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Environmental Assessment

Hughes Creek Hazardous Fuels Reduction Project

North Fork Ranger District, Salmon-Challis National Forest Lemhi County, Idaho

View northwest into the Hughes Creek drainage where it joins with the North Fork of the Salmon River

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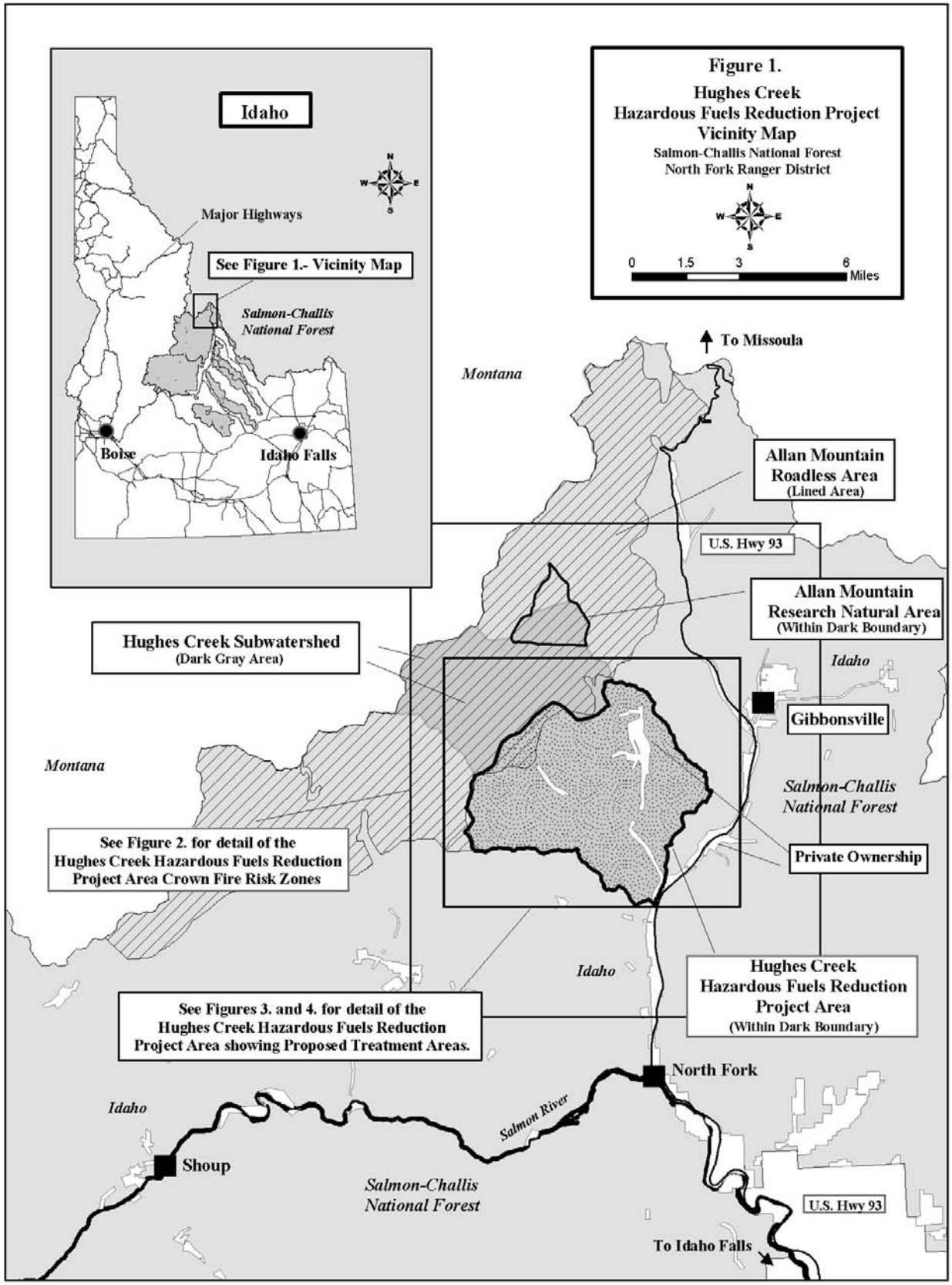

Figure 1. Hughes Creek Hazardous Fuels Reduction Project Vicinity Map

PURPOSE AND NEED

INTRODUCTION

The Forest Service has prepared this Environmental Assessment (EA) on the potential environmental effects of proposed fuel reduction and related activities in the Hughes Creek area (Figure 1) in compliance with the National Environmental Policy Act (NEPA), the Healthy Forest Restoration Act (HFRA) of 2003 and other relevant federal and state laws and regulations. This EA discloses the direct, indirect and cumulative environmental impacts and any irreversible or irretrievable commitment of resources that would result from the proposed action and alternatives. It is prepared according to the format established by Council of Environmental Quality (CEQ) regulations implementing NEPA (40 CFR 1500-1508). Planning was coordinated with the appropriate, state, and local agencies, and local federally recognized tribes. Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the North Fork Ranger District Office in North Fork, Idaho. These records are available for public review.

Background

This proposal was designed to complement other existing and planned fuels treatments within the North Fork drainage. The drainage area includes the communities of Gibbonsville and North Fork that have widespread private land resources, and have been identified as “at-risk” communities by Lemhi County and the State of Idaho. Lemhi County revised its Wildland/Urban Interface Fire Mitigation Plan in 2006 (also known as a County Wildfire Prevention Plan) designating the North Fork drainage as high priority for hazardous fuel reduction. The identified need for reducing hazardous fuel conditions together with the County’s priority designation for this area are essential criteria allowing the use of authorities and environmental analysis under the Healthy Forest Restoration Act of 2003.

PURPOSE AND NEED

There is a need to reduce the current risk of uncharacteristic, large crown fires occurring on National Forest Lands within the Hughes Creek and Gibbonsville areas where private lands and residences are classified as wildland urban interface (WUI). The purpose of this proposal is to reduce the density of forest vegetation and natural fuels to inhibit crown fire occurrence and potential spread within the Hughes Creek subwatershed and into the adjoining Gibbonsville community.

Existing Condition

Current stand conditions in the Hughes Creek subwatershed have not been influenced by the normal pattern of periodic fires. Most stands in the area have been fire free since 1919 (Metzger, 2008). Existing vegetation conditions have been altered from those that would have historically occurred under natural fire regimes. A recently completed fire history study on the Salmon National Forest found that prior to 1900 fires occurred as frequently as every 12 years in the North Fork drainage (Morgan, 2008). Fire regime condition class (FRCC) has been developed to classify the amount or degree of departure from the historic fire regimes. Currently all stands within the Hughes Creek subwatershed are in condition class 3, that indicate a high departure with some minor inclusions of class 2, that indicate a moderate departure. The existing stand conditions in the Hughes Creek project area have changed from their historical FRCC for several reasons. First, timber harvesting that began in the early 1900s and has continued with numerous re-entries since. Next, fire suppression has virtually eliminated fires natural role in the project area. Lastly, the establishment of noxious weeds has increased from historical conditions. All of these

have combined to change species composition and diversity, stand ages, stand densities, and fuel loadings. Approximately 62 percent of the area is currently interpreted to be within an extreme or high crown fire risk zone based on forest stand structural stage conditions (See Figure 2 Fuels/Fire Specialist Report, 2008).

Why Here Why Now

Fire exclusion has allowed dense vegetation and surface fuel loading to accumulate. The potential for a wildfire start is high due to residential development, recreational use, and lightning. Predicted fire behavior modeling of timber stands and representative fuel types indicates that high intensity fire with rapid rates of spread would be likely under high fire-weather conditions.

Conditions similar to the existing condition in the project area, as well as terrain and fuel structures, are typical of forested ecosystems throughout the Salmon-Challis National Forest where many large-scale wildland fires have occurred in the last decade. Data from the Fenster and Clear Creek Fires of 2000, Withington and Tobias Fires of 2003, and the Potato Fire of 2006 ranging from 2,800 to 160,000 acres in size were analyzed to provide a credible projection of fire characteristics and resulting burn severity in the project area (Bennett, 2006). These fires averaged 50 percent of forested ecosystems incurring a lethal fire severity. Lethal fire severity includes crown fire and lethal surface fire resulting in the loss of 75 to 100 percent of overstory vegetation. Additional analysis of these fires indicated that in steep terrain, similar to the Hughes Creek subwatershed, lethal fire severity of 50 percent could also be expected in riparian areas (within 300 feet of streams). Burn severity data for the Clear Creek and Fenster fires exhibited a strong correlation between the occurrence of crown fire and the forest structural stage/fuel profiles. The closed canopy multistory fuel profile accounted for 92 percent of the area burned by crown fire in the Clear Creek fire and 74 percent in the Fenster fire (Bennett, 2006).

Fuel (vegetation), weather, and topography are the three factors that influence fire behavior. Fuels are dense and would readily support crown fires over much of the area. As land managers the only fire behavior factor we are able to modify is fuel through vegetation treatments. The Hughes Creek Hazardous Fuels Reduction Project addresses management on National Forest System lands. However, it has been designed to function in coordination with past and other planned treatments on nearby and adjacent public and private lands. Recent treatments have been accomplished under the Firewise program on private lands along the Hughes Creek corridor with current plans for expansion of landowner participation and treatment area beyond the home defensible space zone. The 2006-2007 Ransack timber sale and Gibbonsville fuels reduction projects on the east side of the Ditch Creek drainage would also be complimented by this project. The Hughes Creek Hazardous Fuels Reduction Project provides mutual benefit of expanding these treatments by treating a large, landscape scale area in addition to public/private land boundaries. There has been a high interest in local communities to expand treatments on public lands, working in collaboration with the Lemhi County Forest Restoration Group.

Desired Condition

The National Fire Plan (2003) and Healthy Forest Restoration Act (HFRA) (2003) provide direction to reduce fuel loadings in fire-prone forests to protect people and sustain resources. The wildland-urban interface (WUI), areas where flammable wildland fuels are near homes and communities, is one of the highest priorities for treatment.

The Salmon National Forest Land and Resource Management Plan (FLRMP) (USDA 1988) outlines desired future condition of the Forest with respect to resource type on pages IV-87a to IV-93. In addition to these expected results, this project is designed to reduce the crown fire risk in the Hughes Creek area by modification of fuel loading and vegetation characteristics. In turn this leads to decreased fire intensity,

a potentially safer fire environment for firefighters and the public, reduced chance for fire spread to adjoining lands and healthy forests with fire resilient conditions.

This action complies with the National Fire Plan, HFRA, and the Salmon National Forest FLRMP. The proposed action is designed to meet Forest program goals (FLRMP, pages IV-1 to IV-3), follow Forest-wide direction along with standards and guidelines (FLRMP, pages IV-4 to IV-82), and Management Area direction for Management Prescriptions 3A, 4A & 5A (FLRMP, pages IV-107 to IV-128).

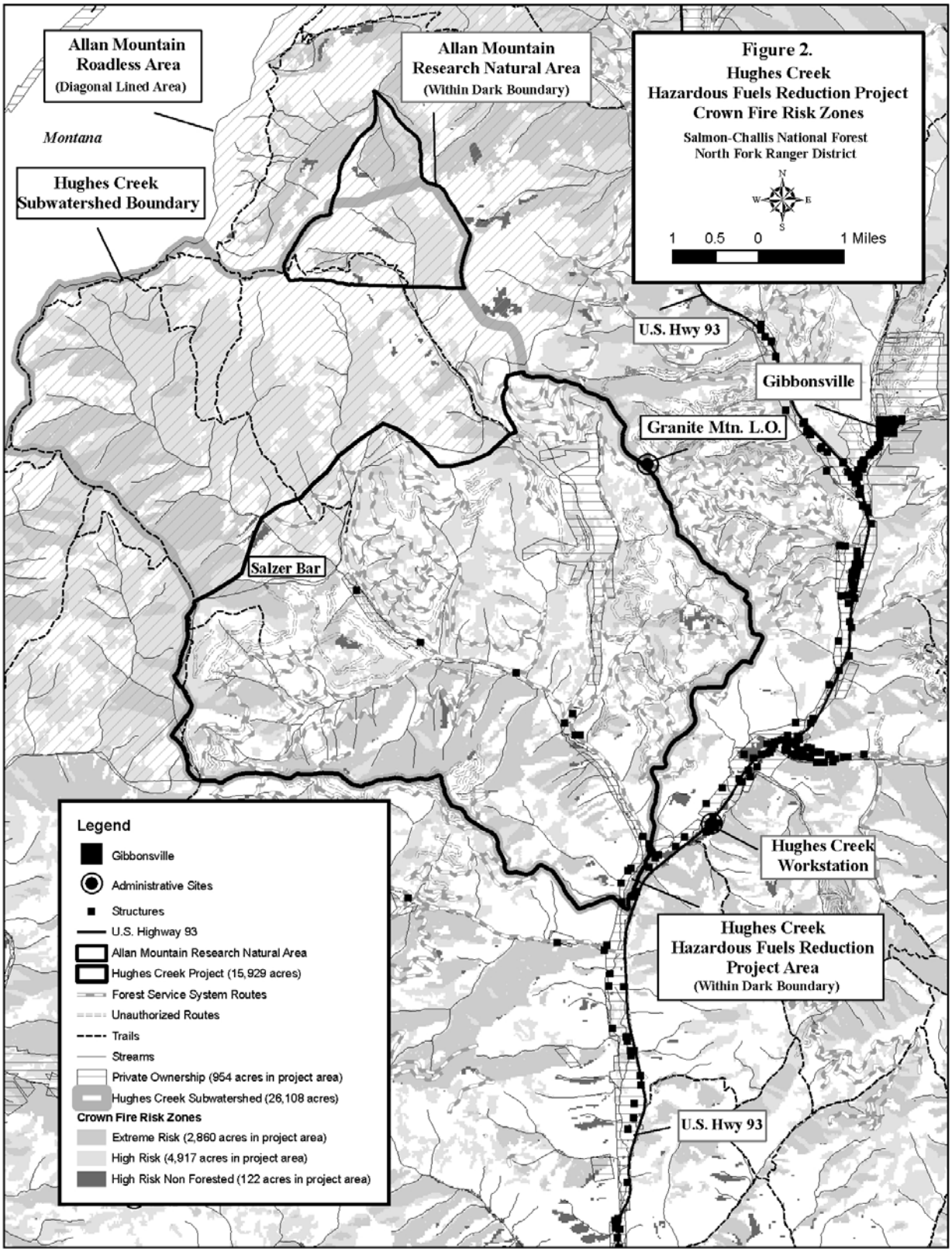

Figure 2. Map of Crown Fire Risk in Hughes Creek Hazardous Fuels Reduction Project Vicinity

PROPOSED ACTION

The following hazardous fuels treatments and associated opportunities have been preliminarily identified by the Forest Service for this project through extensive discussions, focused site visits and numerous exchanges of ideas with the Lemhi County Forest Restoration Group and other local community members:

Table 1. Proposed Fuels Reduction Treatments and Associated Activities

Activity	Description
Roads	Existing roads would be used for access to treatment areas; no new permanent roads would be constructed; after use, roads would be returned to their pre-project condition (open roads would remain open, closed roads would again be closed); Ditch Creek Road (#60089) and Hughes Creek Road (#60091) would be the principal haul routes; the Ditch Creek Road Bridge would be replaced.
Mechanical Treatments	Harvest activities include commercially thinning from below the canopy on about 3,500 acres to reduce one-half of the understory; use tractor or cable logging; precommercial thinning would be conducted in the same areas to achieve ladder fuel reductions; treatment units would be designed to provide opportunities for biomass utilization of slash or non-commercial materials generated or remaining from mechanical fuels reduction treatments. Select hand felling treatments & surface fuel slashing would occur in some old growth retention stands. The general prescription for primary ingress/egress road segments of Hughes Creek Road and Ditch Creek Road includes treatment within a 400 foot strip on either side of these roads except where private land or other mechanical treatments are present. Fuels reduction treatments along these road corridors and associated riparian zones includes: Utilize hand felling of ladder fuels, select conifers and brush pocket thinning with hand piling of slash for biomass use or pile burning. No commercial harvest within Riparian Habitat Conservation Areas (PACFISH - Interim Strategies for Managing Anadromous Fish Producing Watersheds on Federal Lands in eastern Oregon, Washington, Idaho, and Portions of California, USDA Forest Service, 1995) Coordinate activities with companion fuels reduction treatments that may occur on private lands.
Prescribed Burning	Approximately 13,000 acres would be prescribed burned during spring and fall seasons in limited annual increments over 10 to 15 years. The fuels treatments would include broad scale underburning in thinning units and other locations to reduce the concentration of natural surface fuels and activity generated slash from commercial logging, precommercial and hand thinning. Select pile burning would occur where hand or machine piles remained following treatment and alternate biomass utilization. Apply underburning in old growth retention stands on the north side of Hughes Creek where inventory and evaluation has demonstrated that these activities would maintain or enhance old growth characteristics. Coordinate activities with companion fuels reduction treatments that may occur on private lands.
Noxious Weeds	Weeds treatment would include standard prevention activities as defined in the USDA Forest Service guide to Noxious Weed Practices (USDA, 2001) and programmatic treatments accomplished as part of the Forest's annual noxious weeds program management. Emphasize pretreatment of areas where access for fuels reduction activities affords entry by vehicle mounted spray equipment. Coordinate fuels reduction activities to compliment existing weed treatments, bio-control releases and special grant-funded control actions.

