh) and large sized coarse woody debris (largest size class best, preferably over 15 inches dbh), particularly in areas in areas of high and moderate burn severity. However, large sized coarse woody debris will increase as dead trees and snags fall down. Overall, currently snags are abundant within the project and cumulative effects analysis area.

Table 47. Desired Ranges of Snags, Coarse Woody Debris, and Green Tree Snag-Replacement

Snags/Woody Debris	Diameter Group	Desired Range[1] (acre)	Comments
Snags per Acre	10”-20”	1.8 – 2.7 snags	Prefer larger size diameter snags, >20 inches dbh. Minimum height of 30 feet.
	>20”	0.4 – 3.0 snags	
	Total	2.2 – 5.7 snags **6 snags minimum[2]**	
Coarse Woody Debris, Tons per Acre	Preference for retention >15”	4 – 14 tons **15 tons[3]**	Coarse woody debris decay class I and II, >75% comprised of woody debris >15 inches diameter.
Green Tree Snag Replacement per Acre	Preference for retention > 20”	6 – 15	Preference for retention trees > 20 inches dbh. Maintain minimum of 2 – 4 large diameter trees (>20 inches dbh) per acre for replacement snags. Retain sufficient number of live trees for long-term replacement of snags, including those with broken tops, cavities, lightning scars, and dead portions as future recruitment.

[1]The desired ranges depicted in this table is not meant to provide an even distribution of snags across every acre in the forested landscape, but to provide numbers that serve as a guide to approximate an average condition at the stand levels or project area. Exceeding these numbers does not depict adverse conditions, and would provide benefits.
[2]Project design measures identified a minimum of 6 snags per acres, with preference for larger sized snags.
[3]Project specific design measure identified a minimum of 15 tons per acre, because majority of salvage timber harvest would occur on high and moderate burn severity areas and down coarse and large wood would benefit soil productivity and would be beneficial for erosion control when trees fall down and provide protective ground cover for erosion control.

Figure 30. Pileated woodpecker utilizing a snag for a source of insects within the 2012 Sheep Fire perimeter. Pileated woodpeckers are not strongly associated with post-fire habitats and will use burn areas for foraging, but are not expected to nest there. Photo taken October 31, 2012.

Habitat Fragmentation and Connectivity

The 2012 Sheep Fire, past land uses, and other natural events have had varying levels of effects on habitat fragmentation and connectivity for different wildlife species.

Habitat fragmentation is the breaking up of wildlife species' habitat into discontinuous parcels, particularly for species that have difficulty moving from one of those parcels to another. Historically habitats have been fragmented by wildfire, insect and disease and other disturbance processes. Native wildlife species have adapted to a landscape with a high degree of fragmentation, abundant edge and a variety of patch sizes, the result of natural processes and topography.

Habitat connectivity is the degree to which the landscape facilitates wildlife movement and ecological processes. Historically, habitats have not been connected due to natural disturbances (i.e., fire history, natural barriers).

In the project area and analysis area sub-watersheds, as a result of natural processes and topography, wildlife species have adapted to a landscape with a high degree of fragmentation, abundant edge, and a variety of patch sizes. The watersheds and landscapes within the project area have been altered to varying levels by past natural and human actions. Past human and natural activities include: 2012 Sheep Fire, roads, timber harvest, prescribed burning, livestock grazing, rural development, and U.S. Highway 95. Effects of fragmentation on wildlife dispersal or movement between various habitat elements (water, forage, winter/summer range, breeding areas, security) have resulted in varying levels of affects to the viability of any wildlife species within the project area or watershed analysis area.

The 2012 Sheep Fire effects on fragmentation and wildlife dispersal or movement between various habitat elements (water, forage, winter/summer range, breeding areas, security) has potentially the highest impacts on species with smaller home ranges and less mobile species. Refer to burn severity Figures 16 and 17, high and moderate burn severity areas experienced stand replacing fires which create large openings and will have species specific effects on dispersal and movement. The low and very low burn severity areas resulted in less tree mortality and will create smaller openings. Table 46 identifies the pre-fire and post-fire succession classes within the project area.

Habitat connectivity can have positive and negative considerations. Connectivity is important for some wildlife species to move on the landscape. However, habitats that have not been connected due to fire history, natural barriers, etc. that are allowed to become connected (through fire exclusion for example) may allow wildlife, plants, insects and disease to interact in negative ways. Invasive wildlife species and noxious weeds increase their ranges by using these artificial connections on the landscape. These connections may influence how insects and disease interact with and affect habitats.

Wildlife Habitat Guilds

There are four habitat guilds within the project area based on habitat associations or dependency relationships. These include: (1) riparian and aquatic habitats and dependent species; (2) late seral and old growth habitats and dependent species; (3) early seral habitats and dependent species; and (4) elk habitat and security dependent species.

Analysis for the above wildlife habitat guilds will all provide baseline conditions and analysis information for special status species. For analysis purposes, special status species (BLM sensitive and watch list species) will be grouped into similar preferred habitats and guilds.

Riparian and Aquatic Habitats and Dependent Species

Table 44 summarizes burn severity for stream miles/riparian areas within and outside the 2012 Sheep Fire perimeter for the analysis and project area subwatersheds. The project and analysis includes the entire John Day Creek watershed (four subwatersheds) and two small Salmon River face subwatersheds (i.e., Wet Gulch and Dry Gulch) (see Figure 18).

Riparian habitats provide an important habitat or critical habitat component for many wildlife species, such as amphibians. Riparian corridors also provide connectivity and travel corridors for a variety of wildlife. For additional information regarding current conditions for riparian habitats, streams, and spring/seeps within the project area refer to previous sections 3.2.4 *Wetland and Riparian Habitats* and 3.2.5 *Fisheries, Aquatic Habitats, and* 3.2.11 *BLM Sensitive Wildlife Species (Riparian Habitats*); and Figures 19 and 23.

Late Seral and Old-Growth Habitats and Dependent Species

The 2012 Sheep Fire, and past timber harvest have negatively impacted late seral/old growth habitats and dependent species the most within the analysis area; however the recent fire impacts have been beneficial to many early seral dependent species. Within the project area, to date no complete post-fire dedicated or replacement old growth stand analysis has been completed. Using LANDFIRE and burn severity mapping analysis, it is estimated that approximately 23 percent (764 acres) of the project area would meet mature or large tree criteria and provide dedicated or potential replacement old growth and would be managed accordingly (see Table 46). However, it is estimated that stands within the project area that may provide suitable old growth characteristics is 0 to 5 percent. For additional information regarding forest vegetation within the project and cumulative analysis area refer to section 3.2.1 *Vegetation*.

Early Seral Habitats and Dependent Species

Timber harvest, fire exclusion, and wildfires have had various effects on early seral habitats within the project area and larger landscape analysis area (e.g., watersheds). Within the project area, the majority of stands are early seral. Using LANDFIRE and burn severity mapping analysis, it is estimated that approximately 70 percent of the project area would provide early seral habitat conditions (see Table 46). For additional information regarding forest vegetation within the project area, alternative effects, and cumulative effects refer to section 3.2.1 *Vegetation*.

Elk Habitat and Security Dependent Species

Security dependent species are primarily affected by human disturbances, such as: road use and maintenance, timber harvest, wood cutting, hunting, livestock grazing, various recreational activities, and residences. Human caused or natural events (e.g., wildfire) that affect security or hiding cover also have direct and indirect effects on security areas. Within the project area the majority of roads had been developed by the mid-1980s. Although road closures and private land restrictions for public access reduced vehicular and human disturbances, vulnerability to hunting and similar impacts remains. The Wet Gulch Road is the primary public motorized access to the John Day mountain area portion of the project area. A county road provides public access up John Creek for approximately 3 miles, and beyond the county road access would require private land owner permission. Within the project area many of the roads are not available for public motorized use because they are overgrown with vegetation (shrubs/trees), are blocked by rocks/small slides, or are not accessible to the public because of inter-mixed private lands (need private land owner permission). Roads not identified as "open" for motorized travel are designated by default as being closed to motorized travel (USDI-BLM 2009).

The project area includes the BLM Brushy Ridge Habitat Management Plan (HMP) area, which includes approximately 400 acres located in the South Fork John Day Creek drainage. Primary objectives of the plan were to improve quantity and quality of forage for elk. Activities were proposed to maintain early seral conditions for brush fields, reduce conifer encroachment, and maintain more open canopy of forest stands on the East Side of South Fork John Day Creek (west aspect). To date several prescribed burn projects and been conducted in the area. Helicopter timber harvest has also been conducted in the area to achieve these objectives. No livestock grazing is authorized in the HMP area.

Rocky Mountain elk are a security dependent species and summer range habitat is present within the project area. The quality of summer elk habitat and whether the habitat is capable of sustaining or increasing elk populations is rated through the use of the *Guidelines for Evaluating and Managing Summer Elk Habitat in Northern Idaho* (Elk Habitat Effectiveness - EHE) model (Leege 1984). When all habitat factors are in optimum abundance and distribution, habitat would be rated 100% for EHE. The 2012 Sheep Fire altered cover and forage ratios with the John Day Elk Analysis Unit (EAU). The John Day EAU includes the project area (see Figure 18) and approximately 760 acres of private and State lands that are inter-mixed or adjacent to BLM lands. The percentage value refers only to habitat quality and not to actual elk use. Currently, the EHE for the John Day EAU is 48%. The analysis of road-density, cover, and security related effects are determined by conducting EHE analysis. The primary factors decreasing habitat quality are: (1) road density and roads open to vehicle use; (2) road use and hiding cover adjacent to road; (3) size and distribution of hiding and thermal cover, and (4) size and distribution of forage areas. The 2012 Sheep Fire affected EHE for the John Day EAU with reduction of cover along roads, changes to size and distribution of hiding and thermal cover, and size and distribution of forage areas.

3.2.8.2 Direct and Indirect Effects of Alternatives

<u>Snags and Large Down Wood</u>

Common to All Action Alternatives

Action alternatives effects to snags and large down wood and species dependency relationships was used to analyze the action alternatives. Management actions would have varying levels of disturbance, displacement, and potential injury/mortality to wildlife species utilizing habitats in the short term during project implementation. Long-term effects would be dependent on species specific preferred habitats and critical habitat niches (e.g., foraging, nesting, young-rearing, denning sites, etc.). The harvest of only dead or dying trees is proposed. Project design measures include leaving a minimum number of snags and large down wood (see Table 47 above). These design measures would retain legacy features within low and very low severity burn areas or when new green stands develop. However, they would not provide optimum habitat conditions for all snag and large wood dependent species within burned areas. Consequently, the primary effects would be attributed to the amount of acres treated under the alternatives. Table 48 below summarizes the potential effects from implementation of various alternatives.

Table 48. Salvage and Untreated Acres Within Project Area

Alternative	Project Area		Comments
	Treated Acres and Percent	Untreated Acres and Percent	
Proposed Action	916 Acres – 28%	2,410 acres – 72%	Maintain at least minimum standards and guidelines in salvage units for snags and large woody debris. Potential disturbance and displacement of snag dependent species within harvest units. Harvest within high severity or low severity burn areas would impact habitats and dependent species differently. Would provide for a mosaic of conditions regarding density and distribution. Stands outside salvage units would maintain existing snag and down wood levels, with the exception of increased wood cutting along roads.
No New Temporary Road Construction	606 acres – 18%	2,720 acres – 82%	
No Action	0 Acres – 0%	3,326 acres – 100%	Maximizes maintenance of existing snag and down wood levels, with the exception of increased wood cutting along roads. Provides the most burned forest habitat and the greatest number of snags for primary and secondary cavity excavators. All existing snags would be available in multiple size classes with variable densities.

Snag Retention

Project objectives are to recover the value of dead and dying trees, while still providing sufficient snag and down wood habitat for primary and secondary cavity users. A landscape approach to snag retention would occur. Snags would be retained across the project area in untreated areas as well as within treatment units. This strategy would provide for a mosaic of conditions regarding density and distribution. Within units, a portion of the dead trees would be removed based on the prescribed silvicultural strategies. In units, there would be no removal of trees with a moderate to high likelihood of survival. Salvage harvest of trees would focus on those 8 inches dbh and greater primarily due to economics. Within harvest units, 6 snags per acre, and snags greater than 20 inches dbh is preferred size for retention.

The action alternatives vary by the number of acres to be treated. The Proposed Action Alternative would harvest 916 acres and the No New Temporary Road Construction Alternative would harvest 606 acres (see Table 48). Proposed harvest treatments would reduce snag densities on the landscape, specifically snags 8 inches dbh and greater. This would result in a decrease in roosting, nesting and foraging habitat for primary and secondary cavity excavators on less than 30 percent of the project area.

Following treatment, harvest units under all action alternatives would meet or exceed RMP standards (i.e., 2.2 to 5.7 snags per acre), with a retention of a minimum of 6 snags per acre. Snag retention at this level would provide little nesting habitat for woodpeckers in post-fire habitats. Snags will retain legacy features within low burn severity harvest units or when new green stands develop. Stands outside proposed salvage units (at least 72 percent of the area) will maintain existing snag and down wood levels. These untreated areas will provide elevated nesting habitat, but at different levels depending on snag density, snag size and bird species.

Figure 31. This unit is proposed for tractor salvage harvest and experienced high severity burn. After salvage logging this stand, with the exception of six larger sized snags per acre, trees over 8 inches dbh would be removed. It is expected that this stand will not be meeting RMP standards for snags within 10-20 years after salvage logging (retention snags fall down). Even without harvest occurring it would be expected that majority of these dead trees would be on the ground within 20 to 30 years. Tree seed source is lacking in this area, and tree planting is expected to advance reforestation and succession status by 20 years.

The No Action Alternative supports the most primary cavity excavators, followed by the No New Temporary Road Construction Alternative. The Proposed Action Alternative leaves the least habitat, and is the least favorable to dead wood associated species, but still maintains habitat at levels above Historical Range of Variability for the project area (HRV).

Direct effects would primarily be displacement from nests by removal or destruction of nest structures (snags) during salvage operations. Adverse effects would likely be higher for such species as the blackbacked, three-toed and hairy woodpeckers. These species tend to use post-fire habitats first because of their ability to excavate hard snags. Logging would likely be completed within 1 year of the fire when most snags will still be hard enough to limit use by other species.

Lewis' woodpecker, white-headed woodpecker and black-backed woodpecker show the most potential habitat reduction or reduced habitat quality in Table 48 under the Proposed Action Alternative and less with the No Temporary Road Alternative.

Black-backed and three-toed woodpeckers tend to select nest sites with the highest snag densities and the least amount of logging. Therefore, it is unlikely that they would use salvage-logged units for nesting or foraging. In all action alternatives, a portion of the Sheep Salvage Project Area would not be treated, and would continue to provide habitat for species which utilize high density snag patches. Black-backed, three-toed and hairy woodpeckers would likely benefit the most in stands with no salvage harvest. Approximately, 2,410 acres (72%) in the Proposed Action Alternative and 2,720 acres (82 percent) in the No Temporary Road Alternative would not have salvage harvest activities. No salvage logging or temporary road construction would occur within RCAs which would be beneficial to snag dependent species utilizing these areas.

The Lewis' woodpecker, northern flicker and, other species that prefer soft snags over hard snags will begin to expand into the fire area as snags begin to decay and fall. Snag habitat is reduced, but still maintained at suitable levels.

Habitat for white-headed woodpeckers and Williamson's sapsuckers will be reduced, but still provide habitat across all tolerance levels. These species will likely tend towards the periphery of the burned areas where there is a mosaic of live and dead trees to meet their habitat needs.

Pileated woodpeckers will probably not be directly affected by the removal of large diameter snags, as studies show they are rare visitors to early post-fire communities. Indirectly, removal of large diameter snags reduces accumulation of large, down logs, and consequently, reduces future foraging habitat. In salvage units, the low densities of snags left will not provide high quality foraging habitat even after snags fall. In non-salvage areas, the potential for quality foraging habitat will remain high.

Red-naped sapsuckers and downy woodpeckers will not be significantly affected by the reduction in nesting and foraging habitat, since they primarily utilize deciduous tree stands, mixed woodlands, and riparian areas. Salvage timber harvest will generally not take place within these stands preferred by red-naped sapsuckers and downy woodpeckers.

Along with natural reforestation, treated areas would eventually reforest at faster rates with the planting of conifers within salvage units that experienced high severity burn intensity and are lacking a seed source. Ponderosa pine and Douglas-fir trees would eventually dominate stand composition on the sites that were planted. Establishment of ponderosa pine and Douglas-fir habitats would be beneficial for species like the Lewis' woodpecker and white-headed woodpecker in the long term.

There is no scientific basis, and thus a high level of uncertainty, for determining how much burned habitat can be salvaged without negative effects to populations of post-fire associated species (Hutto 2006). Assessment at the eco-regional scale or higher would be needed to reduce the uncertainty of the effects of salvage logging on fire associated species.

The most recent large scale assessment conducted under Interior Columbia Basin Ecosystem Management Project (ICBEMP) (Wisdom et al. 2000) indicates strong declines in habitat for two of the post-fire associated species, white-headed woodpecker and Lewis' woodpecker across the Columbia Basin (Hutto 2006, Wisdom et al. 2000). There are no reliable data on actual population trends for these species, but a downward trend for populations is assumed based on the magnitude of habitat loss. All action alternatives would be expected to further reduce habitat suitability and capability for these two woodpeckers. The adverse effect to habitat would be highest for the Proposed Action Alternative and would be followed by the No Temporary Road Alternative. The No Action Alternative would have the lowest adverse effects.

Populations of black-backed woodpecker appear to be relatively secure across the Columbia Basin (Wisdom et al. 2000). While all action alternatives would reduce habitat suitability in the project area, much of the optimal habitat for this species is being left unsalvaged. Adverse effects due to the action alternatives are considered minimal, and effects to populations as a whole are expected to be minimal.

While all action alternatives would reduce habitat suitability in the project area, adverse effects due to the action alternatives are considered minimal, and effects to populations as a whole are expected to be minimal.

Snag Persistence

Snag numbers do not continually increase over time because the process of tree mortality and snag recruitment are balanced by the processes of snag decay and fall (Everett et al. 1999). Over time, snag habitat will decrease creating a gap in time when little snag habitat exists (primarily in stand replacement areas) because there are few green trees of sufficient size to provide recruitment. This "snag gap" will occur for many decades. Although snag levels currently exceed RMP standards, it is expected that most post-burn snags will be on the ground within 20-30 years. Salvage harvest of snags can extend the length of the snag gap. Conversely, tree planting can shorten the length of the snag gap when compared to natural regeneration. The action alternatives include tree planting within salvage units.

In salvage units, large diameter snags, i.e. snags 20 inches dbh and greater, would be reduced to 3 snags per acre (dependent on availability of large snags). It is predicted that within moderate, and high burn severity areas that existing snags would fall below RMP standards in 10-20 years for the action alternative harvest units, versus 10-40 years for areas where no salvage occurs. Within low burn severity areas, there is little to no snag gap for these burn areas because many trees survived the fire and there will be a sufficient number of large green tree replacements to replace existing snags once they fall.

For the "very high" burn severity areas, a snag gap is expected to occur because the fire killed essentially all the trees and there are no live, green trees left to become snags in the future. Future snags will not be available until a new forest develops, trees reach sizes useful for woodpeckers, and these trees begin to die.

FVS modeling was used to project the growth of planted trees over time. Planting would establish new trees immediately versus 20 years for areas where no trees area proposed to be planted (lacking a seed source). Tree growth was assumed at 2 inches in diameter growth per decade. Based on these assumptions, one would expect a 10-inch dbh tree in about 50 years; at this size, trees will be sufficiently large to provide foraging habitat for most woodpeckers. One would expect a 20-inch tree in 100 years which, if converted to a snag, could provide reproductive habitat for woodpeckers. Therefore, one would expect to have green tree replacements of sufficient size in year 2112 (tree planted areas) versus 2132 in areas where no trees are planted (e.g., high severity burn areas).

Based on assumptions on snag fall down rates and tree planting, the snag gap in the very high burn severity areas is expected to last from about 2019 to 2109 or about 90 years. Therefore, the difference between the snag gap in the no salvage is 80 years and the salvage harvest areas is 90 years and the difference is relatively small. If larger snags persist longer than expected, the snag gap would be reduced further, but particularly for the no salvage areas, which retains the most large diameter snags.

Public firewood gathering and reduction of snags potentially used for nesting or foraging can be expected to occur along roads. However, this is not expected to result in the loss of species viability for snag dependent species since snags would still be present in stands away from roads. In addition, with the decommissioning of temporary roads and gating of one existing road to public motorized use, the impacts of snag losses along roads would be lessened. The action alternatives identify no additional roads for closure to public motorized use and all road use designations are the same as identified in the Cottonwood RMP (USDI-BLM 2009). No existing roads are proposed for decommissioning.

Down Wood

Salvage harvest treatments would result in a decrease in down woody material levels, depending on the snag density in the unit. When available 15 tons/acre, coarse woody debris decay class I and II, >75% comprised of woody debris >15 inches diameter, to meet desired conditions for soil, water, fuel and wildlife. Outside harvest units, down logs will increase rapidly and will exceed RMP standards which will be beneficial.

Inside harvest units, snag retention would also meet or exceed RMP standards. Jackstraw piles of logs form a habitat matrix offering thermal cover, hiding cover, and hunting areas for species such as marten, mink, cougar, lynx, fishers, and small mammals. Smaller logs benefit amphibians, reptiles, and mammals that use wood as escape cover and shelter. Small mammals use logs extensively as runways. Logs provide foraging habitat for such species as the pileated woodpecker. The orientation of down wood also influences wildlife habitat use. Logs oriented along slope contours may be useful travel lanes for wildlife, whereas logs oriented across contours impede travel (Rose et al. 2001).

No Action Alternative

No salvage harvest or temporary road construction would occur which would adversely impact snags and large woody debris habitats and species dependent on these habitats. Within high and moderate severe burn areas, no tree planting would occur, which would result in slower reforestation and succession to mature tree stands and potential green tree replacement for snag recruitment. The No Action Alternative would exceed BLM RMP standards for snags and large down wood over most of the project area. This alternative provides the most burned forest habitat and the greatest number of snags for primary and secondary cavity excavators. The alternative would also provide the highest tolerance level or assurance of habitat availability for all burned forest and cavity dependent species. All existing snags would be available in multiple size classes with variable densities.
It is likely that black-backed, three-toed and hairy woodpeckers would benefit the most from this alternative as they take advantage of the elevated snag levels. Three-toed and black-backed woodpeckers are strongly associated with early post-fire conditions and they tend to select nest sites with the highest snag densities and the least amount of logging (Saab and Dudley 1997). They rapidly colonize stand-replacement burns within 1 to 2 years of a fire; however, within 5 years they become rare, presumably due to declines in prey of bark and wood-boring beetles. The 75-acre patch size also matches minimum recommendations for black-backed woodpeckers made in several Idaho post-fire studies, i.e., 75-125 acres (Saab and Dudley 1997, Saab et al. 2002). This alternative leaves large blocks of unlogged habitat. These contiguous blocks of habitat maximize the number of territories for the black-backed woodpecker based on the 75- to 125-acre recommendations. Due to the mosaic burn pattern of the fire area and site capability, stands may not be ideally distributed.

Lewis' woodpecker would benefit from this alternative as a maximum number of large snags would be available. In some areas, snag density may be too high for use by Lewis' woodpecker in the short-term (5-10 years). Saab et al. (2002) found that Lewis' woodpeckers favor stands with moderate canopy cover (10-40%) in a burned condition or sites with moderate densities of snags of large sizes for nesting. As time progresses, smaller snags would begin to fall (1-15 years) and large snags begin to decay increasing habitat suitability. Maximum use may be delayed for several years until stands become more open, snags are well decayed, and shrub densities have increased. Suitable habitat conditions will persist longer, upwards of 40 years. Lewis' woodpecker nesting territories are 16 to 17 acres versus 75 to 125 acres for black-backed woodpeckers (Saab et al. 2002). Habitat is well distributed across the fire area.

White-headed woodpecker would benefit from this alternative as a maximum number of large snags would be available, particularly in areas of low burn severity that still includes large live trees (e.g., ponderosa pine). The species may use large, well-decayed snags in the burned area for nesting, provided that the burned area is within a potential home range that includes large, live ponderosa pine (Hutto 1995, Sallabanks 1995, Saab and Dudley 1997).

Northern flicker would benefit from this alternative as a maximum number of large snags would be available.

Green stands with little tree mortality would not be harvested. Therefore, these stands will continue to provide habitat for species that require live canopy along with snag habitat (e.g. white-headed woodpecker, pileated woodpecker, and Williamson's sapsucker). Green trees throughout the burned area will serve as snag recruitment trees for future snag development in the area, although few live trees exist in the severely burned areas.

Downy woodpecker and red-naped sapsucker are strongly associated with mixed woodlands and riparian hardwoods. They are not strongly associated with post-fire habitats, although they may use them to a small extent, probably to take advantage of high insect numbers resulting from the fire. Hardwood habitats are limited in the project area.

Once the majority of snags fall, cavity excavators would not likely occupy the area, or they would exist at greatly reduced levels.

Snag Persistence

Snag numbers do not continually increase over time because the process of tree mortality and snag recruitment are balanced by the processes of snag decay and fall (Everett et al. 1999). Over time, snag habitat will decrease creating a gap in time when little snag habitat exists (primarily in stand replacement areas) because there are few green trees of sufficient size to provide recruitment. This "snag gap" will occur for many decades. Although snag levels currently exceed BLM RMP standards, it is expected that smaller post-burn snags will be on the ground within 20-30 years and larger snags will be on the ground in 40 years. The time it takes to reforest burn areas differs between natural regeneration and planting. Natural regeneration can be delayed indefinitely depending on the availability of a live tree seed source. The No Action Alternative would have similar reforestation as the Action Alternatives, because the BLM Sheep Fire ESR Plan identifies planting the same high severity burn areas and additional tree planting would occur in RCAs.

FVS modeling in moderate and high burn severity areas for the No Action Alternative indicates that snags will fall below RMP standards in 10-40 years. There is little to no snag gap for very low and low burn severity areas because many trees survived the fire and there will be a sufficient number of large green tree replacements by year 2032 to replace existing snags once they fall.

For the high and very high burn severity areas, a snag gap is expected to occur because the fire killed essentially all the trees and there are no live, green trees left to become snags in the future. Future snags will not be available until a new forest develops, trees reach sizes useful for woodpeckers, and these trees begin to die.

FVS modeling was used to project the growth of natural regeneration over time. Modeling assumed that it will take at least 20 years for trees to become established. Regeneration will be established in about 2032. Tree growth was assumed at 2 inches in diameter growth per decade. Based on these assumptions, one would expect a 10-inch dbh tree in about 50 years after establishment; at this size, trees would be sufficiently large to provide foraging habitat for most woodpeckers. One would expect a 20-inch tree in 100 years after establishment which, if converted to a snag, could provide reproductive habitat for woodpeckers. Therefore, one would expect to have green tree replacements of sufficient size in year 2132.

Based on snag fall down rates and delays in forest establishment from natural regeneration, the snag gap in the very high burn severity areas is expected to last from about 2052 to 2132 or about 80 years. If larger snags persist longer than expected, the snag gap will be reduced further, particularly for the No Action Alternative, which retains the most large diameter snags.

Public firewood gathering and reduction of snags potentially used for nesting or foraging can be expected to occur along roads. However, this is not expected to result in the loss of species viability for snag dependent species since snags would still be present in stands away from roads.

Down Wood

Jackstrawed piles of logs form a habitat matrix offering thermal cover, hiding cover, and hunting areas for species such as marten, mink, cougar, lynx, fishers, and small mammals. Smaller logs benefit amphibians, reptiles, and mammals that use wood as escape cover and shelter. Small mammals use logs extensively as runways (Rose et al 2001). Logs provide foraging habitat for such species as the pileated woodpecker. The orientation of down wood also influences wildlife habitat use. Logs oriented along slope contours may be useful travel lanes for wildlife, whereas logs oriented across contours impede travel (Rose et al. 2001).

Currently, there is a limited amount of down wood within the higher severity burn areas the Sheep Fire Project area because it was burned. As snags begin to fall, down log levels will greatly increase, thereby increasing denning, nesting and feeding habitat. Down wood levels will exceed Cottonwood RMP standards across all portions of the project area.

<u>Habitat Fragmentation and Connectivity</u>

Common to All Action Alternatives

Salvage harvest of only dead or dying trees is proposed to occur and would minimize adverse effects to habitat fragmentation and connectivity. The primary differences between the action alternatives is the acres of salvage harvest, miles of temporary road constructed, and specific actions occurring on different burn severity areas. The proposed action includes 916 acres of salvage harvest and 2.28 miles of temporary road construction. The no temporary road alternative includes 606 acres of salvage harvest. Refer to Table 43 above which summarizes action alternative activities occurring on different burn severity areas. Refer to Figure 16 above for map for location of activities and burn severity for Proposed Action Alternative, and Figure 17 for location of activities and burn severity for No Temporary Road Alternative.

Salvage harvest within the high and moderate burn severity areas would result in salvage removal of trees which provide some limited value for security or hiding cover. In accordance with salvage harvesting guidelines, approximately 6 snags per acre would be retained. These areas have converted to post-fire early seral habitats and salvage harvest would have negligible effects on existing early seral habitats conditions and the fire caused large openings. However, tree planting would result in faster reforestation in these areas and may be expected to advance succession status by 20 years, compared to areas that had stand replacing fires and are lacking a seed source for reforestation. It would be expected that 100 years may be needed before mid-aged and mature stands of timber reforested these areas. Refer to section 3.2.1 *Vegetation* for additional information regarding forest vegetation succession.

Salvage harvest within the low and very low burn severity areas would result in removal of dead and dying trees, which would result in slightly more open stands. Existing mid-aged and mature stands currently exist in the area, and salvage harvest is not expected to change the succession status for these stands. Tree planting in these areas would supplement existing regeneration and reforestation for openings, but would not be expected to change succession status for these stands.

Untreated stands (no salvage harvest) within the project area and natural reforestation and succession would be dependent on burn severity. In the high and moderate severity areas it may be approximately 120 years before mature forest stands exist. Within the low and very low severity burned areas, existing conditions and succession status would continue. Within 10 to 40 years the dead trees (snags) would fall, with smaller sized snags falling first and larger sized snags standing longer. In areas that experienced moderate and high severity burn effects, these areas would have a potentially high amount of "jack-straw" piles of snags on the ground which may result in varying levels of impairment to natural movement of big game through the area; particularly elk, deer, and moose.

Fragmentation of habitats used by small bodied, relatively immobile, and relatively small home range species such as amphibians, reptiles, and small mammals may be affected by the proposed actions in treatment areas. Affects to mobile, wide-ranging species such as mountain lion and elk, would be less affected. Species using complex vertical and horizontal habitat structure would experience simplification of habitat in treated areas, such as some of the forest type raptors and birds. Simplification of stand structure would occur with salvage harvest treatments, primarily with reduced snags and large woody debris in high and moderate burn severity areas, and more open stands in the low and very low severity burn areas.

Temporary roads would be decommissioned after timber harvest and tree planting activities completed. One existing road that was opened up for salvage logging is proposed to be gated. This road had been previously designated at closed to public motorized use in the Cottonwood RMP (USDI-BLM 2009). The action alternatives would not change any previous road use designations that were identified in the Cottonwood RMP (USDI-BLM 2009).

In summary, no additional large openings would be created and a minor loss of dead tree cover would occur from implementation of the action alternatives. Salvage harvest would result in negligible effects to habitat fragmentation and connectivity at the project and landscape level. Within moderate and high severity burn areas, tree planting would increase reforestation and succession status for treated stands, compared to stands that did not have tree planting. Negligible effects to habitat fragmentation and connectivity would be expected to occur from both action alternatives. Tree planting would be beneficial in reforestation of severely burned areas that are lacking a seed source which would further improve connectivity within the project area.

No Action Alternative

No salvage harvest or temporary road construction would occur resulting in no impact to wildlife habitat connectivity or fragmentation of habitats. Within high and moderate severe burn areas, no tree planting would occur, resulting in slower reforestation and succession (compared to tree planting areas) to mature tree stands, which is less beneficial to species that prefer large tree and mature timber stands. However, slower reforestation and succession advancement would be beneficial to species that prefer open stands and early succession conditions.

Within the project area and analysis area, natural reforestation and succession would be dependent on burn severity. In the high and moderate severity areas it may be approximately 120 years before mature and large tree stands exist. Within the low and very low severity burned areas, existing conditions and succession status would continue and these stands would have more "open" canopy cover, with fire caused mortality ranging from 10 to 40 percent. Within 10 to 40 years the dead trees (snags) would fall, with smaller sized snags falling first and larger sized snags standing longer. In areas that experienced moderate and high severity burn effects, these areas would have a potentially high amount of "jack-strawed" piles of snags on the ground which may result in varying levels of impairment to natural movement of big game through the area; particularly elk, deer, and moose.

Existing conditions and trends for wildlife habitat would continue and such changes would be slow and incremental at the project and watershed scale. Specifically, insects and disease would continue affecting wildlife habitats; fire caused canopy gaps in mixed conifer habitat would create openings where shrubs, forbs, and grasses could respond to available sunlight and moisture. Following this response, the natural succession process from tree regeneration of early seral species such as ponderosa pine to advanced and later succession regeneration of shade tolerant species such as grand fir and Douglas-fir would occur; and the level of patchiness in the watershed would persist until a stand-replacing fire or other management action(s) take place.

Species that prefer mature tree stands would be benefitted with succession advancement and species that prefer early seral habitats would be adversely affected with succession advancement. No additional adverse effects to habitat connectivity or fragmentation would occur with this alternative. Refer to section 3.2.1 *Vegetation* for additional information regarding expected forest vegetation succession and achievement of DFC within the project area.

Wildlife Habitat Guilds

Riparian and Aquatic Habitats and Dependent Species

Common to All Action Alternatives

Action alternatives would have negligible effects to riparian and aquatic habitats; and varying levels of disturbance, displacement, and potential injury/mortality to wildlife species utilizing riparian and aquatic habitats in the short term during project implementation. Amphibians and reptiles which are not as mobile are more prone to mortality or injury from activities occurring within RCAs and riparian areas. Activities occurring within RCAs or riparian areas also have potential to disturb or displace species utilizing the areas and activities such as nesting, denning, or young rearing are more prone to adverse effects. Long-term effects would be dependent on species specific preferred habitats and critical habitat niches (e.g., nesting, young-rearing, denning sites, etc.) and post-project succession advancement and effects to riparian and aquatic habitats.

No salvage harvest or temporary road construction would occur within RCAs or riparian habitats. Primary activities that would occur within RCAs are associated with road use and maintenance (see Table 49 below). Activities within RCAs would be similar for both action alternatives, however, because less timber would be cut and hauled for the No Temporary Road Alternative, less road use would occur under this alternative.

Table 49. Activities Proposed in Watersheds and RCAs by Action Alternatives

Proposed Activity	Proposed Action			No Temporary Roads		
	John Day Creek Watershed	Salmon River Face Drainages	Total	John Day Creek Watershed	Salmon River Face Drainages	Total
Haul Routes Within RCAs	6.3 miles	0.36 mile	6.66 miles	6.3 miles	0.36 mile	6.66 miles
Haul Road - Low Water Ford Crossings[1]	4	0	4	4	0	4
Culvert Stream Crossings – Fish Bearing	3	0	3	3	0	3
Culvert Stream Crossings – Non-Fish Bearing	7	8	15	7	8	15

[1]Three of the low water ford crossing all occur in non-fish bearing tributary streams to Middle Fork of John Day Creek, and one includes a road side spring/ford crossing which flows into the East Fork John Day Creek.

Default no treatment RCA buffers (USDI-BLM 2009) have been established for the rivers, streams, and wetlands/springs occurring within the project area. Project design measures identified for both action alternatives would minimize or avoid adverse effects that potentially would occur to wetland and riparian habitats. Streams and spring/seeps within the project area have been identified from existing BLM past water source surveys and mapping efforts and field reconnaissance conducted during the fall, 2012.

Increased erosion and sediment attributed to implementation of action alternatives would have varying levels of effect on aquatic and riparian habitats, overall, such effects are expected to have negligible effects on wetland and riparian habitats. Primary potential effects to riparian or wetland habitat from implementation of the action alternatives is related to road maintenance and road use occurring within RCAs, such effects are considered minimal. In summary, implementation of the actions alternatives is expected to have negligible effects on riparian and wetland recovery.

Overall, existing riparian conditions and trends would be expected to be similar to the No Action Alternative. A low level of risk exists from action alternative activities that potentially could increase overland flows, route water, increase erosion, and reduce large woody debris on high erosion hazard slopes or moderate and high landslide risk sites and contribute to a mass wasting event. A debris torrent or landslide has potential to impact riparian and aquatic habitats, and level of effects is dependent on the magnitude of the event. Overall, negligible potential for adverse effects to riparian or aquatic dependent species and habitats would be expected to occur in the short term or long term from implementation of the action alternatives.

No Action Alternative

Under this alternative, none of the management activities proposed in the project would be implemented. No vegetation management actions (salvage timber harvest, tree planting) road use and maintenance, and road rehabilitation would occur.

Ecosystem functions and processes would continue to affect riparian and wetland habitat quality in the absence of new management activities with the affected subwatersheds. Stream reaches that experienced high or moderate severity burn effects from the 2012 Sheep Fire would be in early seral condition and more prone for adverse channel effects and infestations of invasive plant species. Natural recovery for riparian and wetland habitats would vary, dependent on burn severity and post-fire conditions. Regrowth of surviving vegetation and establishment of new vegetation from residual seedbanks are expected to restore protective ground cover, riparian structure, streambank stability, and stream shading over time. Some initial tree and shrub recovery (e.g., sprouting and seedlings) and herbaceous species revegetation would start to occur in the short term (one to five years), however, complete riparian functional condition recovery would be longer and is dependent of site specific factors identified above, particularly in regards to post-fire tree and shrub mortality.

Late Seral and Old-Growth Habitats and Dependent Species

Common to All Action Alternatives

Primary potential to affect existing mature or large tree stands and species that prefer these habitats would occur from activities that occur on very low and low burn severity areas during the short term. Implementation of the action alternatives would result in potential short term disturbance or displacement to species utilizing these habitats and habitat effects from removal of dead wood (e.g., snags or potential large woody debris). Project design measures identify retention of a minimum of 6 snags per acre and 15 tons per acre of large woody debris. These design measures would reduce potential adverse effects from salvage harvest and adequate green tree replacement for snags would occur in low severity burn areas.

Tree planting occurring within areas that experienced moderate or high severity burn impacts and are lacking an adequate seed source for reforestation would advance reforestation and succession in these areas up to 20 years. The majority of the project area is currently in early seral condition (70 percent). Tree planting would establish new trees immediately versus 20 years for areas where no trees are proposed to be planted (e.g., high severity with no seed source). Tree growth was assumed at 2 inches in diameter growth per decade. Based on these assumptions, one would expect a 10-inch dbh tree in about 50 years; at this size, trees would be sufficiently large to provide mature forest to large tree stands in 100 years, which would be beneficial to species that prefer these habitats. The majority of moderate and high severity burn areas within the project area would not have tree planting. It may be up to 250 years before DFC is met for the project area, see Tables 13 and 14, section 3.2.1 *Vegetation*.

Harvest of only dead or dying trees is proposed, with the exception of live tree cutting for temporary roads or clearing cable yarding corridors. Overall, negligible potential for changes to live tree stand structure is expected to occur. Adherence to guidance for snags, snag replacement, and large coarse woody debris would minimize potential for adverse effects. Numbers of snags are expected to decrease with the action alternatives as snags would be lost during salvage harvest activities. Because only harvest of dead and dying trees would occur, salvage harvest would have no effect or discountable effects to mature or large tree stands that occurs in very low or low severity burn areas (mature forest). A total of 916 acres and 606 acres are proposed for salvage harvest under the Proposed Action Alternative and No New Temporary Road Construction Alternative respectively.

Table 50 below summarizes action alternatives salvage harvest that would occur on very low or low burn severity areas. These stands provide mid-aged to large tree stands, which may be utilized by species that prefer forested mature and large tree stands. The Proposed Action Alternative identifies that approximately 231 acres of salvage harvest would occur in very low or low burn severity areas (25 percent of salvage units). The No New Temporary Road Construction Alternative identifies 125 acres of salvage harvest would occur in very low or low burn severity areas (21 percent of salvage units). See Figures 16 and 17 for location of salvage harvest activities that would occur in very low and low severity burn areas.

Table 50. Action Alternative Activities on Very Low and Low Severity Burn Area and Tree Planting on Moderate and High Severity Burn Areas

Watershed	Salvage Harvest on Very Low and Low Severity Burn Areas (acres)	Tree Planting on Moderate and High Severity Burn Areas (acres)
Proposed Action Alternative		
John Day Creek	105.32	665.68
Salmon River Face Drainages	125.72	69.86
TOTAL	231.04	
No Temporary Road Alternative		
John Day Creek	55.07 52 % Less	431.14
Salmon River Face Drainages	69.86 No Change	69.86
TOTAL	124.93 54 % Less	501.0

Harvest activities would not change overall seral condition and succession for existing mid-aged or mature forest habitats. Tree planting of very low and low severity burn areas under the action alternatives would supplement natural reforestation within open areas. Tree planting of moderate and high severity burn areas that are lacking a seed source could increase reforestation of these areas and advance succession to mature and large tree stands at a faster rate (+20 years). In the long term, tree planting would be beneficial to species that prefer more advanced forest seral conditions (e.g., mature, large tree stands) because it would speed up reforestation and succession for treated areas.

It is acknowledged that lodgepole pine have serotinous cones, and these cones may persist unopened on the tree for years and only burst open during a forest fire which could also advance succession. Lodgepole pine is not a dominant tree species within salvage harvest units (approximately 2% by volume).

Public firewood gathering and reduction of snags can be expected to occur along roads. However, this is not expected to result in the loss of species viability for snag dependent species since snags would still be present in untreated stands away from roads. No changes to road use designations would occur under the action alternatives, all existing Cottonwood RMP route designations (USDI-BLM 2009) would be applicable. No decommissioning of existing roads would occur under the action alternatives.

No Action Alternative

This alternative would initially have no direct impacts on large tree stands, late seral or old growth habitats. Within the project area, these stands primarily experienced very low or low severity burn impacts from the 2012 Sheep Fire. No potential for disturbance or displacement to mature forest or old forest dependent species would occur. This alternative would maximize retention of large snags and down wood, which provides important wildlife habitat features for old forest and large tree stands.

Insects and disease would have varying levels of impact on mature – large tree stands.

Early Seral Habitats and Dependent Species

Common to All Action Alternatives

The action alternatives are only proposing to harvest dead or dying trees, which includes 916 acres for the Proposed Action Alternative and 606 acres for the No Temporary Roads Alternative. Tree planting would occur in all salvage harvest units for both action alternatives and an additional 52 acres would have tree planting only. Overall, salvage harvest would not decrease or increase the acres of early seral habitat within the project area, but would create more open areas with the removal of dead wood. Tree planting of 968 acres under the Proposed Action Alternative and 658 acres under the No New Temporary Road Construction Alternative would advance succession and reforestation of areas. Reforestation and advancement of succession would primarily occur within high and moderate severity burn area that are lacking seed source for reforestation. These areas are currently in early seral condition as a result of the 2012 Sheep Fire. Areas that had low or very low severity burn effects are currently comprised of mid-aged or mature stands with more open canopy cover as a result of fire related mortality (approximately 25 percent). Previous Tables 19 and 20 identifies burn severity and salvage harvest that would occur for the Proposed Action Alternative (see Figure 16). Previous Tables 20 and 21 identify burn severity and salvage harvest that would occur for the No New Temporary Road Construction Alternative (see Figure 17).

The Proposed Action Alternative identifies that approximately 684 acres of salvage harvest would occur in high and moderate burn severity areas (75 percent of salvage units). The No New Temporary Road Construction Alternative identifies 449 acres of salvage harvest would occur in high and moderate burn severity areas (74 percent of salvage units). Table 51 below summarizes action alternatives salvage harvest that would occur on moderate and high severity areas. See Figures 16 and 17 for location of action alternatives salvage harvest activities that would occur on moderate and high severity burn areas.

Table 51. Action Alternative Activities and Tree Planting on Moderate and High Severity Burn Areas

Watershed	**Salvage Harvest on Moderate and High and Low Severity Burn Areas**	**Tree Planting on Moderate and High Severity Burn Areas**
Proposed Action Alternative		
John Day Creek	613.68	665.68
Salmon River Face Drainages	69.86	69.86
TOTAL	683.54	735.54
No Temporary Road Alternative		
John Day Creek	379.14 38% Less	431.14
Salmon River Face Drainages	69.86 No Change	69.86
TOTAL	449.0 34% Less	501.0

Tree planting of moderate and high severity burn areas would include 736 acres for Proposed Action Alternative and 501 acres for the No Temporary Roads Alternative (see Table 51). These totals include a tree planting only unit of 52 acres. Tree planting of these severe burn areas would advance reforestation and succession by 20 years. Lodgepole pine have serotinous cones, and these cones may persist unopened on the tree for years and only burst open during a forest fire which could also advance succession. Lodgepole pine is not a dominant tree species within salvage harvest units (approximately 2% composition by volume).

Under all action alternatives, salvage harvest would not change seral conditions but tree planting would advance succession rates at a faster rate to a mid-aged and large tree stand condition, which would be approximately 100 years for areas identified in Table 51 above. Within untreated areas that experienced moderate or high severity burn effects, the mature or large tree stand condition would not be reached until 120 + years and DFC for the project area may not be achieved until 250 years. Overall, habitat quality would improve for early seral dependent species such as the olive-sided flycatcher. Short-term beneficial effects would occur (e.g., 15 - 30 years), but with stand succession the amount of areas within the treatment and untreated areas would decline for early seral dependent species over time (reforestation and natural succession). See section 3.2.1 *Vegetation*, Tables13 and 14, for a summary of action alternatives succession advancement and achievement of DFC for the project area.

Salvage harvest would be completed within one year, consequently, disturbance and displacement of wildlife that are strongly associated with post-fire conditions would be affected the most. A variety of wildlife would utilize the area incidentally or for foraging, but some species would prefer more advanced succession in the high severity burn areas (e.g., grass, forb, seedlings, and shrubs). Primary effects from salvage logging include disturbance and displacement to species such as three-toed and black-backed woodpeckers. These woodpeckers are strongly associated with early post-fire conditions and they tend to select nest sites with the highest snag densities and the least amount of logging (Saab and Dudley 1997). They rapidly colonize stand-replacement burns within 1 to 2 years of a fire. Within the project area a large amount of areas would not have treatments, which would provide habitats for early seral and particularly post-fire dependent species.

No Action Alternative

No salvage harvest or temporary road construction would occur resulting in no impact early seral habitats and dependent species; particularly snags and large woody debris habitats and species dependent on these post-fire habitats. Within high and moderate severe burn areas, no tree planting would occur resulting in slower reforestation and succession to mid-aged and mature tree stands, beneficial to early seral dependent species, but not beneficial to species that prefer later seral conditions in the long term (e.g., mature forests).

This alternative provides the most early seral habitat for longer time periods. Most burned forest habitat and the greatest number of snags for primary and secondary cavity excavators. The alternative would also provide the highest tolerance level or assurance of habitat availability for all burned forest and cavity dependent species. All existing snags would be available in multiple size classes with variable densities. With the exception of along roads, minimizes potential for adverse disturbance or displacement of species that prefer early seral and particularly post-fire habitats (e.g., black-backed woodpecker).

Elk Habitat and Security Dependent Species

Common to All Action Alternatives

Both action alternatives identify the same amount of existing roads that would be open or closed to public motorized use. The Proposed Action Alternative identifies 2.28 miles of temporary road that would be constructed, but after harvest activities are completed these roads would be decommissioned. The primary differences between the action alternatives is that more roads would be used and more areas would have salvage logging. Figures 16 and 17 identify action alternative activities and burn severity. Areas with moderate and high severity burning are currently in early seral condition and also provide poor hiding cover for elk along roads.

Under the Proposed Action, temporary road construction would occur in order to access some harvest units, these temporary roads would be decommissioned and would not contribute to long-term motorized access and security reduction. Temporary roads would be closed (when not being used for project implementation) to public motorized vehicle use, reducing potential human impacts. Short-term disturbance and displacement to wildlife would occur during project implementation and associated use of temporary roads and other access roads.

Summer Elk Habitat

Overall, because only harvest of dead and dying trees is proposed to occur changes to cover are minimal. However, dead and dying trees do provide some value for cover and removal would result in a slight reduction to cover. Salvage harvest would also require the "opening up" of several road segments that were overgrown or had sloughing that restricted use by log trucks. Both action alternatives would slightly decrease elk habitat conditions long-term in the project area EAU, due mostly to modest reduction of cover and opening up of several roads. Both action alternatives are not proposing any changes to existing road use designations for public motorized use. A gate would be installed at the start of one road that was opened up for salvage harvest (see Figure 3). This road segment was previously identified as closed to public motorized use in the BLM Cottonwood RMP (USDI-BLM 2009). Salvage harvest along roads would reduce elk hiding and security cover slightly with the salvage harvest of dead or dying trees.

As salvage harvest treatments are implemented in the project area, human-elk interactions would increase in the short term. It is expected that salvage harvest would be completed within one year. Tree planting would be expected to be completed within 2 to 3 years. To minimize this impact, existing public access restrictions would be maintained within the analysis area. Moist sites, such as riparian areas, wet meadows, ponds, seeps, and springs, are important to elk and would be protected by RCA buffers as part of project implementation (see Figure 32).

Figure 32. Elk along South Fork John Day Creek. Default no-harvest buffers would occur along creeks, springs, and wetlands within the project area. Photo taken September 25, 2012.

The Proposed Action Alternative would have more short term effects from increased road use and more harvest. However, both action alternatives are the same in the long term. Table 52 identifies EHE which was calculated as a measure of the effects of each action alternatives and the No Action Alternative.

Table 52. Percent Elk Habitat Effectiveness (EHE) for the John Day Elk Analysis Unit (EAU) and Project Alternatives

Elk Analysis Unit	Existing Condition	Proposed Action	No Temporary Road Alternative	No Action Alternative
John Day EAU(Short-Term) Project Implementation[1]	48%	35%[1]	38%[1]	48%
John Day EAU (Long Term)	47%	47%	47%	47%

[1]Prediction of short-term EHE that would occur with all action alternatives proposed salvage harvest and temporary road construction and related activities occurring at the same time. Temporary roads would be decommissioned and obliterated after timber harvest and tree planting actions. Livestock grazing would be excluded from area in the short term. Short term salvage harvest effects duration less than one year. Temporary road decommissioning and tree planting expected to occur within three years.

No Action

No salvage harvest, temporary road construction, or related human disturbance would occur resulting in no EHE impact within the John Day EAU. Under this alternative, existing open road densities, access, and human intrusion effects would continue within the analysis area. Current risk levels of wildlife disturbance, displacement and potential mortality would remain unchanged in developed areas. No short-term disturbances from project implementation would occur and existing conditions and trends for security dependent species and habitats would continue. Over time, succession advancement would improve elk cover along roads that were in early seral condition primarily as a result of the 2012 Sheep Fire.

Increases in cover would occur with forest succession development in areas, which could result in a decrease in suitable forage areas in the long term, while elk security and cover would increase.

3.2.8.3 Cumulative Impacts

Snags and Large Down Wood

The cumulative effects analysis area consists of the 48,000 acre 2012 Sheep Fire Area, and specific project effects associated with John Day Creek watershed and Salmon River face drainages, and the project area. All of the activities in Section 3.1.2 *Related Past, Present and Reasonably Foreseeable Actions* have been considered for their cumulative effects. Past actions that have affected snags and down wood (e.g., dead wood) and habitat for species relying on these areas include: wildfire, fire suppression, timber harvest, road construction, firewood cutting, fuels treatments, and prescribed burning. Overall, snag densities would meet or exceed RMP standards at the project and landscape level, because of the high snag densities in the Sheep Fire area.

Private lands typically do not provide large diameter snags. In the past, adjacent landowners have generally harvested damaged or dying trees to capture their economic value before they decayed to a level where they had no economic value. Private and State lands that burned within the analysis have been already or will likely be salvage logged. The Forest Service is proposing a Roadside Hazard Tree Removal Project, which would include removal of hazard trees within 200 feet of specific roads within the John Day Creek watershed (no treatments within Riparian Area Conservation Areas). The proposed Forest Service hazard tree removal project would treat 6.2 miles of road (344.5 acres) in the East Fork of John Day Creek drainage and 2.6 miles of road (88.1 acres) in the Middle Fork John Day Creek drainage. Private and State salvage harvest would include approximately 1,100 acres in the John Day Creek watershed and Salmon River face drainages.

The most recent large scale assessment conducted ICBEMP (Wisdom et al. 2000) indicates strong declines in habitat for two of the post-fire associated species, white-headed woodpecker and Lewis' woodpecker across the Columbia Basin (Hutto 2006, Wisdom et al. 2000). There are no reliable data on actual population trends for this species, but a downward trend for populations is assumed based on the magnitude of habitat loss. The BLM action alternatives, along with other private and State and Forest Service salvage logging would reduce suitability and capability for these two woodpeckers.

Populations of black-backed woodpecker appear to be relatively secure across the Columbia Basin (Wisdom et al. 2000). Private and State land fire salvage harvest will reduce habitat suitability for black-backed woodpecker. The BLM action alternatives would reduce habitat suitability in the project area, much of the optimal habitat for this species is being left unsalvaged (BLM and Forest Service lands). Adverse effects due the action alternatives are considered minimal, and effects to populations as a whole are expected to be minimal.

Throughout the West, densities of large-diameter snags (>21 inch dbh) have been reduced in areas with a history of timber sales (Hann et al. 1997; Hessburg et al. 1999; Quigley et al. 1996). The number and distribution of snags would be affected by harvesting activities, prescribed burning, firewood cutting, and natural disturbances (i.e., wildfires). Some of these snags would fall and provide much needed ground structure and habitat. With fire suppression and succession, the density of snags may have increased, but the size of the snags has decreased in more managed areas (e.g., development, timber harvest - public and private lands), which may not be beneficial to many wildlife species that depend on or prefer large-diameter snags and logs. Many past timber activities left few snags on the landscape that could be utilized for foraging, nesting/resting, or drumming sites. In localized areas (action areas) that have had timber harvest or development occur; snag dependent wildlife populations could decline as a result of past, present, and reasonably foreseeable future actions.

Wildlife species impacts from the action alternatives in combination with past, present, and reasonably foreseeable future actions within the project area and analysis area watersheds appear negligible at the project area. Timber harvest treatments would result in reduction and of snags and large down woods in the harvest unit, however, acceptable amounts would be maintained at the landscape area, but not for every treated acre.

Localized adverse effects to snag dependent species and habitats would occur within salvage harvest units; however, at a landscape or project level such effects would still provide a mosaic of suitable habitats for snag dependent species within the cumulative analysis area (e.g., project and watershed level). The majority of the project area and Sheep Fire area would not have any salvage harvest occurring. It is unlikely that the action alternatives or the No Action Alternative would contribute to cumulative effects of past, present, and future management actions on snags and down wood and dependent species within the cumulative analysis area.

Habitat Fragmentation and Connectivity

The action alternatives would not, when combined with other past, present or reasonable foreseeable future actions within the cumulative effects study area have a cumulative impact to habitat fragmentation and connectivity.

Wildlife Habitat Guilds

Riparian and Aquatic Habitats and Dependent Species

The cumulative effects analysis area consists of the action area effects to project area and John Day Creek watershed and Salmon River face drainages, and the project area. All of the activities in Section 3.1.2 *Related Past, Present and Reasonably Foreseeable Actions* have been considered for their cumulative effects. Action alternatives in combination with the past, present, and foreseeable future actions would have localized direct and indirect cumulative beneficial and negative effects on riparian and aquatic habitats, which may be utilized by riparian dependent species.

Timber harvest and salvage logging, prescribed burning, grazing, insect and disease epidemics, fires, fire suppression, small hydro-electric project, and road construction and maintenance can cumulatively affect riparian/aquatic habitats and dependent species through soil compaction, changes in vegetative cover, or altering stream channels. Although historical fires often burned riparian habitats at lower severity, advanced succession and increased fuel loading increased risk for more severe fires within riparian habitats (e.g., 2012 Sheep Fire), which may affect dependent species habitats, water quality and quantity. Fire suppression has created denser forests, which tend to burn hotter, and hotter fires tend to be more destructive. The 2012 Sheep Fire impacted stream channels and riparian habitats to varying levels, which is dependent on burn severity. Stream reaches with high and moderate burn severity have been converted to early seral habitats and are at higher risk for invasive species encroachment, erosion/sediment impacts, and channel scouring/streambank erosion.

Watershed restoration actions identified in the BLM *Sheep Fire Emergency Stabilization and Rehabilitation Plan* (ESR Plan) (USDI-BLM 2012) would occur. Actions identified in the ESR Plan include planting conifer trees and riparian trees and shrubs, and seeding desired species within RCAs.

Action alternatives are expected to result in negligible and minor effects to riparian/aquatic dependent species and habitats within the cumulative analysis area. It is unlikely that the action alternatives or No Action Alternative would contribute to cumulative effects of past, present, and foreseeable future management actions on riparian/aquatic dependent species and habitats within the cumulative analysis area (e.g., project and watershed level).

Late Seral and Old-Growth Habitats and Dependent Species

No salvage harvest, temporary road construction, tree planting, or related activities would occur resulting in no effects on large tree and old forest habitats within the project area. The 2012 Sheep Fire, past fires, current salvage logging, past timber harvest and road construction have reduced the amount and continuity of mature and old growth habitat across the analysis area. In addition, past actions frequently targeted medium and large trees and valuable ponderosa pine and western larch snags, left few snags or legacy trees, and little down wood (e.g., managed areas). These actions have left fewer large tree or old forest stands and individual large legacy trees that could be used by mature or old growth forest dependent species. As these older harvest units have begun to mature, they are devoid of the structures that could be utilized by old growth dependent species.

Action alternatives and the No Action Alternative would have no cumulative effects to past, present, and future management actions on late seral and old growth dependent species and habitats within the cumulative analysis area (e.g., achievement of desired early large tree and old growth DFC or HRV).

Early Seral Habitats and Dependent Species

The cumulative effects analysis area consists of the 48,000 acre 2012 Sheep Fire Area, and specific project effects associated with John Day Creek watershed and Salmon River face drainages, and the project area. All of the activities in Section 3.1.2 *Related Past, Present and Reasonably Foreseeable Actions* have been considered for their cumulative effects. Past actions that have affected early seral habitats include: wildfire, fire suppression, timber harvest, road construction, fuels treatments, and prescribed burning. Overall, early seral habitats comprise 70 percent of project area and not meeting RMP DFC standards (see Table 46). However, post-fire and early seral dependent species are benefitted. Over time, succession (natural) will convert these stands to mid-aged and mature stands, see section 3.2.1 *Vegetation*, and the cumulative analysis section.