DECISION TO BE MADE

Based on the environmental analyses in this EA, the deciding official, William A.Wood, Forest Supervisor, will decide whether or not to reduce hazardous fuels through thinning and prescribed burning as proposed within the project area in accordance with current Forest Plan goals, objectives and desired future conditions.

PUBLIC INVOLVEMENT

This proposal has been listed in the Schedule of Proposed Actions since April 1, 2007. The proposal was provided to the public and other agencies for comment during scoping which began May 10, 2007. Collaborative discussions and information exchanges regarding the project occurred with the Lemhi County Forest Restoration Group between August 2006 and October 2007. This group consists of representatives from local government, the rural fire district, economic development, environmental and conservation groups, contractors, user groups, local nonprofit organizations, concerned community members, landowners and other diverse interests. The collaborative group held six meetings, four conference phone calls and four site tours of the project area. A public meeting requesting recommendations toward development of the proposed action was held at the North Fork fire hall on May 23, 2007. The Lemhi County Forest Restoration Group reached consensus on the purpose and need, priorities and activities/opportunities associated with the proposed action. Formal agreement by the collaborative group conveyed by memo to the Forest Supervisor (March 2007) represented acknowledgement of the Forest Service proposed action as appropriate implementation of the Lemhi County Wildfire Prevention Plan.

The Forest Service read scoping comments and remarks from the collaborative discussions and public meetings to clarify and ensure public concerns would be accurately and adequately addressed in refinement of the proposed action and the environmental analysis. Examples of how these comments and inputs were incorporated into project features in design include:

- Forest Plan designated Old growth stands were prescribed for underburn treatment to maintain and enhance their wildlife habitat values.
- Whole tree yarding and slash piling was greatly expanded to include most harvest and thinning units to facilitate biomass utilization and potentially reduce smoke and emissions from fuels reduction activities.
- Replacement of a road bridge on the Ditch Creek road was included in project activities to facilitate fuels reduction activities on National Forest Lands and private lands in the Ditch Creek area.
- Fuels reduction treatments along the Hughes Creek riparian zone were included to address concerns about safety of ingress/egress routes for firefighters and publics as well as stream area health and protection.

Government to Government Relations

A letter introducing the Hughes Creek Hazardous Fuels Reduction Project was sent to Rebecca Miles, Chairman, Nez Perce Tribe, and Alonzo Coby, Chairman, Shoshone Bannock Tribes on May 23, 2007. Kevin Brackney, Water Resources Division of the Nez Perce Tribe and Yvette Tuell, Environmental Program Manager for the Shoshone Bannock Tribes also received the same letter introducing the project.

ISSUES

Forest Service directives provide for the identification of issues to be analyzed in depth (40 CFR 1501.7). Issues serve to highlight effects or unintended consequences that may occur from the proposed action and alternatives, giving opportunities during the analysis to reduce adverse effects and compare trade-offs for the decision maker and public to understand. Issues are best identified during scoping early in the process

to help set the scope of the actions, alternatives, and effects to consider; but, due to the iterative nature of the NEPA process, additional issues may come to light at any time.

An issue should be phrased as a cause-effect statement relating actions under consideration. An issue statement should describe a specific action and the environmental effect(s) expected to result from that action. Cause-effect statements provide a way to understand and focus on the issues relevant to a particular decision. For this project issues were grouped according to resource categories and described as resource concerns.

A list of resource concerns identified during project planning, preliminary evaluation and public involvement were identified for the purposes of environmental analysis, impact disclosure and comparison of alternatives. This list of relevant concerns and others that were considered can be found in Appendix B.

ALTERNATIVES

INTRODUCTION

This chapter contains a description of the no action and proposed action alternatives, a description of mitigation and monitoring measures and a tabular comparison of the no action and action alternatives.

Process Used to Formulate Action Alternative

The IDT developed the proposed action to respond to the project purpose and need, the existing Forest Plan objectives, goals, and standards, and public and agency concerns as directed by NEPA. The IDT consisted of Forest Service personnel who have expertise in different natural resource fields in order to provide a diverse, interdisciplinary approach to the project. A list of preparers can be found on page 41.

The proposed action (Alternative 2) was developed through a series of resource evaluations, field visits, IDT meetings, public interactions and collaborative involvement with the Lemhi County Forest Restoration Group. If implemented, the project would be designed and administered in accordance with:

- Forest Plan Standards and Guidelines (USDA, 1988)
- Rules and Regulations pertaining to the Idaho Forest Practices Act (1998)
- PACISH Interim Guidelines for Riparian Habitat Conservation Areas (RHCA)
- R1/R4 Soil and Water Conservation Practices Handbook (Forest Service Handbook 2509.22)
- Idaho Water Quality and Wastewater Treatment Requirements (IDAPA 58.01.02) and Clean Water Act
- Lynx Conservation Assessment and Strategy
- Forest Service Manuals and Handbooks (FSH)
- Endangered Species Act
- Idaho/Montana Airshed Group Operational Plan
- The Idaho Roadless Rule (2008 Final Rule)

ALTERNATIVE DESCRIPTIONS

No Action

HFRA under Section 104 does not require the Forest Service to analyze any alternative to the proposed action when a project is in a WUI setting within 1.5 miles of an at-risk community (HFRA Field Guide, 2004). The Hughes Creek HFR Project area is within WUI and the 1.5 mile criteria. HFRA also states that while agencies are not expected to fully develop a no action alternative, "***they should evaluate the effects of failing to implement the project***. This evaluation should allow an assessment of the short and long-term effects of failing to implement the project in the event the court is asked to consider requests for an injunction" (HFRA Field Guide, 2004). Changes in forest structure in the project area have significantly increased the potential for uncharacteristic fire behavior. A landscape scale, stand-replacing wildland fire

during summer drought and extreme weather conditions with lethal fire severity to 50 percent of forested and riparian ecosystems is a plausible event as a consequence of not implementing hazardous fuels reduction activities. This is the context for which "No Action with Wildfire" was evaluated for the Hughes Creek Hazardous Fuels Reduction Project.

Alternative 2 – Proposed Action

Table 2 lists hazardous fuels treatments and associated activities have been identified by the Forest Service for this project through extensive discussions, focused site visits and numerous exchanges of ideas in collaboration with the Lemhi County Forest Restoration Group and other local community members.

Integrated Design Features and Monitoring Requirements

Design features were developed based on standard operating procedures, Best Management Practices (BMPs), Forest Plan standards and guides, and other procedural direction to eliminate or mitigate potential impacts during project implementation. Specific monitoring requirements were also developed to address non-routine information needs in the project area. A complete list of these features and requirements is located in Appendix A.

The Forest Service is currently involved with the Lemhi County Forest Restoration Group in developing a monitoring plan to assess key ecological effects of this project with its implementation. Section 102(g)(5) of the HFRA provides for establishment of multiparty monitoring, evaluation and accountability processes where significant interest is expressed.

Appendix C also includes detailed entries and maps of each treatment unit with a comprehensive description of acres involved, activities, design and other features. These entries provide the primary guidance for project layout and implementation.

Table 2. Alternative 2 proposed treatments by unit type

Activity	Description	
Mechanical Treatments	Tractor Units H6, H8A, H8B, H9, H10, H28, H29, H32, H36, H38, H39, H41, H43, H44, H47, H48, H50, H55, H57, H58, H60, H61, H62, H63, H64, H66, H68, H69, H70, H71, H72, H73, H74, H78	Harvest activities include commercially thinning from below to reduce the understory by about one-half on about **3,500 acres** of the project area; all emphasis would be to retain large trees; use tractor and/or skyline cable logging; whole tree skidding to facilitate use of tree tops and slash as biomass or for pile burning. No thinning in inventoried roadless area. Precommercial thinning of trees <7" DBH would be conducted in tractor & skyline harvest units following commercial thinning to reduce ladder fuels, and create 18 X 18 ft spacing in pockets of healthy saplings for crown separation. Precommercial thinning with these same specifications would also be conducted on **283 acres** in select units as the only mechanical treatment needed for fuels reduction. All thinning units would receive a follow-up prescribed burning treatment as outlined below. Up to **22.6 miles** of fireline[a] along unit perimeters would be needed to implement burning in thinning units.
	Skyline Units H5, H7, H11, H13, H27, H30, H31, H33, H34, H35A, H35B, H37, H40, H42, H45, H46, H49, H52, H53, H54, H56, H77	
	Tractor/Skyline Units H4, H51, H65, H67, H75, H76	
	Precommercial Units H1, H2, H3,H15, H16, H17, H18, H19, H25, H26	

Table 2. Alternative 2 proposed treatments by unit type

Activity	Description	
Prescribed Burning	General Underburn Units B1, B2, B3, B4, B5, B6, B7, B8, B9, B10	About **13,000 acres** (includes thinning areas) would be prescribed burned primarily during spring & fall in limited annual increments over 10 to 15 years. Fuels treatments would include broad scale, low to moderate intensity underburning in thinning units & surrounding locations (including inventoried roadless area) to reduce concentrations of natural surface fuels & activity generated slash from commercial, precommercial & hand thinning. An additional **15.5 miles** of fireline along unit perimeters would potentially be needed. Pile burning would occur where hand or machine piles remained after treatment & biomass utilization. Hughes Creek & Ditch Creek road corridors (primary ingress / egress routes), including adjacent riparian zones, would receive fuels reduction treatment within a 400 foot strip on either side of these roads, except where private land or other mechanical treatments are present. Utilize hand felling of ladder fuels, select conifers & brush pocket thinning on **342 acres**, hand piling of slash for biomass use or pile/underburning. Select hand felling treatments & surface fuel slashing would occur on **784 acres** of old growth retention stands north of Hughes Creek to reduce ladder fuels & surface fuel concentrations in preparation for burning. Underburn with at least two entries to reduce concentrations first, then general broadcast of areas for maintenance or enhancement of old growth characteristics. Old growth retention stands south of Hughes Creek (**735 acres**) not treated. Approx. **5.5 miles** of additional fireline would be needed.
	Roadside and Riparian Units B11A, B11B, B12A, B12B, B13A, B13B, B14	
	Old Growth Units OG1, OG2, OG3, OG4, OG5, OG6, OG7, OG8, OG9, OG11 Old Growth Units with no treatment OG13, OG14, OG15, OG16, OG17, OG18, OG19, OG20, OG21, OG22, OG23	
Roads	Existing roads totaling **71.1 miles** would be used for access to treatment areas; no new permanent roads would be constructed; after use, roads would be returned to their pre-project condition (open roads would remain open, closed roads would again be closed); approx. **49 miles** of existing unauthorized roads, some to be used for access and all needed for future management, would be added to the Forest Service system; Ditch Creek Road (#60089) and Hughes Creek Road (#60091) would be the principal haul routes; the Ditch Creek Road bridge would be replaced with a twenty foot treated timber structure to accommodate 100-year stream flow levels.	
Noxious Weeds	Weeds activities would include standard prevention measures and programmatic treatments accomplished as part of the Forest annual noxious weeds program management. Emphasize pretreatment of areas where access for fuels reduction activities affords entry by vehicle mounted spray equipment. Utilize funding opportunities created by stewardship contracting to accomplish additional acres of integrated weed treatment with priority targeting of new species infestations. Coordinate fuels reduction activities to compliment existing weed treatments, bio-control releases and special grant-funded control actions.	

[a]See Appendix A for definition and specifications for firelines

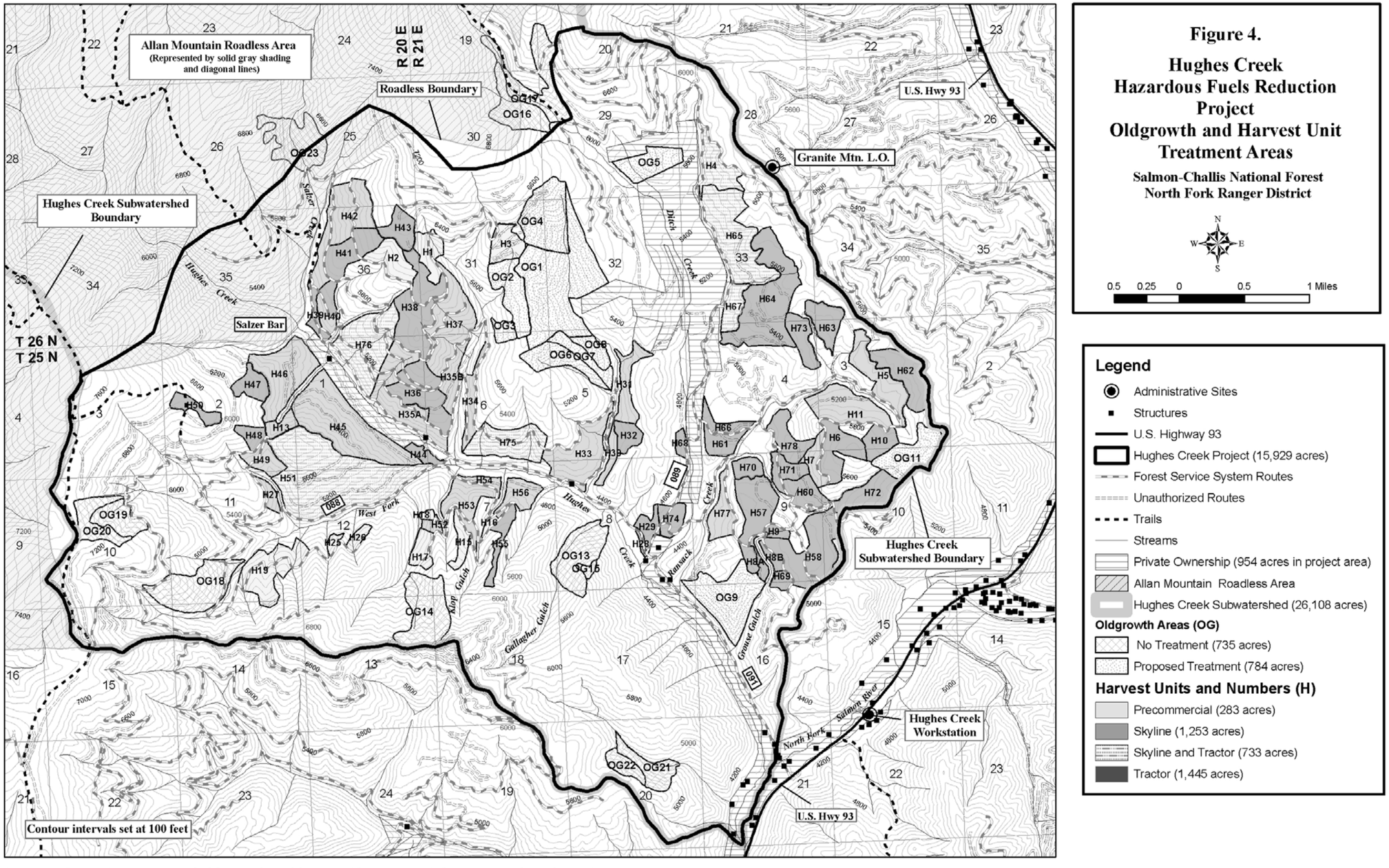

Figure 3. Alternative 2 proposed old growth and harvest (thinning) unit locations and road activity map