Private and State lands that burned within the analysis have been already or will likely be salvage logged and it is expected that some tree planting would also occur in these areas, which would reforest areas faster and early seral habitats would be converted to a more advanced succession class. Salvage harvest of dead and dying trees would not change early seral conditions within the project and analysis area subwatersheds. The Forest Service is proposing a Roadside Hazard Tree Removal Project, which would include removal of hazard trees within 200 feet of specific roads within the John Day Creek watershed (no treatments within Riparian Area Conservation Areas). The proposed Forest Service hazard tree removal project would treat 6.2 miles of road (344.5 acres) in the East Fork of John Day Creek drainage and 2.6 miles of road (88.1 acres) in the Middle Fork John Day Creek drainage. Private and State salvage harvest would include approximately 1,100 acres in the John Day Creek watershed and Salmon River face drainages.

The BLM ESR Plan (USDI-BLM 2012) identifies up to 650 acres of tree planting would occur within the project area, which result in faster succession and achievement of DFC of desired future conditions for mature forest and old forest stands, but would result in a faster decline in early seral habitats in treated areas (20 + years).

Past, present, and foreseeable future fuel treatments and timber harvest on Forest Service, BLM, State, and private lands have created or would continue to affect early seral habitats. An abundance of early seral habitats exists for the project and cumulative analysis area, and increases in early seral would be detrimental for achievement of DFC or having vegetation within HRV within the cumulative effects sub-watersheds.

Elk Habitat and Security Dependent Species

The cumulative effects analysis area consists of the John Day EAU and specific project effects associated with John Day Creek watershed and Salmon River face drainages, and the project area. All of the activities in Section 3.1.2 *Related Past, Present and Reasonably Foreseeable Actions* have been considered for their cumulative effects. Past actions that have affected EHE include: road use and management, timber harvest, road construction, fuels treatments, prescribed burning, wildfire, fire suppression, wood cutting, hunting, residences, livestock grazing, and recreation. Fire salvage on State and private lands has taken place or will likely be conducted. Such salvage was considered when such affected road use or salvage harvest of the private or State lands within the EAU. Roads are a major factor cumulatively influencing wildlife habitat and use patterns, particularly for species preferring areas undisturbed by humans or are a hunted population. Without roads, human use of the cumulative effects analysis area would be very limited. Wildlife habitats and wildlife use patterns would be influenced by natural processes (e.g., weather, fire, insects and disease).

Research focusing on the influence of open roads on wildlife species in the 1970's and 1980's revealed the effects of roads on big game species (Leege 1984). In the 1980s and 1990s, road construction was mitigated by implementing road restrictions. The focus recently has been to decommission roads, thus reversing the cumulative effects of human access into wildlife habitats. The action alternatives are not proposing any additional roads being closed to public motorized use or decommissioning of existing roads.

Cumulative effects (security dependent species) of past incremental road development in the analysis area include variable effects to wildlife such as direct habitat loss; disturbance; displacement; vehicle-induced mortality; human hunting and trapping mortality; habitat fragmentation; edge effects; and noxious weed spread.

Negligible and minor effects are expected to elk and other security dependent species and preferred habitats within the cumulative analysis area. It is unlikely that the action alternatives and the No Action Alternative would contribute to cumulative effects of past, present, and future management actions on security dependent species and habitats within the cumulative analysis area.

3.2.9 Migratory Birds

Affected Environment

All migratory birds are protected under the 1918 Migratory Bird Treaty Act (16 USC 703), as well as the Neotropical Migratory Bird Conservation Act (16 USC Chapter 80). Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds* requires the BLM and other federal agencies to work with the U.S. Fish and Wildlife Service (USFWS) to improve protection for migratory birds. Numerous migratory birds occur within the CFO management area and utilize a variety of habitats on BLM lands. Idaho Partners in Flight (IPIF) has identified 243 species of birds that breed in the State of Idaho. Of these species, 119 are considered Neotropical migrants.

Neotropical migrant birds utilize a variety of habitats; and many occur within the project area, such as coniferous forest habitats, riparian habitats, shrub/early seral habitats, and snag habitats. These species occur in the U.S. during the summer breeding season, but migrate to southern latitudes to spend winters as far south as Mexico and South America.

Fragmentation of nesting habitat is also theorized to increase rates of migrant bird nest predation and brood parasitism by other species. Small, isolated forest patches, particularly in forests of the eastern U.S. are considered at greatest risk. In contrast, natural fire regimes and topographic diversity in the western U.S. combined in the past to produce a temporally dynamic, naturally fragmented landscape compared with the previously extensive and relatively homogenous eastern deciduous forests. Timber harvest and fire suppression activity have nevertheless altered the natural landscape of western forests (Dobkin 1994). The 2012 Sheep Fire also has altered forest and riparian habitats within the project area and cumulative analysis area subwatersheds (see Tables 20 and 22) and Figures 2 and 18.

Idaho Partners in Flight (2000) identified four high-priority habitats in Idaho, which also include important habitats for migratory birds and include riparian, low-elevation, mixed conifer; grasslands; and ponderosa pine. Three of these habitats occur in the project area, which includes: (1) riparian habitat; (2) ponderosa pine habitat; and (3) low elevation mixed conifer habitat. The representative high priority bird species chosen for this analysis are also discussed as BLM sensitive species.

For the riparian habitats, 2 of the 13 priority species that may occur include the dusky and willow flycatchers. The willow flycatcher will serve to represent the riparian habitat, and this species is a BLM Idaho sensitive species. Refer to willow flycatcher discussion and analysis that is included in the *Threatened, Endangered, Proposed, Candidate, and BLM Sensitive Wildlife Species* Section 3.2.10 and 3.2.11, for analysis of direct and indirect effects to the species and habitats.

Four of nine high-priority species, representing the low-elevation, mixed-confer habitat, include northern goshawk, Williamsons's sapsucker, sharp-shinned hawk, and brown creeper. The northern goshawk and Williamson's sapsucker were chosen to represent this habitat class; both of these species are BLM Idaho sensitive species. Refer to northern goshawk and Williamson's sapsucker discussion and analysis that are included in *Threatened, Endangered, Proposed, Candidate, and BLM Sensitive Wildlife Species* Section 3.2.10 and 3.2.11, for analysis of direct and indirect effects to the species and habitats.

The white-headed woodpecker and flammulated owl are two high-priority species in the ponderosa pine habitat and both were chosen to represent this habitat class, both of these species are BLM Idaho sensitive species. Refer to flammulated owl and white-headed woodpecker discussion and analysis that are included in *Threatened, Endangered, Proposed, Candidate, and BLM Sensitive Wildlife Species* Section 3.2.10 and 3.2.11, for analysis of direct and indirect and cumulative effects to the species and habitats.

In addition, many migratory birds may be directly or indirectly affected by activities that would occur to specific habitat guilds they prefer to utilize. For analysis of direct and indirect and cumulative effects to the species and habitats refer to Section 3.2.8 *Wildlife Habitat Guilds: (1) Riparian and Aquatic Habitats and Dependent Species; (2) Fire/Early Seral Habitats and Dependent Species; (3) Late Seral and Old Growth Habitats and Dependent Species; and (4) Elk and Security Dependent Species.*

The Lewis woodpecker is strongly associated with post-fire habitats, particularly, stand-replacement events. Refer to Lewis woodpecker discussion and analysis that is included in Section 3.2.8 *Snags and Large Down Wood* and Section 3.2.10 and 3.2.11 *Threatened, Endangered, Proposed, Candidate, and BLM Sensitive Wildlife Species* for and analysis of direct and indirect and cumulative effects to the species and habitats.

3.2.10 ESA Listed Threatened and Endangered Wildlife Species

3.2.10.1 Affected Environment

Two Threatened (ESA-listed), one proposed, and one candidate species may potentially occur on lands managed by the Cottonwood Field Office (Table 53). In addition, 27 BLM Idaho sensitive species (and habitats) occur or potentially occur within the Cottonwood Field Office management area (Table 54). BLM Manual 6840, *Special Status Species Management*, requires that sensitive animal species be managed with the same level of protection as candidate species, to avoid being listed as threatened or endangered in the future. Species were dismissed from further analysis if habitat was not present in the project area, or if the species is protected by regulation, policies, laws, or project design criteria to the extent that there would be no effect; effect would be unlikely; or the effects would be undetectable (Tables 54 and 55). One federally-listed species, Canada lynx (*Lynx canadensis*) and 16 BLM sensitive species and 1 BLM watch list species were retained for further analysis. For additional detailed information and analysis regarding ESA-listed Canada lynx, refer to the BA that was prepared in coordination with USFWS for the Sheep Fire Salvage Project (USDI-BLM 2013).

Table 53. Federally-Listed Species Summary and Determination

Species	POTENTIAL OCCURRENCE IN PROJECT AREA				
	Potentially Present?		Potentially Affected?		Determination[1]
	Species	Habitat	Species	Habitat	
ESA-Listed Threatened					
Canada Lynx *Lynx canadensis*	Not likely to occur	Yes	Not likely to occur	Yes	NLAA
Northern Idaho Ground Squirrel *Spermophilus brunneus brunneus*	No	No	Not likely to occur	No	NE
Proposed					
Wolverine *Gulo gulo luscus*	Not likely to occur	No	No	No	NI
Candidate					
Yellow Billed Cuckoo *Coccyzus americanus*	No	No	No	No	NI

[1]NLAA="May Affect – Not Likely to Adversely Affect"; NE=No Effect; NI=No Impact

Canada Lynx

The final rule listing Canada lynx as a threatened species in the contiguous Unites States was published on March 24, 2000 (FR, Volume 65, No. 58). The *Lynx Conservation Assessment and Strategy* (LCAS) (Ruediger et al. 2000) was developed by the USDA Forest Service, USDI Fish and Wildlife Service, USDI National Park Service, and USDI Bureau of Land Management. LCAS was developed to provide a consistent and effective approach to conserve Canada lynx on federal lands in the contiguous United States.

A portion of the project occurs within Lynx Analysis Unit (LAU) Number 2090204 and contains potential lynx habitat that may be affected by BLM proposed fire salvage actions. The majority of potential lynx habitat occurs in the higher elevation areas on FS lands and a lesser amount occurs on BLM lands. LAU No. 2090204 delineation and habitat mapping actions directed by LCAS (Ruediger et al. 2000) have been completed by the Nez Perce National Forest (see Figure 33). The mapping was completed in coordination with the U.S. Fish and Wildlife Service and is in accord with Cottonwood RMP (USDI-BLM 2009) for designation of lynx LAU and suitable habitats.

The 2012 Sheep Fire affected suitable lynx habitat and converted suitable foraging and denning habitat to unsuitable habitat. Burn severity was field verified by the US Forest Service's Burned Area Emergency Response (BAER) team and was based on satellite Burned Area Reflectance Classification (BARC) mapping (USDA-FS 2012). The 2012 Sheep Fire burned area (BARC) maps were used to estimate fire severity and effects to forested vegetation and lynx habitat. Overstory tree and understory vegetation mortality can be generalized from the 2012 Sheep Fire BARC maps. Pre-fire suitable foraging and denning habitat within the LAU that had moderate to high burn severity were reclassified as unsuitable for post-fire estimates (see Figure 33 – post fire habitat conditions). However, it is very difficult to estimate fire cause effects to lynx habitat in areas of low burn severity, because of varying levels of overstory and understory tree and shrub mortality. Key and Benson (2006) estimate that 10 – 15 percent of the overstory and understory trees and shrubs die in areas of low severity. Post-fire inspections of low burn identified some areas that exceeded 15 percent, consequently a 25 percent reduction factor will be used for lynx foraging or denning habitat that experienced low burn severity (see Figure 35).

Foraging and denning habitats that had low severity for this analysis are assumed to still be providing 75 percent suitable habitat for lynx

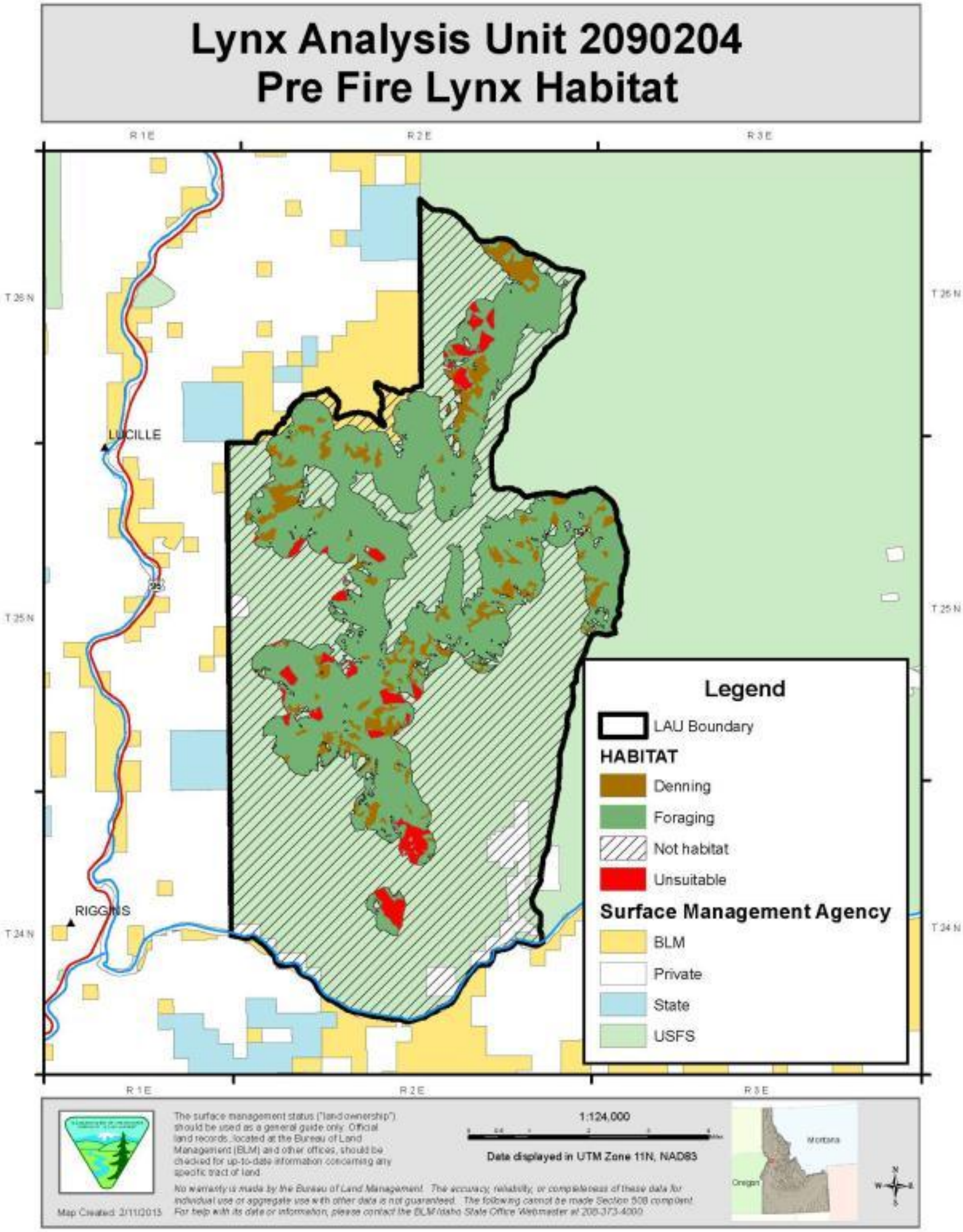

Figure 33. Lynx Analysis Unit Pre-Fire Habitat

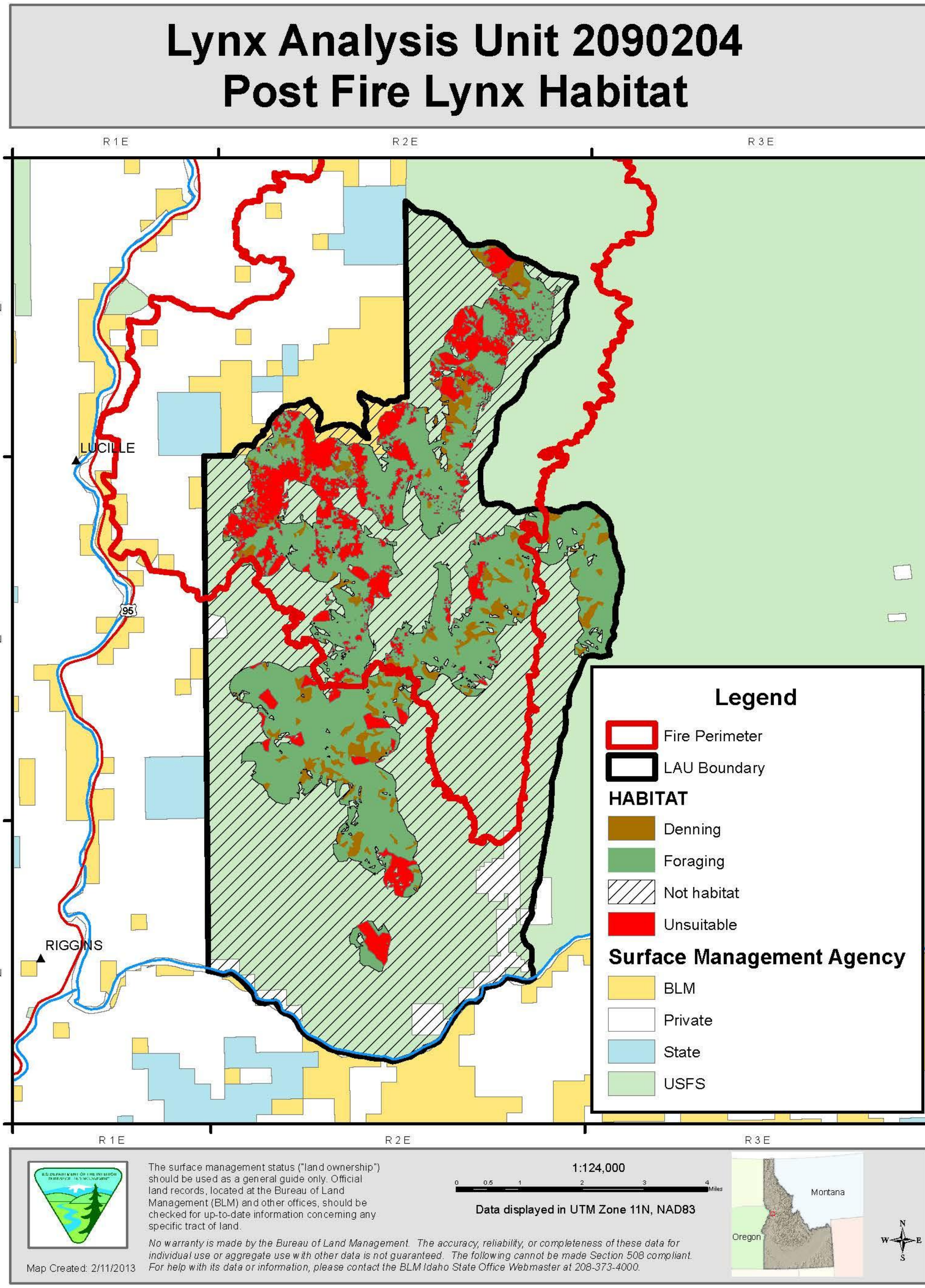

Figure 34. Post Fire Lynx Habitat

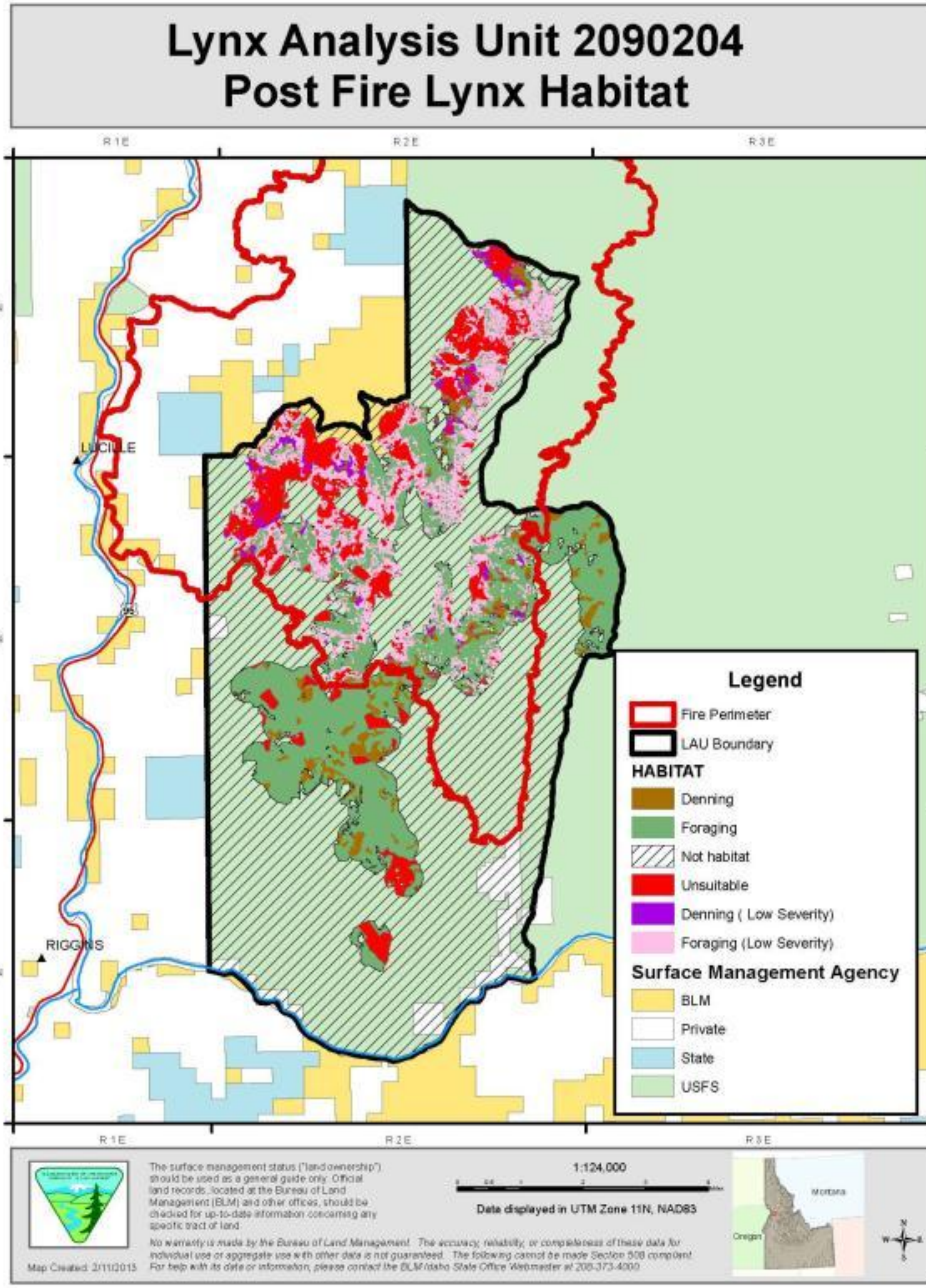

Figure 35. Low Severity Post Fire Lynx Habitat

Table 54 below summarizes pre-fire and post-fire denning, foraging, and unsuitable habitat conditions for LAU No. 2090204. The 2012 Sheep Fire changed pre-fire unsuitable lynx habitat rating of 5 percent to post-fire unsuitable lynx habitat rating of 26 percent.

Table 54. Lynx Analysis Unit No. 2090204 – Habitat Summary

Total LAU Acres	BLM Total Acres Within LAU - %	Potential Habitat Acres[1] (BLM)	Denning Habitat Acres - %[1] (BLM)	Foraging Habitat Acres - %[1] (BLM)	Unsuitable Lynx Habitat Acres - %[1] (BLM)	Not Habitat Acres[1] (BLM)
LAU Pre-Sheep Fire 2012						
38,200	1,033 – 3%	14,238 (623 - 4%)	2,091 – 15% (58 - <1%)	11,389 – 80% (565 – 4%)	758 – 5% (0 – 0%)	23,962 (410)
LAU Post-Sheep Fire 2012						
38,200	1,033 – 3%	14,238 (623 – 4%)	1,641 – 11% (30 - <1%)	8,871 – 62% (250 – 2%)	3,723 – 26% (342 – 2%)	23,962 (410)

[1]Includes FS and BLM lands

Ruediger et al. (2000) identifies that wildland fire and insects have historically played the dominant role in maintaining a mosaic of forest succession stages in lynx habitat. Stand-replacing fires were infrequent and affected large areas. In areas with a mixed fire regime, moderate to low burn severity fires also occurred in the intervals between stand-replacing events. Periodic vegetation disturbances maintain the snowshoe hare prey base for lynx. In the period immediately following large stand-replacing fires, snowshoe hare and lynx densities are low. Populations increase as the vegetation grows back and provides denes horizontal cover, until the vegetation grows out of the reach of hares. Low to moderate intensity fires may also stimulate understory development in older stands.

Fire caused early succession habitats that are rated unsuitable will convert to suitable habitat conditions within 15 to 20 years with succession advancement. With growth of vegetation and succession advancement it may be expected that quality lynx foraging habitat will result within the LAU.

Lynx may be present within the Nez Perce National Forest and Cottonwood Field Office Management area. Lynx sightings are very rare for north-central Idaho, and no verified sighting has been documented in the Lower Salmon River subbasin within the past 25 years. Only one verified sighting (trapped) has occurred in the past 25 years on the Nez Perce National Forest, and this occurred in 1999 in the Earthquake Basin (South Fork Clearwater River), and occurred in non-typical habitat for lynx.

In Idaho, lynx are most often found in areas above 4,000 feet in elevation, and in Engelmann spruce (*Picea engelmannii*)/subalpine fir forests (Koehler and Brittell 1990). Important habitat features include den sites and foraging habitat. Den sites are typically located in hollow logs or rootwads within mesic, mature or old growth coniferous forest (Koehler and Brittell 1990). Lynx foraging habitat corresponds with snowshoe hare habitat, because the hare is the lynx's favored prey. Snowshoe hare are most abundant in seedling/sapling lodgepole pine, subalpine fir, and Engelmann spruce forest stands. Snowshoe hares are the primary prey of lynx, comprising 35-97 percent of the diet throughout the range of the lynx (Koehler and Aubry 1994). Other prey species taken by lynx include red squirrels, grouse, flying squirrels, ground squirrels, mice, voles, porcupines, beaver, and ungulates as carrion or occasionally as prey (O'Donoghue et al. 1998, Koehler 1990, Brand and Keith 1979, Brand et al. 1976, Nellis et al. 1972, Van Zyll de Jong 1966, Saunders 1963).

Although lynx have sometimes been portrayed as a late-succession forest species, lynx appear to be more closely associated with a mosaic of late- and early-succession states (Koehler and Aubry, 1994:86–89). Suitable western mountain habitats for lynx are more fragmented and restricted in extent compared to Canada and Alaska habitats where high quality habitats are more prevalent. These habitat differences may be the key to explaining why population strongholds are limited to Canada and Alaska boreal forests. Providing protected areas in optimal western mountains lynx habitat may be important for lynx persistence (Ruggiero et al., 1994).

Lynx denning habitat is most often characterized as mature forests in moist or wet habitats. Denning sites can occur in a high density of logs, one to four feet above the ground (Koehler, 1990). Down logs and stumps are important for denning habitat because they provide cover for kittens. Timber stands used for denning are between one and five acres, and are connected by travel corridors through mature forest. Favored travel routes are forested areas along ridges and saddles.

From the perspective of the landscape assessment, the goal to benefit lynx habitat would be to "create dense stands of deciduous brush and young conifers attractive to snowshoe hare".

Lynx are considered relatively tolerant of human presence and activities. Preliminary information (Ruediger et al., 2000:7–10) suggests that lynx may not avoid roads, except at high traffic volumes. Therefore, at this time, there is little compelling evidence to recommend management of road density to conserve lynx.

Several important landscape vegetation limitations must be followed when conducting timber harvest and fuel reductions in designated lynx habitats in order to comply with standards and guidelines outlined in the LCAS. LAUs must maintain at least 10 percent denning habitat, unsuitable acres cannot exceed the 30 percent maximum threshold of total lynx habitat within an LAU, and no more than 15 percent of the suitable lynx habitat can be converted to unsuitable habitat within a decade (USDI-BLM 2009).

The entire project area occurs within a Wildland Urban Interface (WUI) area. The Approved Cottonwood RMP (USDI-BLM 2009, Appendix F) includes the following regarding treatments that occur in LAUs and WUIs and provides guidance when the 30 percent threshold is exceeded and fuel projects contributes additional acreage that are unsuitable:

(a) If more than 30 percent of the lynx habitat in a LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, then no additional habitat may be regenerated by vegetation management projects.

(b) Fuel treatment projects that create stand initiation structural stage will be included in the 30 percent calculation – meaning if a fuel treatment within the WUI creates more than 30% unsuitable lynx habitat, then other projects that want to regenerate more would have to be modified or deferred until the standard can be met.

(c) Cumulative total of fuel treatments projects that do meet the vegetation standards shall not exceed 6% of mapped lynx habitat in the LAU amendment area (Defined in the Draft Northern Rockies Lynx Amendment). This standard applies to all vegetation management project and fuel treatment projects outside the WUI.

The LAU (No. 2090204) that includes the project area currently has post-fire (Sheep Fire 2012) conditions of 11 percent denning habitat, 62 percent foraging, and unsuitable classification of 26 percent (see Table 54 above).

3.2.10.2 Direct and Indirect Effects of Alternatives

Common to Action Alternatives

The primary analysis criteria for lynx would be related to suitable denning or foraging habitat converted to unsuitable conditions and short term and long term effects to unsuitable lynx habitat from salvage logging of dead or dying trees. Refer to previous discussion and analysis regarding pre-fire and post-fire conditions from the 2012 Sheep Fire on suitable lynx habitat within LAU No. 2090204 (see Table 54 above, and Figures 33, 34, and 35). The 2012 Sheep Fire changed pre-fire unsuitable lynx habitat rating of 5 percent to post-fire unsuitable lynx habitat rating of 26 percent.

The Proposed Action includes fire salvage of dead or dying trees occurring on the following lynx habitat: 14 acres denning; 99 acres foraging; and 133 acres unsuitable. The No Temporary Road Alternative includes fire salvage of dead or dying trees occurring on the following lynx habitat: 20 acres denning; 93 acres foraging; and 64 acres unsuitable. The suitable lynx habitat proposed for salvage harvest experienced low or very low severity burning from the 2012 Sheep Fire. A worst case scenario analysis assumed that potential harvest effects result in these areas is converted to unsuitable conditions. Harvest activity occurring on unsuitable lynx habitat was not expected to have any short term adverse effects. Tree planting and faster succession (e.g., reforestation) would also convert some of the severely burned areas into suitable snowshoe hare habitat quicker Table 55 below summarizes post-fire conditions and predicted effects to lynx habitat from salvage harvest. Figures 36 and 37 identify salvage harvest and temporary road construction that would occur on suitable and unsuitable (potential habitat) lynx habitat under the action alternatives.

Table 55. Lynx Analysis Unit No. 2090204 – Proposed Action and Lynx Habitat Effects

Total LAU Acres	BLM Total Acres Within LAU - %	Potential Habitat Acres[1] (BLM)	Denning Habitat Acres - %[1] (BLM)	Foraging Habitat Acres - %[1] (BLM)	Unsuitable Lynx Habitat Acres - %[1] (BLM)	Not Habitat Acres[1] (BLM)
LAU Pre-Sheep Fire 2012						
38,200	1,033 – 3%	14,238 (623 - 4%)	2,091 – 15% (58 - <1%)	11,389 ¯80% (565 – 4%)	758 – 5% (0 – 0%)	23,962 (410)
LAU Post-Sheep Fire 2012						
38,200	1,033 – 3%	14,238 (623 – 4%)	1,641 – 11.5% (30 - <1%)	8,871 (250 – 2%)	3,723 – 26% (342 – 2%)	23,962 (410)
BLM Proposed Action Alternative						
38,200	1,033 – 3%	14,238 (623– BLM 4%)	BLM Harvest 20	BLM Harvest 113	152 No Change	23,962 (410)
38,200	1,033 – 3%	14,238 (623– BLM 4%)	Minus 20	Minus 113	Plus 133	23,962 (410)
38,200	1,033 – 3%	14,238 (623 – BLM 4%)	1,621 – 11.4%	8,748 (194 -2%)	3,856 – 27.1% (378 - 3%)	23,962 (410)
BLM No Temporary Road Alternative						
38,200	1,033 – 3%	14,238 (623– BLM 4%)	BLM Harvest 20	BLM Harvest 93	64 No Change	23,962 (410)
38,200	1,033 – 3%	14,238 (623– BLM 4%)	Minus 20	Minus 93	Plus 113	23,962 (410)
38,200	1,033 – 3%	14,238 (623– BLM 4%)	1,621 – 11.4%	8,778	3,836 – 26.9%	23,962 (410)

[1] Includes FS and BLM lands

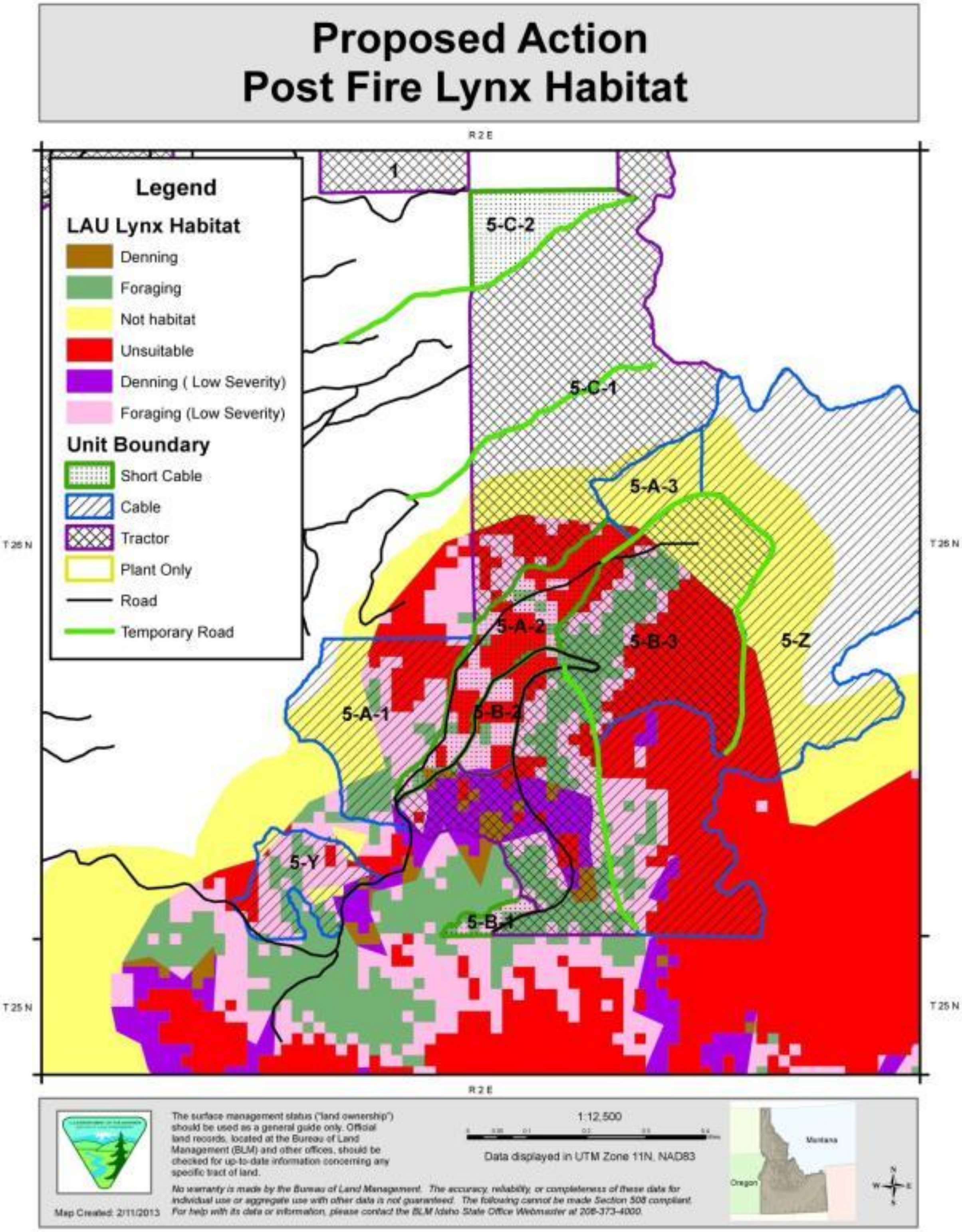

Figure 36. Proposed Action Lynx Habitat

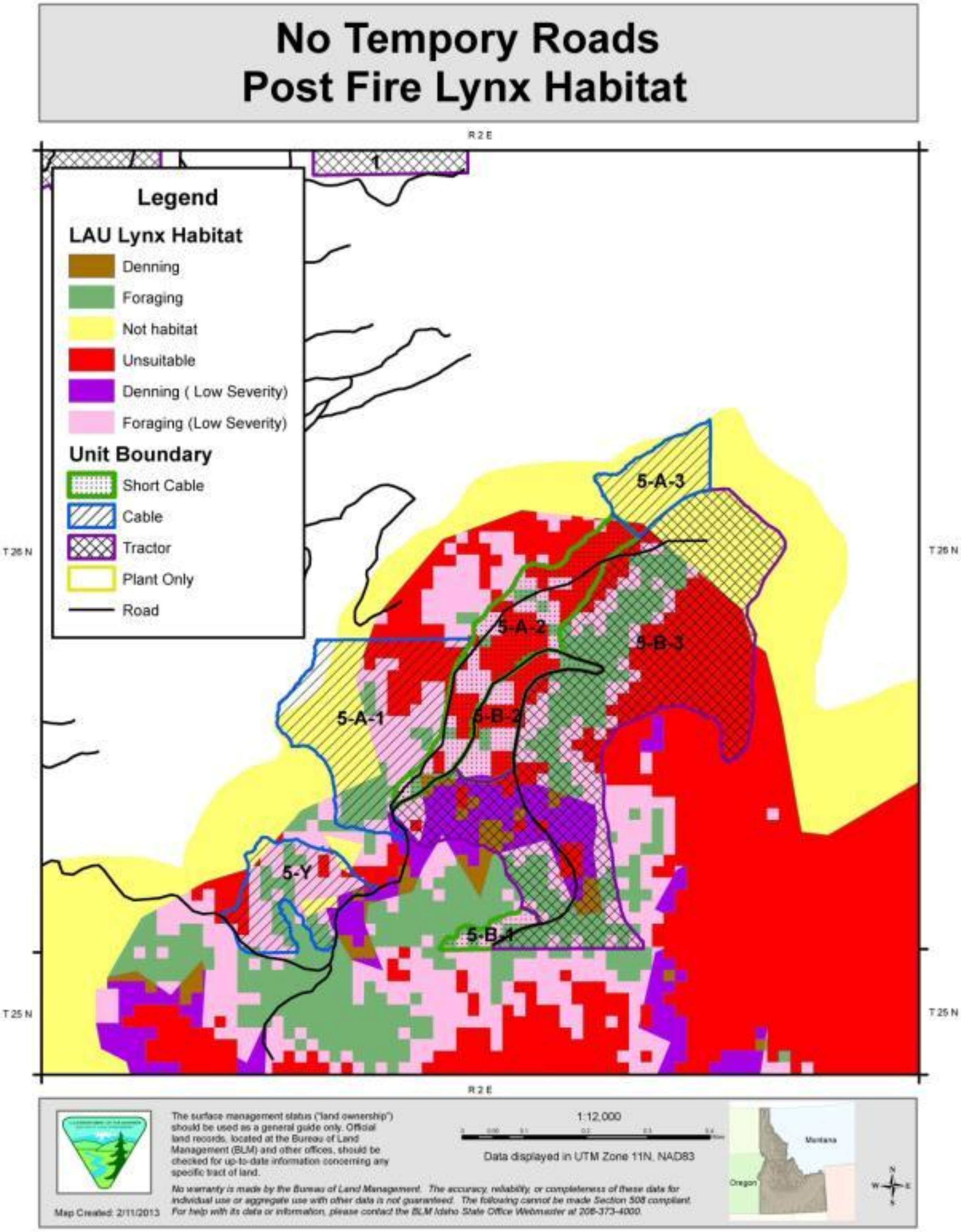

Figure 37. No New Temporary Road Construction Alternative Lynx Habitat

Salvage Timber Harvest and Temporary Road Construction in Unsuitable Lynx Habitat
Salvage timber harvest and temporary road construction within areas rated as unsuitable are expected to have discountable effects regarding impacts to present conditions. Salvage timber harvest would reduce capability of some areas to provide optimum denning habitat in the long term with a reduction of large woody debris, however the large woody debris component would continue to meet goals set forth in the RMP.

Salvage Timber Harvest and Temporary Road Construction in Suitable Lynx Habitat
Salvage timber harvest occurring in suitable denning and foraging areas would have varying levels of impact, which is dependent on impacts to understory live vegetation which provides suitable habitat for snowshoe hare. Because salvage logging is only proposed to harvest dead or dying trees and does not identify any understory treatment of live vegetation, it is expected that low impacts to suitable habitat would occur, however, if salvage logging occurred in suitable habitats, a reduction of all suitable acres that had proposed salvage logging was used to account for potential adverse effects. Salvage harvest of dead or dying trees would potentially affect suitability of areas for future denning habitat and reduce habitat quality for lynx prey species. To assess worst case scenario to suitable habitat logging, a factor of 100 percent reduction was used for potential reductions of suitable lynx habitat that had proposed salvage harvest. The Proposed Action Alternative would convert 133 acres to unsuitable condition, while the No Temporary Road Alternative would convert 113 acres to unsuitable condition. Overall, both action alternatives would contribute in a decline of approximately 1 percent of suitable lynx habitat within the LAU.

Tree Planting
Under the Proposed Action Alternative, planting of trees in areas would result in faster recovery of suitable snowshoe hare habitat and foraging habitat for lynx, which would occur on 133 acres of suitable lynx habitat identified for salvage harvest and 152 acres of unsuitable habitat (total 285 acres). Areas that had high severity and stand replacement as a result of the 2012 Sheep Fire are expected to have reduced natural regeneration of conifers in areas that are lacking a good seed source for natural regeneration. All areas proposed for salvage harvest would also have tree planting. After timber harvest activities and tree planting is completed, temporary roads would be decommissioned and obliterated.

Under the No New Temporary Road Construction Alternative, planting of trees in areas would result in faster recovery of suitable snowshoe hare habitat and foraging habitat for lynx, which would occur on 113 acres of suitable lynx habitat identified for salvage harvest and 64 acres of unsuitable habitat (total 177 acres).

Lynx LAU and Habitat Effects Summary
The project would impact a small amount of suitable lynx habitat, overall, minor effects to foraging or denning habitat are expected to occur. No timber harvest or temporary road construction is proposed to occur within RCAs. These RCA/riparian stands would continue to provide potential travel habitat, however, the quality of these areas were impacted by the fire to varying levels. Salvage timber harvest would move treated stands into more open stands with reduced large woody debris and snags in the long term, thus having some effects to potential travel habitat in the LAU, denning, and foraging within the LAU.

The temporary increase in human activity as a result of project implementation would increase the possibility of human-lynx interactions and could disturb, displace, or disrupt individual lynx in the project area. No lynx are known to occur in the area and the probability is very low for such occurrence. Temporary roads would be closed (when not being used for project implementation) to public motorized vehicle use, reducing potential human impacts. All temporary roads used for project implementation would be decommissioned after treatments are completed. No long-term adverse lynx harassment or potential for mortality is anticipated to result from project implementation.

The action alternatives have the potential to affect 1 percent of the suitable habitat within the LAU and such is not expected to adversely affect connectivity between suitable lynx habitats occurring within and between LAUs. However, even with a small decline in suitable lynx habitat the identified threshold levels for denning (10 percent) and suitable habitat levels (70 percent) would not be exceeded (see Table 55). Even with slight declines, unsuitable lynx habitat post-harvest suitable denning would be 27.1 and 26.9 percent for the action alternatives, with the Proposed Action Alternative only resulting in an additional 0.2 percent (20 acres) of unsuitable habitat within the LAU.

Implementation of the proposed action would result in a "*may affect – not likely to adversely affect*" determination for Canada lynx. The BA for project effects to Canada lynx was prepared cooperatively with USFWS and contains the proposed project description, analysis information, ESA-listed species determinations, and Level 1 Team agreements for the proposed project (see proposed action alternative and project design measures). The BLM has submitted the referenced BA and a requested a letter of concurrence from USFWS regarding the analysis and ESA determination for Canada lynx contained in the BA (transmittal letter dated April 10, 2013).

<u>No Action</u>

No salvage harvest, temporary road construction, or tree planting would occur. No potential for adverse effects to suitable lynx habitat would occur. Under the No Action Alternative, the primary effects to unsuitable lynx habitat within the LAU would occur from natural succession of burned areas. Unsuitable lynx habitat would be expected to convert to high quality lynx foraging habitats within 10 to 30 years. Conversion would be dependent on shrub and conifer re-vegetation, particularly within moderate and high severity areas. Reforestation and revegetation would be slower in areas of moderate and high severity areas that are lacking a seed source. In summary, natural succession would result in improvement of the denning/foraging habitat mosaic important to lynx in LAU 2090204 in the long term.

3.2.10.3 Cumulative Impacts

The cumulative effects analysis area for Canada lynx is LAU No. 2090204. All of the activities in Section 3.1.2 *Related Past, Present and Reasonably Foreseeable Actions* have been considered for their cumulative effects. Past actions that have affected EHE include: road use and management, timber harvest, road construction, fuels treatments, prescribed burning, wildfire, fire suppression, wood cutting, hunting, trapping, residences, livestock grazing, and recreation. FS lands comprise the majority of suitable and unsuitable habitats within the LAU. BLM lands comprise approximately 4 percent of the potential lynx habitat (suitable and unsuitable) within the LAU. Private lands comprise approximately 1,085 acres within the LAU, however, with the exception of approximately 7 acres, which is only a trace amount of potential lynx habitat (2-3 acres suitable and 4 acres unsuitable) the remaining areas are classified as non-habitat for lynx. Forest Service lands comprise approximately 96 percent of the potential lynx habitat within the LAU (suitable and unsuitable).

The Forest Service is proposing a roadside hazard tree removal project within the LAU. This project would involve treatments on 4 acres of suitable denning habitat, 16 acres of suitable foraging habitat, and 128 acres of unsuitable lynx habitat. Primary effects would occur to activities on suitable lynx habitats and discountable or no effects expected to occur to treatments on unsuitable habitats. Worst case scenario analysis would be that 1 percent of potential habitat would be affected (includes all potential habitat). In addition to BLM affects for both action alternatives (approximately 1 percent) unsuitable lynx habitat would be 28 percent for the LAU. If salvage harvest of private lands occurred, it would have discountable effects.

Negligible and minor effects are expected to suitable lynx habitats within the LAU. It is unlikely that the proposed activities would contribute to cumulative effects of past, present, and future management actions on the Canada lynx and potential lynx habitat (e.g., suitable and unsuitable habitat) within the LAU. The determination for Canada lynx is "*may affect – not likely to adversely affect*" for all action alternatives and "*no effect*" for the No Action Alternative.

3.2.11 BLM Sensitive Wildlife Species

3.2.11.1 Affected Environment

BLM sensitive and watch list species retained for further analysis were grouped into preferred habitats (habitat guilds) and include the following: post-burn areas and snags; riparian; early seral; mature forest, late seral-old growth associated; and miscellaneous habitats. Several species utilize a combination of preferred habitats, consequently for this analysis they were grouped in a habitat that project activities would most likely effect (e.g., harvest of dead and dying trees - snags) and would also make reference to other species specific critical habitat niches. Such a species would include the white-headed woodpecker and grouping with post-burn areas and snags, this woodpecker is dependent on mature older ponderosa pine stands, but utilizes large sized snags for nesting and foraging.

BLM sensitive species and the black-backed woodpecker (BLM watch list species) were retained for further detailed analysis. Further analysis and potential project related effects have concluded ta determination of "*May impact individuals or habitat but not likely to cause trend toward federal listing or reduce viability for the population or species*" (see Table 56). Following is analysis information regarding these species.

Table 56. BLM Sensitive Species Summary and Determinations[1]

Species	POTENTIAL OCCURRENCE IN PROJECT AREA				
	Potentially Present?		Potentially Affected?		Determination[2]
	Species	Habitat	Species	Habitat	
Gray Wolf *Canis lupus*	Yes	Yes	Yes	Yes	MI
Fisher *Martes pennant*	Yes	Yes	Yes	Yes	MI
California Myotis *Myotis californicus*	Not likely to occur	Limited	No	No	NI
Fringed Myotis *Myotis thysanodes*	Not likely to occur	Limited	No	No	NI
Townsend's Big Eared Bat *Plecotus tonsendii*	No	No	No	No	NI
Coast Mole *Scapanus orarius*	No	No	No	No	NI
Bald Eagle *Haliaeetus leucocephalus*	Yes	Yes	No	No	NI
Peregrine Falcon *Falco peregrinus anatum*	Yes	Yes	No	No	NI
Northern Goshawk *Accipiter gentilis*	Yes	Yes	Yes	Yes	MI
Prairie Falcon *Falco mexicanus*	No	No	No	No	NI
Flammulated Owl *Ottus flammeolus*	Yes	Yes	Yes	Yes	MI
American White Pelican *Pelecanus erythrorhynchus*	No	No	No	No	NI
Harlequin Duck *Histrionicus histrionicus*	No	No	No	No	NI
Lewis Woodpecker *Melanerpes lewis*	Yes	Yes	Yes	Yes	MI
White-headed Woodpecker *Picoides albolarvatus*	Yes	Yes	Yes	Yes	MI
Willamsons's Sapsucker *Sphyrapicus thryoideus*	Yes	Yes	Yes	Yes	MI
Mountain Quail *Oreotys pictus*	Yes	Yes	Yes	Yes	MI
Olive-sided Flycatcher *Contopus borealis*	Yes	Yes	Yes	Yes	MI
Hammond's Flycatcher *Empidonax hammondii*	Yes	Yes	Yes	Yes	MI
Willow Flycatcher *Empidonax traillii*	Yes	Yes	Yes	Yes	MI
Calliope Hummingbird *Stellula calliope*	Yes	Yes	Yes	Yes	MI
Brewer's Sparrow *Spizella breweri*	No	No	No	No	NI
Common Garter Snake *Thamnophis sirtalis*	Yes	Yes	Yes	Yes	MI
Coeur d'Alene Salamander *Plethodon idahoensis*	No	No	No	No	NI
Idaho Giant Salamander *Dicamptodon*	Yes	Yes	Yes	Yes	MI

Species	POTENTIAL OCCURRENCE IN PROJECT AREA				
	Potentially Present?		Potentially Affected?		Determination[2]
	Species	Habitat	Species	Habitat	
Western Toad *Bufo boreas*	Yes	Yes	Yes	Yes	MI
Woodhouse Toad *Bufo woodhousii*	No	No	No	No	NI
Columbia River Tiger Beetle *Cicindela columbica*	No	No	No	No	NI
Marbled disc *Discus marmorensis*	Yes	Yes	No	No	NI
Shortface Lanx Fisherola nuttalli	No	No	No	No	NI
Columbia Pebblesnail *Fluminicola fuscus*	No	No	No	No	NI
Idaho Banded Mountainsnail *Oreohelix idahoensis idahohensis*	No	No	No	No	NI
Whorled Mountainsnail *Oreohelix vortex*	No	No	No	No	NI
Boulder Pile Mountainsnail *Oreohelix jugalis*	No	No	No	No	NI
Striate Mountainsnail *Oreohelix strigosa goniogyra*	No	No	No	No	NI
Lava rock Mountainsnail *Oreohelix waltoni*	No	No	No	No	NI
Black-backed Woodpecker[2] *Picoides arcticus*	Yes	Yes	Yes	Yes	MI

[1]NI=No 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]Black-backed woodpecker is a BLM Watch List species, and was included because of habitat preference for post-fire snag habitat.

Post-Burn Areas and Snags

Black-Backed Woodpecker

The analysis area for black-backed woodpecker includes the 3,326-acre project area. For black-backed woodpecker, burned conifer forests provide key conditions necessary for both nesting and foraging (Hutto 1995, Marshall 1992, Saab and Dudley 1998). Nest cavities are excavated in live trees with heart rot or recently killed trees (dead < 5 years). This species nests in ponderosa pine, lodgepole pine, and western larch trees in the Blue Mountains (Wisdom 2000). In the northern Rockies, Hutto (1995) stated that early post-fire conditions (1 to 5 years after fire) are critical for supporting black-backed woodpecker populations.

Black-backed woodpeckers are relatively restricted in distribution to early post-fire conditions (Hutto 1995). They rapidly colonize stand-replacement burns within 1 to 2 years of a fire; however, within 5 years they become rare, presumably due to declines in bark and wood-boring beetles (Kotliar et al. 2002, Saab 2007). Hutto (1995) found that of 77 species only two were more specialized than the black-blacked woodpecker. He suggested that the relatively low number of black-backed woodpeckers in unburned forests may be sink populations (populations that are generally decreasing), maintained by emigrants from burns when conditions become less suitable for the species 5 years after a fire; in other words, burns support source populations of black-backed woodpeckers (populations that increase and spread). Consequently, burned habitats may be of critical importance to this species.

Lewis Woodpecker

The analysis area for Lewis woodpecker includes the 3,326-acre project area. Lewis' woodpecker is strongly associated with open, dry forest habitat where ponderosa pine is the dominant species. This species use large snags (primarily ponderosa pine) for nesting and roosting (Altman 2000, Wisdom et al. 2000). Lewis's woodpeckers are considered burn specialist for their use of snags as nest trees in post-burn areas dominated by ponderosa pine (*Pinus ponderosa*) and riparian areas dominated by cottonwood (*Populus* spp).; Vierling 1997; Linder and Anderson 1998; Saab and Vierling 2001; and Gentry and Vierling 2007) and for their use of snags in post-burn areas (Saab and Dudley 1998, Saab and Vierling 2001). Breeding habitat for Lewis's woodpecker is characterized by an open canopy, brushy understory, available perch sites and abundant insects (Bock 1970; Linder and Anderson 1998; and Sabb and Dudley 1998). While a certain number of trees are necessary for nesting and perching sites, a closed canopy forest is not suitable due to reduced visibility, limited room for aerial maneuvers, and retarded shrub development (Bock 1970 and Saab and Dudley 1998).

Fire areas only provide habitat for Lewis' woodpeckers for about 10 years. In salvaged areas Lewis' woodpecker will show up in burned stands within the first 5 years. In unsalvaged burned areas they wait until small snags have fallen and the stand has opened up enough to allow flycatching, usually 10-20 years post-fire (Kotliar et al 2002).

Lewis' woodpeckers require softer snags for excavating nest sites. Fire-killed trees that were previously sound, soften with decay introduced by the multitude of insects that colonize dead and dying trees following a burn. Lewis' woodpeckers also use burned forests because of the relatively open canopy that allows for shrub development and associated arthropods prey, perch sites for foraging, good visibility, and space for foraging maneuvers (Saab et al. 2002, Marshall 1992b, Saab and Dudley 1997). Maximum use by Lewis' woodpeckers may be delayed for several years until fire killed trees began to fall, stands become more open, snags are well decayed, and shrub densities have increased.

White-headed Woodpecker

The analysis area for white-headed woodpecker includes the 3,326-acre project area. White-headed woodpeckers are strongly associated with open, dry forest habitat where ponderosa pine is the dominant species. This species use large snags (primarily ponderosa pine) for nesting and roosting (Altman 2000, Wisdom et al. 2000). White-headed woodpeckers primarily occupy low-to-mid-elevation, multi-storied open stands of mature and large, late seral ponderosa pine, including large snags (Wisdom et al. 2000, Frederick and Moore 1991). This species generally prefers to use large-diameter (> 21 inch dbh) snag classes for nesting and foraging in greater proportion than available (Bull et al. 1997; Dixon 1995a; Dixon 1995b; Frederick and Moore 1991; Ritter 2000; and Wisdom et al. 2000). They feed on seeds and insects extracted from the bark of trees. They are dependent on mature and older ponderosa pine as a source of seeds for winter survival (Garret et al. 1996). Partially cut stands with moderate to heavy stocking of large pine trees, or open forested lands with remnant, large-size pine can provide suitable nesting and foraging habitat (Ritter 2000). Road access and cutting of large snags for firewood may have adverse effects in localized areas.

White-headed woodpecker feed almost exclusively on ponderosa pine seeds during fall and winter, and thus, need live trees in moderate severity stands or adjacent unburned stands (Frenzel 2004). The species may use large, well-decayed snags in the burned area for nesting, provided that the burned area is within a potential home range that includes large, live ponderosa pine (Hutto 1995, Sallabanks 1995, Saab and Dudley 1997). Lewis' woodpecker feeds by "flycatching" insects; they fly out from perches provided by snags, catching insects in flight (Altman 2000). Both of these species occur in higher densities and/or reproduce more successfully in post-fire habitats than in other habitats (Saab and Dudley 1998, Frenzel 2004).

Riparian Habitats

Refer to section 3.2.4 *Wetland and Riparian Habitats* and 3.2.5 *Fisheries, Aquatic Habitats and Special Status Species* for detailed description of affected environment. Section 3.2.8 *Wildlife Habitat Guilds – Riparian and Aquatic Habitats and Dependent Species* also provides background information and affected environment information. Figure 19 identifies the locations of streams and springs within the project area.

Willow Flycatcher

The analysis area for willow flycatcher includes the 3,326-acre project area and analysis area subwatersheds. The 2012 Sheep Fire impacted riparian habitats to varying levels, Table 44 summarizes burn severity that occurred for stream and riparian miles occurring within the analysis area subwatersheds. The willow flycatcher is a migratory bird that breeds over a large portion of North American. Winter habitat is tropical, from Central Mexico to Columbia (Idaho Partners in Flight 2000). Found in thickets, scrubby and brushy areas, open second growth, swamps, and open woodlands (Groves et al. 1997). In Idaho study of riparian birds, willow flycatchers were intermediate in association with mesic and xeric willow habitats (Groves et al. 1997). Willow flycatchers breed in riparian habitat that has a mid-story cover layer of shrubs within 5-6 feet of the ground (Idaho Partners in Flight 2000). They nest in edge habitats of large, continuous shrub patches juxtaposed with open areas. The project area does provide suitable habitat (e.g., riparian areas, wetlands, etc.) for willow flycatcher, but optimum habitat conditions are limited.

Calliope Hummingbird

The analysis area for Calliope hummingbird includes the 3,326-acre project area and analysis area subwatersheds. The 2012 Sheep Fire impacted riparian habitats to varying levels, Table 44 summarizes burn severity that occurred for stream and riparian miles occurring within the analysis area subwatersheds. Found in mountains (along meadows, canyons and streams), in open montane forests, and in willow and alder thickets (Groves et al. 1997). The calliope hummingbird is the smallest long-distance migrant in the world. Breeding habitats include shrub-sapling habitats 8 to 15 years following logging or fire; aspen thickets, often along running streams, and in open montane forests; late shrub-sapling habitats 14 to 16 years after burning and clear-cutting, respectively; regrowth after deforestation; willows along drainages, lodgepole pine; and birch and maple draws. They defend a territory of 0.5 to 0.75 acres. Habitats in and near the project area may be suitable breeding habitat for calliope hummingbird.