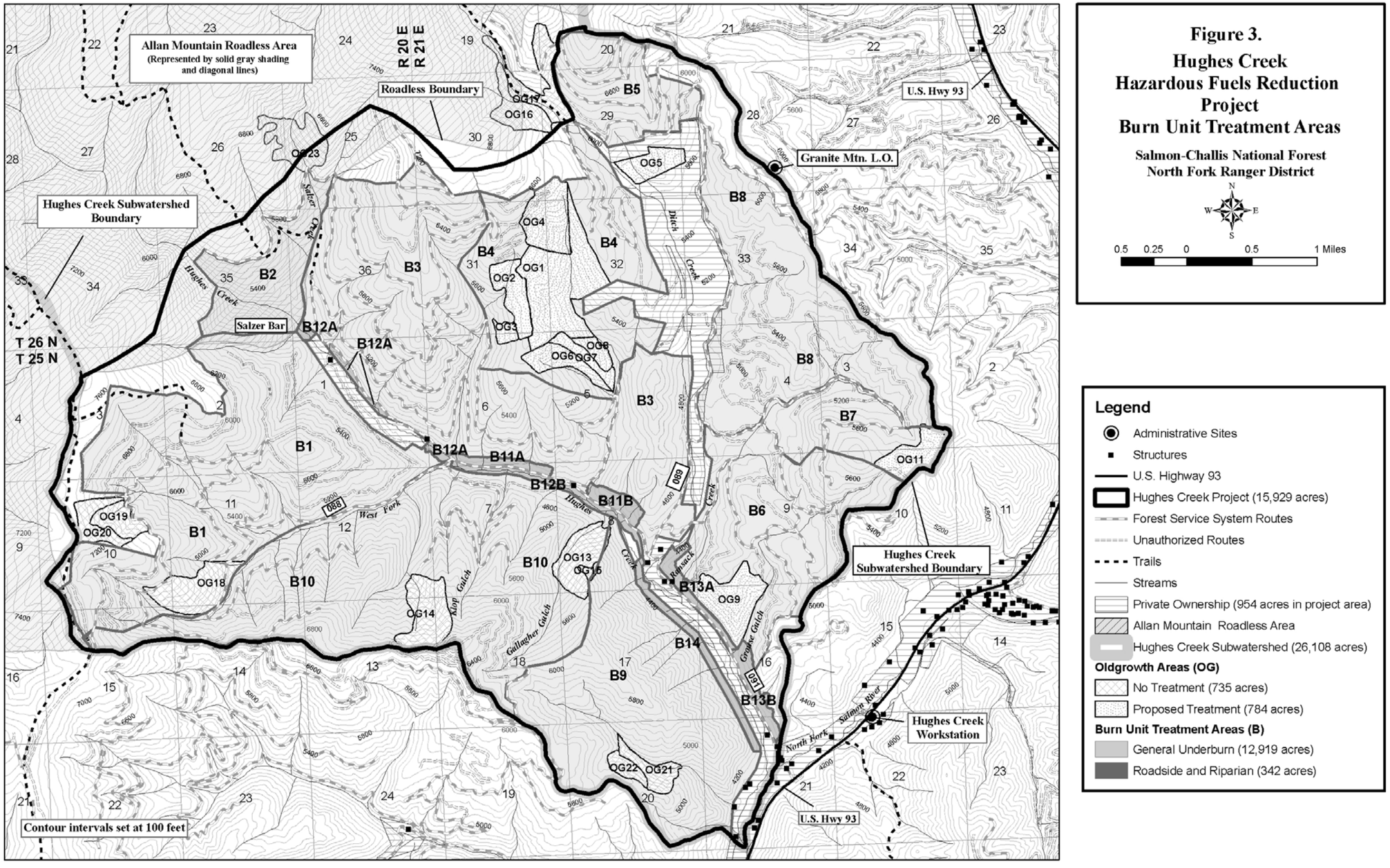

Figure 4. Alternative 2 proposed prescribed burn unit locations and road activity map

Comparison of Alternatives

Table 3 provides a comparison of relevant resource indicators and environmental consequences associated with implementation of the alternatives. A more detailed description of environmental effects can be found in this EA in the following section titled Environmental Consequences starting on page 17.

Table 3. Comparison of Alternatives

Factors and Effects Indicators	Alternative 1 No Action – Wildfire		Alternative 2 Proposed Action
Acres of fuels reduction treatment (Rx burn acreage inclusive of areas commercially, precommercially thinned, Old Growth treatments)	0		3431 ac. commercial 283 ac. precommercial 342 ac. hand treatment 13,261 ac Rx burn 784 ac OG Rx burn
Timber Volume (ccf)	0		13,700 ccf
Biomass Volume (tons)	0		7,700 tons
Existing Unauthorized (non-system) Road miles added to system	0		49 miles
Existing road miles used for project	0		71.1 miles
Potential Fireline needs	0		43.6 miles
Fire and Fuels-Risk to Life, Property and Firefighter Safety			
Fuel loading in tons/acre (tpa)	Current condition	Post Wildfire	5 tpa
	6-12 tpa	0-12 tpa	
Crown fire potential – acres at high to extreme risk	7777 acres	<1000 acres	1445 acres
Firefighter safety expressed in fire type, spread rate (chains/hour) and flame length (feet)	Active crown fire 90 ch/hr 60-88 ft	Surface fire 65-394 ch/hr 9-10 ft	Surface fire 4-86 ch/hr 2-11 ft
Air Quality and Smoke Management			
Compliance with Idaho/Montana Airshed Group Operating Guide	Not applicable to wildfires		Compliant when guidelines followed
Fine Particulate matter (PM 2.5) lbs/acre	1930 lbs/acre		945 lbs/acre
Carbon Dioxide (CO2) lbs/acre	176,100 lbs/acre		54,286 lbs/acre
Wildlife Species and Habitats			
Acres of big game security areas maintained	467 acres		2461 acres
Cover/forage ratios in big game habitat (40/60 is optimum)	27/67		49/45
Acres of habitat within designated old growth stands maintained	1204 acres		2408 acres

Table 3. Comparison of Alternatives

Factors and Effects Indicators	Alternative 1 No Action – Wildfire	Alternative 2 Proposed Action
Water Resources and Aquatic Species and their Habitats		
Modeled % increase of erosion and sediment delivery	34-48%	2-6%
Compliance with State Water Quality Standards; maintenance of beneficial uses	Immediate to short term degradation due to wildfire; compliance, as beneficial uses likely supported	Compliant, maintains beneficial uses; long term reduction of risk
Equivalent Clearcut Acres (ECA) in % of watershed in ECA	50%	12%
Road densities in miles/square mile	3.2 miles/sq. mile	3.2 miles/sq. mile
Watershed risk rating	High	Moderate-High
Fish presence/absence; population densities and trend	Degraded to adverse effects	Low risk of effects
Stream habitat condition (large woody debris, pools, width/depth	Degraded to adverse effects	Low risk of effects
Stream sediment (% fines by depth)	Degraded to adverse effects	Low risk of effects
Stream temperature	Degraded to adverse effects	Low risk of effects
Stream connectivity	Degraded to adverse effects	Low risk of effects
Soil Resource		
% detrimental soil disturbance within harvest treatment units	5% current 17.5% with wildfire	2.5-10.9%
Tons/acre coarse woody debris (CWD) within harvest units	0-22 tons/acre; < recommended years 0-5, moving towards recommended years 5-10	Maintains existing up to 5 tons/acre or designed to increase to at least 5 tons/acre
% total soil resource commitment in project area including harvest units	1.5%	1.5%
Acres of treatment in high to very high erosion hazard & very high mass instability ratings	1483.5 acres impacted by wildfire	552.4 acres
Noxious Weeds		
Changes to existing weed infestations by plant cover density & distribution	6000 acres light to heavy coverage; widespread increase from fire effects & disturbance of suppression actions	Increase in presence and density on treated acres
Risk of an increase of weed infestation by new and existing species	Very high risk of enhanced weed spread with wildfire occurrence	Increase moderated by project design & prevention measures

ENVIRONMENTAL CONSEQUENCES

Fire and Fuels

No Action - Wildfire

Direct and indirect Effects

Under the No Action alternative there would be no new proposed treatments. Natural processes would continue and accumulation of forest debris would increase natural fuel loadings. Forest stands would remain overstocked and ladder fuels would continue to fill-in and crowd the overstory. The drier forest stands would continue to lose vigor due to competition from a dense understory of shade tolerant species. This understory would serve as ladder fuels that would permit a surface fire to expand into the canopy of overstory trees. This would result in the mortality of many of the existing overstory trees that would have otherwise survived a surface fire of lower intensity. The supposition for the analysis of “No Action with Wildfire” for the Hughes creek HFR project is the occurrence of an uncharacteristic large fire that would average 50 percent lethal fire severity. Lethal fire severity includes crown fire and lethal surface fire resulting in the loss of 75 to 100 percent of overstory vegetation. An additional assumption for a fire in steep terrain such as the Hughes Creek subwatershed, would be lethal fire severity of 50 percent in riparian areas (within 300 feet of streams).

Because there would be no fuel treatments to reduce the fire hazard in the project area, the potential for high-severity wildland fires would continue and be more likely than under the Proposed Action alternative. The historical non-lethal fire regimes would remain in a mixed-lethal and lethal fire regime. Any fire start inside the project area or start outside and moving into the project area would likely be more expensive, difficult, and dangerous to suppress. The threat to private property, homes, public safety, and firefighter safety would be much higher under the No Action alternative than the Proposed Action. It can be said with reasonable certainty that 60-70 percent of the project area would be subject to a stand replacing fire should initial attack actions fail based on fire behavior modeling. This assumption also takes into account an analysis of recent wildfire events. Similar stand conditions, as well as terrain and fuel structures, were typical of forested ecosystems throughout the Salmon-Challis National Forest where many large-scale wildland fires have occurred in the last decade. Data from the Fenster and Clear Creek Fires of 2000, the Withington and Tobias Fires of 2003, and the Potato Fire of 2006 were analyzed to provide a credible projection of fire characteristics and resulting burn severity for the project area. These past fires ranged in size from 2,800 to 160,000 acres and averaged over 50 percent of the forested ecosystems incurring a lethal fire severity. Lethal fire severity includes crown fire and lethal surface fire resulting in the loss of 75 to 100 percent of overstory vegetation. Burn severity data for the Clear Creek and Fenster fires exhibited a strong correlation between the occurrence of crown fire and the forest structural stage/fuel profiles. The closed canopy multistory fuel profile accounted for 92 percent of the area burned by crown fire in the Clear Creek fire and 74 percent in the Fenster fire.

Cumulative Effects

Past fire history, fire suppression policies and actions, timber harvest and grazing since settlement times (1880s) have had the greatest influence in present conditions of natural fuels and fire hazard in the project area. Circumstances and management activities shaping the current condition of the fuels profile include past vegetation management (thinning, reforestation, insect and disease treatment) mining, firewood gathering, road building, private land development and associated activities. (A catalog of activities and actions for Cumulative Effects Analysis is located in the project record). Recent thinning and fuels reduction in the Ransack and Granite Mountain ridge areas, and private land firewise activities have had

positive effects to the fuels situation in the individual stands. Overall these recent and ongoing actions have not addressed landscape fuels management and urban interface protection needs in the Hughes creek project area and adjacent Gibbonsville/Northfork corridor area.

Foreseeable future actions include additional firewise program activity on private lands within Hughes Creek, but no significant activity on National Forest Lands to address vegetation or fuels. As directed by federal wildland fire policy and due to the fact the project area is fully within the Wildland Urban Interface, appropriate fire management actions (ie, fire suppression) would continue within the project area.

Cumulative effects associated with the occurrence of an uncharacteristic crown fire would be much the same as the direct and indirect effects presented above. Fuel loadings and characteristics across the landscape would be immediately altered in the short term. Crown fire potential would remain low in areas experiencing lethal fire severity burn for 1-2 decades until regeneration is well established, other areas where fire severity was low or did not burn would see the return or continuance of crown fire risk unless other actions were taken to reduce the potential. Characteristics of future prescribed fires or wildfires in the project area following a severe crown fire would be less intense, less resistance to control, and perhaps provide more of a safety margin for firefighters and residents.

Proposed Action

Direct and Indirect Effects

The Proposed Action alternative would implement commercial and non-commercial fuels reduction activities on approximately 13,261 acres. Treatments would include: commercial thinning from below, precommercial thinning, hand slashing, hand piling, pile burning, and landscape underburning.

Stand density thinning (thinning from below) and crown opening would occur in stands that have high stand density, and more continuous crown density than is desirable from a fuel management perspective. These stands also have higher density than would occur within historic fire regimes. Reducing stand density would decrease ladder fuels and modify fire behavior that would increase initial attack success, and it would reduce the probability that extreme fire behavior would occur (Graham, McCaffrey, Jain, 2004). This treatment would increase the growth and vigor of the residual conifers and increase sunlight to the forest floor which would stimulate growth of vegetation in the forest understory.

Whole tree skidding and yarding of tops would be required in most commercial treatments to remove the excess biomass from the site. This would allow for greater opportunities to utilize prescribed fire because of the reduction in fire intensities. This would also allow the opportunity for slash or biomass utilization.

Ladder fuel (shrub/small tree stratum) reduction through slashing and harvest would break up the continuity from the surface fuels to the canopy fuels, thus reducing the likelihood of crown fire ignition. Aerial fuels separated from surface fuels by large gaps are more difficult to ignite thus requiring higher intensity surface fires, surface fires of longer duration, or ignition from spotting to ignite the crowns, and wind.

Surface fuel reduction would occur through hand piling, machine piling, or underburning. Reducing the amount, depth and continuity of surface fuels (especially those less than 3 inches in diameter) reduces the likelihood that overstory canopies would ignite during a wildfire. This would modify fire behavior so wildfires can be suppressed more easily (Graham, McCaffrey, Jain, 2004).

Table 4. Summary of effects to fire and fuels

Effects Indicator	Alternative 1 No Action - Wildfire		Alternative 2 Proposed Action
	Current condition	Post Wildfire	
Fuel loading in tons/acre (tpa)	6-12 tpa	0-12 tpa	5 tpa
Crown fire potential – acres at high to extreme risk	7777 acres	<1000 acres	1445 acres
	Does not decrease the potential for destructive crown fires because we are not increasing canopy base height, reducing ladder fuels and reducing the amount of surface fuels.		**Decreases the potential for destructive crown fires** by removing ladder fuels, increasing crown base heights and reducing canopy bulk density on approximately 13,261 acres. Establishes conditions that are favorable for future stand maintenance prescribed burning.
Firefighter safety expressed in fire type, spread rate (chains/hour) and flame length (feet)	Active crown fire 90 ch/hr 60-88 ft	Surface fire 65-394 ch/hr 9-10 ft	Surface fire 4-86 ch/hr 2-11 ft
	Firefighter safety would not be improved because of fireline intensities, flame length, crown fire potential.		**Firefighter safety** would be improved through reduction in potential fire intensity on approximately 13,261 acres.
Fire suppression capability	**Fire suppression capability** would not be increased, because fireline intensities and flame lengths would be such that mechanized equipment and indirect firefighting tactics would be needed for control.		**Fire suppression capability** would be increased by decreased resistance to control on approximately 13,261 acres
Future wildland fire characteristics	**Future wildland fires** would not exhibit higher rates of spread but would increase in intensity and severity because of the accumulation of surface fuels, ladder fuels and canopy bulk density.		**Future wildland fires** would exhibit higher rates of spread but decreased intensity and severity on approximately 13,261 acres. Mitigates factors that tend to increase fire behavior potential, such as increased wind penetration, increased grass and brush growth, by reducing surface fuel accumulation.
Private property protection	**Private property protection**, adjacent to and near the project area, would not be improved because fireline intensities and flame lengths would be such that mechanized equipment and indirect firefighting tactics would be needed for control.		**Private property protection**, adjacent to and near the project area, would be improved.
Cost of fire suppression	**Cost of fire suppression** would not be reduced because the difficulty of suppression operations would require a larger firefighting organization.		**Cost of fire suppression** would be reduced due to reduced resistance to control on approximately 13,261 acres.
Fire suppression strategies (control)	**Fire suppression strategies** (control) would be increasingly difficult to attain over time because the current lack of managed fuel conditions.		**Fire suppression strategies** (control) would be more readily attainable on approximately 13,261 acres.
Regulatory consistency	**Not consistent with National Fire Plan and Healthy Forest Initiative** because we are not reducing the accumulation of hazardous fuels within the wildland urban interface.		**Consistent with National Fire Plan and Healthy Forest Initiative.**

These treatments would reduce the amount of shading on surface fuels, increase the wind speeds to the forest floor, reduce the relative humidity at the forest floor, increase the fuel temperature, and reduce fuel moisture. These factors may increase the probability of ignition over current conditions - depending on weather conditions – yet reduced fuel levels and arrangement would reduce fire severity and increase opportunities for safe and effective fire management actions.

Cumulative Effects

Cumulative effects discussion above under the No Action Alternative describes the past, ongoing and reasonably foreseeable future activities and actions. The cumulative effects of the proposed action are a beneficial change and reversal in conditions and trends in the fuels profile, the risk of uncharacteristic crown fire, and threats to firefighter and public safety.

Air Quality

No Action - Wildfire

Direct and Indirect Effects

The No Action Alternative is the least effective in reducing potential smoke emissions from future wildland fire since there would be no reduction in fuels. If a wildland fire were to occur in the project area during the summer fire season, smoke production would be approximately 2 times greater than would be produced from prescribed burning the same acreage during the spring or fall season (refer to Table 5 below based on First Order Fire Effects Model (FOFEM) runs contained in the project file). Since smoke produced by a wildland fire may occur during periods of poor dispersion the actual impacts may be far greater than indicated by the comparison of estimated smoke production. Wildland fires would exhibit longer duration burning with more consumption of fuels. Transport winds and atmospheric conditions typical of the fire season in the mountainous terrain of central Idaho may transport large plumes of smoke great distances indirectly causing decreased visibility and air quality problems in downwind areas such as the river valleys of Lemhi County, and the Big Hole and Bitterroot Valley of Montana. At the same time temperature inversions can trap smoke in localized drainages such as Hughes Creek and the North Fork river corridor.

The Clean Air Act of 1970 established national ambient air quality standards for particulate matter. The State of Idaho has adopted these standards. Air Quality standards for PM 2.5 (fine particulate matter 2.5 microns and smaller) is 15 ug/m3 annual mean, 65 ug/m3 for a 24 hour period (Metzger, 2008). While fire modeling is not predictive of PM 2.5 in these quantity terms, large summer wildland fires in central Idaho can often produce smoke that exceeds the 24 hour period standard.

Cumulative Effects

The effects on air quality from the No Action – Wildfire Alternative are not specifically known since these effects are related to weather conditions and other wildland fires that may be burning at the same time. In recent decades frequent episodes of multiple, large, long-duration wildland fires have occurred in Idaho and other western states during the summer months. Smoke produced from a wildland fire in the Hughes Creek project area would add to the particulate load and reduced atmospheric visibility during periods when other fires and burning were occurring in upwind areas.

Proposed Action

Direct and Indirect Effects

The direct effects on air quality from the implementation of the proposed action would be the result of smoke produced from all the fuels reduction burning activities. These effects would occur in and adjacent to the project area.

The prescribed fuel treatment for commercially harvested stands would include whole tree yarding in tractor logging units, which means trees would be cut and skidded to a landing area before being limbed and removing the top above the minimum top diameter limit. In areas scheduled to be skyline harvested the amount of slash would vary according to mitigation measures set forth by the down woody debris requirements (5 tons per acre). In most areas tops would be left on the last log and hauled to the landing. The branches would be limbed resulting in more tons of slash per acre to be left within the unit. These tops and limbs in both skyline and tractor harvested units would then be piled at the landing for biomass utilization or burning during wet weather. Most of the dead limbs and a portion of live limbs would break off during the yarding process so would remain on site. Biomass removal would reduce the air quality effects from burning proportionate to the amount removed.

Table 5 shows the estimated particulates produced by the implementation of the burning associated with the proposed action and predicted amounts from a wildland fire. These estimated amounts are included to allow for comparison of No Action with wildfire and the Proposed Action Alternative. Actual amounts may differ depending on fuel moisture conditions at the time of burning. If woody debris is removed or utilized as biomass, the resulting smoke production would be reduced accordingly. Fine particulate matter produced from prescribed burning of slash piles or from low to moderate intensity underburns during the spring or fall season would be less than one half of burning the same acreage in a summer wildland fire.

Table 5. PM2.5 generated by fire type

PM 2.5 (lbs/acre)	Fire Type
1930	Wildfire
945	Prescribed Fire

Indirect affects to air quality associated with the implementation of the Proposed Action Alternative would be the result of smoke that drifts from the project area. These impacts would vary by atmospheric conditions during and shortly after burning occurs and would be directly related to the amount of material burned. Short term smoke impacts may affect the local area, especially during stable atmospheric conditions, particularly at night. This could include reduced visibility along travel corridors adjacent to the project area, as well as reduced visibility and the smell of smoke at adjacent residences.The Montana/Idaho Airshed Group Operating Guide has standards for emission levels and dispersion rates. The Salmon-Challis National Forest operates under the guidelines of this plan. Prior to all ignitions, the management plan coordinator would evaluate all burns, existing air quality, and forecasted weather conditions including atmospheric stability and transport winds for each burn unit. This information along with consultation with the Montana and Idaho regulators would be used to issue daily burn restrictions which are issued from March through November of each year. All burn restrictions and the Montana/Idaho Airshed Operating Guide would be strictly adhered to prior to any ignition. If a burn permit is issued and smoke dispersal becomes unfavorable or is impacting local area residents, the burn boss may terminate burning under their own discretion. Operating under the guidelines of the Montana/Idaho Airshed Group minimizes the chances that prescribed burning activities under the Proposed Action Alternative would exceed regulatory limits or cause long duration visibility impairment.

Table 6. Summary of effects to air quality

Effects Indicator	Alternative 1 No Action - Wildfire	Alternative 2 Proposed Action
Compliance with Idaho/Montana Airshed Group Operating Guide	Not applicable to wildfires	Compliant when guidelines followed
Particulate matter (PM 2.5) lbs/acre	1930 lbs/acre	945 lbs/acre
Carbon Dioxide (CO2) lbs/acre	176,100 lbs/acre	54,286 lbs/acre

Cumulative Effects

The cumulative effects on air quality from the implementation of the Proposed Action Alternative are not specifically known since these effects are dependent on weather conditions and other quality factors at the time of burning. Smoke produced by prescribed burning would add to the particulate and chemical load of the atmosphere during and for a short period after associated burning occurs. All burn restrictions and the Montana/Idaho Airshed Operating Guide would be adhered to at all times which would minimize the chances of smoke adding to degraded air quality conditions.

Wildlife

No Action - Wildfire

Direct and Indirect Effects

Direct and indirect effects of an uncharacteristic crown fire in Hughes Creek with the subsequent loss of 50% of vegetative cover would have substantial impacts to wildlife and their habitats. Direct mortalities of wildlife are unlikely to occur. Big game are known to move out of wildland fire areas (Singer and Schullery 1989 IN: Smith et al 2000), birds fly from the area and other species such as small mammals are usually able to escape by burrowing underground. All vegetative habitat types would generally be set back in ecological succession processes. The uncontrollable circumstances surrounding wildfire including larger areas being influenced by more severe impacts can likely dictate a much slower recovery to pre-fire conditions.

Hiding cover values important to big game would likely be greatly reduced in some areas, and/or eliminated, making those species potentially more vulnerable to predators and/or harvest. Security areas have great potential to be negatively influenced by a 50% loss in hiding cover. These effects from wildfire are estimated to eliminate five of six existing security areas within the Hughes Creek drainage because they would no longer meet the 250ac minimum. Desirable forage species may have a longer response time depending on precipitation levels following wildfire. Resulting cover/forage percentages are estimated to decrease to 27% cover while forage levels would subsequently increase to 67% (Haggas, 2009).

There are a total of 37 designated old growth stands (DOGs) comprising 2408 acres in the Hughes Creek drainage. DOGs dominated by Douglas-fir may likely lose features of multi-storied structure and loss of interior microclimatic conditions. DOGs characterized by large diameter ponderosa pine are also at risk because of the presence of smaller Douglas-fir often in the immediate vicinity of pine that serves as ladder fuels. Large ponderosa pine may be jeopardized due to this situation. Large ponderosa pine may additionally be susceptible to loss as intense heat becomes concentrated in litter or duff layers at the base where root damage may occur. More snags of various sizes would likely be created with subsequent accumulations of dead and down debris.

Cumulative Effects:

The cumulative effects of an uncharacteristic crown fire in Hughes Creek would likely be more deleterious on wildlife because they are additive to the effects that past and present activities have had on area habitats. Depending on fire severity and available moisture, the natural succession of plant communities may take several decades or longer to provide desirable conditions for hiding cover, security areas and old growth habitat.

Proposed Action

Direct and Indirect Effects

Mechanical treatments would reduce cover levels and increase forage levels in the managed portion of the Hughes Creek drainage (Table 7). Effects of the mechanical thinning treatments would be most evident in areas previously harvested that now have regenerating conifers that provide some hiding cover value and those areas with hiding cover that would be converted to forage. Cover areas expected to receive the most impacts would be those located on the south side of Hughes Creek above and below the West Fork Hughes Creek, and areas east of Ditch Creek. Much of these areas would no longer have hiding cover values. Conifers and shrubs would regenerate to provide future cover, however, the harvest activities coupled with repeated prescribed fire treatments have the potential to keep cover values reduced. Elk may become more vulnerable to harvest during hunting season. Due to reduced cover values, the effectiveness of the habitat to provide for the reproductive needs of elk may also be reduced. Although the effects of these project activities may not be compatible with state management objectives for increasing elk herd levels in this game management unit, it is important to note that the Hughes Creek project area represents a small percentage (7.9%) of the state unit (Haggas, 2009)

Security areas would be maintained with existing road closures, especially on the south side of Hughes Creek where commercial activities as well as administrative use would be restricted during hunting season. These road closure actions are consistent with state management objectives to maintain security areas and avoid disruption of elk migration routes (Idaho Department of Fish and Game 1985).

The direct and indirect effects of the prescribed burn treatments would largely benefit wildlife through the regeneration opportunities for upland shrub species, sagebrush grasslands and aspen habitats. Wildlife may be temporarily displaced; however, there is an abundance of available habitat that would not be simultaneously subjected to treatment activities. Design features have been added to maintain larger size classes (i.e., up to 10-12 ft in height) to provide future thermal cover.

Areas within the Hughes Creek drainage that contain stands of curl-leaf mountain mahogany or native bunchgrass communities require special consideration in the fuel management process because these communities are prone to damage from prescribed fire, and can be difficult to regenerate. Project design features have been identified to address these concerns and minimize effects by avoiding direct fire ignitions in mountain mahogany, and avoiding burning identifiable patches, especially on the upper one third of slopes (Haggas, 2009).

Aspen would be regenerated and potentially enhanced through the benefits of disturbance. Prescribed fire activities would promote conifer removal and/or mortality, stimulate aspen and shrub regeneration, enhance the vigor of clones, and be an overall benefit for wildlife. Additionally, aspen regeneration would provide another component of vegetative diversity that would be enhanced on the landscape.

Old Growth Habitat

Ten DOGs (784ac) have been selected for treatment to enhance and maintain the old growth characteristics of the stands. These characteristics as defined by Hamilton (1993) include horizontal and

vertical diversity, multiple canopy layers, snag groups and dead and down debris. Limited mechanical treatments together with prescribed fire would direct DOGs currently not in old growth condition toward these levels. Large diameter Douglas-fir and ponderosa pine would be maintained via prescribed fire (Unit cards, Appendix C). Fire treatments that regenerate shrub species and maintain large size dead and down materials would be emphasized. It is anticipated that old growth conditions recommended by Hamilton (1993) would be promoted and more DOGs would then meet these criteria. Overall, the Proposed Action Alternative treatment of hazardous fuels promotes maintenance of habitats in the 2408 acres of DOGs in the Hughes Creek drainage.

Threatened and Endangered Species

Gray wolf and Canada lynx are the species of concern in the project area. Habitat for federally listed species including the gray wolf would be maintained. No direct, indirect or cumulative effects on the gray wolf are anticipated. It is anticipated that there would be no negative and/or measurable impacts on Canada lynx, its habitat or its prey due to the factors listed here:

- the proposed project would not occur in mapped lynx habitat,
- the infrequent nature of the occurrence of lynx within the project area,
- the absence of this species on the US Fish and Wildlife Service Quarterly Species List (#14420.2009.SL.0039) for the Salmon-Challis National Forest,
- because the proposed project would not significantly interfere with the Lynx Risk Factors (Ruediger et al 2000) including no significant change to the character, type of permitted use, or use level at present,
- and human induced changes in interspecific competition are not likely to occur

Sensitive Species

Habitat for US Forest Service-Region 4 designated sensitive species including western big-eared bat, wolverine, fisher, northern goshawk, peregrine falcon, boreal owl, flammulated owl, three-toed woodpecker, Columbia spotted frog, flexible alpine collomia and Lemhi penstemon would be maintained. Open stand conditions that favor the development and retention of large diameter Douglas-fir and ponderosa pine would be promoted, thus enhancing habitats used by many of these sensitive species. Mechanical treatment and prescribed fire may enhance habitats for several sensitive species (including western big-eared bat, northern goshawk, boreal owl, flammulated owl, and three-toed woodpecker) because project activities would emphasize the retention of large diameter trees and open understory conditions suitable for foraging activities. The recommendations of Reynolds et al. (1992) would be used in the event a goshawk territory is located to maintain the nesting habitat characteristics of stands within the territory. Prescribed fire also has the potential to create more snags of different sizes suitable for cavity nesters such as boreal and flammulated owl. Habitat conditions that favor the maintenance of Lemhi penstemon would likely be promoted through fire.