Common Garter Snake

The analysis area for common garter snake includes the 3,326-acre project area and analysis area subwatersheds. The 2012 Sheep Fire impacted riparian habitats to varying levels, Table 44 summarizes burn severity that occurred for stream and riparian miles occurring within the analysis area subwatersheds. Common garter snakes are almost always found in and around marshes, lakes, and meadows where they feed on amphibians and fish. They are also found along slow-moving creeks and sloughs. These snakes are generally found around water; however, the majority of small tributary streams within the project area are steep gradient and fast-moving. The project area has several small ponds and wetlands that provide preferred habitats for common garter snake. Common Garter Snake inhabit virtually any type of wet or moist habitat throughout its range, but regional population's exhibit different preferences (Groves et al. 1997). This species is most common in wet meadows and along water courses, but it can be found far from water in open valleys and in deep coniferous forests (Nussbaum et al. 1983).

Idaho Giant Salamander

The analysis area for Idaho giant salamander includes the 3,326-acre project area and analysis area subwatersheds. The 2012 Sheep Fire impacted riparian habitats to varying levels, Table 44 summarizes burn severity that occurred for stream and riparian miles occurring within the analysis area subwatersheds. Idaho giant salamander larvae usually inhabit clear, cold streams, but are also found in mountain lakes and ponds. Adults are found under rocks and logs in humid forests, near mountain streams, or on rocky shores of mountain lakes (Groves et al. 1997). The occurrence of Idaho giant salamander has been documented within the Little Salmon River subbasin. Adults eat terrestrial invertebrates, small snakes, shrews, mice, and salamanders (Groves et al. 1997). The salamander hibernates/aestivates. Breeding occurs in spring and fall. No known documentation of Idaho giant salamander is known to exist for the analysis area subwatersheds, however, suitable habitat exists for the species.

Western Toad

The analysis area for western toad includes the 3,326-acre project area. The 2012 Sheep Fire impacted riparian habitats to varying levels, Table 44 summarizes burn severity that occurred for stream and riparian miles occurring within the analysis area subwatersheds. Western toads are strongly associated with wetlands, but toads may use forested terrestrial habitats outside of breeding and over-wintering periods (Keinath and McGee 2005). Bull (2006) found toads in Oregon traveled nearly 4 miles from breeding areas and most traveled over 1 mile. Uplands in the project area are considered marginal habitat because of dense canopy cover. Approximately 75% of the project area has moderate to high tree canopy cover. Bull (2006) found toads preferred open forests with high prey (ants and beetles) availability. In all of Bull's (2006) study areas, toads selected south-facing slopes. Most of the project area is on south-facing slopes. Toads preferred open sites to forested settings. Ground cover at selected sites had more rock, water, and forbs with fewer logs and less bare ground than random sites in the study area. Toads in Bull's (2006) study found refuge in rocks (31%), burrows (18%), logs (17%) and stumps, root wads or bark (6%).

The western toad will breed in a large variety of natural and artificial aquatic habitats, from the shallow margins of lakes and ponds to roads side ditches. It does not seem to matter if the sites have tree or shrub canopy cover, coarse woody debris, or emergent vegetation. Adult females may lay their eggs at depths of 5 centimeters to 2 meters (depths over one meter are rare) in the same location within sites each year. Adult toads can be found in forested areas, wet shrublands, clearcuts, and meadows. They appear to favor dense shrub cover, perhaps because it provides protection from desiccation and predators. Hibernation sites generally are deep enough to prevent freezing, and moist enough to prevent desiccation.

Mature Forest, Late Seral – Old Growth Associated

Refer to section 3.2.8 *Wildlife Habitat Guilds – Late Seral – Old Growth Habitats and Dependent Species* and section 3.2.1 *Vegetation* for affected environment information regarding late seral and succession for forest vegetation.

Fisher

The analysis area for the fisher is the 3,326-acre project area including the old growth/mature forest stands affected by the proposed project. As a result of the 2012 Sheep Fire, approximately 23 percent (764 acres) of the project area provides mature forest – large tree characteristics. These areas also experienced very low to low burn severity, and average tree mortality is estimated at approximately 25 percent. Fishers are wide-ranging forest predators that prefer late seral, mesic, (moist) forest habitats (Idaho Department of Fish and Game, 1995). The CWCS (IDFG 2005) summarizes fisher habitat in Idaho as a mosaic of mesic conifer, dry conifer, and subalpine forests. Mature and older forests are used during summer; early seral and late succession forests are used in the winter. Current distribution of fishers in North American is substantially fragmented compared to their historical (pre-European) distribution. Across the species' range, fisher populations declined in the early twentieth century, probably due to a combination of over trapping, predator poisoning, and habitat loss from settlement, logging and forest fires (Heinemeyer 1994). No fisher trapping is currently allowed in Idaho, but animals are occasionally caught incidental to trapping for our species.

There are approximately 764 acres in the project area that potentially may provide suitable fisher habitat, which includes mature – large tree stands. Fishers are closely associated with forested riparian areas which are used extensively for foraging, resting, and travel corridors.

Northern Goshawk

The analysis area for northern goshawk includes the 3,326-acre project area. As a result of the 2012 Sheep Fire, approximately 23 percent (764 acres) of the project area provides mature forest – large tree characteristics. These areas also experienced very low to low burn severity, and average tree mortality is estimated at approximately 25 percent. In northern Idaho and western Montana, goshawks nest in stands or groups of trees in the mature to over-mature age classes principally on the mid to lower third of slopes. Douglas-fir and Western larch are preferred nest tree species (Hayward and Escano 1989). In Idaho, Northern goshawks (*Accipiter gentilis*) are typically found in montane coniferous forest, where they occupy relatively large home ranges of 1,988 to 9,638 acres in size (Patla et al. 1995). Goshawks prey on a variety of medium-sized forest birds and small mammals. Pole stage or larger stands open enough to permit unimpeded flight are suitable for feeding (Hayward et al. 1990). However, foraging habitat may be as closely tied to prey availability as to particular habitat composition or structure (Patla et al. 1995).

Recent studies suggest that goshawks may not be as tied to old growth forests as previously thought. McGrath et al. (2003) indicate that old growth forest structures are not useful in predicting goshawk nesting habitat. In the northern Rockies, goshawks are often associated with mature forests, not necessarily old growth forests (Squires and Ruggerio 1996, Clough 2000).

Flammulated Owl

The analysis area for flammulated owl includes the 3,326-acre project area. As a result of the 2012 Sheep Fire, approximately 23 percent (764 acres) of the project area provides mature forest – large tree characteristics. These areas also experienced very low to low burn severity, and average tree mortality is estimated at approximately 25 percent. Flammulated owls may potentially occur within the project area during the breeding season (May to mid-October). Flammulated owls are secondary cavity nesters and are dependent on cavity excavators, such as pileated woodpeckers. In Idaho, the flammulated owl occupies older ponderosa pine, Douglas-fir, and mixed coniferous forests (Idaho Department of Fish and Game 1997).

Williamson's Sapsucker

The analysis area for Willimanson's sapsucker includes the 3,326-acre project area. As a result of the 2012 Sheep Fire, approximately 23 percent (764 acres) of the project area provides mature forest – old forest characteristics. These areas also experienced very low to low burn severity, and average tree mortality is estimated at approximately 25 percent. For this analysis, Williamson's sapsucker nesting habitat was defined as forested stands with large trees (greater than 15 inches) and canopy cover greater than 60%. Foraging habitat consists of nesting habitat, plus pole-sized trees (greater than 5 inches dbh) or larger with canopy cover greater than 25 percent.

Williamson's sapsucker habitat use in Idaho is found in montane coniferous forests, especially fir and lodgepole pine (Groves et al. 1997). Williamson's sapsuckers are primary excavators creating nest and roost sites for themselves and other cavity-dependent species in forested habitats. They forage by pecking, gleaning, and feeding at sap wells during the breeding season (Crockett and Hadow 1975; Jackman 1975; Bull et al. 1986). Ants may comprise 86% of the birds' food. They also eat white wood-boring larvae and moths of spruce budworms. In Colorado, upon first arriving on the breeding grounds, Williamson's sapsuckers fed primarily on the sap and phloem of live conifers (Stallcup 1968; Crockett 1975). Crockett (1975) observed each pair establishing four to five sap trees during the breeding season, noting that sap trees were significantly smaller in height and diameter compared to what was available.

They nest in cavities in standing snag/hollow trees; sometimes returning to the same tree, but not the same cavity, year after year (Groves et al. 1997). Williamson's sapsuckers seem to be severely restricted to large diameter trees and snags for their nest requirements, except when nesting in aspen. Bevis (1994) reported the mean dbh of nest trees as 92 cm (n=4); three were in live western larch and one was in a Douglas-fir snag. In Oregon, Bull et al. (1986) observed Williamson's sapsuckers nesting primarily in grand fir forest types, in large snags (mean dbh=70 cm). They nested in both dead (51%) and live tree (49%); mostly in western larch (62%). They are considered a poor excavator and the trees selected for nests had advanced heart rot (64% had broken tops) with most of the snags having died in the past three years.

Hammond's Flycatcher
The analysis area for Hammond's flycatcher includes the 3,326-acre project area. As a result of the 2012 Sheep Fire, approximately 23 percent (764 acres) of the project area provides mature forest – large tree characteristics. These areas also experienced very low to low burn severity, and average tree mortality is estimated at approximately 25 percent. In preliminary results of Idaho-Montana study, Hammond's flycatchers were found to be old-growth associated in Douglas-fir/ponderosa pine forests (Groves et al. 1997). Hammond's Flycatcher is a common but poorly known migratory species that breeds in mature coniferous and mixed forests of western North America. This species frequently nests high in conifers, saddling its nest on a horizontal limb well away from the main trunk. This species prefers mature and old-growth coniferous forests, generally stands of more than 10 hectares [25 acres] and a minimum age of 80 to 90 years. The project area provides suitable habitat for Hammond's flycatcher.

<u>Early Seral Habitats</u>

Refer to section 3.2.8 *Wildlife Habitat Guilds – Early Seral Habitats and Dependent Species* for detailed discussion and analysis of effects of alternatives regarding habitat, dependent species, and cumulative effects. Section 3.2.1 *Vegetation* also provides additional information regarding analysis of effects and cumulative effects for forest vegetation.

Olive-sided flycatcher
For this analysis, olive-sided flycatcher nesting habitat was defined as forested stands with trees greater than 10 inches dbh and canopy cover 10–25%. Foraging habitat consists of shrublands, all seedling/sapling stands (early seral), and all other forest stands with a canopy cover less than 25%.

The analysis area for olive-sided flycatcher includes the 3,326-acre project area. Olive-sided flycatchers are found in forests and woodlands (especially in burned-over areas with standing dead tress) such as subalpine coniferous forests, mixed forests, and borders of lakes and streams (Groves et al. 1997). They generally breed in montane and boreal forests in the mountain west of North America, as well as throughout the boreal forests of Canada (Kaufman 1996). Olive-sided flycatchers are most often associated with forest openings, forest edges near natural (i.e., meadows, wetlands, canyons, rivers) or man-made openings, or open/semi-open stands with a low percentage of canopy closure (Kaufman 1996; Altman 1997). Hutto and Young (1999) found olive-sided flycatchers were more abundant in early post-fire habitats than in any other major cover type. They had similar occurrence in seed tree cover types, and were only slightly less common in clear-cut and shelterwood cover types. They occur more frequently in disturbed than in undisturbed forests in the northern Rocky Mountains. In Douglas-fir forests of west-central Idaho, olive-sided flycatchers were found to be more abundant in forest types created by logging methods such as diameter-cut and single tree selection that retained residual medium and large trees (moderate to high canopy height) and low canopy closure (Medin 1985; Medin and

Booth 1989). In northwestern Montana, Tobalske et al. (1991) found olive-sided flycatchers to be more abundant in logged (clear-cut and partial cut) than in unlogged forest.

Olive-sided flycatchers have been classified as common in spruce and aspen forest types, uncommon in mixed conifer, ponderosa pine, pine-oak, and cedar-hemlock forest types, and rare in lodgepole pine and pinyon-juniper (Hejl et al. 1995). In the northern Rockies, Hutto (1995) found that among undisturbed types, olive-sided flycatchers occurred most often in spruce-fir, marsh-wetland, and mixed conifer types, with some occurrence in riparian shrub, cedar hemlock, Douglas-fir, lodgepole pine, and ponderosa pine types. Although olive-sided flycatchers are more common in disturbed, early succession types, they appear to require residual large snags and/or live trees for foraging and singing perches (Altman 1997).

<u>Other BLM Sensitive Species and Preferred Habitats</u>

Gray Wolf

The analysis area for the gray wolf is the 3,326-acre project area and the John Day EAU. Refer to section 3.2.8 *Wildlife Habitat Guilds: Elk and Security Dependent Species*, this section provides a good evaluation of habitat for elk, primarily because wolves are dependent on elk as an important prey species.

Three aspects of wolf habitat in the project area were reviewed: security of dens and rendezvous sites, prey base (elk), and security from human disturbances and harm. The project area is suitable wolf habitat and wolves have been documented within the project area. Denning and rendezvous areas would be expected to occur in the project area.

An important effect on gray wolf recovery in Idaho is incidental mortality from shooting and vehicle-strikes. The probability of wolf mortalities increases with increased road access and creating open areas where animals can be easily seen. It is currently legal to hunt or trap wolves in Idaho (designated areas only) in accord with State regulations. The majority of access routes into the project area are restricted for public vehicle motorized use. However, private land owner granted access could occur.

Mountain Quail

The analysis area for mountain quail includes the 3,326-acre project area. In Idaho, mountain quail have a range restricted mostly to areas of west-central Idaho, with remnant population strongholds occurring in the Lower Salmon River. Mountain quail have been recently documented as occurring within the John Day Creek drainage.

Mountain quail breed and winter in shrub-dominated communities. Mountain quail may move to high elevation, forested habitats during the summer (Herman et al. 2002). Mature quail eat most plant material, whereas invertebrates are very important food items for chicks. Seed heads and bulbs are important food in Idaho (Ormiston 1966), as are perennial forbs and mast-producing shrubs (Reese et al. 1999).

Habitat loss and degradation from forest succession, reservoir construction, wildfire, weed invasion, livestock grazing, and human developments are all important limiting factors in some areas (Gutierrez and Delehanty 1999). Limited availability of shrubby habitats within a matrix of grasslands and forest restricts mountain quail in many interior populations to narrow strips, rather than broad expanses of mountain shrub habitat common in populations west of the Sierra-Cascade Crest (Brennan 1990). Critical factors affecting habitat and that ultimately may be responsible for the decline of mountain quail in Idaho include: (1) loss of wintering areas along creeks and riparian shrub communities due to the development of hydroelectric dams along the Snake River and tributaries, (2) agricultural development along the Snake River corridor, and (3) excessive cattle grazing that degrades creek-side shrub communities (Brennan 1990, 1994). Road building, ranchettes, and housing development in and near shrubby draws, and accompanying activities including predation by dogs and cats, are additional concerns leading to further fragmentation and degradation of mountain quail habitat in Idaho (Odell and Knight 2001; Maestas et al. 2003).

Interspecific competition with California quail and chukars, introduced around 1950, also may be a limiting factor. The 2012 Sheep Fire converted a large amount of the project area to early seral habitats.

3.2.11.2 Direct, Indirect and Cumulative Effects of the Alternatives

This section, due to the nature of the habitat guild associations will be organized slightly different from the other sections. Effects will be organized by habitat guild, with effects by alternative and cumulative impacts within each habitat guild association.

Post-Burn Areas and Snags

Refer to section 3.2.8 *Snags and Large Down Wood* for detailed discussion and analysis of effects of action alternatives regarding snags (dead wood effects), No Action Alternative, and cumulative effects. The referenced section includes detailed analysis regarding snag persistence, "snag gap" periods, reforestation and succession (tree planting and no tree planting areas), and salvage harvest effects in different burn severity areas. The following effects discussion will summarize key effects to these BLM sensitive and watch list woodpecker species. Refer to section 3.2.1 *Vegetation* for additional information regarding effects and analysis regarding forest vegetation and succession.

Common to all Action Alternatives

The action alternatives vary by the number of acres to be treated. The Proposed Action Alternative would harvest 916 acres and the No Temporary Road Alternative would harvest 606 acres (see Table 38). Proposed harvest treatments would reduce snag densities on the landscape, specifically snags 8 inches dbh and greater. This results in a decrease in roosting, nesting and foraging habitat for primary and secondary cavity excavators.

Within harvest units, 6 snags per acre, and snags greater than 20 inches dbh is preferred size for retention. A landscape approach to snag retention would occur. Snags would be retained across the project area in untreated areas as well as within treatment units. This strategy would provide for a mosaic of conditions regarding density and distribution. Within salvage harvest units, a portion of the dead trees would be removed based on the prescribed silvicultural strategies. Within salvage harvest units only dead or dying trees would be removed.

Saab and Dudley (1998) and Saab et al. (2002), suggest that management strategies that incorporate the continuum of habitat used by black-backed and Lewis' woodpeckers would likely provide habitat for the entire assemblage of cavity nesting birds. Generally, black-backed woodpeckers prefer high density snags of small diameters in an unlogged condition. Lewis' woodpecker prefers moderate snag densities with larger diameter snags in partially logged conditions. Discussion will highlight effects to these species.

While it is clear that even partial salvage logging has negative effects on species that depend on burned forest, there are practically no data bearing on the ecological effects of alternative styles of partial salvage logging (Hutto 2006). Less severe understory fires may be less critical to bird populations (Hutto 2006).

Research on cavity excavator use of post-fire salvaged and unsalvaged stands have provided some insight regarding bird use (Haggard and Gaines 2001, Saab and Dudley 1998, Hutto and Gallo 2006). Within harvest units in burned forests, it was noted that 6-14 snags per acre was beneficial to woodpecker species (Haggard & Gaines 2001). More than 25 snags per acre were recommended for partially logged units (Saab & Dudley 1998). Beschta et al. (1995) recommended leaving 50% of each diameter class and all snags greater than 20 inches dbh. Hutto and Gallo (2006) re-affirm that having appropriate nest snags is only part of the equation; large numbers of insects are what sustain the birds, and salvage logging removes post-fire insect habitat.

Direct effects would primarily be displacement from nests by removal or destruction of nest structures (snags) during salvage operations. Adverse effects would likely be higher for species such as the black-backed woodpecker. This species tend to use post-fire habitats first because of their ability to excavate hard snags. Logging would likely be completed within 1 year of the fire when most snags will still be hard enough to limit use by other species.

Lewis' woodpecker, white-headed woodpecker and black-backed woodpecker show the most potential habitat reduction, or reduced habitat quality in Table 2 under the Proposed Action Alternative with salvage treatments that comprise 916 acres and 28 percent of the project area. The No Temporary Road Alternative has salvage treatments that comprise 606 acres and 18 percent of the project area. Approximately, 2,410 acres (72%) in the Proposed Action Alternative and 2,720 acres (82 percent) in the No Temporary Road Alternative would not have salvage harvest activities, within these areas post-burn specialist woodpeckers would benefit with the maximum number of snags available. One-hundred percent of the project area occurs within the 2012 Sheep Fire perimeter area, and burn severity is summarized in Table 43.

The Lewis' woodpecker prefers soft snags over hard snags and will begin to expand into the fire area as snags begin to decay and fall. Snag habitat is reduced, but still maintained at suitable levels within the project area and cumulative analysis area subwatersheds.

Habitat for white-headed woodpeckers will be reduced, but habitat will still be provided at suitable tolerance levels within the project area and cumulative analysis area subwatersheds. These species will likely tend towards the periphery of the burned areas where there is a mosaic of live and dead trees to meet their habitat needs.

Black-backed woodpeckers tend to select nest sites with the highest snag densities and the least amount of logging. Therefore, it is unlikely that they would use salvage-logged units for nesting or foraging. In all action alternatives, a portion of the Sheep Salvage Project Area would not be treated, and would continue to provide habitat for species which utilize high density snag patches.

No Action

The No Action Alternative provides the most burned forest habitat and the greatest number of snags for primary and secondary cavity excavators. The highest tolerance level or assurance of habitat availability for all burned forest and cavity dependent species occurs with this alternative. All existing snags would be available in multiple size classes with variable densities. Initially, snag distributions and wildlife habitat would be as described in the existing condition section.

Saab and Dudley (1998) and Saab et al. (2002), suggest that management strategies that incorporate the continuum of habitat used by black-backed and Lewis' woodpeckers would likely provide habitat for the entire assemblage of cavity nesting birds.

It is likely that black-backed, three-toed and hairy woodpeckers would benefit the most from this alternative as they take advantage of the elevated snag levels. Three-toed and black-backed woodpeckers are strongly associated with early post-fire conditions and they tend to select nest sites with the highest snag densities and the least amount of logging (Saab and Dudley 1997). They rapidly colonize stand-replacement burns within 1 to 2 years of a fire; however, within 5 years they become rare, presumably due to declines in prey of bark and wood-boring beetles (Kotliar et al. 2002).

Lewis' woodpecker would benefit from this alternative as a maximum number of large snags would be available. In some areas, snag density may be too high for use by Lewis' woodpecker in the short-term (5-10 years). Saab et al. (2002) found that Lewis' woodpeckers favor stands with moderate canopy cover (10-40%) in a burned condition or sites with moderate densities of snags of large sizes for nesting. As time progresses, smaller snags would begin to fall (1-15 years) and large snags begin to decay increasing habitat suitability. Maximum use may be delayed for several years until stands become more open, snags are well decayed, and shrub densities have increased. Suitable habitat conditions will persist longer, upwards of 40 years. Lewis' woodpecker nesting territories are 16 to 17 acres versus 75 to 125 acres for black-backed woodpeckers (Saab 2002). Habitat is well distributed across the fire area.

White-headed woodpecker would benefit from this alternative as a maximum number of large snags would be available. The species may use large, well-decayed snags in the burned area for nesting, provided that the burned area is within a potential home range that includes large, live ponderosa pine (Hutto 1995, Sallabanks 1995, Saab and Dudley 1997).

Green stands with little tree mortality would not be harvested or only have minimal harvest. Therefore, these stands would continue to provide habitat for species that require live canopy along with snag habitat (e.g. white-headed woodpecker, pileated woodpecker, and Williamson's sapsucker). Green trees throughout the burned area will serve as snag recruitment trees for future snag development in the area, although few live trees exist in the severely burned areas.

Cumulative

The cumulative effects analysis area consists of the 48,000 acre 2012 Sheep Fire Area, and specific project effects associated with John Day Creek watershed and Salmon River face drainages, and the project area. All of the activities in Section 3.1.2 *Related Past, Present and Reasonably Foreseeable Actions* have been considered for their cumulative effects. Past actions that have affected snags and down wood (e.g., dead wood) include: wildfire, fire suppression, timber harvest, road construction, firewood cutting, fuels treatments, and prescribed burning. Overall, snag densities would meet or exceed RMP standards at the project and landscape level, because of the high snag densities in the Sheep Fire area.

Localized adverse effects to snag dependent species and habitats would occur within salvage harvest units, however, at a landscape or project level such effects would still provide a mosaic of suitable habitats for snag dependent species within the cumulative analysis area (e.g., project and watershed level). At a landscape approach, adequate snag retention would occur. Snags would be retained across the project area in untreated areas as well as within treatment units. This strategy would provide for a mosaic of conditions regarding density and distribution. The majority of the project area and Sheep Fire area would not have any salvage harvest occurring. It is unlikely that the proposed activities would contribute to cumulative effects of past, present, and future management actions on snags and down wood within the cumulative analysis area.

<u>Riparian Habitats</u>

Refer to section 3.2.4 *Wetland and Riparian Habitats,* 3.2.5 *Fisheries, Aquatic Habitats and Special Status Species, and* 3.2.8 Riparian *and Aquatic Habitats and Dependent Species* for detailed discussion and analysis of effects of alternatives regarding habitat, dependent species, and cumulative effects. The following effects discussion will summarize key effects to riparian dependent species.

Common to all Action Alternatives

No salvage harvest or temporary road construction would occur within RCAs or riparian habitats. Primary activities that would occur within RCAs are associated with road use and maintenance (see Table 49 above). Activities within RCAs would be similar for both action alternatives, however, because less timber would be cut and hauled for the No Temporary Road Alternative, less road use would occur under this alternative.

Action alternatives would have negligible effects to riparian and aquatic habitats; and low potential for disturbance, displacement, and potential injury/mortality to wildlife species utilizing riparian and aquatic habitats in the short term. Amphibians and reptiles which are not as mobile are more prone to mortality or injury from activities occurring within RCAs and riparian areas. Activities occurring within RCAs or riparian areas also have potential to disturb or displace species utilizing the areas and activities such as nesting, denning, or young rearing are more prone to adverse effects. Long-term effects would be dependent on species specific preferred habitats and critical habitat niches (e.g., nesting, young-rearing, denning sites, etc.) and post-project succession advancement and effects to riparian and aquatic habitats.

Overall, low potential for adverse effects from species mortality, injury, disturbance, and displacement is expected from implementation of the action alternatives. Low potential for adverse modification of riparian or wetland habitats is expected to occur from implementation of the action alternatives. Present riparian conditions and trends are expected to occur within the project area.

No Action

Under this alternative, none of the management activities proposed in the project would be implemented. No vegetation management actions (salvage timber harvest, tree planting) road use and maintenance, and road rehabilitation would occur.

No action alternative effects resulting in disturbance, displacement, mortality, or injury to riparian dependent species would occur.

Ecosystem functions and processes would continue to affect riparian and wetland habitat quality in the absence of new management activities with the affected subwatersheds. Stream reaches that experienced high or moderate severity burn effects from the 2012 Sheep Fire would be in early seral condition and more prone for adverse channel effects and infestations of invasive plant species. Natural recovery for riparian and wetland habitats would vary, dependent on burn severity and post-fire conditions. Regrowth of surviving vegetation and establishment of new vegetation from residual seedbanks are expected to restore protective ground cover, riparian structure, streambank stability, and stream shading over time. Some initial tree and shrub recovery (e.g., sprouting and seedlings) and herbaceous species revegetation would start to occur in the short term (one to five years), however, complete riparian functional condition recovery would be longer and is dependent of site specific factors identified above, particularly in regards to post-fire tree and shrub mortality.

Cumulative

Action alternatives in combination with the past, present, and foreseeable future actions would have localized direct and indirect cumulative effects on riparian and aquatic habitats, which may be utilized by riparian dependent species.

Timber harvest and salvage logging, prescribed burning, grazing, insect and disease epidemics, fires, fire suppression, and road construction and maintenance can cumulatively affect riparian/aquatic habitats and dependent species through soil compaction, changes in vegetative cover, altering stream channels, or by changing the quantity and quality of stream discharge.

The 2012 Sheep Fire has impacted stream channels and riparian habitats to varying levels, which is dependent on burn severity. Stream reaches with high and moderate burn severity have been converted to early seral habitats and are at higher risk for invasive species encroachment, erosion/sediment impacts, and channel scouring/streambank erosion.

Watershed restoration actions identified in the BLM *Sheep Fire Emergency Stabilization and Rehabilitation Plan* (ESR Plan) (USDI-BLM 2012) would occur. Actions identified in the ESR Plan include planting conifer trees and riparian trees and shrubs, and seeding desired species within RCAs.

Action alternatives are expected to result in negligible and minor effects to riparian/aquatic dependent species and habitats within the cumulative analysis area. It is unlikely that the proposed action alternatives would contribute to cumulative effects of past, present, and foreseeable future management actions on riparian/aquatic dependent species and habitats within the cumulative analysis area (e.g., project and watershed level).

Mature Forest, Late Seral – Old Growth Associated

Refer to section 3.2.8 *Wildlife Habitat Guilds – Late Seral – Old Growth Habitats and Dependent Species* for detailed discussion and analysis of effects of alternatives regarding habitat, dependent species, and cumulative effects. Section 3.2.1 *Vegetation* also provides additional information regarding analysis of effects and cumulative effects for forest vegetation.

Common to all Action Alternatives

Salvage harvest of only dead or dying trees are proposed, however, the exception included temporary road construction or cable yarding corridor clearing. Overall, salvage harvest is not expected to change the living green tree stand structure. However, removal of snags and reduction of large woody debris recruitment would potentially affect old forest desired dead wood characteristics (e.g., snags and down large woody debris). Snags and large down logs provide habitat and are important to old growth dependent species.

Salvage harvest occurring in high or moderate burn severity burn areas (high tree mortality – stand replacing fire impacts) would not affect mature forest or old forest characteristic stands, because these stands have been converted to early seral stands. Salvage harvest that potentially would affect large tree – old forest stands include salvage harvest that occurs in very low or low severity burn areas (mature forest). A total of 916 acres and 606 acres are proposed for salvage harvest under the Proposed Action Alternative and No Temporary Road Alternative, however, the majority of harvest would not occur in mature forest stands. Table 57 summarizes alternatives for salvage harvest, temporary road construction, and untreated areas that occur within mature timber stands within the project area.

Table 57. Comparison of Alternatives for Salvage Harvest and Temporary Road Construction Within Mature Forest Stands (Very Low or Low Severity Burn Effects) within Project Area

Alternative	Salvage Harvest Mature Forest Acres - %	Temporary Road Construction Mature Forest Miles (Acres)	Untreated Acres Mature Forest Acres - %
Proposed Action	231 – 30%	0.84 mile (2 acres)	534 acres – 70%
No New Temporary Road Construction	125 – 16%	0 mile	640 acres – 84%
No Action	0 acres – 0%	0 mile	765 acres – 100%

All salvage areas (action alternatives) are proposed for tree planting in addition to 52 acres not identified for salvage harvest. Within high and moderate severe burn areas (lacking seed source) it may be expected that tree planting may achieve desired future conditions up to 80 years faster than the areas not planted. Tree planting in these high and moderate burn severity areas could advance reforestation by 20 years, compared to no tree planting. However, areas that experienced low or very low severity burn effects would be expected to have adequate seed source and also pre- and post-fire stand conditions (seral condition) would be similar, except with more open canopy cover. Tree planting in these areas would supplement reforestation.