Management Indicator Species

Pileated woodpecker habitat would be maintained by the proposed project because large diameter trees for nesting and large downed logs for foraging would be emphasized for retention during fuels reduction activities. Underburns conducted in Oregon old growth forests showed no change in use of these stands by this species (Smith et al 2000). No adverse effects to this species or the population are anticipated as a result of project activities.

Because limited prescribed fire treatment would occur in riparian areas within Hughes Creek, the Columbia spotted frog or their habitat may be impacted by project activities but these impacts are not anticipated to cause changes in population levels or lead to a trend toward federal listing.

Greater sage-grouse or their habitat would not be impacted by this project. Extensive sagebrush habitats that are required by this species do not occur within the proposed project area. Because habitat is largely unavailable, it is anticipated that the proposed project would have no impact on this species, its prey, or its habitat.

Table 7. Summary of effects to wildlife in the Hughes Creek drainage

Effects Indicator	Alternative 1 No Action - Wildfire	Alternative 2 Proposed Action
Acres of big game security areas maintained	467 acres	2461 acres
Cover/forage ratios in big game habitat (40/60 is optimum)	27/67	49/45
Acres of habitat within designated old growth stands maintained	1204 acres	2408 acres

Cumulative Effects

Direct and indirect effects of the proposed action alternative are not likely to substantially influence the wildlife resource due to the incorporation of appropriate design features. Although cumulative effects have the potential to promote deleterious effects on big game, these effects are expected to be much less than the uncontrollable conditions from uncharacteristic crown fire.

Fisheries

No Action - Wildfire

Direct and Indirect Effects

There would be no direct effects associated with the No Action Alternative on the five fisheries measurement indices listed in Appendix B. The consequences of not treating fuels at this time would likely result in indirect effects that occur following a major wildfire.

Indirect effects of the No Action Alternative relate to the unnatural build-up of fuels in the project area. The probable long-term consequence of not treating fuels is a large scale, high intensity wildfire. Predicting actual long-term effects from a major fire is difficult due to variability in location of fire and fuel types. The worst case scenario would concentrate a major wildfire in the Hughes Creek subwatershed, in heavy timber, and remove the majority of understory and overstory vegetation. Results of a large stand replacing wildfire could include:

- Creation of hydrophobic soil conditions in areas with heavy fuel accumulation
- Appreciable changes in slope stability, runoff, and sediment delivery following a large scale, high intensity wildfire
- Removal of overstory and understory vegetation which helps minimize sediment transport from the uplands to the riparian areas, the floodplains, and the stream channels

- Removal of the stream side shade components thus creating warmer undesirable stream temperatures for the cold water salmonids.

These effects can in turn result in negative impacts to fish populations and fish habitat, decreased fish numbers and degraded environmental baseline conditions for the five fisheries measurement indices. See Table 9 for a summary of effects to fisheries.

Cumulative Effects

When considered with past, present, and reasonably foreseeable future actions, the potential cumulative effects of the No Action –Wildfire Alternative are easier to qualify rather than quantify because of the unpredictable nature of large fires. Risk to fish and their habitats is closely related to the results of modeling of watershed risk rating. The risk of adverse cumulative watershed effects was calculated based on watershed relief, road density, channel stability, and Equivalent Clearcut Acres (ECA). The watershed risk rating determined for hydrologic and aquatic resources in the Hughes Creek subwatershed is described in Table 8 (USDA, Forest Service, 2008a). The No Action – Wildfire Alternative has a high watershed risk rating, therefore a potential adverse cumulative effect on the fisheries effects indicators (Table 9).

Table 8. Watershed Risk Rating for Hughes Creek

Current Condition	Alternative 1 No Action - Wildfire	Alternative 2 Proposed Action
Moderate Risk Rating	**High Risk Rating**	**Moderate-High Risk Rating**
basin relief <30% road density 3.2 ECA 5%	basin relief <30% road density 3.2 ECA 50%	basin relief <30% road density 3.2 ECA 12%

Proposed Action

Direct and Indirect Effects

The nine different activity types associated with the Proposed Action Alternative would have no direct effects on any of the five fisheries measurement indices. There would be no project activities that would directly increase or decrease fish population densities and trends. As designed and planned the project's activities would meet FLRMP standard and guidelines, PACFISH; RHCAs, Riparian Management Objectives (RMOs) and standard and guides thus ensuring there would be no direct effect on stream habitat conditions, stream sediment and stream temperatures. There would be no activities that would restore or degrade stream connectivity.

Implementation of the Proposed Action Alternative is expected to have a low risk of potential indirect effects to any of the five fisheries measurement indices because of the design features associated with the project's activities. See Table 9.

Table 9. Summary of Effect to Fisheries

Indicator	Alternative 1 No Action - Wildfire			Alternative 2 Proposed Action		
	Direct	Indirect	Cumulative	Direct	Indirect	Cumulative
Fish Presence/Absence, Population Density/Trend	None	Degraded	Adverse	None	Low risk	Low risk
Stream Habitat Condition	None	Degraded	Adverse	None	Low risk	Low risk
Stream Sediment	None	Degraded	Adverse	None	Low risk	Low risk
Stream Temperature	None	Degraded	Adverse	None	Low risk	Low risk
Stream Connectivity	None	Degraded	Adverse	None	Low risk	Low risk

Cumulative Effects

When considered in combination with past, present, and reasonably foreseeable future actions, the Proposed Action Alternative and its activities maintain fish populations and the environmental baseline conditions for the five fisheries measurement indices. There is a low risk of adverse cumulative effects to the fisheries resource and the measurement indices because of the design features associated with the proposed project's activities.

Determinations:

Threatened and Endangered Species

The fisheries Biological Assessment/Biological Evaluation (BA/BE) determined the Alternative 2 Proposed Action's activities shall have No Effect to the federally listed endangered Snake River sockeye salmon and No Effect to their Designated Critical Habitat.

The fisheries BA/BE determined the Alternative 2 Proposed Action activities May Effect - Not Likely to Adversely Affect the federally listed threatened Snake River spring/summer Chinook salmon, threatened steelhead, and threatened bull trout.

The fisheries BA/BE determined the Alternative 2 Proposed Action activities May Effect - Not Likely to Adversely Affect the Designated Critical Habitat for the Snake River spring/summer Chinook salmon and the Snake River Basin steelhead.

The fisheries BA/BE determined the Alternative 2 Proposed Action activities May Effect - Not Likely to Adversely Affect the Essential Fish Habitat for Chinook salmon.

Management Indicator Species

The Salmon-Challis National Forest completed a Forest Plan Amendment for its Management Indicator Species (MIS) in 2004. In this Forest Plan Amendment the bull trout is the MIS fish species selected to represent the aquatic habitat/community type on the Salmon-Challis Forest.

This analysis considered how each of the two alternatives would affect bull trout population viability and bull trout population trend across the Salmon-Challis National Forest. Alternative 1 and Alternative 2 would maintain existing bull trout viability, maintain the bull trout population trend and maintain bull trout habitat on the Salmon-Challis National Forest. The rationale for this assessment is based on the Hughes Creek Hazardous Fuels Reduction Project's biological assessment determination for bull trout as May Effect- Not Likely to Adversely Affect determination (USDA, Forest Service, 2009b).

R4 Sensitive Species

The fisheries BA/BE determined the Alternative 2 Proposed Action activities May Impact the R4 sensitive fish, westslope cutthroat trout and their spawning and rearing habitat but shall not contribute to a trend towards Federal listing or cause a loss of viability to the population or species.

Hydrology

No Action - Wildfire

Direct and Indirect Effects

There would be no direct effects associated with the No Action Alternative because the consequences of not treating fuels would likely occur at a later time.

Indirect effects of the No Action Alternative relate to the unnatural build-up of fuels in the project area. The probable long-term consequence of not treating fuels is a large scale, high intensity wildfire. Predicting actual long-term effects from a major fire is difficult due to variability in location of fire and fuel types. The worst case scenario would concentrate a major wildfire in the Hughes Creek subwatershed, in heavy timber, and remove the majority of vegetation which would create hydrophobic soil conditions in areas with heavy fuel accumulation. Appreciable changes in slope stability, runoff, and sediment delivery are likely to occur following a large scale, high intensity wildfire.

Compliance with State Water Quality Standards and Maintenance of Beneficial Uses.

Water quality has three components: chemical, physical and biological. These combined parameters make up the water environment as defined by the Clean Water Act. Water quality standards are legally established rules consisting of three parts: designated uses, criteria to protect those uses, and an antidegradation policy. Designated uses are the beneficial uses identified by the State of Idaho Department of Environmental Quality which are supported by the water quality in a given stream or lake. Criteria are the conditions presumed to support or protect the designated uses. There are no beneficial uses identified for Hughes Creek, however existing beneficial uses include domestic water supply, agricultural water supply, cold water biota, salmonid spawning, primary contact recreation, and secondary contact recreation. The assessment units and streams within the analysis area currently fully support designated beneficial uses. In the event of a catastrophic wildfire there would be negative effects to existing beneficial uses, however it is unlikely that beneficial uses would not continue to be supported. There are no water quality limited segments in the Hughes Creek subwatershed.

Potential for change in hydrologic response (timing and discharge) of project area streams, measured by Equivalent Clearcut Area (ECA) - (percent of area in ECA)

The ECA in Hughes Creek peaked in 1978 with about 27 percent of the subwatershed in a hydrologically immature condition (Hydrology Specialist Report). Recovery has outpaced harvest allowing trees in the subwatershed to mature. Currently 97 percent of the subwatershed is in a mature condition. In the wildfire scenario described in the No Action Alternative it is expected that 50 percent of the forested ecosystems would incur a lethal fire severity and increase the ECA to over half of the subwatershed. Thresholds of concern for ECA are reached when ranges exceed 15 to 30 percent. The Salmon-Challis NF typically uses an ECA of 20 percent of a 5th field HUC watershed as a threshold of concern, but the Salmon NF FLRMP does not specifically prescribe a threshold level (Hydrologist Specialist Report).

Modeled probability of erosion and sediment delivery to stream channels- (percent probability)

Wildfires burn indiscriminately without regards to mitigation normally associated with prescribed burning including buffer strips, fuel loadings and burn severity. Wildfires usually burn late in the summer when relative humidity is low and fuel moistures are low even in the riparian areas. Because the buffer strips burn under these extreme conditions there would be a greater chance for the eroded materials to enter stream courses. The increased risk of sediment yield to streams is represented in the high probability of sediment yield predicted by the WEPP model. WEPP is a physically-based soil erosion model that can provide estimates of soil erosion and sediment delivery, considering the specific soil, climate, ground cover, and topographic conditions (Hydrology Specialist Report). The WEPP sediment model indicates that in a worst-case scenario there would be a 34 to 48 percent chance of both erosion and sediment delivery from the proposed project area in the first year following a large scale, high intensity wildfire. In the event of a large scale fire, effects would not be confined to the treatment units or the project area, and the magnitude of effects could result in detrimental impacts to the North Fork of the Salmon River, downstream and outside the project area.

Cumulative Effects

Cumulative effects watershed risk rating combining existing condition, watershed sensitivity and degree of management as a comparison of the potential to experience adverse effects to water resources (low, moderate or high)

The existing condition, watershed sensitivity and degree of management within a watershed or subwatershed affect the potential to experience adverse effects to watershed and aquatic resources. As a general rule, the probability of experiencing adverse effects increases as the percentage of the watershed or subwatershed affected by management actions or natural disturbances increases. Based upon a watershed risk assessment presented in the document Determining the Risk of Cumulative Watershed Effects Resulting from Multiple Activities (USDA, Forest Service 1993), road density and percent of the subwatershed covered with "hydrologically immature" vegetation were used as indicators of potential effects on water yield and timing as well as erosion and sediment potential and compared between alternatives (Table 10).

Table 10. Cumulative Effects Watershed Risk Rating for Hughes Creek

Current Condition	Alternative 1 Wildfire	Alternative 2 Proposed Action
Moderate Risk Rating	**High Risk Rating**	**Moderate-High Risk Rating**
basin relief <30% road density 3.2 ECA 5%	basin relief <30% road density 3.2 ECA 50%	basin relief <30% road density 3.2 ECA 13.5%

Other on-going and proposed activities that affect water resources and beneficial uses in the Hughes Creek drainage considered in this analysis are listed in the document *Hughes Creek Hazardous Fuels Reduction Project Catalog of Activities and Actions for Cumulative Effects Analysis* found in the project file.

Proposed Action

Direct and Indirect Effects

Compliance with State Water Quality Standards and Maintenance of Beneficial Uses

Mechanically harvesting by means of tractor and skyline activities has the potential to accelerate natural erosion rates and provide conduits to move sediment off site. Prescribed burning activities have the potential to increase natural erosion rates by reducing ground cover and for a short period leave the soil surface susceptible to high intensity storms. Over the long term the proposed treatments would reduce fuel loadings and the threat of large, high intensity wildfires which are greater risks to the goal of maintaining water quality and down stream beneficial uses. Existing beneficial uses would be maintained if the proposed activities were implemented.

Potential for change in hydrologic response (timing and discharge) of project area streams, measured by Equivalent Clearcut Area (ECA)- (percent of area in ECA)

Implementation of the Proposed Action Alternative would increase the ECA in the year 2009 in the Hughes Creek subwatershed from 3.9 to 6.6 percent. Over the period of proposed activities the peak would be in the year 2016 where ECA would reach 13.5 percent of the forested acres in the subwatershed. Assumptions and values used to calculate ECA values are displayed in the project files (Hydrology Specialist Report). The Hughes Creek subwatershed is not likely to show measurable increases in peakflows and subsequent channel morphology changes with this scale of activity. Implementation of the Proposed Action Alternative would also reduce the risk of a large scale, high intensity wildfire that would result in increased ECAs (estimated to be 50 percent of the forested acres) in the project subwatersheds as well as surrounding areas, and could result in detrimental impacts to streams within the project area.

Modeled probability of erosion and sediment delivery to stream channels- (percent probability)

The Proposed Action Alternative harvest units were designed so that the standard PACFISH buffers were excluded from the treatment units with the exception of units where a road prism would intercept overland flow before it reached a stream channel. Harvest activities within the delineated RHCAs of these units would maintain PACFISH Riparian Management Objectives (RMOs) for pool frequency, water temperature (i.e. no measurable increase in maximum water temperature), large woody debris (i.e. >20 pieces/mi, >12 inches diameter, >35 feet long), bank stability (>80 percent stable), lower bank angle (>75 percent with <90° angle), and channel width to depth ratios (<10). The PACFISH RMOs were designed to protect aquatic habitat and channel morphology, and promote desired channel, riparian, and floodplain characteristics.

The objective of the unit buffers was to minimize the percent probability that there would be sediment delivery in the first year following harvest. Most of the lodgepole pine units were designed with adequate buffer strips to maintain less than or equal to 6 percent probability of sediment delivery in the year following harvest. Implementation of project design criteria, BMPs, other soil and water mitigations, and proper sale administration would reduce erosion and sediment delivery probabilities. The estimated probability of sediment delivery from the WEPP model ranged from 2 to 6 percent which represents the worst-case scenario using the minimum expected cover estimates following treatment (Hydrology Specialist Report).

In the long-term, effective road closures, restoration of natural drainage patterns, revegetation, increased infiltration rates, decreased road densities, and reduced risks of culvert plugging/blowouts and sediment delivery potential would improve watershed conditions and aquatic habitat over the existing condition.

Some of the secondary haul roads are currently closed and would be reopened for hauling. To reduce the risk of increased soil erosion and sediment delivery, the pre-project maintenance would retain the existing vegetative cover on the roads to the extent possible. Road blading would be limited to rock removal (high blading) or necessary slough removal. Existing small trees or brush on the road would be removed by hand-felling or pruning to minimize disturbance of the road surface and maintain the vegetative cover. These mitigation measures have been used on the Forest in the past and were very successful in reducing erosion of the road surface. Additionally the proposed action would mitigate the effects of main haul routes by applying a magnesium chloride surface-aggregate stabilizer. Analysis of haul routes (Hydrology Specialist Report) estimates a 56 percent reduction in surface loss. Treated roads would require less maintenance and fewer bladings further reducing surface loss and sediment potentially available to streams, thus contributing to protection of water quality and beneficial uses.

Cumulative Effects

Cumulative effects watershed risk rating combining existing condition, watershed sensitivity and degree of management as a comparison of the potential to experience adverse effects to water resources (low, moderate or high)

The watershed risk rating would be slightly elevated for the proposed action relative to the current condition however; it would be far less than would be expected with the NoAction-Wildfire Alternative (Table 11). Because there is no proposed change in road management the primary driver for the change in watershed risk rating is the change in ECA. With the other conditions in the subwatershed remaining the same the change in ECA of 13.5 percent puts the risk rating on the line between moderate and high. A catastrophic wildfire expected to increase ECA as much as 50 percent would put the subwatershed at a much higher risk for cumulative effects.

Table 11. Summary of effects to hydrology.

Effects Indicator	Alternative 1 No Action - Wildfire	Alternative 2 Proposed Action
Modeled % probability of sediment delivery	34-48%	2-6%
Compliance with State Water Quality Standards; maintenance of beneficial uses	Likely immediate and short term degradation due to wildfire and suppression efforts; compliance, as beneficial uses likely supported	Slight potential for short term degradation; long term reduction of risk to beneficial uses
Equivalent Clearcut Acres (ECA) in % of watershed in ECA	50%	13.5%
Road densities in miles/square mile	3.2 miles/sq. mile	3.2 miles/sq. mile
Watershed risk rating	High	Moderate-High

Soils

Analysis Area

Due to the numerous activities proposed for this project there will be more than one analysis area for the soil resource. This is so potential beneficial and adverse affects are reflected more accurately. The analysis area for determining detrimental soil disturbance from management activities encompasses the acres within proposed vegetation treatment units for the existing condition and the alternatives. The activity area for determining total soil resource commitment, which takes into account activities that remove land from the soil productive base, is the 13,261 acre project area. The cumulative effects analysis

also is the 13,261 acre project area since this is the total area that would have management activities that could impact the soil resource. In general soils outside the unit boundaries (activity area) are not expected to be directly, indirectly, or cumulatively affected by this proposal.

No Action - Wildfire

Direct and Indirect Effects

Soil Productivity

Soil Erosion and Mass Movement

If a large stand replacing wildfire did occur it may result in soil erosion and mass movement depending on ground conditions and storm activity. Soil erosion occurs where ground cover, duff, and litter have been consumed by fire or hydrophobic soil conditions develop due to fire intensity. Mass movement occurs primarily in the form of debris flows within channels following high intensity, short duration storm events and can be worse following a wildfire.

Approximately 2,400 acres, including the 1,043 harvest unit acres, occur on high erosion hazard lands. Quantification of potential soil loss through post-wildfire erosion and mass movements is speculative because so many independent variables (fire severity, climate, soil types, soil effects, etc.) need to be incorporated into the predictions. WEPP modeling for erosion rates and probability was completed for the vegetation treatment units (see Hydrology Resource report located in the Planning Record for discussion of WEPP). Soil erosion rates after a wildfire were between 0.4 and 3.8 tons per acre. The probability of erosion after a wildfire was between 34 percent and 48 percent.

Organic Matter, Groundcover, and Coarse Woody Debris

Effects of the No Action-Wildfire Alternative relate to the unnatural build-up of groundcover, both coarse woody material and fine organic matter in the project area which may lead to increased fire severity and intensity during a fire event. If this were to occur severe soil heating may cause physical, chemical, and biological changes in the soil resource. Fire instantaneously combusts organic matter and causes the rapid acceleration of decomposition rates and nutrient cycling processes that are essential for plant growth and soil organisms. The effects of fire have short-term and long-term adverse effects (USDA Forest Service 2005). Organic matter acts as a primary reservoir for several nutrients and therefore is the source of most available phosphorous and sulfur and virtually all available nitrogen. When organic matter burns, essential nutrient loss can occur during a fire in the following ways: nutrients are transferred to the atmosphere through volatilization and ash convection, or surface runoff (erosion) of deposited nutrients in the ash layer (USDA Forest Service 2005). Nutrients at a greater depth in the soil profile may be immediately lost following a fire due to leaching. Compared to the pre-burn condition, a large reduction in the organic matter covering the soil would reduce the insulating effect this layer has on soil temperature. Under a reduced organic layer soils would experience greater temperature extremes. In addition, a blackened surface, due to partially combusted organic materials, would absorb more light and become warmer than a soil without a dark surface. Soil temperatures may be elevated for months or years depending on the degree of organic matter consumption (Neary et al., 1999). Such changes in the soil temperature regime would affect the rates of biological activity in the soil, resulting in altered nutrient cycling regimes (USDA Forest Service 2005). These effects would be detrimental effects to the soil condition, and a departure from the desired condition of the soil resource in the short term.

Soil Disturbance

Not treating ground and surface fuel loads could lead to increased fire severity and intensity during a fire event. Soil structure and reduction of porosity are the most common physical changes to soil that can occur with burning. Both of these properties are related to the consumption of organic matter above and within the soil surface and with micro-flora and fauna that bind soil particles together. During a high severity wildfire soils could become hydrophobic resulting in infiltration and permeability rate changes. This could result in slowed plant growth, impeded root development, and increased overland flow during high precipitation events.

Assuming 12.5 percent burn severity approximately 474 acres could potentially be classified as severely burned which could increase the soil disturbance area to 664 acres. Percent detrimental soil disturbance in the area of the harvest units would potentially increase from the existing 5% to 17.5%. This resulting percentage would exceed the Region 4 guidelines of no more that 15%, but still be within the Salmon NF FLRMP standard of no more than 20%. Soil disturbance factors for the various treatments and the calculations used to determine the potential level of detrimental soil disturbances for each proposed unit are included in Appendix D of the Soils Resource Report located in the planning record.

Total Resource Commitment

Total soil resource commitment would remain at approximately 1.5 percent of the project area as no new permanent roads or landings would be constructed. This percentage remains below the Salmon NF FLRMP standard of no more than 5% total soil resource commitment.

Proposed Action

Direct and Indirect Effects

Soil Productivity:

Soil Erosion and Mass Movement

Approximately 2,400 acres of burn units have a high inherent erosion hazard rating indicating that unprotected bare soil would erode sufficiently to severely damage productive capacity or would yield high volumes of sediment. Harvest units within these burn units acres total approximately 1,080 acres. No units exist in areas rated as a high mass movement hazard. These areas are assumed to have the highest probability of erosion due to the ground disturbing equipment use within the units coupled with prescribed burning. Soil erosion rates after a prescribed burn are between 0.0 and 0.1 tons per acre. The probability of erosion is between 0 and 10 percent.

Organic Matter, Groundcover, and Coarse Woody Debris

Loss of groundcover and organic matter at landing sites and on main skid trails is expected due to equipment operations. However, the Proposed Action is designed to leave a variety of organic matter on site. Vegetation and organic matter protects the soil surface from raindrop impact, dissipates energy of overland flow, binds soil particles together, and dampens soil temperature extremes and daily fluxes. Any increase in groundcover and/or fine logging slash through harvest may be offset by fuel treatments. Fuel treatments may reduce the amount of organic matter and groundcover in the short term (0-5 years after treatment) through the use of fire and slash pile burning. In the long-term (greater than 5 years) re-growth of vegetation and needle drop would provide groundcover and leaf and litter material for conversion into soil organic matter.

Ground based harvest would reduce ground cover on heavily used landings, skid trails, at trail junctions, and near landings. On lightly used trails (one or two passes) ground cover is not anticipated to be reduced along the entire trail length. Constructing waterbars, ripping landings, and seeding would hasten groundcover recovery and reduce soil erosion and movement off-site. Harvest prescriptions in tractor units would be whole tree yarding. This method would reduce fire potential but would not leave much coarse woody debris on the ground.

Groundcover in skyline corridors and at landings would be reduced due to equipment operations and corridor convergence. Corridors and landings would have soil rehabilitation treatments following logging and site prep activities. Treatments include construction of water bars, pulling slash into the corridors and landings, ripping landings along the contour and seeding. In the long-term (greater than 5 years) it is anticipated that groundcover would become re-established through vegetation re-growth and needle cast. Harvest prescriptions in skyline units would be to lop and scatter slash or yard tops. This would provide additional coarse woody residue.

Soil Disturbance

Thinning within proposed vegetation treatment units is designed to avoid detrimental soil impacts. This goal is achieved by implementing mitigation and design features as well as Best Management Practices and Soil and Water Conservation Practices. The design features and management practices would minimize the extent of compaction, rutting, puddling, and displacement.

Soil disturbance factors for the various treatments and the calculations used to determine the potential level of detrimental soil disturbances for each proposed unit are included in Appendix D of the Soils Resource report located in the Planning Record. Soil disturbance factors are calculated to represent a “maximum disturbance scenario” during harvest operations. Conventional clearcut skidder harvesting systems cover about 15 percent of the stand (unit) in trails and landings. The most heavily impacted areas are the primary skid trails, delimbing areas, and landings (USDA Forest Service, 2001). Harvest intensity also affects the amount of soil disturbance. Even though 15 percent of a stand may be impacted by skid trails and landings not all areas that are impacted are detrimentally disturbed. Detrimental disturbance is a combination of such factors as existing ground cover, soil texture, timing of operations, equipment used, skill of the equipment operator, the amount of wood to be removed, and sale administration. Forest Plan disturbance guidelines are applied after the completion of all management activities including mitigation measures, such as, ripping skid trails and landings, redistributing berm and slash onto roads and skid trails, redistributing soil and slash on firelines, and installing waterbars. (Appendix E in the Soils Resource report summarizes existing conditions, No Action, and Proposed Action indicators).

Vegetation Treatments

Tractor Harvest

Soil compaction and displacement at landing sites and on main skid trails is expected due to equipment operations. Soil displacement is expected to be small and localized and may occur where logs are lifted from the forest floor or at landings. Compaction is not expected to be an issue due to the high rock fragment content and sandy loam soil texture. In addition, areas that do become compacted or displaced would be rehabilitated by scarifying or ripping the soil to restore proper water infiltration, redistributing displaced topsoil, seeding with native species, and constructing waterbars (Design features in Appendices A and C in this EA). Plant root expansion, freeze/thaw cycles, and rodent activities would continue to rework the soil to improve soil structure.

Approximately 192 acres are at risk of increased soil disturbance. Small, localized areas may have reduced soil productivity in the first 10 years following harvest, but would improve as vegetation becomes re-established and organic layers rebuild. Areas of reduced productivity include skid trails,

landings, and burn piles. However, rehabilitation is prescribed to limit the severity of soil damage or its aerial extent (Design features in Appendices A and C in this EA).

Skyline Harvest

Soil compaction and displacement in skyline corridors and at landings is expected due to equipment operations and corridor convergence. Soil disturbance occurs when moving trees to and within the corridor. These corridors are narrower than skid trails caused by ground-based equipment with an average spacing of 200 feet. Skyline logging soil disturbance may be greatest at the landings where logs are no longer suspended and corridors converge. These effects can be minimized by ensuring good suspension of the log and avoiding wet soil conditions. Soil mitigation for skyline yarding include construction of waterbars and covering areas of bare soil within the corridors with slash where needed in order to minimize the risks of soil erosion (Design features in Appendices A and C in this EA).

Approximately 42 acres are at risk of increase soil disturbance. Small, localized areas within the skyline corridor may have reduced soil productivity in the first 10 years following harvest, but would improve as vegetation becomes re-established and organic layers rebuild. Areas of bare soil are expected to be short and discontinuous. Other areas of reduced soil productivity include landings and burn piles. However, rehabilitation is prescribed to limit the severity of soil damage or its aerial extent (Design features in Appendices A and C in this EA).

Pre-Commercial Thinning

Pre-commercial thinning activities would not impact the soil resource. All work would be accomplished with hand tools so there would be no increases in soil compaction or other detrimental changes in soil physical properties.

Prescribed Burning

Approximately 13,261 acres in 14 units would be burned to reduce hazardous fuel buildup. Impacts to the soil resource as a result of a high severity fire can result in significant changes in physical, chemical, and biological properties. These include breakdown in soil structure, reduced moisture retention and capacity, development of water repellency, changes in nutrient pools cycling rates, atmospheric losses of elements, offsite erosion losses, combustion of the forest floor, reduction or loss of soil organic matter, alterations or loss of microbial species and population dynamics, reduction or loss of invertebrates, and partial elimination (through decomposition) of plant roots (USDA Forest Service 2005).

Widespread heating that would adversely change soil physical, chemical and biological properties would not be expected during this project. Mixed severity fire could occur where pockets of dense trees exist. Localized soil charring under and immediately adjacent to large accumulations of downed woody debris would be expected. Approximately 393 acres could be detrimentally disturbed in the burn units based on past activities and current proposed activities. Burn units 6 and 8 are potentially the greatest risk to the soil resource as these units occur on soils that are rated high risk for soil erosion. Burning in spring or moist fall conditions would reduce adverse effects caused by high soil heating such as hydrophobic conditions, loss of nutrients through volatilization, and loss of microorganisms necessary for nutrient cycling. Soil organisms necessary to recycle nutrients would remain available on the burned sites.

Bacteria, Nitrosomas bacteria, and fungi are relatively sensitive to the increased soil temperatures encountered with light to moderate intensity fire, whereas sulfur, soil structure, soil wettability, nitrogen, and organic matter are only moderately sensitive (DeBano et al., 1991). The risks to soil organisms lowers when soil moisture content is less than 15 percent and the duration of the heat is less than 30 minutes. Burning prescriptions would be written and implemented to take these as well as other resource limitations into consideration based on design features in Appendices A and C in this EA.

Areas of potentially higher risk to soil resource damage from prescribed burning include approximately 1,084 acres on south and southwest aspects, 490 acres occur on slopes over 55 percent, and 130 acres (3.5 percent) on south and southwest aspects with a slope over 55 percent. These areas would have limitations for prescribed fire due to soils that are generally low in organic matter content, may have high erosion potential following surface cover removal, or are shallow in depth. The 130 acres located on south and southwest aspects with a slope over 55 percent are the areas that are rated as severe limitation.

There are 9 acres that occur on volcanic soils with south and southwest facing slopes greater than 55 percent. These 9 acres are at greatest risk of lowered or loss of productive capacity. Design features and mitigation measures are incorporated into the prescribed burn plan to protect the soil resource.

In summary, the percent detrimental soil disturbance in the area of the harvest units resulting from all fuels reduction activities would potentially range from 2.5 to 10.9%. These results would be below the Region 4 guidelines of no more that 15%, and Salmon NF FLRMP standard of no more than 20%.