Action alternative activities occurring within or adjacent to mature – large tree stands have the ability to disturb or displace special status species utilizing the habitat. The primary impact would occur to species utilizing the habitat for nesting, denning, or young rearing. Project design measures identify that if an occupied raptor nest is located that a 350 to 450 foot non-disturbance or non-treatment buffer while nest is occupied (buffer may be modified by Biologist on potential for disturbance).

In summary, the primary potential effect to old forest characteristic stands is the removal of snags and potential large down wood which provide important habitat features within these stands. However, existing down wood would not be removed and snag criteria would be maintained to provide for legacy snag conditions.

No Action

This alternative would initially have no direct impacts on large tree stands, late seral or old growth habitats. Within the project area, these stands primarily experienced very low or low severity burn impacts from the 2012 Sheep Fire. No potential for disturbance or displacement to mature forest or old forest dependent species would occur. This alternative would maximize retention of large snags and down wood, which provides important wildlife habitat features for old forest and large tree stands. Snags and large down logs provide habitat and are important to old growth dependent species. In this alternative, all snags would be left standing and would benefit old growth depend species. Down logs will increase in untreated areas and dead standing trees will start to fall in the next several years.

Within moderate to high severity burn areas reforestation will be dependent on seed source availability and natural regeneration success. Consequently, areas lacking good seed source will not reforest as fast and begin succession towards mature and large tree stands.

Insects and disease would have varying levels of impact on mature – large tree stands.

Cumulative

Refer to section 3.2.8 *Wildlife Habitat Guilds – Late Seral – Old Growth Habitats and Dependent Species* and Section 3.2.1 *Vegetation* for analysis and cumulative effects.

<u>Early Seral Habitats</u>

Refer to section 3.2.8 *Wildlife Habitat Guilds – Early Seral Habitats and Dependent Species* for detailed discussion and analysis of effects of alternatives regarding habitat, dependent species, and cumulative effects. Section 3.2.1 *Vegetation* also provides additional information regarding analysis of effects and cumulative effects for forest vegetation.

Common to all Action Alternatives

The Proposed Action Alternative identifies that approximately 684 acres of salvage harvest would occur in high and moderate burn severity areas (75 percent of salvage units). The No Temporary Roads Alternative identifies 449 acres of salvage harvest would occur in high and moderate burn severity areas (74 percent of salvage units) (see Table 43). See Figures 16 and 17 for location of action alternatives salvage harvest activities that would occur on moderate and high severity burn areas.

Tree planting of moderate and high severity burn areas would include 736 acres for Proposed Action Alternative and 501 acres for the No Temporary Roads Alternative (see Table 51). These totals include tree planting only unit of 52 acres. Tree planting of these severe burn areas would advance reforestation and succession by 20 years. Lodgepole pine have serotinous cones, and these cones may persist unopened on the tree for years and only burst open during a forest fire which could also advance succession. Lodgepole pine is not a dominant tree species within salvage harvest units (approximately 2 percent by volume).

Under all action alternatives, salvage harvest would not change seral condtions but tree planting would advance succession rates at a faster rate to a mid-aged stands. Overall, habitat quality would improve for early seral dependent species such as the olive-sided flycatcher. Short-term beneficial effects would occur (e.g., 15 - 30 years), but with stand succession the amount of areas within the treatment and untreated areas would decline for early seral dependent species over time (reforestation and natural succession).

Salvage harvest would be completed within one year, consequently, disturbance and displacement of wildlife that are strongly associated with post-fire conditions would be affected the most. A variety of wildlife would utilize the area incidentally or for foraging, but some species would prefer more advanced succession in the high severity burn areas (e.g., grass, forb, seedlings, and shrubs). Primary effects from salvage logging include disturbance and displacement to species such as three-toed and black-backed woodpeckers. These woodpeckers are strongly associated with early post-fire conditions and they tend to select nest sites with the highest snag densities and the least amount of logging (Saab and Dudley 1997). They rapidly colonize stand-replacement burns within 1 to 2 years of a fire. Within the project area a large amount of areas would not have treatments, which would provide habitats for early seral and particularly post-fire dependent species.

No Action Alternative

No salvage harvest or temporary road construction would occur which would adversely impact snags and large woody debris habitats and species dependent on these post-fire habitats. Within high and moderate severe burn areas, no tree planting would occur, which would result in slower reforestation and succession to mid-aged and mature tree stands, which would be beneficial to early seral dependent species, but would be beneficial to species that prefer later seral condtions in the long term (e.g., mature forests). . The No Action Alternative would exceed BLM RMP standards for early seral habitats within the project area. This alternative provides the most early seral habitat for longer time periods. Most burned forest habitat and the greatest number of snags for primary and secondary cavity excavators. The alternative would also provide the highest tolerance level or assurance of habitat availability for all burned forest and cavity dependent species. All existing snags would be available in multiple size classes with variable densities. With the exception of areas along roads, minimizes potential for adverse disturbance or displacement of species that prefer early seral and particularly post-fire habitats (e.g., black-backed woodpecker).

Cumulative

Refer to section 3.2.8 *Wildlife Habitat Guilds – Early Seral Habitats and Dependent Species*

<u>Other BLM Sensitive Species and Preferred Habitats</u>

Gray Wolf

Common to all Action Alternatives

Salvage harvest, temporary road construction, and tree planting would have negligible effects on existing available cover and connectivity, causing a short-term reduction in EHE, and minimal effects to EHE in the long term (see Table 52). Overall, because only harvest of dead and dying trees is proposed changes to cover are minimal. However, dead and dying trees do provide some value for cover and removal will have slight reduction. Salvage harvest would also require the "opening up" of several road segments that were overgrown or had sloughing that restricted use by log trucks. Both action alternatives would slightly decrease elk habitat conditions long-term in the project area EAU, due mostly to modest reduction of cover and opening several roads. Both action alternatives are not proposing any changes to existing road use designations for public motorized use. A gate will be installed at the start of one road that was opened up for salvage harvest (see Figure 3).

The temporary increase of human activity in the project area associated with harvest and vegetative treatments could increase the possibility of human-wolf interactions. The construction and use of temporary roads and road use and maintenance would temporarily displace wolves and/or their prey. Disturbance of individuals during project implementation would not cause, or is unlikely to cause injury or decrease productivity, by substantially interfering with normal breeding, feeding, or rearing behavior. All current motorized access closure would be maintained as part of the proposed project. Temporary roads would be closed for public motorized use (when not being used for project implementation).

Based on the nature and duration of the proposed project, the mortality risk for wolves would remain low.

Prey base is assumed sufficient to support wolves if elk habitat effectiveness desired conditions are maintained. Elk Habitat Effectiveness (EHE) in the project area is currently 48 %. Short term effects would affect EHE the most during the short term, under the Proposed Action Alternative it would decline to 35% and under the No Temporary Road Alternative it would decline to 38%. Long term effects after salvage harvest activities are completed it would be 47% for both action alternatives.

No Action

No salvage harvest, temporary road construction, or related human disturbance would occur resulting in no EHE impact within the John Day EAU and no effects to elk and deer. Under this alternative, existing open road densities, access, and human intrusion effects would continue within the analysis area. Current risk levels of wildlife disturbance, displacement and potential mortality would remain unchanged in areas that are accessible by roads. No short-term disturbances from project implementation would occur and existing conditions and trends for security dependent species and habitats would continue. Even though slight, some reduction in cover would occur from salvage harvest of dead and dying trees. Over time, succession advancement would improve elk cover along roads that were in early seral condition primarily as a result of the 2012 Sheep Fire, which would be beneficial to gray wolves.

Increases in cover would occur with forest succession development in localized areas, which could result in a decrease in suitable forage areas in the long term, while elk security and cover would increase which would benefit gray wolves.

Cumulative

Refer to section 3.2.8 Wildlife Habitat Guilds: Elk and Security Dependent Species regarding cumulative effects to elk and other security dependent species, which is similar to cumulative effects for gray wolf.

Mountain Quail

The analysis criteria includes actions that impact riparian/shrub areas and forested shrub communities; road building and timber harvest potential effects to habitat fragmentation; and timber harvest and fuel treatments that affect nesting habitats and mountain quail during the nesting period

Common to all Action Alternatives

Salvage harvest of dead or dying trees is expected to have minimal adverse short term or long term effects to mountain quail. Primary potential activities to affect mountain quail would occur to actions occurring within the very low and low severity burn areas, refer to Table 43 and Figures 16 and 17. The Proposed Action Alternative identifies acres of harvest on low severity areas and the No Temporary Road Alternative identifies acres of harvest on low severity burn areas. Areas that had moderate to high burn severity burn impacts have degraded mountain quail habitat in the short term with the loss of protective shrub and tree cover and are not expected to provide optimum nesting habitat. No harvest activities would take place in RCAs, so these stands would remain relatively intact and available for potential mountain quail nesting habitat.

Tree planting would be beneficial for mountain quail, particularly in areas that had moderate or high severity burn effects. Refer to section 3.2.4 *Wetland and Riparian Habitats*, section 3.2.8 *Wildlife Habitat Guilds: Late Seral and Old Growth Habitats and Dependent Species and Early Seral Habitats and Dependent Species* for additional effects analysis from implementation of action alternatives.

No Action

This alternative would have no effects on forest and shrub habitats within the project area. Within the project area, these stands primarily experienced very low or low severity burn impacts from the 2012 Sheep Fire. No potential for disturbance or displacement to mountain quail would occur. Areas that experienced moderate or high severity burn effects would have slower reforestation if the areas are lacking seed source and no tree planting occurs. Natural succession would improve the area for mountain quail with shrub and conifer re-vegetation within the project area.

Cumulative

Refer to section 3.2.4 *Wetland and Riparian Habitats*, section 3.2.8 *Wildlife Habitat Guilds: Late Seral and Old Growth Habitats and Dependent Species and Early Seral Habitats and Dependent Species* for cumulative effects analysis for mountain quail.

3.2.12 Livestock Grazing

3.2.12.1 Affected Environment

Portions of the John Day (36284), John Day Mountain (36345), and Wet Gulch (36112) Allotments are within the project area. The portions of the allotments that burned in the Sheep Fire have been placed in non-use to allow for recovery of vegetation after the fire, this non-use corresponds to the period when harvest activities would occur. It is expected that vegetation will be recovered from fire and the allotments would be fully available for grazing use the fall of 2014. Ninety-five percent of the John Day Allotment's authorized animal unit months (AUM)s have been placed in non-use (171 out of 180). All 34 of the AUMs allocated in the John Day Mountain Allotment are in non-use status (100%). Eighty percent of the AUMs in the Wet Gulch Allotment are in non-use status (16 out of 20). The AUMs not in non-use status are to be harvested on non-burned portions of the allotments. Prior to the fire, grazing use within the portions of the Wet Gulch and John Day Mountain Allotments within the project area was minimal. Typically the use was occurring on roads and trails because the forest canopy precluded forage from growing in the understory. The John Day Allotment lessee typically utilized more of the allotment for grazing although use was mainly occurring on associated private lands and along roads, riparian areas and other flatter areas on BLM lands. A majority of this use occurred in the main John Day watershed with less use being made in the upper portions of the South Fork.

3.2.12.2 Direct and Indirect Effects of Alternatives

Proposed Action

Since the portions of the allotments occurring in the project area are currently in non-use status, harvest activities would not immediately impact the lessees. Grazing use on BLM lands where reforestation plantings are implemented would be modified longer term to ensure livestock grazing does not impact the successful re-establishment of tree seedlings if necessary. Once seedlings are planted, limited utilization (an average of less than 30% of available forage) would be allowed in planted areas until trees reach an average height of approximately 24 inches. Trees are expected to reach this height two to three years post planting. No placement of salt or supplements would be allowed within or adjacent to planted areas in order to reduce congregation of animals in areas where seedlings were planted. Lessees will have the 30% utilization criteria for reforested areas placed in their leases as a term and condition along with the requirement that livestock be removed from areas where seedlings have been planted once the utilization levels have been reached. They will also have a term and condition placed in their lease that prohibits the placement of salt or supplements within planted areas. If the utilization criteria does not avoid excessive damage to trees from livestock grazing or trampling, the planted areas may be fully closed to livestock grazing until the 24 inch height criteria is met. It is expected that seedlings would be planted the spring of 2015.

The lessee of the John Day Mountain and Wet Gulch Allotments has agreed to modify grazing use to accommodate reforestation efforts. Since use was minimal prior to the fire, this does not reflect a large change in livestock grazing as a result of the proposed action.

The John Day Allotment lessee would be impacted by implementation of reforestation efforts since grazing use would potentially be modified through 2018. Reforestation areas in cable harvest units would not be likely to receive grazing use at levels high enough to cause damage to seedlings as they are typically steeper. Livestock would be more likely to utilize less steep areas in tractor units and the use in these areas may need to be modified to assure reforestation efforts are successful. There are approximately 319 acres within tractor units in the John Day Allotment which account for approximately 11% of the allotment area (319 out of 2,820 acres). Implementation of herbicide treatments around seedlings would reduce forage around the trees and reduce potential conflict with grazing use. Since the herbicide would limit the amount of grass and forbs around the base of the seedling, animals would not be as likely to be in proximity to the seedlings looking for forage thereby reducing the opportunity for trampling or grazing damage. Since the forest canopy is reduced as a result of the fire and also from harvest it is expected that there would be a large increase in forage available for grazing. There are no current plans to increase the grazing allocation so the increase in forage may be ample enough to accommodate current levels of grazing use and maintain use levels in reforestation areas below the 30% utilization criteria, which triggers removal of livestock. These expected low levels of utilization and the fact that herbicide should reduce the amount of forage available around seedlings may allow attainment of reforestation goals without full closure of planted areas.

No New Temporary Road Construction Alternative

Impacts to the John Day Mountain and Wet Gulch Allotments would be the same as in the proposed action as temporary roads accessed harvest units in the John Day Allotment only. The same utilization standards and closures would be implemented for reforested areas in this alternative as those in the Proposed Action. As in the proposed action grazing use conflicts would be most likely in tractor harvest units that were planted as the topography is less steep. Given topography and proximity to areas where livestock grazing use has typically been made in the past, dropping unit 5-C-1, the only tractor unit accessed by temporary road, would reduce the tractor unit acreage to 199 acres within the John Day Allotment, approximately 7% of the allotment area (199 of 2,820 acres). This would reduce the potential to implement long-term grazing use modifications by about four percent (7% vs 11% of the total allotment area).

As described in the Proposed Action, the increase in forage expected as a result of the fire may provide ample forage to accommodate allocated grazing use while maintaining use levels above the 30% that triggers removal of livestock from the replanted areas.

No Action Alternative

Grazing use modifications would not be necessary in allotments due to no reforestation activities. In addition, since reforestation efforts would not be undertaken, there would be a longer-term increase in forage availability as it is expected that the coniferous forest species would not attain densities in the near future that would reduce the herbaceous component providing livestock forage. As described in the vegetation section, the project area may be maintained in a grass/forb/shrub state for as long as a century. This increase in forage availability may offer an opportunity for an increase in grazing use allocation on the allotments.

3.2.12.3 Cumulative Impacts

Removal of overstory species within the fire area will increase herbaceous components of the plant community resulting in ample forage for livestock grazing across all ownerships within the project area until the forest canopy begins to close. These post-fire effects on the understory plant community are expected to extend over the next 10 to 20 years, or until brush and saplings become large enough that they compete for resources and begin to shade the understory. Due to this increase in forage availability, there may be an increase in livestock grazed on private lands, and potentially requests to increase forage allocations on the BLM and IDL managed lands.

Within the next two years the BLM and IDL have instituted livestock grazing closures on lands under their management to allow for the recovery of vegetation post fire. Like BLM, IDL will be implementing measures to assure reforestation plantings are not damaged by livestock grazing. Private landowners may rest private lands for a short period in the spring of 2013 but will likely turn livestock out once ample forage is available. It is unknown what measures may be taken by private landowners to restrict grazing in areas where reforestation activities have taken place.

Restrictions on grazing use in reforested areas on BLM and IDL lands may impact lessees through the 2018 grazing season if it becomes necessary for livestock removal from those areas. This may result in increased time that livestock remain on private lands. It is expected that the increased forage on private lands would be ample to sustain this longer grazing period. If the lessees do not have enough forage on their private lands to provide livestock forage, they may need to purchase additional hay supplies or reduce their livestock herd temporarily. This would result in some additional economic hardship to the lessees.

3.2.13 Visual Resources

3.2.13.1 Affected Environment

BLM is required to manage public lands to protect their scenic values. To consistently evaluate its lands within their regional context, BLM developed the Visual Resource Management (VRM) program (Handbook H-8410-1; USDI-BLM 1986). Visual values are identified through VRM inventory and are considered with other resource values in the Resource Management Planning process. Visual management objectives are established in conformance with the land use allocations. These area specific objectives provide the standards for planning, designing, and evaluating future management projects. BLM uses the VRM process to manage the scenic quality of the landscape and to reduce the impact of development on the scenery.

Visual Resource Management classes (VRM) and the corresponding VRM objectives were established in CFO RMP in 2009. The Proposed Action and all alternatives fall within areas managed under VRM Class III and Class IV. Thirty five percent of the proposed harvest units are within Class III, while 65% are within Class IV. In general the portion of the project area classified as Class III has line of sight from Highway 95 at one or more locations. The remainder of the project area is not visible from Highway 95 and can only be viewed from within the project area or from opposing ridges accessed by steep mountain roads.

The Class III objective is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

The Class IV objective is to provide for management activities which requite major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance and repetition of the basic elements.
Two Key Observation Points (KOPs) were selected along commonly traveled routes or other likely observation points. Factors that influence KOPs are angle of observation, number of viewers, length of time area is in view, and season of use. KOPs for the project area are along Highway 95 and from the end of BLM road 2501 (Wet Gulch Road). Contrast ratings were then completed from the KOPs. A rating matrix is used to rate the degree of contrast by looking at basic features (i.e., landform/water, vegetation, and structures) and basic elements (i.e., for line, color, and texture). The impacts were evaluated considering a 5-year recovery period following the end of the project Class III areas can have a moderate contrast rating.

<u>Existing Condition</u>

Landforms within the project area are generally representative of the physiographic area. Steep, rocky terrain intermixed with rolling, burned forested hills intersected by perennial and intermittent streams and seeps, with expanses of open grassland form the basis of the landscape. The landscape type is common throughout the region. Typical views from ridge tops include foreground, middle ground if not obscured by landmass or vegetation, and background images. From valleys and river banks, the typical view is primarily foreground with occasional background images. Lines in the landscape are generally horizontal in nature, formed by the shape of the hills and differences in vegetative concentration and composition.

Vegetation is predominately Douglas fir, ponderosa pine and western larch interspersed with Spruce stands and riparian zones and meadows that are generally grassy with shrubs.

Black is the predominant color in the burned areas with small interspersed segments of various shades of green with incidences of browns due to high numbers of dead and dying lodgepole pine in areas that were not burned over. The natural texture of the vegetation is coarse in the foreground, evolving to smooth texture in the middle and background areas. Ridgeline Douglas-firs provide a bit of textural contrast in background areas.

The natural landscape in the area has been modified with various sizes of roads from Hwy 95 to old trail systems, structures, mining activities, and forest management activities occurring on private, IDL and USFS lands adjacent to the project area. The extent of these modifications are an indication that visitor sensitivity to change in the visual landscape is low, and acceptance to visual change in the landscape is high. Travel corridors in the project area are mainly along the stream and river system, limiting the amount of proposed activities that would be visible from high traffic areas. Most travel on the roads within the project area is occasional and is generally limited to those collecting forest products, hunting, and private land access.

The Sheep Fire resulted in a high degree of contrast alteration to the vegetation within the project area and surrounding areas. Color changed from green to black. The form and texture of the landscape were also altered to a more course texture and irregular form as a result of high severity burning which consumed needles and branches. . The effects of alternatives will be measured against the post-fire landscape.

3.2.13.2 Direct and Indirect Effects of Alternatives

Common to All Alternatives

No irreversible commitments are proposed under any of the alternatives. Visual vegetation changes are irretrievable but not irreversible as trees and other plant life would regenerate over time. The difference would likely be the amount of time changes would be predominate under each alternative.

Proposed Action

Under the proposed action the post-fire landscape provides moderate to extreme contrast across the visible landscape in comparison to the adjoining property owners harvested areas of affected timber. From the White Bird Battlefield Historic Overlook sharp edges can currently be seen from this activity. As harvesting activities on adjoining properties continue the contrast rating will increase dominating the characteristic landscape and will attract more attention than under current conditions. The proposed action would aid in blending line and form changes by diminishing the appearance of hard lines and vegetative contrasts on nearly 900 acres, including 320 acres of Class III, therefore resulting in a lower contrast between the proposed action and the activities occurring on the existing landscape. Vegetation would be sparser in the short term, however, in the long term as standing dead trees begin to fall and regenerated forests grow the contrast will lessen. Color would not change significantly in the short-term, although color, in the long-term would change from black to green as the planted forest becomes established. Temporary roads would not generally be visible from Highway 95. Temporary roads and skid trails within the project area would be located so that they are substantially hidden from view in the majority of the project area, and new construction would be put to bed upon completion of the project. Therefore structural contrast is considered low. The proposed action meets both Class III and Class IV VRM objectives.

No Temporary Road Construction Alternative

The effects of the no temporary road alternative would be the same as under the proposed action except that a higher percentage of the project would be in Class III. Under the No Temporary Road Alternative 43% of the project area would be managed as Class III and 57% managed as Class IV. The largest units of the proposed action that would be dropped in the no temporary road alternative are Class IV, thus increasing the portion of this alternative in Class III. Three hundred ten fewer acres would be disturbed and the degree of contrast would reflect that, especially from within the unit. Contrast from Highway 95 would not be noticeably different between the proposed action and no temporary road alternatives. The no temporary road alternative meets both Class III and Class IV VRM objectives.

No Action Alternative

The no action alternative would not result in any change to the contrast in the landscape as a result of this proposal. Contrast would still be ever changing as the forest recovers naturally over a long period of time. Sharp edges, color and texture would be visibly apparent from both observation points thereby defining BLM managed lands in stark contrast to adjoining properties. The no action alternative meets class III objectives in the long term and Class IV objectives in the long and short term.

3.2.13.3 Cumulative Impacts

Adjacent landowners are currently logging approximately 1000 acres of private land adjacent to the project area. This activity increases the contrast of the landscape as seen from both Highway 95 and from within the project area. Existing human-caused modification on adjacent lands renders the contrasts of the proposed project less noticeable than if they were to occur in a natural landscape. As vegetation is removed the texture will become increasingly discontinuous and clumped and the form will become increasingly patchy and complex as seen from Highway 95 and increasingly simplified as seen from within the project area. The proposed project has been designed to maintain or reduce the contrast rating according to RMP guidance; therefore, the project would not contribute substantially to the visual decline in landscape character cumulatively.

3.2.14 Air Quality

The analysis area for air quality includes the project area and the airsheds immediately surrounding it that may potentially be affected by smoke emissions. The project area is located in Idaho Airshed No. 13. The analysis of air quality includes identifying the adjacent and downwind airsheds of concern (Class I and non-attainment areas) and comparing the amounts of smoke and particulate matter to be produced as a result of the fuels treatment activities associated with each alternative

3.2.14.1 Affected Environment

The Clean Air Act requires that the Environmental Protection Agency (EPA) identify pollutants that have adverse effects on public health and welfare and to establish air quality standards for each pollutant. Each state is also required to develop an implementation plan to maintain air quality. The EPA has issued National Ambient Air Quality Standards (NAAQS) for sulfur dioxide, carbon monoxide, ozone, nitrogen dioxide, lead and particulate matter 10 microns in diameter or smaller (PM 10) and 2.5 microns and smaller (PM 2.5; Table 58). Idaho maintains similar standards for these pollutants.

Table 58. National Ambient Air Quality Standards for PM 10 and PM 2.5

$PM_{2.5}$	primary and secondary	Annual	15 µg/m^3	annual mean, averaged over 3 years
		24-hour	35 µg/m^3	98th percentile, averaged over 3 years
PM_{10}	primary and secondary	24-hour	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years

71 FR 61144, Oct 17, 2006

Section 176(c) (42 U.S.C. 7506) of the Clean Air Act (CAA) requires Federal agencies' actions to conform to any applicable State, Tribal or Federal implementation plans (SIP, TIP or FIP) [1] for attaining and maintaining the National Ambient Air Quality Standards (NAAQS). Prescribed fires conducted in accordance with a smoke management program (SMP) which meets the requirements of EPA's Interim Air Quality Policy on Wildland and Prescribed Fires or an equivalent replacement EPA policy are "presumed to conform" (40 CFR 93.153 (h)(4)).

Air quality associated with the Sheep Salvage Project analysis area is generally considered good to excellent most of the year. Local adverse effects result from dust from native-surfaced roads and smoke from prescribed burning, agricultural burning, and wildfires. Due to active fire suppression, current smoke emissions are significantly reduced from historical averages, especially during the wildfire season (Quigley and Arbelbide 1997).

The Environmental Protection Agency (EPA) determines airshed compliance defined by criteria pollutants. The Sheep Salvage Project analysis area is unclassified, but is considered by the BLM to be in compliance with the NAAQS. The closest non-attainment areas include McCall, Idaho (43 miles to the southeast), Salmon, Idaho (over 115 miles east), and Missoula, Montana (approximately 130 miles to the northeast). The average large-scale airflow is generally from a westerly direction throughout the year.

The Selway-Bitterroot Wilderness, 56 air miles to the northeast, and the Hells Canyon National Recreation Area, 5 air miles to the west, are the closest Class I areas to the project area. Class I areas receive the highest levels of protection under the Prevention of Significant Deterioration (PSD) program. All other areas, including the Sheep Salvage Project analysis area, are designated Class II areas.

3.2.14.2 Direct and Indirect Effects of Alternatives

Effects Common to the Action Alternatives

The Bureau of Land Management is a party to the North Idaho Smoke Management Memorandum of Agreement (MOA), which initiated the joint smoke management program with the state of Montana through the Smoke Management Monitoring Unit located in Missoula, Montana. This MOA can be found in the project file. The Operating Guide for the Montana/Idaho Smoke Management Group is based upon the Environmental Protection Agency Interim Air Quality Policy on Wildland and Prescribed Fires. The Smoke Monitoring Unit coordinates prescribe burn activities through meteorological scheduling in order to ensure that cumulative air quality impacts are minimized.

Air quality impacts due to prescribed fire smoke result from a combination of emission production and atmospheric dispersion (Sandberg et al. 2002). The emission of particulate matter is related to the method of burning conducted and how much of each method is conducted. Dispersion is dependent on meteorological conditions including seasonality, large-scale prevailing wind patterns, atmospheric stability, and local terrain-influenced weather patterns. The Smoke Monitoring Unit utilizes dispersion forecasts as a tool for making daily burn recommendations to members of the MT/ID Smoke Management Group.

Landing pile burning would be used for activity created fuels. This type of burning concentrates slash in specific locations, slash is gathered and piled mechanically at a landing site. Piles are burned after a season of curing when the fuel moistures are low resulting in efficient combustion, thus lessened particulate matter. This type of burning has lower potential to affect air quality compared to broadcast burning.

Smoke from pile burning activities would temporarily affect air quality for a period of one to four days following treatment depending on climatic events. Dust generated from related mechanical operations would also temporarily affect air quality. Transporting material would be the largest source of dust released into the air. The release of fugitive road dust would be minimized by dust abatement practices during log hauling activities

Table 59. Estimated* smoke emissions (tons) from pile burning.

	Proposed Action	No Temporary Road Construction Alt
PM 10	76	60
PM 2.5	65	51

***** *Piled Fuels Biomass and Emissions Calculator (http://depts.washington.edu/nwfire/piles)***

Particulate matter released into the air as a result of prescribed burning can have adverse effects on visibility and public health. Local residents and the Highway 95 corridor may be impacted in the evenings immediately following prescribed burn operations, as large diameter fuels continue to smolder and downslope/down valley winds push residual smoke into the valley bottoms. The amount and duration of these smoke impacts should be limited by limiting the acres burned at one time, by scheduling ignitions early in the day to allow for more complete combustion during daytime conditions, and by planning the ignition to occur prior to a precipitation event that would extinguish the residual fire. During ignition operations, daytime heating as well as the heat created by the burn itself will lift smoke above the ridge with prevailing winds carrying the smoke northeast away from any impact zones.

No Action

There would be no direct effects on the existing condition of air quality from this alternative because no prescribed burning would occur. No particulate matter would be produced and visibility would not be impaired due to prescribed burning.

3.2.14.3 Cumulative Impacts

The cumulative effects area for air quality is Airshed 13. Consideration of cumulative effects for air quality takes a different approach than for other resources. Past activities in the analysis area don’t necessarily require consideration because the temporal period of interest is related primarily to a regulatory standard, ranging generally from a 24 hour period peak to annual mean (Sandberg et al 2002, and 40 CFR Part 51), except in the sense that use of existing roads and facilities may contribute to fugitive dust levels as described above. Present use of and activities in the analysis area are continuing with a current assessment of good to excellent air quality based on EPA compliance.

All action alternatives would affect air quality. Locally adverse and cumulative impacts to air quality could be expected if extensive prescribed burning, particularly if that burning occurred in conjunction with on-going wildfires or other prescribed burning activities in and adjacent to the airshed. Timber salvage activities on private property, State of Idaho, and Forest Service land in the Sheep Fire area (listed in section 3.1.2) may result in pile burning activities in the same time frame as this project. However, design measures and procedures outlined in the North Idaho Smoke Management Memorandum of Agreement are intended to increase the efficiency and effectiveness of communications about, and coordination of, prescribed burning to avoid adverse cumulative effects.