Total Soil Resource Commitment

No new road construction, permanent landings, or permanent skid trails that would convert productive sites to a condition of total soil resource commitment are planned as part of the proposed action. With this alternative approximately 49 miles of “unauthorized”(non-system) roads would be added to the Forest road system. These roads are Level 1 roads that have been on the landscape for decades (past timber sale roads, etc) and are not new construction. These roads would remain closed following project implementation as described in the Proposed Action description and Roads Analysis recommendations (see Road Analysis summary in Appendix D of the EA).

The total soil resource commitment remains at 1.5 percent of the project area. This percentage remains below the Salmon NF FLRMP standard of no more than 5% total soil resource commitment.

Cumulative Effects

For activities to be considered cumulative their effects need to overlap in both time and space with those of the proposed action. Since physical soil changes (detrimental compaction, detrimental displacement, detrimental erosion, severe burning, and puddling) can persist on the landscape for greater than 20-40 years activities from at least the 1950s are considered. Biological soil conditions change quicker. Revegetation occurs within 1 to 5 years under most situations and organic matter begins to rebuild in 10 years but may take greater than 50 years to reform humus.

Legacy soil disturbance that has occurred as a result of past activities forms the foundations of the soil condition on the landscape today. These activities include timber harvest and post harvest, grazing, roads, recreation, and mining.

Timber Harvest

Past timber harvests have occurred on approximately 10,000 acres within the analysis area since the late 1950’s. The Proposed Action would include approximately 3,430 acres of harvest with potentially 236 acres of additional soil disturbance. This would not increase the acres harvested in the Hughes Creek project area but would be minimally additive to areas previously harvested. No future timber harvests within the project area have been proposed. The combined effects of past timber harvest in combination with the Proposed Action would not result in reaching or exceeding any Forest Service standards and guides for soils protection.

Grazing

The Indian Ridge Allotment is within the Hughes Creek Project area. Impacts of grazing are limited to areas where the animals bed, lounge, trail, or access water. Impacts include compaction, removal of groundcover, and displacement and are included in the existing condition section of this report. Existing grazing standards and compliance with grazing instructions minimize the detrimental soil disturbances and loss of soil productivity from livestock uses. This is not expected to change with either alternative.

Recreation

Firewood removal is expected to slightly increase the level of soil disturbance by increasing compaction, displacement, and puddling where off-road vehicles are used. Firewood removal also reduces the amount of coarse woody debris in the area. All - terrain vehicle (ATV) use, which is becoming a very popular form of recreation, causes displacement where trails are concentrated or when use occurs on wet soils which increases susceptibility to damage. Most of the current ATV use in the project area occurs on existing roads and trails. Dispersed camps may be located along the roads and adjacent to or on the edge of harvest units. Areas of dispersed camps can increase the level of soil disturbance by increasing compaction. Use in the project area is considered light as are the overall impacts of recreation. Use is not expected to change appreciably with either alternative, therefore, no cumulative effects to soils are anticipated.

Mining

Extensive placer and hydraulic mining has taken place in the past on the lower stem of Hughes Creek on both private and National Forest lands. Due to past mining processes extensive areas have had the fines and gravels removed leaving the coarser material. Although these areas are functional, the soil productivity potential has been greatly altered due to the fact that much of the soil has been removed from the project area. There are no current or anticipated proposals for mining in the Hughes Creek project area. Cumulative effects of either alternative in combination with mining activities are not expected to occur.

Noxious Weeds

Eliminating noxious weeds maintains soil productivity. Existing soils have developed in association with native vegetation. Noxious weeds have the potential to alter nutrient cycles, moisture regimes, and erosion rates of soil systems. Both alternatives have the potential to increase noxious weeds and related soil impacts as they both involve fire. However, the increase in noxious weeds would be less with the Proposed Action because the fire would not have the intensity or severity of a wildland fire and therefore not be as damaging to the soil resource.

Table 12. Summary of effects to soils

Measurement Indicator	Alternative 1 No Action - Wildfire	Alternative 2 Proposed Action
% detrimental soil disturbance within harvest treatment units	5% current 17.5% with wildfire	2.5-10.9%
Tons/acre coarse woody debris (CWD) within harvest units	0-22 tons/acre; < recommended years 0-5, moving towards recommended years 5-10	Maintains existing up to 5 tons/acre or designed to increase to at least 5 tons/acre
% total soil resource commitment in project area including harvest units	1.5%	1.5%
Acres of treatment in high to very high erosion hazard & very high mass instability ratings	1483.5 acres impacted by wildfire	552.4 acres

Noxious Weeds

No Action - Wildfire

Direct and Indirect Effects

The analysis area is already very heavily infested with spotted knapweed and contains substantial amounts of other noxious weed species that are spreading rapidly in the analysis area (e.g. houndstongue). There are approximately 6000 acres of inventoried noxious weeds within the project area (38% of the area). Other infestations have not been inventoried and the acreages of these infestations are unknown.

The No Action –Wildfire Alternative cannot be viewed as ecologically benign with regard to the management of noxious weeds. Like many noxious weed species, spotted knapweed, houndstongue, rush skeletonweed and sulphur cinquefoil all tend to react favorable to fire in many instances (Schuldt, 2009). Fire reduces competition with native plants, most of which understory are not as aggressively competitive as noxious weeds, increases solar radiation on the soil surface, generates a flush of nutrients for regrowth of existing plants and for seeds in the soil that germinate after the fire (Asher et al. 2002).

Fire suppression activities associated with wildfires and with prescribed burning (such as re-opening and blading closed roads to create firelines and access for fire suppression equipment or building fireline with bulldozers or other equipment) also promote the spread of noxious weeds. For example, firelines can spread seeds and soil contaminated with weed seeds far from the infestation from which they originated (Techline 2000). Therefore, the risk of enhanced weed spread in the burned areas is very high. Widespread increase in noxious weeds would be expected to result from fire effects and disturbance of suppression actions associated with large fire in the Hughes Creek drainage (Schuldt, 2009).

Cumulative Effects

The No Action-Wildfire Alternative cumulative effects would be similar to the direct and indirect effects listed above: widespread and enhanced increase in noxious weed infestations in proportion to the land area burned and impacted by suppression operations.

Proposed Action

Direct and Indirect Effects

Timber harvest and precommercial thinning under the Proposed Action Alternative would encourage the establishment of denser, more robust weed infestations in the analysis area. This would occur because timber harvest and precommercial thinning decreases canopy closure and exposes the soil surface to more sunlight, favoring noxious weed species, such as spotted knapweed, that prefer full sun (Parendes and Jones 2000, Ferguson et al. 2003). In addition, the soil disturbance generated by logging equipment creates favorable conditions for establishment and rapid spread of noxious weeds by providing fresh seed beds, increased nutrient levels from microbial activity and reduced competition from native plants (Ferguson et al. 2003).

Increased levels of road maintenance and motor vehicle traffic also heighten the risk of noxious weed establishment and spread (Parendes and Jones 2000; Gelbard and Belnap 2003). Road maintenance activities can spread noxious weeds by moving road surface material up and down a road system, creating fresh seedbeds for weed germination or removing competing vegetation (Ferguson et al. 2003).

To minimize disturbance to soil and vegetation on roadways, noxious weed prevention best management practices recommend high-blading to remove rocks and debris and retaining existing vegetation to the extent possible. Depending on the condition of the road at the time of maintenance, adherence to these practices may or may not be feasible.

To reduce the probability of introducing noxious weeds into harvest units, heavy equipment, such as mechanized harvesters, must be thoroughly cleaned and pass inspection before being moved onto national forest system lands (WO-CT6.36 7/2000).

It is anticipated that approximately 50 to 80 percent of the more than 13,000 acres slated for prescribed fire would be burned. Scattered bunchgrass slopes would be burned to reduce sagebrush and tree encroachment by 40-60 percent, leaving a mosaic pattern. Timbered areas would be burned with varying degrees of expected mortality in the mature overstory ranging from <25 percent to <35 percent. Based on the literature review of the response of the spotted knapweed, houndstongue, rush skeletonweed and sulphur cinquefoil, infestations of these species would respond favorably to the prescribed fire treatments. Infestations would become more dense and set more seed as overstory cover is reduced. It can reasonably be expected that the number and size of infestations of houndstongue, sulphur cinquefoil and rush skeletonweed would increase.

Although existing roads within and between treatment areas would be used for containment lines as much as possible for the prescribed fire treatments, other containment lines would need to be constructed. These lines may consist of fuel breaks or traditional fire line construction approximately 18 inches wide with removal of all vegetation and other fuel down to mineral soil. ATVs with small plow attachment or small track-mounted excavators with less than 9-foot width would be used where terrain and soil surface conditions allowed efficient construction. Construction of these containment lines would contribute to noxious weed establishment and spread without careful adherence to noxious weed prevention best management practices for fire suppression. These practices would consist of minimizing the amount of line construction, cleaning and inspecting line construction equipment before use and before moving from one location to another, avoiding line construction through noxious weed infestations to the extent possible, and rehabilitating fireline as soon as possible (USDA Forest Service 2001).

In conclusion, implementation of the Proposed Action Alternative is likely to increase the overall presence and density of noxious weeds in the project area. The acreage infested by spotted knapweed is not likely to increase substantially as the entire project area is essentially impacted by spotted knapweed now. However, the density of spotted knapweed infestations would increase with soil disturbance and the increased solar exposure at ground level brought about by harvest and prescribed fire. Fortunately, this may be offset by the fact that increased solar exposure would provide more ideal conditions for the establishment of insectaries of the knapweed root weevil. If these insectaries are protected from fire during implementation of the prescribed burning, insects would be available to colonize areas of dense knapweed occurring several years post-burn. Even though biological control would not eliminate spotted knapweed, widespread establishment of this biological control agent in the project area could keep the density of spotted knapweed in check. This would promote proper functioning of ecological processes and benefit native plant communities and wildlife species that depend on native plant habitats.

Any disturbance in riparian areas is likely to spread houndstongue, which would probably increase in acreage in the project area. This risk can be reduced if the forest chooses to fully and carefully implement noxious weed prevention best management practices.

Prescribed fire would potentially increase the risk of rush skeletonweed establishing in the project area. Nonetheless, this should not preclude project implementation since invasion by rush skeletonweed is

likely inevitable given the lack of effective biological control agents for this species and the current rate of expansion eastward from the large, unmanaged infestations to the west.

The adverse effects of project implementation to the current level of noxious weed infestations in the project area do not negate the need for the Proposed Action Alternative to manage fuels. The risks can be mitigated with careful adherence to noxious weed prevention best management practices. Adequate weed management resources combined with project implementation could improve conditions in the project area with regard to noxious weeds.

Cumulative Effects

Activities in the analysis area that have contributed to noxious weed spread and establishment include timber harvest and associated road construction and maintenance, mining activities, domestic livestock grazing, dispersed recreational use, off highway vehicle use and private land uses. Most of these activities serve as both a source of noxious weed introductions and as vector for distributing noxious weeds. They act as a source by bringing noxious weed seeds or other vegetative propagules into an area on vehicles, heavy equipment, in the hair, hooves or intestinal tracts of domestic animals, etc. (Harrod 2001). Once the noxious weeds are present in small amounts, they are easily spread by other means.

As discussed under Direct and Indirect Effects above, best management practices and design features of the Proposed Action Alternative would moderate the risk of increase and spread of existing noxious weed infestations in the project area. The results of fuels reduction activities in diminishing the chance of large wildfire would be beneficial effect to the management of noxious weeds in comparison to the high risk of spread from the No Action Alternative.

Table 13. Summary of effects to noxious weeds

Measurement Indicator	Alternative 1 No Action - Wildfire	Alternative 2 Proposed Action
Changes to existing weed infestations by plant cover density & distribution	6000 acres light to heavy coverage; widespread increase from fire effects & disturbance of suppression actions	Increase in presence and density on treated acres
Risk of an increase of weed infestation by new and existing species	Very high risk of enhanced weed spread with wildfire occurrence	Increase moderated by project design & prevention measures

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APPENDIX A - INTEGRATED DESIGN FEATURES AND MONITORING REQUIREMENTS

Mechanical Treatments

- Emphasis on large tree retention. Priority for leave trees would be largest diameter Ponderosa Pine (PP) and largest diameter Douglas-fir (DF), then largest diameter lodgepole pine (LP), insect and disease free, largest crown, trees with tallest height, straightest stem. Favor PP over DF where characteristics are similar, favor DF over LP where characteristics are similar and favor / enhance aspen wherever it occurs. Trees greater than 7.0 inches dbh would be considered commercial size. There would be no harvest in designated old growth retention stands.

- Whole tree skidding in tractor units and yarding of top slash in cable units (some exceptions) during commercial thinning to designated landings to facilitate biomass utilization of slash remaining on landings for both economic opportunity, reduction of material to be burned and subsequent smoke emissions. Delay handpile/slash pile burning and/or underburning until Oct 1 the year following thinning to allow chance for removal/use.

- Retain at least 5 tons/acre of downed woody material to meet Salmon National Forest Coarse Woody Debris (FLRMP pg. IV-17 to18) requirements for site productivity.

- No commercial harvest within Riparian Habitat Conservation Areas (RHCA) or Modified PACFISH RHCAs per PACFISH guidelines.

- The normal operating season for commercial thinning would be from July 1 to November 30 (inclusive) to minimize Ips beetle buildup in slash then spread to residual/adjacent stands (Contract Provision RO-CT6.45 Protection from Ins Buildup (11/98)).

- No logging camp to be allowed on National Forest lands, including within the project area.

- Fueling operations/storage would be governed by U.S.F.S Timber Sale Special Contract Provision CT6.344 Prevention of Oil Spills (Idaho Forests)(01/2001).

- Impact by skid trails on thinning units harvested during this project with conventional tractor operations would be limited to less than 10% of the area. Skid trail gradient would be limited to a maximum of 60% on quartzite landtypes and 45% on volcanic, granitic, sedimentary landtypes (FLRMP pg. IV-34). Skid trails rehabilitation and water-bar spacing would use the guidelines in the FLRMP (pg. IV-35). Water-bar skyline corridors in units with erosive soils.

- Fuels reduction work behind closure gates would be allowed in most locations during fall hunting seasons and other times during the operating season where closures are yearlong. Restrictions to operating season for commercial thinning east of Ditch Creek, and for mechanical thinning and vehicle access to parts of the West Fork of Hughes Creek during the general hunt season would be imposed to further provide for big game security and to avoid interference with elk migration to winter range. Existing closures to public travel throughout the project area would be retained for big game security.

- Snag retention guidelines as specified in the FLRMP (pg. IV-17) and other guides would be met through contractual provisions.

- FLRMP wildlife standards and guides for Management Areas 4A (pg. IV-110 to 112) and 5A (pg. IV-121) would be incorporated in thinning and prescribed burn prescriptions with emphasis on big game security and cover requirements, key big game winter range, unique habitats, ridgetop ecotones, and habitats for special status species and other forest associated wildlife species. Restrict harvest and human disturbance activities within 0.5 mi radius of raptor nests until times when inactive. In the event a goshawk territory is located, appropriate management prescriptions would be used to maintain the nesting habitat characteristics of the stands surrounding nest sites and alternate nest sites (ie, 6 nest sites where each site is 30ac, for a total of 180ac). Recommend retaining 1-2 slash handpiles per acre for habitat diversity in select units.

- Avoid or protect identified heritage sites, rangeland improvements (fences, water developments, cattleguards, and exclosures), special use water pipelines and phone lines, and trailhead facilities and Granite Mountain Lookout.