3.2.15 Socio/Economic Resources

3.2.15.1 Affected Environment

The economic analysis for the project will focus on those costs and revenues associated with implementation of each of the proposed alternatives. The project specific area is located within Idaho County; however, Adams County is near to the project and it is likely that at least some of the purchasers and/or contractors would either be from Adams County or do business in Adams County. Two primary processing facilities for timber products likely to be interested in the project are, one in Tamarack (approximately 52 miles) and the other in Grangeville (approximately 35 miles), Idaho. There are several regional service contractors within 200 miles that could be impacted. The purpose of the economic analysis is to display potential costs and revenues associated with implementation of the alternatives for comparison purposes.

Information comes from the Idaho Department of Labor Work Force Trends (December 2012). "Idaho County's economy remains heavily dependent on natural resources — both forest products and agriculture. The U.S. Forest Service employs more than 300 people. One in eight of the county's private sector jobs is in logging or wood products manufacturing. Unfortunately, the decrease in U.S. housing starts depressed lumber prices, forcing local mills to reduce employment. The county lost more than 150 logging and mill jobs in 2008 and 2009. Many of those jobs returned in the last two years. Other manufacturers continued to expand job opportunities. Although graced by mountains, forests and rivers, the county is just beginning to fully tap its tourism potential. Over the last few years, the Super 8 Motel in Grangeville, Salmon Rapids Lodge in Riggins and a $4 million retreat center and a bed and-breakfast at St. Gertrude's Monastery near Cottonwood have opened. Toward the end of 2010, the county started showing significant signs of recovery. Some of the improvement resulted from a stabilizing lumber market and some from higher wheat and other commodity prices, which allowed farmers to increase their spending. Many small manufacturers have been hiring during recent months." The report notes that Idaho Forest Group is the second largest employer in the County.

"Adams County's labor force has fluctuated between 1,800 and 2,100 for the past 10 years. The largest spike was caused by the influx of people to work on the Tamarack Resort and the surrounding developments in 2006. After the resort shuttered its doors, nothing has come in to take its place. The unemployment rate reached a 10- year low in 2007 of 5.4 percent and then began ballooning — from 10 percent in 2008 to over 17 percent in 2011. Employment has declined steadily since 2006 with the exception of a small bump in 2009. Employment in 2011 was 24 percent below the county's 2006 high. Over the decade the greatest declines have occurred in the construction and government sectors, which lost almost 130 jobs between them. For the construction sector, that accounts for 66 percent of its total employment in 2001. Not all industries have declined since 2001. Professional and business services as well as the education and health care sectors posted modest gains—around 100 jobs between them. This isn't enough to offset the other industries losses though." The report notes that Tom Mahon Logging Inc. is the sixth largest employer in the County.

3.2.15.2 Direct and Indirect Effects of Alternatives

Only direct costs and revenues are considered in the analysis for the project. Non-market values such as hunting and dispersed recreation were not considered. There may be some temporary displacement of these activities during project implementation; for example, users could hunt and recreate in other areas of BLM and adjacent Nez Perce National Forest during harvest activities. Upon completion of project activities, hunting and recreation is expected to return to present levels.

Common to All Action Alternatives

Local Employment

Local employment would be directly and indirectly impacted by all action alternatives. It is difficult to determine the extent of new jobs created, but with current unemployment at 18.6 percent in Adams County and 11.2 percent in Idaho County (Idaho Department of Labor, November 2012), employment opportunities that may result from project implementation include:

- forest products (including harvest, transportation and milling)
- reforestation (seedlings, planting)
- road construction/maintenance.

Secondary economic activity would also be supported indirectly through implementation of any action alternative. This would be related to suppliers of equipment and fuel, repairs, lodging, etc.

It is anticipated that the No New Temporary Roads Alternative would yield approximately 55% of the new jobs the proposed action would based proportionally on the costs of implementation of the action alternatives. Jobs at sawmills are unlikely to be considered new jobs, however, added volume may mean shorter shut-down periods or fewer layoffs at other times of the year. Similarly loggers and truck drivers would have more work lined up and fewer down times.

Revenues and Costs to the Government

The implementation of an action alternative has the potential to directly affect associated revenue and costs. The top portion of Tables 60 and 61 display the revenue and costs associated with the harvest activities and the bottom portion displays the rehabilitation activity and its associated cost. This information provides an estimate only and can be used as a relative comparison tool of the economic impact of each alternative.

The information in Tables 61 and 62 displays the net value (all implementation costs minus revenues). They illustrate the full project implementation of any of the alternatives would necessitate the expenditure of appropriated monies. The differences between alternatives are primarily the result of the number of acres harvested.

Table 60. Revenue and Costs of Implementation-Proposed Action

Item	Cost/Unit	Units	Costs	Revenue
Timber/Fuels Treatment Activities				
Delivered Log Revenue (tons)	$43.65	80,007		$3,492,286
Tractor Logging (tons)	$30.95	44,350	$1,372,628	
Cable/Skyline Logging (tons)	$38.10	28,790	$1,096,886	
Short Cable Logging (tons)	$34.00	6,867	$233,480	
Reforestation (acre)	$171	968	$165,528	

Item	Cost/Unit	Units	Costs	Revenue
Timber/Fuels Treatment Activities				
Temporary Road Construction & Decomm. (miles)	$11,722	2.28	$26,726	
Minor Reconstruction (miles)	$4,065	6.72	$27,317	
Rehabilitate Existing Road (miles)	$4,435	4.76	$21,110	
Subtotal			**$2,943,675**	
Net Revenue				**$548,611**

Table 61. Revenue and Costs of Implementation-No Temporary Road Alternative

Item	Cost/Unit	Units	Costs	Revenue
Timber/Fuels Treatment Activities				
Delivered Log Revenue (tons)	$43.65	45,536		$1,987,660
Tractor Logging (tons)	$30.95	31,007	$959,652	
Cable/Skyline Logging (tons)	$38.10	9,331	$355,498	
Short Cable Logging (tons)	$34.00	5,119	$176,771	
Reforestation (acre)	$171	658	$112,518	
Temporary Road Construction & Decomm. (miles)	$0	0	$0	
Minor Reconstruction (miles)	$4,065	6.72	$27,317	
Rehabilitate Existing Road (miles)	$4,435	4.76	$21,110	
Subtotal			**$1,652,866**	
Net Revenue				**$334,794**

Other Economic Effects

Grazing and recreation-based services also provide economic inputs to the local economy, but they are very minor relative to the values of the forest products and rehabilitation treatments. Current grazing levels and recreation-based economic activities would not be appreciably affected by implementation of any alternative.

No Action

Local Employment

Local employment could be directly or indirectly impacted by the No Action Alternative. This alternative harvests no timber, generates no revenues, and incurs no expenses from fuels reduction treatments. No jobs or individual income are generated. The only expense incurred with no action alternative is the cost of preparing the environmental analysis.

No action results indirectly in a lost opportunity for commercial timber harvest for a complete rotation of timber harvest, which could be as long as 150 years or more. The indirect effect would be the lost employment potential of managing the current forest stands and the risk of a stand replacing fire that should it occur extends the timeframe to the maturity of the next generation approximately 100 years.

Revenues and Costs to the Government

The No Action Alternative, by foregoing implementation of timber harvest and the development and rehabilitation package would result in no change to the current revenue production or expenditures. The timber volume proposed in the project would be part of the BLM's allowable sale quantity of 46.9 million board feet per 15 year planning period. If the sale is not offered, the BLM's planned volume for the year in which the sale was to occur may decline, affecting local and regional economies. Changes in harvest levels translate into changes in timber industry employment and income levels.

3.2.15.3 Cumulative Impacts

Cumulative effects of individual projects are difficult to quantify. Private lands will continue to produce forest products, but the rate of harvest is largely dependent on the landowner's circumstances and is unpredictable. The Nez Perce National Forest as well as the Idaho Department of Lands administers some of the adjacent lands. Currently the Nez Perce National Forest is planning on salvage harvest of nearly 1500 acres within Idaho County. Idaho Department of Lands is currently salvaging timber from the Sheep Fire and is expected to continue harvesting within Adams and Idaho Counties at a rate similar to what they harvest now. Reduced funding for federal agencies may reduce the number of timber sales and other projects brought forward by the agencies in the coming years. Tourism to Adams and Idaho Counties will continue to bring people into the area, as will hunting and fishing activities. As the economy continues to improve the forest products industry will likely expand and new businesses may be seen in the rural communities within the analysis area. This project, combined cumulatively with other projects will contribute to a positive impact on socio/economic resources.

3.2.16 Health and Safety

3.2.16.1 Affected Environment

Health and Safety is being analyzed in relation to the use of hexazinone herbicide in reforestation efforts. The herbicide will likely be used in a granular form around some seedlings in an approximate 4-foot diameter circle. Precipitation dissolves the granular pellets releasing the herbicide into the soil where it is available for uptake into actively growing plants via the roots. The use of herbicides involves potential risk or the perception of risk to workers and members of the public living or engaging in activities in or near herbicide treatment areas.

3.2.16.2 Effects of Alternatives

Proposed Action

Beginning on page 4-184, volume 1 of the Programmatic EIS for Vegetation Treatments on BLM Lands in 17 Western States (Vegetation EIS), human health risks of hexaxzinone were summarized (USDI-BLM 2007a). Human Health Risk Assessments (HHRA) were utilized to evaluate potential risks to humans from exposure to the herbicide active ingredients. The main potential impact associated with the use of hexazinone herbicide in a granular formulation is exposure to the product by applicators. Once the herbicide is incorporated into the soil it is relatively unavailable for public exposure. A hexazinone product label notes the product is corrosive and cautions about eye damage. Most clinical reports of herbicide effects are of skin and eye irritation.

The greatest risk for occupational exposure in the proposed action is when the worker must directly handle the product during application. Occupational exposure can occur either through skin contact, eye exposure, or inhalation of the material. Adherence to operation safety guidelines such as the use of personal protective equipment (PPE) as required by the label, equipment checks to make sure the equipment is functioning properly, and correct application techniques are all ways to limit these exposures. Accidental ingestion is a less common route of entry for herbicide exposure. Examples of this exposure include someone drinking from a food or drink container in which herbicides have been improperly stored or improper personal hygiene, such as not washing your hands before eating. The Vegetation EIS notes low risk categories for occupational receptors with accidental exposure to hexazinone mixed for the maximum application rate via contaminated gloves and spills on the lower legs.

In the proposed action public receptors would most likely be exposed to hexazinone by entering areas soon after treatment. Since the herbicide is taken into the plant from the root, exposure from eating berries or other foods which have been treated is not a likely exposure scenario. The Vegetation EIS noted that at the typical application rate, there is low modeled risk potential for exposure to hexazinone under the following scenarios: direct spray of the entire body, acute consumption of water contaminated by a spill, and acute consumption of contaminated fish by the general public and subsistence populations. It is unlikely that these public exposures would occur.

A thorough discussion of human health and safety can be found in the Vegetation EIS pages 4-174 through 4-196. Please refer to the document for additional information.

No New Temporary Road Construction Alternative

Because 310 fewer acres would be reforested there would be fewer acres potentially treated with hexazinone and therefore even less potential for exposure by the public. Risk to applicators would be approximately the same as the proposed action as they would be handling the product directly.

No Action

Since no reforestation would occur, there would be no hexazinone used and therefore no risk to occupational or public receptors from exposure to the herbicide.

3.2.16.3 Cumulative Impacts

It is currently unknown the extent to which private and state logging operations will be using herbicides following harvest operations. It can be anticipated that some use of the herbicide hexazinone will occur in the analysis area. The analysis under the proposed action would hold true for private and state land as well, as we can anticipate other entities using the herbicide in accordance with the manufacturer's label. However, more acres may be treated which may increase the slight risk of human exposure.

3.3 Mitigation and Monitoring

Mitigation and monitoring measures are described as environmental design features in the action alternatives.

4 CONSULTATION AND COORDINATION

4.1 Persons, Groups or Agencies Consulted

4.1.1 Coordination with Other Agencies

Consultation under section 7 of the Endangered Species Act is ongoing for ESA-listed wildlife and fish. BLM coordinated with NOAA Fisheries and USFWS biologists in preparing a biological assessment specific to the Proposed Action. The BLM is now conducting formal consultation with NOAA Fisheries and USFWS. A biological opinion is expected in June 2013. A BLM decision will not be issued prior to receiving a Biological Opinion from NOAA fisheries and USFWS.

Consultation under section 106 of the National Historic Preservation Act with the Idaho State Historic Preservation Office was completed in November, 2012.

4.1.2 Native American Consultation

The BLM sent a letter describing the proposal to the Nez Perce Tribe on November 13, 2012, and a formal consultation letter on December 13, 2012. Coordination with the Tribe via letters did not identify any concerns for traditional cultural properties or their ability to exercise treaty rights.

4.2 Preparers

BLM Cottonwood Field Office
Zach Peterson (Team Lead), Forest Vegetation, Socio Economic
Kristen Sanders, Fire/fuels, Air Quality
Craig Johnson, Riparian Habitats; Aquatic Resources; Wildlife/Habitat; Special Status Species
Lynn Danly, Invasive Species, Livestock Grazing, Health and Human Safety
Mark Lowry, Special Status Plants
David Sisson, Cultural Resources
Judy Culver, Recreation, Visual Resource Management, Transportation
Scott Pavey, Planning and Environmental Coordinator
Mike Stevenson, Soils, Water Resources

4.3 Distribution

This EA will be available from the Idaho BLM public internet site at:

https://www.blm.gov/epl-front-office/eplanning/nepa/nepa_register.do

Copies may be requested by calling or visiting the BLM office in Cottonwood (208-962-3245).

A notice of availability will be sent to the following interested entities that commented during scoping and/or requested one.

Individuals
Lilian Kashmitter
Mike Cereghino
Samuel McGee
Dick Artly
Carolyn Dixon-Hegvet
John Borkoski
Gary Hegvet
Robert Miotke
Robin Courtright
Richard Halligan
Prospero Gomez
Stephen Orth
Christopher Wood
Leslie Caputo
John Sincleir
Rodney Larson
James Koby
Vernon Kapusta
Donald Van Cleave
Calvin Family Trust
John Basye
Andrea Bergin
Dick Lewis
Jim Rupp
Estil Hunt

Businesses
Camp 34 LLC
Idaho Forest Group
Blue North Forest Products
Evergreen Forest

Non-Governmental Organizations

Wild West Institute
Idaho Conservation League
Friends of the Clearwater
American Forest Resource Council
Rocky Mountain Elk Foundation

Federal, State and Local Governmental Agencies
NOAA Fisheries, Boise ID
NOAA Fisheries, Grangeville ID
U.S. Fish and Wildlife Service, Boise ID
U.S. Forest Service, Nez Perce National Forest, Grangeville, ID
Idaho Department of Environmental Quality, Lewiston ID
Idaho Department of Fish and Game, Boise ID
Idaho Department of Fish and Game, McCall, ID
Idaho Department of Lands, McCall, ID
Idaho State Historic Preservation Office, Boise, ID

Tribes
Nez Perce Tribe, Lapwai, ID

Elected Officials
James Rockwell, Chairman, Idaho County Commissioner, Grangeville ID
Jim Chmelik, Idaho County Commissioner, Grangeville ID
Skip Brandt, Idaho County Commissioner, Grangeville ID
Rep. Raúl R. Labrador, First Congressional District, Idaho
Rep. Mike Simpson, First Congressional District, Idaho
Senator Mike Crapo, Idaho
Senator James E. Risch, Idaho

REFERENCES

Altman, B. 1997. Olive-sided flycatcher in western North America: Status review. USDI U.S. Fish and Wildlife Service, Portland, OR.

Altman, B. 2000. Conservation Strategy for Landbirds in the Northern Rocky Mountains of Eastern Oregon and Washington. American Bird Conservancy and Oregon-Washington Partners in Flight [Available online at http://community.gorge.net/natres/pif/con_plans/north_rocky/north_rocky_page1.html

Barrett, S.; Havlina, D.; Jones, J.; Hann, W.; Frame, C.; Hamilton, D.; Schon, K.; Demeo, T.; Hutter, L.; and Menakis, J. 2010. Interagency Fire Regime Condition Class Guidebook. Version 3.0 [Homepage of the Interagency Fire Regime Condition Class website, USDA Forest Service, US Department of the Interior, and The Nature Conservancy]. [Online], Available: http://www.frcc.gov/.

Belt, H.T., T. Merill, and J. O'Laughlin. 1992. Design of forest riparian buffer strips for the protection of water quality: analysis of scientific literature. Idaho Forest, Wildlife, and Range Policy Analysis Group. Report No. 8. 39 p.

Beschta, R.L. 1978. Long-term patterns of sediment production following road construction and logging in the Oregon Coast Range. Water Resources Research, 14(6):1011-1016.

Beschta, R.L., C.A. Frissell, R. Gresswell, R. Hauter, J.R. Karr, G.W.. Marshall, D.A. Perry, and J.J. Rhoads. 1995. Wildfire and salvage logging: recommendations for ecologically sound post-fire salvage logging and other post-fire treatments on federal lands in the west. Pacific Rivers Council, Portland, OR.

Beschta, Robert L., J.J.Rohodes, Kaufman, J.B., Gresswell, R.E., Minshall, G.W., Karr, J.R., Perry, D.A., Hauer, F.R., and Frissell, C.A. 2003. Post-fire management on forested public lands of the western United States. *Conservation Biology* 18, 957-967.

Bevis, K.R. 1994. Primary cavity-excavator birds in managed and unmanaged grand fir forest habitats of central Washington's east Cascades. MS thesis, Central Washington University, Yakima, WA.

Bilby, R.E. 1984. Removal of woody debris may affect stream channel stability. Journal of Forestry 82:609-613. p. 611.

Bjornn, T.C., and D.W. Reiser. 1991. Habitat requirements of salmonids in streams. In: Influences of forest and rangeland management of salmonid fishes and their habitats. Meehan, editor. American Fisheries Society Special Publication 19, Bethesda, MD.

Bock, C.E. 1970. The ecology and behavior of the Lewis' woodpecker (*Asyndesmus lewis*). University of California Publication of Zoology 92:1-100.

Bragg, Don C.; Kershner, Jeffrey L.; Roberts, David W. 2000. Modeling Large Woody Debris Recruitment for Small Streams of the Central Rocky Mountains. Gen. Tech. Rep. RMRS GTR-55. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain ResearchStation. 36 p.

Brand, C.J. and L.B. Keith. 1979. Lynx demography during a snowshoe hare decline in Alberta. Journal of Wildlife Management 43(4):827-849.

Brand, D.J., L.B. Keith, and C.A. Fischer. 1976. Lynx responses to changing snowshoe hare densities in Alberta. Journal of Wildlife Management 43(4):827-849.

Brazier, J.R. and G.W. Brown. 1973. Buffer strips for stream temperature control. Research Paper 15. Forest Research Laboratory, School of Forestry, Oregon State University, Corvallis, OR, p. 1.

Brennan, L.A. 1990. What happened to the mountain quail in Idaho? Quail Unlimited Magazine 9:42-43, 69.

Brennan, L.A. 1994. Broad-scale population decline in four species of North American quail: an examination of possible causes. Pages 44-50 *In* Sustainable Ecological Systems: Implementing an Ecological Approach to Land Management. USDA Forest Service Gen. Tech. Rep. RM-247. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Broderson, J.M. 1973. Sizing buffer strips to maintain water quality. University of Washington, Seattle, WA.

Brown, G.W. 1983. Forestry and water quality. P. 74. In: MacDonald, L.H., A.W. Smart, and R.C. Wissmar. 1991. Monitoring guidelines to evaluate effects of forestry activities on streams in the Pacific Northwest and Alaska. United States Environmental Protection Agency. EPA/910/9-91-001.

Bull, E.L. 2006. Sexual differences in the ecology and habitat selection of western toads (Bufo boreas) in northeastern Oregon. Pacific Northwest Research Station La Grande, OR.

Bull, E.L. 2002. The value of coarse woody debris to vertebrates in the Pacific Northwest. U.S. Dept. of Agriculture Forest Service Gen. Tech. Rep. PNW-GTR-181.

Bull, E.L.; C.G. Parks; and T.R. Torgensen. 1997. Trees and logs important to wildlife in the interior Columbia River basin. USDA For. Serv. Gen. Tech. Rep. PNW-GTR-391. USDA-Forest Service, Pacific Northwest Research Station, Portland, OR. 55 p.

Bull, E.L., Peterson, S.R., and J.W. Thomas. 1986. Resource partitioning among woodpeckers in northeastern Oregon. PNW-444. Portland, OR. USDA, Forest Service, Pacific Northwest Research Station. 19 p.

Buskirk, S.W., and L.F. Ruggiero. 1994. American marten. U.S. For. Serv. Gen. Tech. Rep. RM 254. pp. 7-37.

Burroughs, E.R. Jr., and B.R. Thomas. 1977. Declining root strength in Douglas-fir after felling as a factor in slope stability. Research paper INT-190. Ogden, UT: Intermountain Forest and Range Experiment Station, USDA Forest Service.

Burroughs, E.R., and J.G. King 1985. Surface erosion control on roads in granitic soils. Proceedings, symposium sponsored by Committee on Watershed Management/Irrigation & Drainage Division, American Society of Civil Engineers; 1985 April 30 – May 1, Denver, CO; New York. American Society of Civil Engineers: 183-190.

Burroughs, E.R., and J.G. King. 1989. Reduction of soil erosion on forest roads. General Technical Report INT-264, U.S. Department of Agriculture, Forest Service, Ogden, UT.

Chamberlin, T.W., R.D. Harr, and F.H. Everest. 1991. Timber harvesting, silviculture, and watershed processes. American Fisheries Society Special Publication 19: 181-205.

Chapman, D.W., and K.P. McLeod. 1987. Develop of criteria for fine sediment in the Northern Rockies Ecoregion. U.S. Environmental Protection Agency, EPA Report 910/9-87-162, Washington, DC.

Chatwin, S.C., D.E. Howes, J.W. Schwab, and D.N. Swantson. 1994. *A guide for management of landslide- prone terrain in the Pacific Northwest*, 2nd ed. Victoria, BC: Research Program, Ministry of Forests.

Cherry, J., and R.L. Beschta. 1989. Coarse woody debris and channel geomorphology: a flume study. P. 127. In: MacDonald, L.H., A.W. Smart, and R.C. Wissmar (1991), Monitoring guidelines to evaluate effects of forestry activities on streams in the Pacific Northwest and Alaska. United States Environmental Protection Agency. EPA/910/9-91-001.

Clough, L.T. 2000. Nesting habitat selection and productivity of northern goshawks in west-central Montana. M.S. thesis, University of Montana, Missoula, MT. pp. 67-68.

Covert, S.A., P.R. Robichaud, W.J. Elliot, and T.E. Link. 2005. Evaluation of runoff prediction from WEPP-Based Erosion Models for Harvested and Burned Forest Watersheds. American Society of Agricultural Engineers Vol 48(3).

Crocket, R.B. 1975. Ecology and behavior of the Williamson's sapsucker in Colorado. Ph.D. dissertation , University of Colorado, Boulder, CO. 137 p.

Crockett, A.B., and H.H. Hadow. 1975. Nest site selection by Williamson and red-naped sapsuckers. Condor 77 (3): 365–368.

Dixon, R.D. 1995a. Ecology of White-headed woodpeckers in the central Oregon Cascades.

M.S. Thesis, Univ. Idaho, Moscow, ID.

Dixon, R.D. 1995b. Density, nest-site and roost characteristics, home-range, habitat-use, and behavior of white-headed woodpeckers; Deschutes and Winema National Forests, Oregon. Oregon Department of Fish and Wildlife Nongame Report No. 93-3-01.

Dobkin, D.S. 1994. Conservation and management of neoptropical migrant birds in the Northern Rockies and Great Plains. University of Idaho Press, Moscow, ID. 220 pp. p. 4–5.

Doerr, S.H., R.A. Shakesby, and L.H. MacDonald. 2013. Soil water repellency: a key factor in post-fire erosion? Accepted for publication in Cerda, A. and Robichaud, P. (Eds) *Restoration Strategies after Forest Fires*. (in press).

Dunne, T., and L.B. Leopold. Water in Environmental Planning. W. H. Freeman, New York, 1978. ISBN 0-7167-0079-4. R. H. McCuen. Hydrologic Analysis and Design.

Dykstra P. and M. Curran.2002. Skis road recontouring in British Columbia: 7-year tree growth results. Res. Br. B.C. Ministry for Victoria, B.C. Tech Rep. 001.

Elliot, W.J., D.E. Hall, and D.L. Scheele. 2000. Disturbed WEPP (Draft 02/2000). WEPP Interface for Disturbed forest and Range Runoff, Erosion and Sediment Delivery. Technical Documentation. USDA Forest Service. Rocky Mountain Research Station and San Dimas Technology and Development Center.

Erman, D.C., J.D. Newbold, and K.B. Roby. 1977. Evaluation of streamside buffer strips for protecting aquatic organisms. California Water Resources Center Technical Completion Report. Number 165. p. 36.

Everett, R., J.Lehmkuhl, R. Schellhaas, P.Ohlson, D.Keenum, H.Riesterer,and D.Spurbeck. 1999. Snag dynamics in a chronosequence of 26 wildfires on the east slope of the Cascade Range in Washington State, USA. International Journal of Wildland Fire 9(4):223-234.

Fannin, R.J., G.D. Moore, J.W.Schwab, and D.F. VanDine. 2007. The Evolution of forest practices associated with landslide management in British Columbia: Part II.

FERC (U.S. Federal Energy Regulatory Commission). 1986. John Day Creek Project. U.S. Federal Energy Regulatory Commission, Project No. 5865-002, Washington, DC.

Frederick, G.P. and T.L. Moore. 1991. Distribution and habitat of white-headed woodpeckers in west-central Idaho. Conservation Data Center, Idaho Department of Fish and Game, Boise, ID. 32 p.

Frenzel, R.W. 2004. Nest-site occupancy, nesting success, and turnover rates of white-headed woodpeckers in the Oregon Cascade Mountains in 2004. Audubon Society of Portland, Oregon Department of Fish and Wildlife, Bureau of Land Management, and U.S. Forest Service, Portland, Unpubl. Report. 35 p.

Furniss, M.J., T.D. Roelofs, and C.S. Yee. 1991. Road construction and maintenance. Pages 297 324 in W.R. Meehan, editor. Influences of forest and rangeland management on salmonid fishes and their habitats. Amer. Fish. Soc , Spec. Pub. 19, Bethesda, MD.

Gardner, R.B. 1979. Some environmental and economic effects of alternative forest road designs. Transactions of the American Society of Agricultural Engineers. 22:63-68.

Garrett, K.L., M.G. Raphael, and R.D. Dixon. 1996. White-headed woodpecker (*Picoides alborarvatus*). In The Birds of North American, No. 252 (A. Poole and F. Gill eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC.

Gentry, F.J. and K.T. Vierling. 2007. Old burns as source habitats for Lewis's woodpeckers in the Black Hills of South Dakota. Condor 109:122-131.

Gibbons, D.R., and E.O. Salo. 1973. An annotated bibliography of the effects of logging on fish of the Western United States and Canada. In: U.S. Dept. of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, OR.

Grable, A.R. 1971. Effects of compaction on content and transmission of air in soils. In: Barnes, K.K., W.M. Carleton, H.M. Taylor, R.I. Throckmorton, and G.E. Van den Berg, eds. Compaction of agricultural soils. Monograph 1, St. Joseph, MO: American Society of Agricultural Engineers: 154-164.

Grant, G.E., S.L. Lewis, F.J. Swanson, J.H. Cissel, and J.J. McDonnell. 2008. Effects of forest practices on peak flows and consequent channel response: a state-of-science report for western Oregon and Washington. Gen. Tech. Rep. PNW-GTR-760. U.S. Dept. of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR. 76 p.

Gray, D.H., and W.F. Megahan 1981. *Forest Vegetation removal and slope stability in the Idaho Batholith.* Research paper INT-271. Ogden, UT: Intermountain Forest and Range Experiment Station, USDA Forest Service.

Greacen, E.L., R. Sands. 1980. Compaction of forest soils: a review. Australian Journal of Soil Research. 18:163-189.

Gregory, S.V., G.A. Lambertti, D.C. Erman, (and others). 1987. Influences of forest practices on aquatic production. Pp. 233-256 In: Salo, E.O., T.W. Cundy eds. Streamside management: forestry and fishery interactions. Contribution 57. Institute of Forest Resources, University of Washington, Seattle, WA.

Groves, C., B. Butterfield, A. Lippincott, B. Csuti, and J. M. Scott. 1997. Atlas of Idaho's wildlife. Idaho Department of Fish and Game, Nongame and Endangered Wildlife Program, Boise, Idaho. 372 p.

Gucinski, Hermann, Michale J. Furniss, Robert R. Ziemer, and Martha H.Brookes, 2001. Forest Roads: A synthesis of Scientific Information, USDA, Forest Service, Pacific Northwest Research Station, Portland, Oregon, Gen. Tech. Rep. PNW-GTR-509.

Gutierrez, R.J., and D.J. Delehanty. 1999. Mountain quail (*Oreortyx pictus*). In Birds of North American, No. 457. (A. Poole and F. Gill, editors). The Birds of North American, Incorporated, Philadelphia, PA.

Gutsell, J.S. 1921. Danger to fisheries from oil and tar pollution of water. Bureau of Fisheries. Document 910. Appendix to Report of U.S. Commission of Fisheries.

Hankin, D.G., and G.H. Reeves. 1988. Estimating total fish abundance and total habitat area in small streams based on visual estimation. Canadian Journal of Fisheries and Aquatic Sciences. 45(5):834-844.

Haggard, M., and W.L. Gaines. 2001. Effects of Stand-Replacement Fire and Salvage Logging on a Cavity-Nesting Bird Community in Eastern Cascades, Washington. Northwest Science, Vol. 75, No. 4.

Hann, W.J., J.L. Jones, M.G. Carl (et al.). 1997. Landscape dynamics of the basin. In: Quigley, T.M., S.J. Arbelbide, tech. eds. An assessment of ecosystem components in the interior Columbia basin and portions of the Klamath and Great Basin. Gen. Tech. Rep. PNW-GTR-405. USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

Hayward, G.D., and R. Escano. 1989. Goshawk nest-site characteristics in western Montana and northern Idaho. Condor 91:476-478.

Heede, B.H. 1980. Stream dynamics: an overview for land managers. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Gen. Tech. Rep. RM-72.

Hejl, S.J., R.L. Hutto, C.R. Preston, and D.M. Finch. 1995. Effects of silvicultural treatments in the Rocky Mountains. Pages 220-244 in T.E. Martin and D.M. Finch (eds.) Ecology and management of neotropical migratory birds; a synthesis and review of critical issues. Oxford Univ. Press. 409 p.

Helvey, J.D. 1980. Effects of a north central Washington wildfire on runoff and sediment production. Water Res. Bull. 16(4):627-634.

Herman, B., K.P. Reese, and P. Zager. 2002. Spring and summer ecology of mountain quail (*Oreortyx pictus*) in west-central Idaho. Unpublished report on file at Idaho Department of Fish and Game, Boise, ID.

Hessburg, P.F. 1992. Toward Building a Risk Assessment Methodology: A Summary of Insect and Disease Risk Factors for National Forests in Eastern Washington. Prepared for the OKA, WEN, COL Forest Supervisors: April 30, 1992: revised 5/15/92: 5/26/92.

Hutto, R.L., and J.S. Young. 1999. Habitat relationships of landbirds in the Northern Region, USDA Forest Service. General Technical Report RMRS-GTR-32. USDA Forest Service, Rocky Mountain Research Station, Ogden, UT.

Hutto, R.L. 1995. USFS Northern Region songbird monitoring program: Distribution and habitat relationships. USFS Contract #R1-95-05, University of Montana, Missoula, MT.

Hutto, R.L. 2006. Toward Meaningful Snag-Management Guidelines for Postfire Salvage Logging in North American Conifer Forests. Conservation Biology Vol. 20, No. 4.

Hutto, R.L. and S. Gallo. 2006. The Effects of Post-fire Salvage Logging on Cavity-Nesting Birds. Condor 108:817-831.

Ice, G.G. and J. D.Stednick. 2004. A Century of Forest and Wildland Watershed Lessons. Society of American Foresters.

Idaho Department of Fish and Game (IDFG). 1995. Draft Habitat Conservation Assessment for the Fisher (Martes pennanti) in Idaho. 24 p.

Idaho Department of Fish and Game. 2005. Idaho Comprehensive wildlife conservation strategy. Idaho Conservation Data Center, Idaho Department of Fish and Game, Boise, ID.

Idaho Partners in Flight. 2000. Idaho bird conservation plan, version 1.0. Idaho Partners in Flight, compiled by S. Ritter, Hamilton, MT. 166 p.

Jackman, Siri M. 1975. Woodpeckers of the Pacific Northwest: their characteristics and the forests. Corvallis, OR: Oregon State University. 147 p. M.S. Thesis.

Kaufman, K. 1996. The lives of North American birds. Houghton Mifflin Co., Boston and New York.

Keinath, D., and M. McGee. 2005, May 25. Boreal toad (Bufo boreas boreas): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/boaraltoad.pdf

Key, C., and N. Benson. 2006. Landscape assessment. U.S. Dept. of Agriculture, Forest Service Gen. Tech. Rep. RMRS-GTR-164-CD. Fort Collins, CO.

Kidd, H., and D.R. James, eds. 1991. The agrochemicals handbook, third edition. Royal Society of Chemistry Information Services, Cambridge, UK. 8-7.

Kirchner, J.W., Finkel, R.C., Riebe, C.S., Granger, D.E., Clayton, J.L., King, J.G., and Megahan, W.F., 2001, Mountain erosion over 10 yr, 10 k.y., and 10 m.y. time scales: Geology, v. 29, p. 591–594.

Koehler, G.M. and K.B. Aubry. 1994. Pages 74-98 *In* Ruggiero and others 1994. The scientific basis for conserving forest carnivores: American marten, fisher, lynx and wolverine in the western United States. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-254. 184 p.

Koehler, G.M. 1990. Population and habitat characteristics of lynx and snowshoe hares in north central Washington. Canadian Journal of Zoology 68: 845-851.

Koehler, G.M. and J.D. Brittell. 1990. Managing spruce-fir habitat for lynx and snowshoe hares. Journal of Forestry 88:10-14.

Kotliar, N.B, S. Heil, R.L. Hutto, V.A. Saab, C.P. Melcher, and M.E. McFadzen. 2002. Effects of Fire and Post-fire Salvage Logging On Avian Communities in Conifer-Dominated Forests of the Western United States. Studies in Avian Biology No. 25: 49-64.

LANDFIRE. [Homepage of the LANDFIRE Project, U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior], [Online]. Available http://www.landfire.gov/index.php [2013, March 2].

LANDFIRE: LANDFIRE 1.1.0 Biophysical Setting layer. U.S. Department of the Interior, Geological Survey. [Online]. Available: http://landfire.cr.usgs.gov/viewer/ [2013, March 25].

LANDFIRE: LANDFIRE 1.1.0 Existing Vegetation Type layer. U.S. Department of the Interior, Geological Survey. [Online]. Available: http://landfire.cr.usgs.gov/viewer/ [2013, March 25].

LANDFIRE: LANDFIRE 1.1.0 Succession Class layer. U.S. Department of the Interior, Geological Survey. [Online]. Available: http://landfire.cr.usgs.gov/viewer/ [2013, March 25].

LANDFIRE: LANDFIRE 1.1.0 Vegetation Dynamics Models. [Homepage of the LANDFIRE Project, U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior], [Online]. Available: http://www.landfire.gov/index.php [2013, March 25].

Leege, T.A. 1984. Guidelines for evaluating and managing summer elk habitat in northern Idaho. Wildlife Bulletin No. 11. Idaho Department of Fish and Game, Boise, ID.

Linder, K.A., and S.H. Anderson. 1998. Nesting habitat of Lewis' woodpeckers in southeastern Wyoming. Journal of Field Ornithology 69:109-116.

MacDonald, L.H., A.W. Smart, and R.C. Wissmar. 1991. Monitoring guidelines to evaluate effects of forestry activities on streams in the Pacific Northwest and Alaska. United States Environmental Protection Agency. EPA/910/9-91-001.

MacDonald, A. and K.W. Ritland. 1989. Sediment dynamics in type 4 and 5 waters: a review and synthesis. TFW-012-89-002, Wash. Dept. of Natural Resources, Olympia, WA.

Maestas, J.D., R.L. Knight, and W.C. Gilgert. 2003. Biodiversity across a rural land-use gradient. Conservation Biology 17:1425-1434.

Marshall, D.B. 1992. Lewis' Woodpecker (Melanerpis lewis). In: Sensitive Vertebrates of Oregon, First ed. Oregon Department of Fish and Wildlife.

McGrath, M.t., S. DeStefano, R.A. Riggs, L.L. Irwin, and G.J. Roloff. 2003. Spatially explicit influences on northern goshawk nesting habitat in the interior Pacific Northwest. Wildlife Monograph 154. The Wildlife Society, Bethesda, MD.

McDade, M.H., F.J. Swanson, W.A. McKee (and others). 1990. Source distances for coarse woody debris entering small streams in western Oregon and Washington. Canadian Journal of Forest Research. 20: 326-330.

McIver, J.D., and L. Starr, technical editors. 2000. Environmental effects of postfire logging: literature review and annotated bibliography. General technical report PNW-GTR-486. US. Dept. of Agriculture, Forest Service, Portland, OR.

McIver, J.D., and L. Starr. 2001. A literature review on the environmental effects of postfire logging. West. J. Appl. For. 16(4):159-168.

McIver, J.D., and R. McNeil. 2006. Soil Disturbance and Hill-Slope Sediment Transport After Logging of a Severely Burned Site in Northeastern Oregon. *West. J. Appl. Forestry* 21(3):123-133.

Medin, D.E. 1985. Breeding bird responses to diameter-cut logging in west-central Idaho. USDA Forest Service, Intermountain Research Station, Research Paper INT-355. 12 p.

Medin, D.E., and G.D. Booth. 1989. Responses of birds and small mammals to single-tree selection logging in Idaho. USDA Forest Service, Intermountain Research Station, Research Paper INT-408. 11 p.

Meehan, W.R., ed. 1991. Influences of forest and rangeland management on salmonid fishes and their habitats. Special Publication 19, MD: American Fisheries Society. 751 p.

Megahan, W.F. and J.G. King. 2004. Erosion, Sedimentation, and Cumulative Effects in the Northern Rocky Mountains. Pages 201-222 in George G. Ice and John D. Stednick editors. A Century of Forest and Wildland Watershed Lessons. Society of American Foresters, Bethesda, MD.

Megahan, W.F., N.F. Day, and T.M. Bliss, 1978, Landslide Occurrence in the Western and Central Northern Rocky Mountain Physiographic Province in Idaho, Proceedings: fifth North American Soils Conference, Ft. Collins, CO, August 1978, pp. 116-139.

Megahan, W.F., and W.J. Kidd. 1972. Effect of logging roads on sediment production rates in the Idaho Batholith. USDA Forest Service Research Paper, INT-123. 14 p.

Megahan, W.F., and R.A. Nowlin. 1976. Sediment storage in channels draining small forested watershed. P. 128. In: MacDonald, L.H., A.W. Smart, and R.C. Wissmar (1991) Monitoring guidelines to evaluate effects of forestry activities on streams in the Pacific Northwest and Alaska. United States Environmental Protection Agency. EPA/910/9-91-001.

Megahan, W.F., M.Wilson, and S.B. Monsen. 2001. Sediment production from granitic cutslopes on forest roads in Idaho, USA. *Earth Surface Processes and Landforms* 26(1):1-11.

Megahan, W.F. and J.G. King. 2004. Erosion, Sedimentation, and Cumulative Effects in the Northern Rocky Mountains. Pages 201-222 in George G. Ice and John D. Stednick editors. A Century of Forest and Wildland Watershed Lessons. Society of American Foresters, Bethesda, MD.

Mihursky, J.A., and V.S. Kennedy. 1967. Water temperature criteria to protect aquatic life. P. 43. In: Overton, K.C., J.D. McIntyre, R. Armstrong, S.L. Whitewell, and K.A. Duncan. 1995. User's guide to fish habitat: Descriptions that represent natural conditions in Salmon River Basin, Idaho. USDA Forest Service General Technical Report INT-GTR-322. Intermountain Research Station.

Montana/Idaho Airshed Group. 2010. Operating Guide. http://www.smokemu.org/docs/20100601OpsGuide.pdf

Neary, D.G., and K.C. Ryan, and L.E. DeBano (EDS.) 2004. *Fire effects on soil and water*. General Tech. Rept. RMRS-GTR-42, Volume 4. Ft. Collins, CO: USDA-FS, Rocky Mountain Research Station.

Nellis, C.H., S.P. Wetmore, and L.B. Keith. 1972. Lynx-prey interactions in central Alberta. Journal of Wildlife Management 36(2):320-329.

Neihoff, G.J. 2002. Soil NEPA analysis process and source of soil disturbance model coefficients. Unpublished IPNF technical guide.

NOAA Fisheries (NMFS). 2012. Biological opinion Cottonwood BLM 10-year noxious weed control program (2011-2022). National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Seattle, WA.

NOAA-Fisheries (NMFS). 1995. Biological Opinion on the Land Resource Management Plans for the Boise, Challis, Nez Perce, Payette, Salmon, Sawtooth, Umatilla, and Wallowa-Whitman National Forests.

NOAA Fisheries (NMFS), USFWS, USDA-FS, and USDI-BLM. 1998. Matrix of pathways and indicators of watershed conditions for Chinook salmon, steelhead trout, and bull trout. National Oceanic and Atmospheric Administration – National Marine Fisheries Service; U.S. Dept. of Interior, U.S. Fish and Wildlife Service; U.S. Dept. of Agriculture, Forest Service; and U.S. Dept. of Interior, Bureau of Land Management. Local adaptation for the Northern Central Idaho Level 1 Team.

Norris, L.A., H.W. Lorz, and S.V. Gregory. 1991. Forest chemical. American Fisheries Society special Publication 19: 207-296.

Nussbaum, R.A., E.D. Brodie, Jr., and R.M. Storm. 1983. Amphibians and reptiles of the Pacific Northwest. University Press of Idaho.

Odell, E.A., and R.L. Knight. 2001. Songbird and medium-sized mammal communities associated with exurban development in Pitkin County, Colorado. Conservation Biology 15:1143-1150.

O'Donoghue, M., S. Boutin, C.J. Krebs, G. Suleta, D.L. Murray, and E.J. Hofer. 1998. Functional responses of coyotes and lynx to the snowshoe hare cycle. Ecology 79(4):1193 1208.

Ormiston, J.H. 1966. The food habits, habitat and movements of mountain quail in Idaho. M.S. Thesis, University of Idaho, Moscow, ID.

Page-Dumroese, D.S. 1993. Susceptibility of volcanic ash-influenced soil in northern Idaho to mechanical compaction. USDA Forest Service. Intermountain Research Station. Research Note INT-409. page 1.

Page-Dumrose, D.S., and M.F. Jurgensen, W. Elliot and others. 2000. Soil quality standards and guidelines for sustainability in northwestern North America. For. Ecol.and Mgmt. 138:445 462.

Page-Dumrose, D.S., M.F. Jurgensen, A. Abbott, T. Rice, J. Tirocke, S. Farley, and S.DeHart. 2006. Proceedings RMRS-P-41. Ft. Collins, CO: USDA Forest Service, Rocky Mountain Research Station

Patla, S. (team leader), K.K. Bates, M. Bechard, E. Craig, M. Fuller, R. Howard, S. Jefferies, S. Robinson, R. Rodrigues, and B. Wall. 1995. Habitat conservation assessment and strategy for the northern goshawk for the State of Idaho, March 3, 1995. 35 p.

Pfankuch, D.J. 1978. Stream reach inventory and channel stability evaluation. R1-75-002, USDA Forest Service, Northern Region.

Prichard, D., P. Clemmer, M. Gorges, G. Meyer, and K. Shumac. 1996. Riparian Area Management. Technical Reference 1737-12, USDI Bureau of Land Management, National Applied Resource Sciences Center, Denver, CO.

Quigley, T.M., R.W. Haynes, and R.T. Graham (Technical Editors). 1996. An integrated scientific assessment for ecosystem management in the Interior Columbia Basin and portions of the Klamath and Great Basins. USDA, Forest Service, General Technical Report PNW GTR-382, Pacific Northwest Research Station, Portland, OR. 303 p.

Rainville, R.P., S.C. Rainville, and E.L. Lider. 1985. Riparian silvicultural strategies for fish habitat emphasis. P. 127. In: McDonald, L.H., A.W. Smart, and R.C. Wissmar. Monitoring fuidelines to evaluate effects of forestry activities on streams in the Pacific Northwest and Alaska. Unites States Environmental Protection Agency. EPA/910; 9-91-001.

Reese, K.P., P.J. Nelle, and P. Zager. 1999. Movements, habitat use, and survival of mountain quail (*Oreotyx pictus*) during fall and winter in west-central Idaho. Unpublished report on file at Department of Fish and Wildlife Resources, University of Idaho, Moscow, ID.

Rehg, K.J., A.I. Packman, and J. Ren. 2005. Effects of suspended sediment characteristics and bed sediment transport on streambed clogging. Hydrol. Process. 19:413– 427.

Reid, L.M., and T. Dunne. 1984. Sediment production from forest road surfaces. Water Resources Research, 20:1753-1761.

Reinhardt, E.D. and M.B. Dickinson. 2010. First-Order Fire Effects Models for Land Management: Overview and Issues. *Fire Ecology* 6(1): 131-141.

Reynolds, K.M., P.F. Hessburg, R.E. Miller and R.T. Meurisse. 2011. Evaluating Soil Risks Associated With Severe Wildfire and Ground- Based Logging. USDA Forest Service. Pacific Northwest Research Station. General Technical Report PNW GTR-840.

Reeves, D., Page - Dumroese, D. and Coleman, M. 2011. USDA Forest Service. Rocky Mountain Research Station. Research Paper RMRS-RP-89.

Ritter, S. 2000. Idaho Bird Conservation Plan, Version 1.0. Idaho Partners in Flight.

Robison, G.W. and R.L. Beschta. 1990. Identifying trees in riparian areas that can provide coarse woody debris to streams. Paper #2450. Oregon State University. Corvallis, OR.

Robichaud, P. R., L.E. Ashmun, and B.D. Sims. 2010. Post-fire treatment effectiveness for hillslope stabilization. USDA Forest Service. Rocky Mountain Research Station. General Technical Report RMRS-GTR-240.

Rone, G. 2011. North Zone Roadside Salvage EA Soil Specialist Report. USDA-Idaho Panhandle National Forest

Rosgen, D. 1996. Applied river morphology. Printed Media Companies, Minneapolis, Minnesota.

Rose, C.L., B.G.Marcot, T.K. Mellen, J.L. Ohmann, K.L. Waddell, D.L.Lindley, and B. Schreiber. 2001. Decaying Wood in Pacific Northwest Forests: Concepts and Tools for Habitat Management, Chapter 24 in Wildlife Habitat Relationships in Oregon and Washington (Johnson, D.H. and T.A. O'Neil. 2001. OSU Press).

Ruediger, B., J. Claar, S. Gniadek, B. Holt, L. Lewis, S. Mighton, B. Naney, G. Patton, T. Rinaldi, J. Trick, A. Vandehey, F. Wahl, N. Warren, D. Wenger, and A. Williamson. 2000. Canada lynx conservation assessment and strategy. USDA, Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service. Forest Service Publication #R1-00-53, Missoula, MT. 142 p.

Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, L.J. Lyon, and W.J. Zielinski, tech. eds. 1994. The scientific basis for conserving forest carnivores: American marten, fisher, lynx and wolverine in the western United States. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-254. 184 p.

Saab, V.A., and T.D. Rich. 1997. Large Scale Conservation Assessment for Neotropical Migratory Land Birds in the Interior Columbia River Basin. GTR PNW-GTR-399, USDA Forest Service, PNW Station, Portland, OR, (Quigley, T.M., ed. Interior Columbia Basin Ecosystem Management Project: Scientific Assessment).

Saab, V.A. and J.G. Dudley. 1997. Bird responses to stand-replacement fire and salvage logging in ponderosa pine/Douglas-fir forests of southwestern Idaho. USDA For. Ser. Prog. Rept. 94 96, Study No. 4202-1-7-711. Intermouintain Res. Stat., Boise, ID.

Saab, V.A. and J.G. Dudley. 1998. Responses of cavity-nesting birds to stand-replacement fire and salvage logging in ponderosa pine/Douglas-fir forests of southwestern Idaho. USDA Forest Service Research Paper, RMRS-RP-11.

Saab, V.A. and K.T. Vierling. 2001. Reproductive success of Lewis's woodpecker in burned pine and cottonwood riparian forests. Condor 103:491-501.

Saab, V., R. Brannon, J. Dudley, L. Donohoo, D. Vanderzanden, V. Johnson, and H. Lachowski. 2002. Selection of Fire-Created Snags at Two Spatial scales by Cavity-nesting Birds. USDA Forest Service. Gen. Tech. Rep. PSW-GTR-181.

Saab, V., R. Russell and J. Dudley. 2007. Nest Densities of Cavity-Nesting Birds in Relation to Postfire Salvage Logging and Time Since Wildfire. *The Condor* 109:97-108.

Saha, M.K., and S.K. Konar. 1986. Chronic effects of crude petroleum on aquatic systems. Environmental Ecology 4:506-510.

Sallabanks, R. 1995. Effects of Wildfire on Breeding Bird Communities in Coniferous Forests of Northeastern Oregon. Unpublished annual report to the Blue Mountains Natural Resources Institute.

Sandberg, D.V., R.D. Ottmar, J.L. Peterson, and J. Core. 2002. Wildland Fire in Ecosystems: Effects of Fire on Air. Gen. Tech. Rep. RMRS-GTR-42 vol. 5. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 79p.

Sands, R., E.L. Greacen, and C.J. Gerard. 1979. Compaction of sandy soils in radiate pine forest. I. a penetrometer study. Australian Journal of Soil Research. 17: 101-113.

Saunders, J. K. Jr. 1963. Movements and activities of the lynx in Newfoundland. J. Wildlife Management. 27(3):390-400.

Scott, D.W., C.L. Schmitt, and L.H. Spiegel. 2002, as amended 2006. Factors affecting survival of fire injured trees: a rating system for determining relative probability of survival of conifers in the Blue and Wallowa mountains. BMPMSC-03-01. La Grande, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Wallowa-Whitman National Forest, Blue Mountains Pest Management Service Center. 66 p., as amended August 30, 2006.

Silins, U., M. Stone, M.B. Emelko, and K.D. Bladon. 2009. Sediment production following severe wildfire and post-fire salvage logging in the Rocky Mountain headwaters of the Oldman River Basin, Alberta. *Catena* 79 (2009)189-197.

Smith, B. and D. Prichard. 1992. Riparian Area Management–Management Techniques in Riparian Areas. Technical Reference 1737-6, USDI Bureau of Land Management, Service Center, Denver, CO.

Smith, Hugh G., G.J. Sheridan, P.N.J. Lane, L.J.Bren. 2010. Wildfire and salvage harvesting effects on runoff generation and sediment exports from radiate pine and eucalypt forest catchments, south-eastern Australia. *Forest Ecology and Management* 261(2011)570-581

Spence, B.C., G.A. Lomnicky, R.M. Hughes, and R.P. Novistski. 1996. An ecosystem approach to salmonid conservation conservation. TR-4501-96-6057. ManTech Corp, Corvalis, OR. Funded by National Marine Fisheries Service, U.S. Fish and Wildlife Service and the U.S. Environmental Protection Agency. Available from NMFS, Portland, OR.

Squires, J.R., and L.F. Ruggerio. 1996. Nest-site preference of northern goshawks in southcentral Wyoming. Journal of Wildlife Management. 60:170-177.

Stallcup, P.L. 1968. Spatio-temporal relationships of nuthatches and woodpeckers in ponderosa pine forests of Colorado. Ecology 49:831-843.

Steinblums. I. 1977. Streamside buffer strips: survival, effectiveness, and design. Master's Thesis, Corvallis, OR: Oregon State University. 181 p.

Sullivan, K., T.E. Lisle, C.A. Dolloff, G.E. Grant, and L.M. Reid, 1987. Stream channels: the link between forests and fishes. Pp. 39-97. In: Streamside management: forestry and fishery interactions. E.O. Salo and T.W. Cundy (eds.) University of Washington Institute of Forest Resources. Contribution No. 57.

Swanson, F.J., and G.W. Lienkaemper. 1978. Physical consequences of large organic debris in Pacific Northwest streams. P. 127. In: MacDonald, L.H., A.W. Smart, and R.C. Wissmar

(1991), Monitoring guidelines to evaluate effects of forestry activities on streams in the Pacific Northwest and Alaska. United States Environmental Protection Agency. EPA/910/9 91-001.

Swanston, D.N. and F.J. Swanson. 1976. Timber harvesting, mass erosion and, steepland forest geomorphology in the Pacific Northwest. Pp. 199-221, In: D.R. Coates, ed. Geomorphology and engineering. Dowden, Hutchinson and Ross. Stroudsburg, PA.

Tobalske, B.W., R.C. Shearer, and R.L. Hutto. 1991. Bird populations in logged and unlogged western larch/Douglas-fir forest in northwestern Montana. Res. Pap. INT-442, U.S. Dept. of Agriculture, Forest Service, Intermountain Research Station, Ogden, UT. 12 p.

USDA-USDI. 1996a. Biological assessment for East Fork John Day Creek road obliteration and watershed restoration project. U.S. Dept. of Agriculture, Forest Service, Nez Perce National Forest, Salmon River Ranger Distric, White Bird, ID and U.S. Dept. of Interior, Bureau of Land Management, Cottonwood Resource Area Office, Cottonwood, ID.

USDI-USDAI. 1996b. Environmental analysis of East Fork John Day Creek road obliteration and watershed restoration project. U.S. Dept. of Agriculture, Forest Service, Nez Perce National Forest, Salmon River Ranger District, White Bird, ID and U.S. Dept. of Interior, Bureau of Land Management, Cottonwood Resource Area Office, Cottonwood, ID.

USDA-Forest Service. 2013. Environmental assessment Nez Perce – Clearwater Roadside hazard tree project. U.S. Dept. of Agriculture, Forest Service, Nez Perce – Clearwater National Forest, Grangeville, ID.

USDA-Forest Service. 2012. Burned-area report for Sheep Fire. U.D. Dept. of Agriculture, Forest Service, Nez Perce National Forest, Grangeville, ID. 11 p.

USDA-FS. 1995. Biological Assessment Lower Salmon. U.S. Dept. of Agriculture, Forest Service, Nez Perce National Forest, Grangeville, ID.

USDA-FS. 1984. Pesticide background statements, Vol. I: herbicides. Washington, D.C. 8-32.

USDI-BLM. 1999. John Day Creek watershed analysis. U.S. Dept. of Interior, Cottonwood Resource Area, Cottonwood, ID. 76 p.

USDI-BLM. 2000. Lower Salmon River subasin biological assessment of ongoing and proposed Bureau of Land Management activities on sockeye salmon, fall Chinook salmon, spring/summer Chinook salmon, steelhead trout, bull trout, and BLM, sensitive species. U.S. Dept. of Interior, Bureau of Land Management, Upper Columbia-Salmon Clearwater District, Cottonwood Field Office, Cottonwood, ID. 433 p.

USDI-BLM. 2007a. Final Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement. BLM, Nevada State Office, Reno, NV, June 2007.

USDI-BLM. 2007b. Final Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Report. BLM, Nevada State Office, Reno, NV, June 2007.

USDI-BLM. 2009. Cottonwood Approved Resource Management Plan and Record of Decision. U. S. Department of the Interior, Bureau of Land Management, Cottonwood Field Office, Cottonwood, Idaho.

USDI-BLM. 2011. Biological assessment of 2011 – 2021 noxious weed control program for federally listed and candidate species. U.S. Dept. of Interior, Bureau of Land Management, Coeur d'Alene District, Cottonwood Field Office, Cottonwood, ID.

USDI-BLM. 2012a. Sheep Fire emergency stabilization and rehabilitation plan. U.S. Dept. of Interior, Cottonwood Field Office, Cottonwood, ID.

USDI-BLM. 2012b. Cottonwood integrated weed control program, environmental analysis. U.S. Dept. of Int., Bureau of Land Management, Cottonwood Field Office, Cottonwood, ID.129 p.

USDI-BLM. 2012c. Decision record, Cottonwood integrated weed treatment program. U.S. Dept. of Interior, Bureau of Land Management, Cottonwood Field Office, Cottonwood, ID. 5 p.

USDI-BLM. 2013. Biological Assessment of Sheep Fire Salvage Timber Sale for ESA-listed, proposed, and candidate species. U.S. Dept. of Interior, Cottonwood Field Office, Cottonwood, ID.

USFWS. 2003. Recovery plan for the Northern Idaho ground squirrel (*Spermophilus brunneus brunneus*). U.S. Dept. of Interior, U.S. Fish and Wildlife Service, Portland, OR.

U.S. Fish and Wildlife Service (USFWS). 2012. Biological opinion Cottonwood 2011 – 2022 noxious weed control program. U.S. Dept. of Interior, U.S. Fish and Wildlife Service, Idaho Fish and Wildlife Office, Boise, ID.

Van Zyll de Jong, C.G. 1966. Food habits of the lynx in Alberta and the Mackenzie District, Northwest Territories. Canadian Field-Naturalist 80:18-23.

Vierling, K.T. 1997. Habitat selection of Lewis's woodpeckers in southeastern Colorado. Wilson Bulletin 109:121-130.

Vogel, C.A., and K.P. Reese. 1995. Habitat conservation assessment for mountain quail (*Oreortyx pictus*). Idaho Department of Fish and Game, Boise, ID.

Willis, W.O., and W.A. Raney. 1971. Effects of compaction on content and transmission of heat in soils. In: Barnes, K.K., W.M. Carleton, H.M. Taylor, R.I. Throckmorton, and G.E. Van den Berg, eds. Compaction of agricultural soils. St. Joseph, MO: American Society of Agricultural Engineers: 165-177.

Wisdom, M.J., R.S. Holthausen, B.C. Wales, C.D. Hargis, V.A. Saab, D.C. Lee, W.J. Hann, T.D. Rich, M.M. Rowland, W.J. Murphy and M.R. Eames. 2000. Source habitats for terrestrial vertebrates of focus in the interior Columbia basin: broad-scale trends and management implications. Vols. 1-3. Gen. Tech. Report PNW-GTR-485. U.S. Dept. of Agriculture, Forest Service, Pacific Northwest Research Station. Portland OR. (Quigley, Thomas M., tech. ed.; Interior Columbia Basin Ecosystem Management Project: scientific assessment).

Weed Science Society of American. 1994. Herbicide handbook, seventh edition. Champaign, IL. 8-16.Wondzell, S. M., and J. G. King (2003), Post-fire erosional processes in the Pacific Northwest and Rocky Mountain Regions, For. Ecol. Manage.,178, 75– 87.

Wondzell, S. M., and J. G. King (2003), Post-fire erosional processes in the Pacific Northwest and Rocky Mountain Regions, For. Ecol. Manage.,178, 75– 87.

Ziemer, R.R.1981. *Roots and the stability of forested slopes.* IAHS publication 132, 343-61. Wallingford, UK: International Association of Hydrologic Sciences.