- If unanticipated heritage resources are discovered during project implementation, all work in that area would cease and the North Zone Archaeologist would be notified within 24 hours to assess the significance of the find and the need for further consultation with SHPO and/or appropriate tribal parties.

- Thinning and prescribed burn activities would be coordinated in the advance of each operating season with private land holders, concerned residents, ID Fish & Game – avoidance of wolf den sites and management activities (trapping); Outfitter/Guides – spring and fall activities; grazing permittee – scheduled pasture use.

- For safety of public and project area residents, post appropriate signs to warn of logging activities, traffic and hazards with prescribed burning.

Prescribed Burning

- Approximately 50 to 80 percent of the surface is expected to be burned. Scattered bunchgrass slopes would be burned to reduce sagebrush and tree encroachment by 40-60 percent, leaving a mosaic pattern. Timbered areas would be burned with varying degrees of expected mortality in the mature overstory ranging from <25 percent to <35 percent.

- Dozer constructed firelines would not be used. Existing roads within and between treatment areas would be used for containment lines as much as possible. Other containment lines as needed may be constructed. These lines may consist of fuel breaks with no traditional fire line construction, or traditional fire line construction approximately 18 inches wide that includes removal of all vegetation and other fuel down to mineral soil. ATV with small plow attachment or small track mounted excavator less than 9 ft width would be used where terrain and soil surface conditions allowed efficient construction of 18 inch wide containment line. Fireline constructed parallel to water courses would be avoided. Hose lays and wet line are the preferred containment method. If traditional fire line construction is used, Minimum Impact Suppression Techniques would be used. All firelines would be rehabilitated by water-barring and pulling in debris as available.

- Methods of ignition would include aerial ignition using helitorch or Plastic Sphere Dispenser, and hand ignition with drip torches or fusees. Strategies would include strip head fire, backing fire and jackpot burning. Multiple entries would likely occur during the life of the project to meet objectives. Ignition in filter strips would likely occur if the risk of damaging

the filter strip values as defined in the FLRMP (pg. IV-57 to 61) is less than allowing a backing fire in the same area. Backing fire would be allowed in filter strips where the risk of damage is low at the recommendation of the Burn Boss. To maintain water quality, no ignition material, such as helitorch gel, drip torch fuel, or plastic spheres would be allowed in stream courses or areas of standing water.

- Hand piles along Hughes Creek and Ditch Creek road corridors and slash piles in skyline units would be available for biomass use until October 1 the year following thinning. Prescribed burning of these units and/or piles would occur after this period.
- Aviation management-helicopter use would be managed from the North Fork Fire Station Helipad, Trail Gulch trailhead along Highway 93 corridor or the Salmon Helibase.
- Idaho/Montana Airshed Group operational plan would guide smoke management.
- Prescribed burn plans and water source use would follow mitigation measures stated in the Programmatic Biological Assessment for Fire Suppression and Prescribed Natural Fire Activities in the Upper Salmon River Sub-basin (USDA Forest Service, 2002).
- Protect / avoid recent releases sites of insects for biological control of noxious weeds.
- Avoid burning sensitive plant species during spring flowering period in limited locations where known to occur.
- Retain at least 5 tons/acre of downed woody material to meet Salmon National Forest Coarse Woody Debris (FLRMP pg. IV-17 to18) requirements for site productivity.
- Access would be compliant with the Salmon National Forest Travel Management Plan (1988) and future revisions.
- Coordinate activities with companion treatments that may occur on private lands. Provide notification of prescribed burning activities to local newspapers, radio stations, fire departments, sheriff's department, permittees, outfitter-guides and concerned residents.

Roads

- Ditch Creek Road bridge installation would follow mitigation measures stated in the June 9, 2005 Programmatic Biological Assessment for Stream Crossing Structure Replacement and Removal Activities Affecting ESA-Listed Species. The treated timber bridge structure would meet HS20-44 traffic loading, designed to pass 100-year flood flow and bank full heights between abutments without constriction. The design vehicle for this single lane bridge is a log truck
- Pre-haul maintenance would be conducted to restore the road to a suitable condition for the proposed activity and use objectives for the road. Work may include opening of closed roads, brushing and limbing encroaching vegetation, restoration or replacement of damaged running surface, and maintenance of the drainage system, including ditches, rubber water deflectors (including replacement with culverts), drain dips and template crowns or cross slopes. Slash from clearing of encroaching vegetation would be scattered to avoid adverse effects from burning.

- To minimize the potential effect of actions related to road maintenance, use, reopening, and closure during the project, the following protection measures for heritage resources must be followed. All ground disturbing activities such as vegetation removal, scarification, grading, and berming would be carried out entirely within the existing road footprint. Where vegetation removal in the roadbed is required to allow access, ground disturbance would be minimized by hand felling conifer regeneration and shrubs, and allowing only high blading. Sediment material for road closure berms must be taken from the existing roadbed or a pre-designated area and have no effect on known historic properties. All vehicles must remain on the road at all times. If any staging or storage areas must be established outside the existing roadbed, these areas would be situated within existing heritage inventory areas and the action must be determined through consultation with the North Zone Archaeologist to have no effect on known historic properties. Depending on the context of these locations and the scale of the proposed work, an on-site archaeologist may also be required to monitor the work.

- Magnesium chloride applications would be applied annually as needed during haul period to the Hughes Creek road from Hwy 93 up to Salzer road junction, and on the Ditch Creek road up to the Granite turnoff for dust abatement around private land, facilitate maintenance and reduce need for continuous water applications. Water rights would be obtained by the Forest before any water drafting for dust abatement occurs. Magnesium chloride applications would follow the standard operating procedures as identified in the May 24, 2002 Roads Programmatic BA (USDA Forest Service, 2002b) and the August 7, 2008 Monitoring Report for Salmon-Challis National Forest Dust Abatement Operations (USDA Forest Service, 2008b).

- Travel routes to be used during prescribed burning would be the existing road system as managed for access for mechanical thinning. No additional routes would be developed or opened.

- Post-activity maintenance would be done to return the road to the pre-haul condition and the established road objectives. The intent is to close roads that were to only be opened for timber hauling and associated fuels reduction activities and to correct any problems that result from the use of the road by the commercial user (i.e. ruts, wheel depressions, damaged structures etc.). Level 1 roads remaining on the Forest Service system would receive the following treatments upon completion of activities: Compaction of the road surface would be relieved and a seed bed prepared through either ripping or scarifying the road surface depending on the level of compaction. Natural slope drainage would be restored. Culverts would be cleaned or removed if replaced with driveable dips, and the road surface would be outsloped where feasible. The road surface would be revegetated using a native seed mix. Roads that are currently closed would be closed again after treatment; entrance would be gated, fenced or humped as appropriate.

- All current gates would remain in place and in their respective closure status as per the Forest Travel Plan. Contractor(s) would be responsible for opening and locking gates as passage is necessary. The same applies to prescribed burning activities. Gates or other road access control features would be utilized for temporary restriction of road use on routes that were previously closed, especially during hunting season.

Noxious Weeds

- Utilize USDA Forest Service Guide to Noxious Week Prevention Practices for all fuels reduction and project associated activities, for instance:

To prevent the spread and establishment of noxious weeds equipment would be cleaned before being used off road. Cleaning activities include power-washing of the undercarriage and tires of vehicles such that they are free of dirt and/or caked mud that may contain weed seeds. Cleaning must occur off National Forest lands. A visual inspection would be scheduled and completed by knowledgeable Forest personnel at a designated site prior to the proposed use and entry into the project area [Contract Provision BT6.35 – Equipment Cleaning (06/06)].

Monitoring:

Information gathered before, during and after implementation of activities is used to determine the effectiveness of the project's design and associated design features. This establishes a feedback mechanism so management can develop and employ an adaptive learning curve. Monitoring is done at recurring intervals as a basis for Forest Plan implementation. Project effectiveness monitoring is done by routine of sampling specific projects at specified time intervals. The activities associated with this proposed action would include the following additional monitoring:

- Down Woody Debris: During sale administration and follow-up prescribed underburning the amount of debris left in the mechanical treatment units needs to meet recommended minimum levels. Accomplishment of this activity would be by sale administration, fuels, or soils personnel.
- Northern Goshawk: Goshawk surveys for nesting activity and/or post-fledging habitat use would be accomplished during unit layout and administration of thinning and other fuels reduction activities. Recommended avoidance or buffer provisions would be applied when occupancy is found. Timber, fuels and wildlife personnel would accomplish this monitoring.
- Soil Disturbance: Post logging activity monitoring would be conducted to assure that detrimental soil disturbance in thinning areas does not exceed the FLRMP standard of 20 percent (pg. IV-59). Tractor landings would be ripped if monitoring results indicate detrimental soil disturbance in excess of the 20 percent threshold. Soils personnel would accomplish this monitoring
- Old Growth: Established protocols to assess stand composition, decadence, downed woody debris, and presence of old growth dependent wildlife species would be completed to evaluate the effectiveness of the treatments
- CO_2 and Smoke Emissions: Smoke dispersion would be monitored on burn days. If dispersion becomes unfavorable or impacting to local residents, the burn boss may terminate burning at his/her discretion.
- Heritage Resources: Monitor effectiveness of avoidance/protection of resources during prescribed burning. Periodic reports provided to SHPO.
- Noxious Weeds: Normal protocols for the North Zone Weed Management program of establishing permanent monitoring transects would be implemented to assess the efficacy of weed control treatments and track vegetative recovery and trend.

APPENDIX B – CONCERNS AND INDICATORS FOR NEPA ANALYSIS

The following are the primary resource concerns and indicators developed by the Interdisciplinary Team with Line Officer concurrence. The basis of these concerns were internal scoping, community meetings and collaborative group involvement (Lemhi County Forest Restoration Group) since the summer of 2006, and public scoping conducted in May 2007:

Fire and Fuels – Risk to Life, Property and Firefighter Safety:

There is a concern that current conditions (risk in not implementing the Hughes Creek Hazardous Fuels Reduction proposal) resulting in an uncharacteristic crown fire would threaten residents and private lands in Hughes Creek and adjacent Gibbonsville area. There is also a concern for the safety of firefighters called upon to protect people and their property as well as natural resources on National Forest lands.

Measurement Indicators:

- Fuel loading in tons/acre
- Crown fire potential expressed in acres at high to extreme risk
- Firefighter safety expressed in fire characteristic terms of fire type, spread rate and flame length

Air Quality and Smoke Management:

There is a concern that the proposed activities would produce a large amount of smoke and CO_2 emissions affecting the quality of life of residents during the 10-15 year project life. The Clean Air Act requires the Forest Service to comply with regulatory standards for smoke pollutants for maintenance of air quality and protection of human health

Measurement Indicators:

- PM 2.5 in Tons/acre
- CO2 in Tons/acre

Wildlife Species and Habitats:

There is a risk that implementing the proposed activities, or an uncharacteristic crown fire occurrence would affect big game species and their habitats and other wildlife habitats in forested ecosystems with old growth characteristics.

Measurement Indicators:

- Acres of big game security areas maintained in relation to hazardous fuels reduction treatments
- Cover/forage ratios in big game habitat
- Acres of habitat within designated old growth stands maintained

Water Resources and Aquatic Species and their Habitats:

Mechanical thinning treatments, road management actions and prescribed burning have the potential to adversely affect water resources by altering the timing and magnitude of flow and increase sediment

delivery to streams. This could adversely impact anadromous and non-anadromous fish species and/or their habitats.

Measurement Indicators:

- Modeled percent increase of erosion and sediment delivery
- Compliance with State Water Quality Standards and maintenance of beneficial uses
- Equivalent Clearcut Acres (ECA) in percent of watershed in ECA
- Road densities in miles per square mile
- Watershed risk rating
- Fish presence/absence and population densities and trend
- Stream habitat condition (large woody debris, pools and width to depth ratio)
- Stream sediment (percent fines by depth)
- Stream temperature
- Stream connectivity

Soil Resource:

There is a risk that implementing the proposed activities, or an uncharacteristic crown fire occurrence would adversely affect soil resources, land productivity and cause detrimental soil disturbances.

Measurement Indicators:

- Percent detrimental soil disturbances within a defined area (harvest treatment units).
- Average tons per acre of coarse woody debris retained within activity area (harvest treatment units)
- Percent total soil resource commitments within a defined activity area (project area including all harvest treatment units)
- Acres of treatment in areas with high to very high erosion hazard and very high mass instability ratings

Noxious Weeds:

There is a risk that implementing the proposed activities, or an uncharacteristic crown fire occurrence would affect the species composition, spread rate and plant density of noxious weeds in the project area.

Measurement Indicators:

- Changes to existing weed infestations by plant cover density and distribution
- Risk of an increase in extent or density of weed infestations by new and existing species within the project area.

Other Resource Concerns Eliminated from Detailed Study:

- **Forest Vegetation**-acres related to forest types, species composition, insect and disease risk, changes in vigor/health; volume and biomass were determined not key to the analysis and decision to be made.

- **Roads and Public Access**-changes were minimal within the context of the proposed action and no action, so detailed comparison was not needed for disclosure in the EA document. A Roads Analysis was conducted to inform and support the decision to be made (See Appendix D)

- **Heritage Resources**-fuels reduction activities as well as uncharacteristic crown fire pose risks to these resources. Standard operating procedures including consultation with the State Historic Preservation Office, and design features of the proposed action adequately address this concern eliminating the need for additional analysis.

- **Rangelands**-acres of riparian and upland resource affected by fuels reduction activities were determined not to be key to the analysis and decision to be made

.

APPENDIX C – HUGHES CREEK HAZARDOUS FUELS REDUCTION PROJECT – UNIT CARDS AND MAPS

- See Separate Appendix C Document -

APPENDIX D – SUMMARY OF ROADS ANALYSIS PROCESS

Summary of Roads Analysis
for Hughes Creek Hazardous Fuels Reduction Project

Currently, there are 68.80 miles of Forest System road in the analysis area.
- 33.19 miles of maintenance level 1(closed),
- 19.77 miles of maintenance level 2(high clearance),
- 15.84 miles of maintenance level 3(sedan).

Also within the analysis area, there are 63.63 miles of unauthorized roads,
- 8.47 miles of open roads and
- 55.16 miles of closed roads.

Under the proposed action, which is to add needed unauthorized roads to the Forest System, the analysis area would contain 117.62 miles of roads, of which
- 36.32 miles of open roads and
- 81.30 miles of closed roads.

Of the remaining unauthorized roads, 12.46 miles would be recommended for decommissioning and 2.3 miles would be removed from the unauthorized road list because they are on private land.

The resulting Forest road system would have a net gain of 48.82 miles of road,
- 48.11 miles of maintenance level 1 and
- 0.71 miles of level 2.

The net change of open roads in the analysis area would be -7.76miles. The net change of miles of closed roads would be -7.05 miles.

Table D-1. Summary of Road Status and Changes within Analysis (Project) Area

	Current (No Action)	Proposed Action	Net Change
Total OML* 1	33.19	81.30	48.11
Total OML 2	19.77	20.48	0.71
Total OML 3	15.84	15.84	0.00
Total System Roads	68.80	117.62	48.82
Total Open System Roads	35.61	36.32	0.71
Total Open Unauthorized Roads	8.47	0.00	-8.47
Total Open Roads	44.08	36.32	0.71
Total Closed System Roads	33.19	81.30	48.11
Total Closed Unauthorized Roads	55.16	0.00	-55.16
Total Closed Roads	88.35	81.30	48.11
Private Roads	2.30	2.30	0.00
Recommended Decommissioned		12.46	12.46

*OML = Operation Maintenance Level